

# Science in an Ecology of Achievement



*The First  
Paul F-Brandwein  
Symposium*

Copyright © 1998 by the Paul F-Brandwein Institute. This volume may not be reproduced in whole or in part in any form without written permission from the publisher. Requests for permission should be addressed to the Paul F-Brandwein Institute, RR 2, Dingmans Ferry, PA 18328. Telephone (717) 828-8953

Designed by Thomas Thornton

---

# Science in an Ecology of Achievement

The First Paul F-Brandwein Symposium

*November 13–16, 1997*



*Deborah C. Fort*

The Paul F-Brandwein Institute  
Dingmans Ferry, Pennsylvania

The First Paul F-Brandwein Symposium was made possible by a grant from the Brandwein-Morholt Trust.

The Paul F-Brandwein Institute is a project of the Pocono Environmental Education Center (PEEC) in cooperation with the Brandwein-Morholt Trust.

---

## Contents

- 3 Message from the Chairwoman  
The Paul F-Brandwein Institute
- 4 Message from the Executive Director  
The Paul F-Brandwein Institute: A Beginning
- 6 Mission Statement  
The Paul F-Brandwein Institute
- 7 Paul F-Brandwein (1912–1994)  
Author, Teacher, Scientist, Publisher,  
Conservationist
- 12 The Sites
- 14 The Paul F-Brandwein Institute  
First Meeting
- 17 Issues: Highlights
- 21 The Fellows and the Board  
The Paul F-Brandwein Institute  
1998
- 29 Issues
- 33 Paul F-Brandwein (1912–1994)  
Books at the U.S. Library of Congress



## Message from the Chairwoman The Paul F-Brandwein Institute

It may be of interest to learn how the Brandwein Institute was established. My husband Paul F-Brandwein and I, along with our friend, partner, and colleague the late Evelyn Morholt, had been planning for over 20 years to establish the Rutgers Creek Wildlife Conservancy in Greenville, New York. To that end, we had incorporated the Brandwein-Morholt Trust as a 501(c)3 nonprofit organization. Progress on the project slowed, however, when Paul died in September 1994.

In 1995, Evelyn suggested that we talk to Jack Padalino, president of the nearby Pocono Environmental Education Center (PEEC). Why Jack? Because he had known Paul, who had been one of PEEC's first trustees, over a period of many years, and we knew that Paul and Jack shared similar views on the environment, conservation, and education.

Jack agreed to help make our vision a reality. To that end, over the year, Jack brought two other friends of PEEC, Bill Hammond (Florida) and Alan Sandler (Washington, D.C.) to scout the property. They expressed admiration for its natural beauty and its possibilities for conservation education. In succeeding months, Jack brought several experts to look over Rutgers Creek. They included botanists/environmentalists Bill Olsen and Jim Montgomery; Alan Sexton, a water quality specialist; and Fred Tetlow, a New Jersey-based ornithologist. All four were struck with the property's beauty, and each found phenomena of scientific interest in his field. They admired its flora, fauna (at least 23 species of birds, for example), and invertebrates, and looked with interest at the water flow, algae, and water marks of the stream.

Jack also brought international visitors from the former Soviet Union to the property. On one occasion, a group of Russian teachers came to the Conservancy; on another, 10 Russian children; on a third, Russian scientists. At another time, several Junior Natural Scientists came to help Fred set out 10 bluebird boxes.

In the meantime, Jack assembled a group of distinguished advisors to plan future activities at Rutgers Creek. Joining Bill [Hammond], Alan [Sandler], and Jack in this capacity were Dean Bennett (Maine), Marily DeWall (Washington, D.C.-area), and Keith Wheeler (Vermont). We met once in 1995 and four times a year since then. In 1996, the advisors decided unanimously to locate the Paul F-Brandwein Institute on the grounds of the Conservancy. And lo, the Institute, a joint effort of the Brandwein-Morholt Trust and PEEC, was born. The advisors became board members, and PEEC received an endowment for an annual Brandwein lecture series. (Two talks have been delivered, and the third will take place in April 1998.) In 1997, Dave Foord was hired as assistant director to Jack (executive director), and the Paul F-Brandwein Institute convened 17 scientists and teachers to Milford, Pennsylvania, as newly selected fellows. From November 13 to 16, 1997, the Institute fellows met with six of seven members of the Brandwein board for a planning session. This document describes their progress.

It is my hope and expectation that, in the near future, Paul's dream of a viable conservancy serving children, teachers, and scientists interested in and committed to a thriving environment will come to fruition.

—*Mary Brandwein*



## Message from the Executive Director The Paul F-Brandwein Institute: A Beginning

Reflecting the wisdom and vision of Paul F-Brandwein, the Institute named for him is dedicated to the education of teachers and students in recognition of their responsibility for sustaining a healthy and sanative environment. To perpetuate his legacy, the Pocono Environmental Education Center collaborated with the Brandwein-Morholt Trust to establish the Paul F-Brandwein Institute. Institute programs encourage an ecology of achievement where students and teachers can discover and develop gifts and talents in science and the humanities and express them in meaningful work.

Institute programs will foster the skills, concepts, and values of the sciences and the humanities that form the basis for environmental decision making in the context of global citizenship. To foster learning about the environment and conservation, the Paul F-Brandwein Institute will serve students, scientists, teachers, and teachers of teachers.

### *Conservation*

The Institute will conserve the ecosystems, habitats, niches, and their constituent flora and fauna within the Rutgers Creek Wildlife Conservancy, a central area of 77 acres of generalized deciduous woods interlaced with

tributary brooks feeding a creek (Rutgers Kill, within the township of Greenville, New York).

The Conservancy forms a clearly delineated ecosystem appropriate for teaching and experimental study of the area. A partial catalog of terrestrial and aquatic animal

species (some 760 have been observed in numerous field trips and microscopic studies over the recent years) indicates that, because the woodlands and waters are exemplary of northeastern deciduous forests, they offer a fit teaching and learning environment. In addition, the

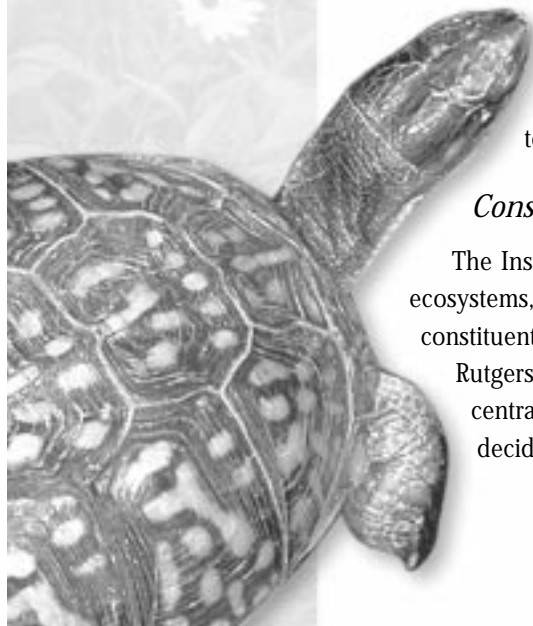
*The gifted in science and mathematics—even as the gifted in athletics—require special opportunity to develop their gifts. Eventually, we shall come to know and practice what is becoming obvious: Given the fact of great variety in ability in the young, special opportunities as well as equal opportunities are to be afforded to all. . . . Nothing is so unequal as the equal treatment of unequals.*

— PFB, 1981

Conservancy and the 123 acres of meadows and woodland that protect it from further development are within the eastern fly route of diverse species of birds. This ecosystem is an excellent site for observation and study by teachers and their students. It offers a base for a series of demonstration field trips and lectures to teachers, students, and the general public.

### *Research in Teaching and Learning*

Paul F-Brandwein Institute advisory board members, Brandwein fellows, teachers of teachers, and scientists will eventually use the Conservancy of the Brandwein-Morholt Trust for a summer school devoted to teaching research practices of selected biological and environmental sciences to high school







students inclined to explore them. The Institute will develop formal teaching and learning experiences in conservation of eastern deciduous ecosystems. Teachers and students who wish to conduct research and science clubs will also be welcome.

### *Teaching*

Over time, the Institute will develop a formal teaching facility given over to the education of teachers and students in the principles and practices of modern theory and practice in the ecology of Rutgers Creek.

—John Padalino  
President

The Pocono Environmental  
Education Center

### *Students*

*...Once equality of educational opportunity is safeguarded for all, the young can be trusted to fulfill their special powers in the pursuit of excellence.*

*Thus both difference and likeness will become precious...*

*When they do, we shall outwit time.*

—PFB, 1981

### *Teachers*

*As teachers, we enter the minds of others; thus we live in eternity. We help others live better lives, thus teaching remains a mercy.*

—PFB, 1983





## Mission Statement

### The Paul F-Brandwein Institute

Reflecting the wisdom of Paul F-Brandwein—author, teacher, scientist, publisher, conservationist, and humanitarian—the Paul F-Brandwein Institute dedicates itself to the education of future leaders and their recognition of human interdependence with the rest of nature and of human responsibility for maintaining a culture that sustains a sanative environment, one that is healthy and healing. In collaboration with the Pocono Environmental Education Center (Dingmans Ferry, Pennsylvania), the Brandwein-Morholt Trust, working through the Paul F-Brandwein Institute, offers programs that nurture the developing gifts and talents of all learners at all levels. It helps all learners who approach acquire the knowledge, understanding, skills, concepts, values, and habits of mind in science and humanities that lead to the formation of meaningful, sustainable, symbiotic relationships between humans and their environments, defined in the broadest sense. The Paul F-Brandwein Institute aims, with René Dubos, to “Think globally and act locally.”

Located at the Rutgers Creek Wildlife Conservancy

(Greenville, New York) and Loch Lomond Farmstead (Pike County, Pennsylvania), the sites of the Paul F-Brandwein Institute model sensitive, caring relationships between nature and humanity in regions facing growing population pressure.

### *Structure*

The Brandwein-Morholt Trust (Greenville, New York) was established as a 501(c)3 organization in 1994 by Paul F-Brandwein, his wife, Mary Brandwein, and their colleague and friend, Evelyn Morholt. In conjunction with the Pocono Environmental Education Center (Dingmans Ferry, Pennsylvania), the Trust supports the activities of the Paul F-Brandwein Institute (Loch Lomond Farmstead, Pike County, Pennsylvania) to encourage teaching and learning about the environment nationwide. Trust programs advocate careful stewardship of the lands in the Rutgers Creek Wildlife Conservancy in Greenville as an exemplar for environmental education everywhere. While the Paul F-Brandwein Institute programs focus on conservation



education at the precollege level, they also serve other lifelong learners. The trust encourages the development of mentor programs that link students, teachers, teachers of teachers, and scientists in in-depth teaching and learning about, study of, and care of the environment. The Trust supports ecologies in which scientists of today and tomorrow can work and thrive.

## Paul F-Brandwein (1912 – 1994)

### Author, Teacher, Scientist, Publisher, Conservationist

Born an Austrian, Paul F-Brandwein emigrated to America before World War II. A profoundly modest and private man in his personal life, PFB came nonetheless to be professionally at home at podiums and in laboratories, in classrooms, in the board rooms of the publishing industry, in scientific societies, and in education associations. During the course of his long, distinguished, varied career, he worked productively as a scientist, an author, an educator (grade school to graduate school), an editor and publisher, and a conservationist. In the service of science and education, he delivered almost a thousand speeches to audiences worldwide.

PFB's wide-ranging publications concern the humanities, science, and education. His



first book of more than 50 in several languages, *Manual of Biology* (with Douglas Marsland [Holt]), appeared in 1939. His last book, *Science Talent in the Young Expressed Within Ecologies of Achievement*, was published posthumously by the National Research Center on the Gifted and Talented (Storrs, Connecticut). In addition, he was author and/or coauthor of many research papers in science and science education, particularly in relation to the

science shy, the science prone, the science talented, the gifted, and the disadvantaged. He also published widely in the humanities and the social sciences.

Although childhood arthritis cut short PFB's formal piano studies, as many of his listening audiences would later testify, he never gave up the piano as avocation. He often punctuated his talks by sitting down to the keyboard to emphasize the analogies among music, science, art, and teaching and learning.

As a young man, while being treated in hospitals, PFB became interested in science, and his professional focus changed from piano to biology. Shortly thereafter, a hospital chemist sponsored PFB as an assistant in the Littauer Pneumonia Research Laboratory (New York). While working at Littauer during the 1930s, PFB completed his bachelor of science, Phi Beta Kappa, from New York

*Speaking at the first meeting of the Paul F-Brandwein Institute on the subject of "Remembering Paul Brandwein," PFB's acquaintance of 30 years Professor Emeritus Calvin W. Stillman (Rutgers University) noted that "Paul was a folk hero to science teachers. As with most folk heroes, his origins are obscure." While regretting that his contact with PFB had been limited, Stillman summarized, "I have the utmost admiration for Paul. He was one of the greatest people in my life and a very great man of our time."*



*Lawrence Rockefeller, Lady Bird Johnson and Paul F. Brandwein*

University by taking night, afternoon, and summer classes. During those years, he was cited as a coauthor on several research papers.

Thus, before beginning his doctoral studies, PFB spent four years observing and assisting in research on the biochemistry of *Pneumococcus*. His practical experience at Littauer in what he would come to call “the well-ordered empiricism of research” (including the processes and protocols of problem finding and solving) focused on the microecology of protists and the ecology of host-plant fungus relationships. By the time he earned his master’s (1937) and doctorate (1940) (both also from New York University),

PFB had come to a belief based in his own experience that would be life-long: The best way to encourage the young in science was to help them early to do original work. And the best way to help that happen was through mentoring.

After the war, in the late 1940s, PFB and his wife Mary moved into the Orange County historic farmhouse where they lived for most of the rest of their lives.

Although professional demands would in the future frequently take him away from Sun Hill Farm, it was to this haven of

pastoral and forested lands that he would always return. There, on the surrounding acres, PFB established extensive gardens and an arboretum and continued his botanical research on rusts and smuts.

PFB first taught at George Washington High School. Later, between the early 1940s

*In 1986, the National Science Teachers Association gave PFB its highest honor, The Robert H. Carleton Award for National Leadership in Science Education, praising him as follows:*

*Dr. Brandwein is known first as a teacher, then as a scholar, writer, and international leader in education. His creative, insightful, energetic gifts are known the world over through almost one thousand eloquent speeches, dozens of textbooks, films, articles, and scholarly writings, and countless studies.*

*He has been a major leader and contributor over some 40 years to the guidance of generations of children in their understanding of the major concepts of science through his many series of textbooks. His eloquence as a platform speaker, delivering powerful ideas with grace to teachers, supervisors, administrators, as well as superintendents of schools, has conveyed an urgency for competence and compassion in providing opportunities for all youngsters, however diverse their talents and special needs. His qualities of selfless quiet service and commitment are well-known in the community of science educators...*

*Paul F. Brandwein has had a positive and pervasive influence on our profession and children throughout the world. Thus, the profession of science teaching will be enhanced by the widespread recognition of a man who embodies the standards of excellence to which we all aspire.*

and the mid-1950s, he served as a member and later as chair of the science department at Forest Hills High School. At Forest Hills, PFB instituted a program where students could select themselves to do original work in science. According to a colleague, more of PFB's early students—who studied in a heterogeneous American public school, not a specialized one training mathematicians and scientists—won the Westinghouse Science Talent Search than those of any other teacher.

The research PFB completed on students' progress in science came out in 1955 as *The Gifted Student as Future Scientist* (Harcourt, Brace, republished by the National/State Leadership Training Institute on the Gifted and the Talented, 1981).

Until the National Science Teachers Association in 1989 published *Gifted Young in Science: Potential Through Performance*, PFB's 1955 volume was the only one available suggesting means to encourage students to develop gifts in science.

A stunningly gifted teacher and mentor himself, PFB was convinced by William Jovanovich that he could make a bigger difference in American education by writing and publishing textbooks than with individual students in individual classrooms, and he therefore turned to publishing in 1946. Before and during his development of curricula and instructional materials, PFB's publishing career was flourishing. He became president of Harcourt Brace Jovanovich's Center for the Study of Instruction (San Francisco) and its director of Research in Curriculum and Instruction; later, he was director and editor

in chief of the School Division; finally, he was co-publisher of Research-Based Publications. Among his most widely distributed books were those making up the series *Concepts in Science*, best-selling grade-specific texts published by Harcourt Brace Jovanovich that transformed the teaching of science in U.S. schools.

*The role of the warm mentor is fundamental in Paul's work. The younger person has to identify himself, and once he does so, the mentor is the strong person who helps the young one to find out [through original work] what it means to be a scientist. For Paul, science was the system of constructing a hypothesis and testing it carefully, with no sense of failure if the hypothesis turns out to be wrong.*

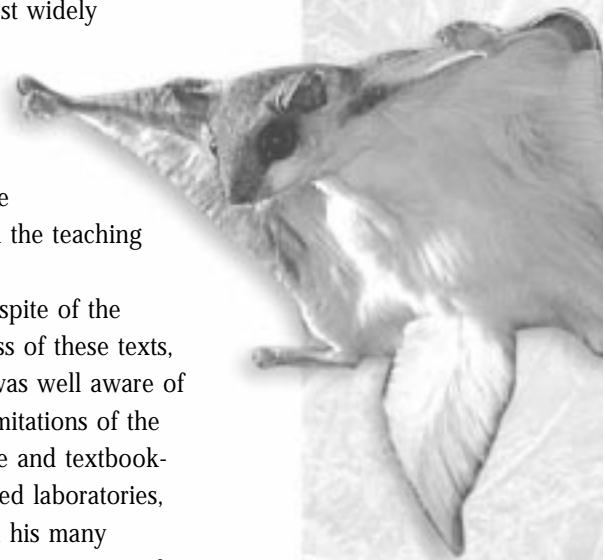
—Calvin W. Stillman

In spite of the success of these texts, PFB was well aware of the limitations of the lecture and textbook-oriented laboratories, which his many classroom visits taught him were the norm in American science education.

Partially because of this concern, in the late 1950s and early 1960s,

he joined other scientists and educators nationwide on the Sputnik science project, which worked to change science education in response to that "educational crisis"—one, PFB dryly noted, of a continuous and recurrent series. He served on the Steering Committee of the Biological Sciences Curriculum Study (BSCS), as chair of its Gifted Student Committee, and as consultant to the Physical Science Study Committee (PSSC). These three committees developed programs of what PFB called "originative" inquiry designed to interest high school students in science.

Profoundly committed to the American vision of education for all and considering the equal treatment of unequals both unfair and absurd, PFB worked especially to improve circumstances for the two groups of children whose needs he felt were most neglected—





*Paul F-Brandwein in the classroom.*

the disadvantaged and the gifted. “We do pretty well for the 80 percent of the students in the middle,” he once said. “But the 10 percent at the top and the bottom: We grind them under our feet!” The cornerstone of his philosophy was deeply democratic: He believed all young should be given equal access to opportunity, so that those who freely chose, not those who tested high, could select themselves for the original work, through which—in science as in any field—they could discover their talent. “One is not gifted,” said PFB, “until one has given a gift.”

Believing, as he put it, that “the value of a person’s advice about teaching is inversely proportional to the square of the distance he or she is away from the classroom,” PFB visited hundreds of schools in America and on four other continents to observe teaching and learning firsthand. Over a third of a century, making an average of 36 school visits per year to observe and investigate classes in about 1,000 schools, he clarified his conception that the best education takes place when an “ecology of achievement” results as “the school-community ecosystem acts in mutualism with cultural and university

## Concepts in Science

*Paul was integral to creating the science series—Concepts in Science. To this day, [I] remember the book emblazoned with his name—Paul F-Brandwein. The series took on special meaning because it offered the novice teacher a hands-on investigative approach. This science series was more than just teachers' and students' editions for various grade levels—leaving teachers to navigate their ways through the pages unassisted. No! Concepts in Science was a premier series with all the necessary tools, materials, instructions, rocks, minerals, fossils, chemicals, beakers, plastic tubing, measuring devices, etc., to turn traditional elementary classrooms into scientific laboratories. The laboratory atmosphere that Paul knew so well was now available to all who accessed the well-designed, forward-thinking science series . . . The large closet-size cabinets and small table top compartment in green and purple will never be forgotten because they held the tools and keys to experience the wonderment of science. Students would think and act like professional scientists as they hypothesized and conducted experiments. Science went beyond words on paper—it was what it should be.*

— E. Jean Gubbins, 1996  
The National Research Center on  
the Gifted and Talented (Storrs,  
Connecticut)

ecosystems.”

PFB's research in this area culminated in *Memorandum: On Renewing Schooling and Education* (Harcourt Brace Jovanovich, 1981). There and throughout his career, PFB

emphasized that “education” is made up of much more than “schooling,” noting that he rarely found an effective school in a poor neighborhood or a severely flawed one in an affluent area. Failed educational ecologies, he noted, should not be blamed on teachers, continuing,

*We ask of them... everything.  
We pay them... nothing.  
And we give them...  
dark and dreary scoldings.*

Though not formally professionally affiliated with a single college or university, PFB was no stranger to higher education, speaking, consulting, and teaching at many graduate and undergraduate institutions nationwide and internationally. Out of his lifelong interest in conservation, he became education director and, later, co-director of the Pinchot Institute for Conservation Studies at Grey Towers in Milford, Pennsylvania (1954 to 1966). Its proximity to the Brandwein home and property in nearby Greenville, New York, probably influenced

PFB only minimally to take these posts. His commitment to conservation was lifelong, and he was one of the world’s first long-distance commuters, travelling nation and worldwide as a matter of course generations before such mobility became the norm.

He and his wife long planned to bequeath their property (as the Rutgers Creek Wildlife Conservancy) to an organization committed to students, teachers, scientists, historians, staff, and volunteers interested in the environment

and natural systems. The Brandwein-Morholt Trust (see page 14 on Evelyn Morholt, a friend and colleague of the Brandweins) was formed after PFB’s death to administer the Conservancy through affiliation with the Pocono Environmental Education Center (Dingmans Ferry, Pennsylvania).

PFB’s biography appears, among other places, in *American Men and Women in Science*, *Who’s Who in the Humanities*, and *National Leaders of American Conservation*. He was a member of Phi Beta Kappa, Sigma Xi, and of the New York Academy of Sciences. He was also a fellow of the American Association for the Advancement of Science and a life member of the National Science Teachers Association. His awards include several honorary degrees and many citations and honors from organizations

devoted to science, the humanities, and teaching.

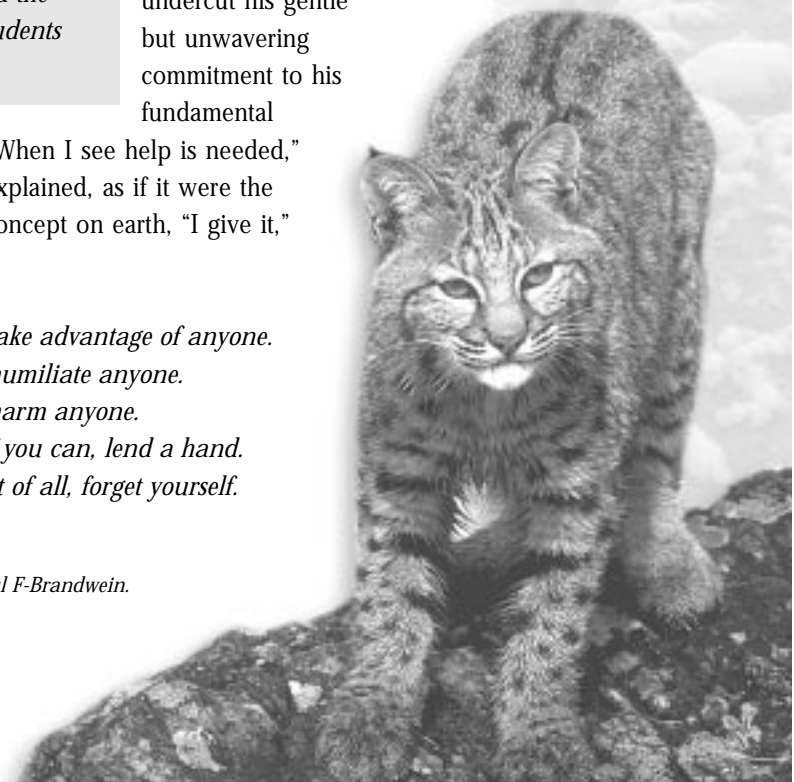
PFB’s sense of humor and humility informed his refusal to lecture rather than to teach but did not undercut his gentle but unwavering commitment to his fundamental

*Stillman remembers that PFB’s visits to schools and science teachers again and again saddened him that the teachers had so much to do—run lunchrooms, monitor halls, oversee recess, fill out forms—that they had almost no time to live, much less to do their own work. In the welter of demands, they rarely had the time to give specially interested students the care they needed.*

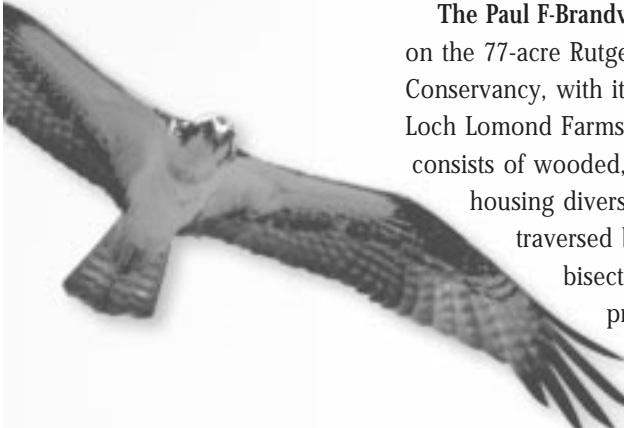
mission: “When I see help is needed,” he once explained, as if it were the simplest concept on earth, “I give it,” adding,

*Never take advantage of anyone.  
Never humiliate anyone.  
Never harm anyone.  
And, if you can, lend a hand.  
Hardest of all, forget yourself.*

*Special thanks to Dr. Calvin W. Stillman for his biographical research of Paul F-Brandwein.*



## The Sites

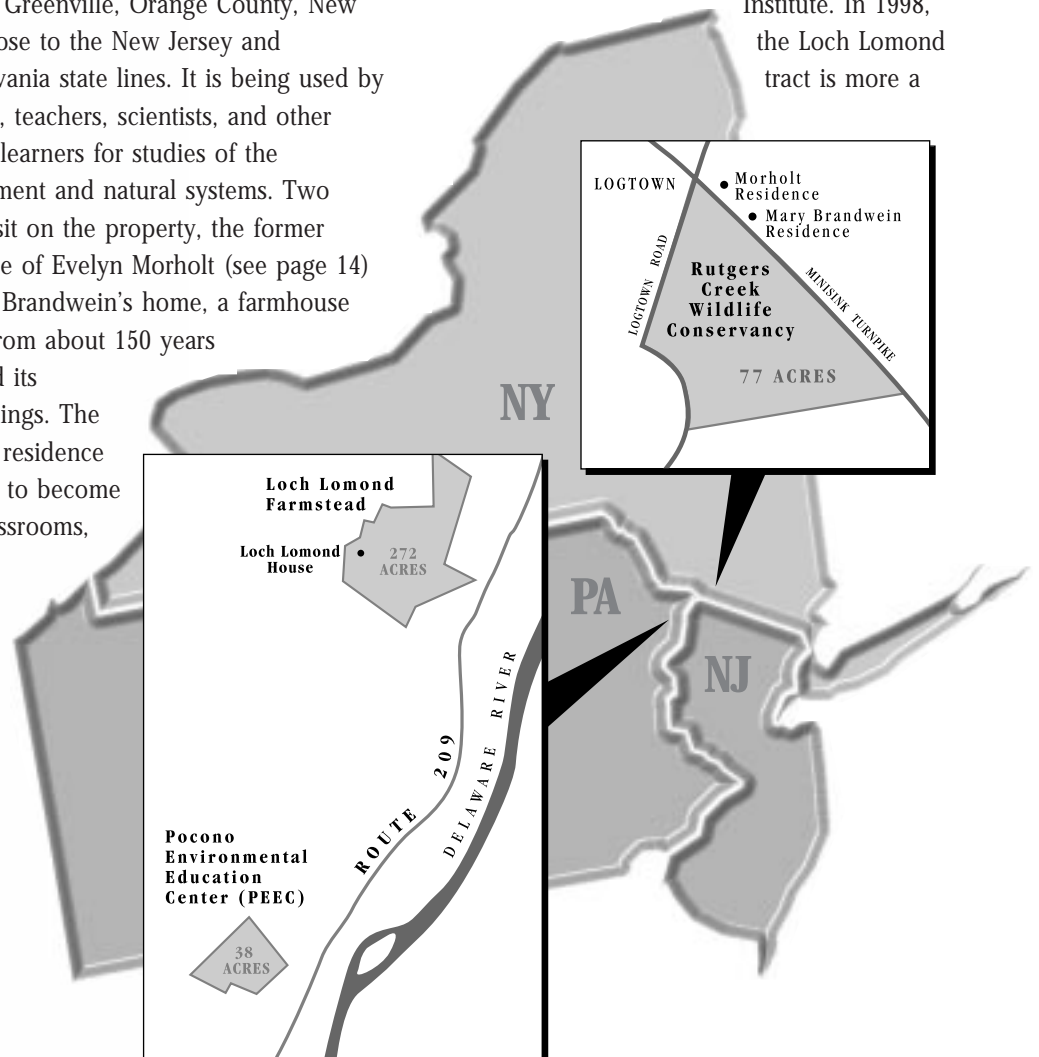


The **Paul F-Brandwein Institute** is located on the 77-acre Rutgers Creek Wildlife Conservancy, with its offices on the nearby Loch Lomond Farmstead. The Conservancy consists of wooded, old field succession housing diverse wildlife habitats traversed by stack stone walls and bisected by Rutgers Creek. The preserve is surrounded by active dairy farms and growing residential development in the rolling wooded hills in the town of Greenville, Orange County, New York, close to the New Jersey and Pennsylvania state lines. It is being used by students, teachers, scientists, and other lifelong learners for studies of the environment and natural systems. Two houses sit on the property, the former residence of Evelyn Morholt (see page 14) and the Brandwein's home, a farmhouse dating from about 150 years ago, and its outbuildings. The Morholt residence is slated to become field classrooms,

libraries, and laboratories for the Brandwein Institute.

The **Loch Lomond Farmstead** (272 acres in Pike County, Pennsylvania, on National Park Service land) was by 1935 primarily farmland. In that year, it was developed as a summer residence, but had reverted to agriculture 10 years later. The one-story summer house, which faces northwest overlooking the pond, survives, as does much of the landscaping, including stone walls, a line of Norway spruces, and built-in steps. The house has become the offices of the Brandwein

Institute. In 1998, the Loch Lomond tract is more a







*Loch Lomond  
Professional  
Development Center*

summer retreat than active farmland.

Both sites are administered by the **Pocono Environmental Education Center (PEEC)** (Dingmans Ferry, Pennsylvania), the Western Hemisphere's largest residential environment education center. Its 38-acre campus houses 54 post World War II structures, which sit on the escarpment of the Pocono plateau. PEEC has served over half a million people over the last quarter century. Established in 1972 and incorporated in 1986, PEEC is a partner with the National Park Service. Surrounding parklands—along with those of the Nature Conservancy—offer visitors over a quarter of a million acres for study. PEEC, a nonprofit organization, serves more than 22,000 students—children, families, teachers, scientists, and other lifelong learners—annually.

Both PEEC and Loch Lomond are part of the 67,000-acre Delaware Water Gap National Recreation Area (so authorized in 1965), a distinctive combination of natural, cultural, and recreational features providing opportunities for public use and enjoyment in an increasingly urbanized region. Current geological theories suggest that changing climate conditions, bounteous forests, and plentiful and diverse plant and animal



*Russian exchange  
students at Rutgers  
Creek Wildlife  
Conservancy*

populations have made human habitation in the area possible since approximately 8500 BC. Approximately 40 miles of the exceptionally unpolluted Delaware River lie within its boundaries. Unique geologic and natural features in the Park form some of the best-known scenic landscapes in the northeastern United States and illustrate characteristic landforms and biotic areas of the Appalachian Mountains. The Park (elevation 500 to 1500 feet) contains many different kinds of habitats for plants, invertebrates, amphibians, reptiles, birds, mammals, and fish (several of whose survival is "of special concern"). The Park's mission is to provide outdoor recreation opportunities while conserving its natural, cultural and scenic resources by working cooperatively with surrounding communities and the public.

## The Paul F-Brandwein Institute First Meeting

Seventeen new fellows, the assistant director, and five board members of the newly formed Institute gathered November 13-16, 1997, at the Cliff Park Inn in Milford, Pennsylvania, for an intense four days of discussion, field work, and collaboration to begin to explore the nature of the mission of the Paul F-Brandwein Institute. Fellows also climbed into vans to begin to become familiar with the areas and institutions with which the new organization is directly or indirectly affiliated.

The Institute convened with an informal opening dinner session the 13th. The next morning, members travelled through the snow to nearby Grey Towers, the former home of pioneer conservationist Gifford Pinchot, which currently houses the Pinchot Institute for Conservation. There in the snow-covered Poconos, at the foundation where Paul F-Brandwein had served as education director and, later, co-director between 1954 and 1966, members heard reminiscences from Rutgers Professor Emeritus Calvin W. Stillman, a Brandwein acquaintance of some 30 years and a longtime volunteer at Grey Towers, which is now administered by the U.S. Forest

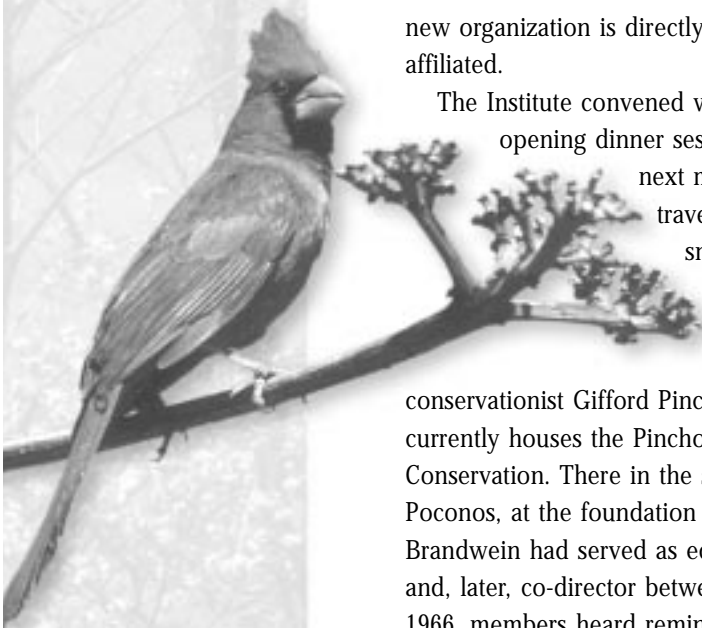
### *Evelyn Morholt*

*Evelyn Morholt (1914-1995), a former science teacher with PFB at Forest Hills, and an old friend of both Brandweins, bequeathed her residence to the Brandweins in 1994. The Paul F-Brandwein Institute plans to turn her house, which is close by the Brandwein residence, into a laboratory. Over the course of her long career, Morholt served as editor of The Teaching Scientist (Federation of Science Teachers, New York City), chair of a New York City high school science department, and acting examiner for the New York Board of Education. She wrote nine books used in the schools; the most recent (in 1986, with PFB) was A Sourcebook for the Biological Sciences (3rd ed.).*

Service. Stillman characterized PFB as a gentleman and a dedicated conservationist. He summarized what he saw as the heart of the Brandwein philosophy by quoting from one of PFB's last contributions:

*Wherever and whenever we find a search for truth, beauty, love, faith, and justice, then and there we find the human and the humane. Whenever and wherever this probe pervades the community of scholars, we transcend our biology. Then the humanities interpenetrate community and commonwealth and become the measure of the nobility of human existence and the high mark of our calling. Then we will find ourselves as compassionate as we are competent.*

Following a tour of the Grey Towers mansion and some scrambling about on the





snowy 102-acre grounds, members travelled to luncheon at the Evelyn Morholt residence and as much exploration of the 77-acre Rutgers Creek Wildlife Conservancy surrounding it as the melting snow permitted.

Institute members were joined for luncheon by Mary Brandwein, PFB's widow, who currently chairs the advisory board.

After lunch, fellows divided into three teams—one focusing on soils, one on ecology and wildlife, and one looking at interrelationships among processes, properties, and information—and went into the snow-covered fields and woodlands of the Rutgers Creek Wildlife Conservancy. These groups, with fluid memberships, would re-form during the course of the Institute as fellows visited various sites.

A full day ended with dinner back at Grey Towers. There, as snow continued to fall, Pinchot board members and Brandwein fellows mingled before dinner and a lecture on environmental law by Elizabeth Rieke, director of the Natural Resources Law Center, University of Colorado School of Law.

On the clear, cold morning the of 15th, the fellows piled back in the vans for a visit to

the 272-acre Loch Lomond Farmstead in Pike County, Pennsylvania. On the way, they stopped to slip down snowy steps to Raymond's Kill, a spectacular series of frozen waterfalls tumbling into a steep gorge. The summer house at Loch Lomond (built in 1936) houses the offices of the Paul F-Brandwein

Institute. With the Rutgers Creek Wildlife Conservancy and the Pocono Environmental Education Center's 38-acre campus, to say nothing of the 230,000-acre lands of the National

Park Service public land, and the Nature Conservancy, Loch Lomond provides another site for comparative environmental studies.

Before they redivided into teams to explore surrounding fields and hills with field monitoring equipment, participants gathered in the Brandwein offices to hear about the surrounding environment and its flora and fauna—introduced and native—from the National Park Service's Beth Johnson. While priorities change, Johnson listed her current four highest for the Delaware Water Gap area:

1. managing exotic species
2. protecting endangered species—mammals, reptiles, amphibians, birds, fish
3. maintaining water quality
4. facing landscape diversity issues

The needs of local communities, visitors, wildlife, and the environment need careful balancing, Johnson pointed



out. Hunting and fishing in the Park are legal with a license, for example. Farmers' wishes to drain swamps for pasturage must be considered as well as the need to maintain wetlands to conserve wildlife.

Following a brief exploration of Loch Lomond's surroundings, fellows went to the Pocono Environmental Education Center (PEEC) for lunch and a short debriefing session. After a quick tour of the PEEC campus, several of the fellows shared some of their most effective teaching strategies with the group. After dinner at a nearby inn, fellows gathered back by the fire at Cliff Park Inn to conclude the sharing session. All the teachers discussed how they based their teaching in surrounding ecologies, from areas as humble as the school parking lot to ones as unusual as cypress preserves and the Caribbean. Several fellows described their successes in working with students and insects, mammals, and fish. One teacher and his classes focused on monarch butterflies ("the whales of the insect world"); another had his students observe manatees; a third

taught her class about vertebrates by presenting each student with a canned sardine. The latter, who "teaches everything through science" in spite of the fact that her school's formal curriculum makes no room for it, concluded the sharing with this poem from one of her—supposedly—"ungifted" first graders:

*I wonder where the world came from.*

*Who makes the night?*

*What made that seem right?*

*Who makes the seasons*

*And what was the reason?*

*Who makes it dark and then makes it light?*

*Who melts the ice*

*And makes our world nice?*

*I wonder where the world came from.*

On the morning of November 16th, fellows convened in one of the cabins at Cliff Park Inn for a wrap-up and evaluation of the Institute's four days of meetings and explorations. On this session, see pages 17-20 and 29-32 of this report.



## Issues: Highlights

Paul F-Brandwein Institute fellows and board members came to consensus on 10 central priorities.

**1. The Institute will serve as a national center modeling techniques in local research.** It will provide introductions to field-based science. Teachers will learn how to meet long-term research needs while allowing learner-driven science. Through their work at the Institute, teachers will learn to address the ecologies of their local communities.

The Institute will create intimate—but transferable—knowledge of the Rutgers Creek Wildlife Conservancy and the Loch Lomond Farmstead into studies and presentations. It will support student-driven questioning and research in combination with specific local issues. It will encourage and focus on locally grounded environmental projects with

connections to national scientific projects. It will set focused projects in long-time horizons, simultaneously asking holistic, large-system questions and thoroughly investigating local places. It will use scientific strategies and approaches to develop transferable strategies for getting to know a specific locale.

**2. The Institute will serve teachers, students, and the surrounding community.** Institute programs will insure continuity by focusing its offerings on the needs of teachers and by encouraging the development of long-term mentoring relationships between teachers and scientists. Teachers come again, providing continuity, while students come and go; however, mentor-protégé bonds often transcend academic boundaries. The Institute will encourage teachers by enabling them to guide their students to analyze community issues and design research questions to solve problems. Critical to the Institute is the relationship between mentoring and citizenship.

The Institute will encourage students by creating a learner-driven program and a community of learners. Students at the Institute will do real science by generating their own questions and inventing methodologies that go beyond data collection. The Institute will help them to pursue their own interests within the research program by building their own experimental designs. It will empower them to learn on their own, challenging them to design their own investigations driven by local conditions or ecologies, and offering follow-up activities after they have left the sites.

### *Paul F-Brandwein on the Environment*

*A people—without a future—has no need to seek wisdom, has no need to change its behavior, has no need to maintain the “health of the environment.” This phrase, as René Dubos uses it, is no mere play on words, and it has more than a biological thrust. Man\* has made his environment as wide as the cultures which comprise the family of man. Indeed, man’s concept of environment is larger than the biological concept of earth, the physical concept of the world. Man now needs a larger mind to encompass this new concept of his environment. The cultivation of this larger mind is the function of education...*

—1970

\*Man...his...i.e. human throughout.

*With thanks for the contributions of Marily DeWall, Win Everham, Larry Peterson, and Keith Wheeler*



### *PFB on Confounding Schools with Education*

**S**chooling *attempts to transmit the concepts, values, and skills prized by a community acting under the constraints of public custom, rule, and law (local, state, and federal). Education, on the other hand,... affects all of life and living and comprises all influences, in school and out, that affect and effect changes in the behavior of the individual.*

*Specific communities get the kind of schools their economic and social conditions permit; it is simplism itself to blame schools for the plight of the community or of society.*

—1981

Students will be invited to come to the Institute asking questions and help them to leave with new ones.

Because schooling is but a part of education, the Institute will integrate its offerings with local schools and the community as a whole. It will build bridges between communities and schools by involving administrators—principals, superintendents, and the like—and parents. It will collaborate with schools and communities to develop programs in conservation

education. In addition, it will identify resources (including people) of the region to support training programs. Finally, it will balance the needs of the National Recreation Area with human needs and join some of the National Park Service's many ongoing projects.

**3. The Institute will make baseline studies of the lands making up the Rutgers Creek Wildlife Conservancy and the Loch Lomond Farmstead.** The Institute will compile a human and natural history of the

uses of these sites. It will gather data both from background sampling—changes in land use, patterns in the landscape, and managed regrowth—and from historic information. It will use the data collected as the basis for studies of individual organisms or species in relation to the environment. (For particulars see pages 29-30)

The Institute will, in some places, sustainably manage the land of the Rutgers Creek Wildlife Conservancy and the Loch Lomond Farmstead in the light of particular goals and experimental designs. In others, it will monitor change without intervention. Basing its studies on the fact that human systems and natural systems interact, it will examine current building and explore the possible need for further building on the sites.

In all cases, the Institute will ensure that people's needs are balanced with those of natural nonhuman ecologies and that the land serves both priorities in an age of worldwide pressure on resources. It will strive to reconstruct environments so that the land can heal itself.

**4. The Institute will give teachers on-site opportunities for professional development of varying durations.** The Institute will offer resident programs for teacher-student-scientist collaborations. In order to share information, it will provide teachers with access to scientists, teachers of teachers, and other mentors online and face-to-face. It will encourage mentoring by developing two-way mentoring relationships and finding local teachers who can work with other teachers and students. The Institute will encourage teachers to perform field research and to engage their students in data collection. It will offer them opportunities to appreciate the environment.

**5. Time frames for work at the Institute will vary with the programs offered.** The Institute will study issues that take a lot of time to investigate—for example, the consequences of pollution—as well as undertake short-term research projects. In its collaborations with the community, the Institute will take into account the fact that the schedules of outside agencies and institutions do not always jibe with academic calendars. The Institute will offer students and teachers both daylong field trips and extended residential studies.

The Institute will balance the need for long-term research with students' immediate needs. It will strive to achieve learner-driven science and will encourage a cross-disciplinary approach to the research program. Students will generate questions and protocols in order to conduct long-term basic research.

**6. The Institute will provide teachers, administrators, and curriculum developers with opportunities to create instruments to measure field-based learning and will evaluate alternative assessments and performance-based examinations.** It will follow PFB in asking

*What is it that is to be taught?*

*How is it to be taught?*

*To whom is it to be taught?*

*Where and when is it to be taught?*

*And, unalterably,*

*What proof is there that it has been taught?*

—1981

It will find ways to measure not only what students have learned, but whether their learning has had an impact on them, on their society, and/or on the environment.

**7. The Institute will promote certain scientific priorities to enhance teaching and learning science.** Programs at the

## *Working Together*

### *Teams*

*of two or more students*

*of students and teachers*

*of students, teachers, and*

*other resource providers*

*(local historians, National Park*

*Service personnel, scientists,*

*for example)*

*of teachers and administrators*

*of students, teachers, and parents*

*could help programs in environmental curriculum and instruction achieve continuity and support.*

—Suggestions from  
the Brandwein Fellows

Institute will follow the dictates of good science. Participants will design workable sampling plans. They will learn how energy moves along a landscape. The Institute will encourage teacher-facilitated, question-driven field science linking science investigations with real-world environmental issues. Participants will strive to understand how systems work and to learn what processes underlie systems thinking. They will remember that the whole—the system—may emerge piecemeal and that systems are more important than species.

The Institute plans to approach studies inclusively through a creative interdisciplinary methodology—including art, philosophy, literature, mathematics, and history as well as formal scientific study. It will work to forge connections between outside and inside and to view local conditions in relation to global issues.

**8. The Institute advocates certain methods of teaching and learning.** The Institute holds PFB's precept that no

## *PFB on Knowing*

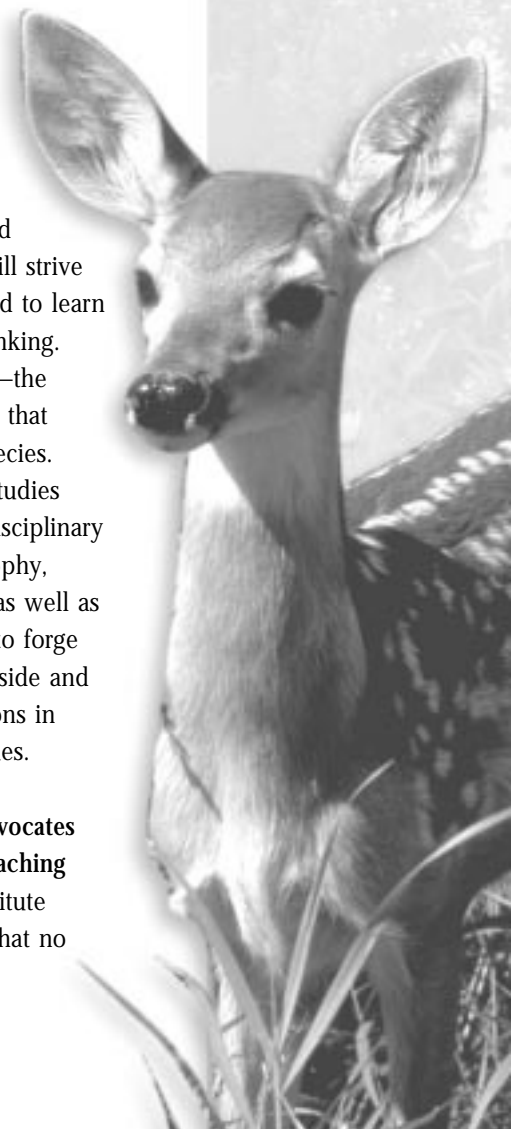
*What do you know?*

*How do you know it?*

*How well do you know it?*

*Is it true?*

*Is it kind?*





*PFB on the “Scientific Method”*

*Almost never in my personal work with some 26 scientists prior to teaching, with 14 more during the Sputnik crisis, and with the 354 young doing originaive research between 1944 and 1954, did I note their paths following the procession of steps of the so-called “scientific method.” On the other hand, often with Jerome Bruner’s “effective surprise” (1966), I saw brilliant mental breakthroughs . . . Percy Bridgman made this point decades ago when he wrote that the scientist, in attacking a specific problem, suffers no inhibitions or precedent on authority but is free “to adopt any course that his ingenuity is capable of suggesting to him . . . In short, science is what scientists do, and there are as many scientific methods as there are individual scientists” (1949).*

—1994

one is gifted until s/he has given a gift: We revere Einstein not for his IQ but for his wisdom, his humanity, and his theory of relativity; people in MENSA are significant only if they make meaningful contributions to society.

The Institute will identify the best teachers of teachers and give them opportunities to share their skills with others.

Programs at the Institute will proceed carefully and deliberately not precipitantly, following PFB’s advice to proceed “one obstacle at a time, one problem at a time, one facet at a time; not all obstacles, not all problems, not all facets” (1981).

- 9. The Institute holds certain practical goals.** Among its priorities are support for teaching about the environment in schools, using the Rutgers Creek

Wildlife Conservancy and the Loch Lomond Farmstead sustainably, encouraging mentors who can reach out to others, and broadening the scope of the Institute. This last goal will be accomplished by

- expanding the program strategically through selection and reinforcement over the next three to five years
- maintaining communication among the Brandwein fellows and board members
- using the Internet to create a listserv or Web page forum with discussions of reality-based problems
- holding more gatherings of Institute fellows on site and at professional meetings

**10. Future Institute projects will employ state-of-the-art technologies to monitor the environment and to collect, organize, report, and analyze data from field studies.** Students will use the same instruments as their teachers, scientists, mentors, and other professionals. Participants will share the data they collect with scientists, teachers, teachers of teachers, students, and other interested parties on the Internet. Participants will employ digital mapping technologies, such as Global Information Systems and other interfaces, including computer-assisted probes that monitor water quality, soil pH, and meteorological phenomena, to develop land use management/ habitat assessment at Institute field sites. This technology will engage learners in understanding the complex natural systems at work in the landscape.

*PFB on Pedagogy*

*Brandwein’s Rule #67: “The value of a person’s advice about teaching is inversely proportional to the square of the distance he or she is from the classroom.”*

## The Fellows and the Board The Paul F-Brandwein Institute 1998

**Richard W. Arnold**  
Fellow, Paul F-Brandwein Institute  
Special Assistant to the Chief for Soil Science  
Natural Resources Conservation Service  
U.S. Department of Agriculture  
Washington, D.C.

Richard W. Arnold, PhD in soil science, began his career in 1952 as a soil scientist with the U.S. Department of Agriculture Soil Conservation Service in Iowa. He was associate professor at the University of Guelph, Ontario, Canada (1963-1966) and professor at Cornell University, Ithaca, New York (1966-1979), where he guided research in pedology and taught courses in soil morphology, genesis, and classification. In 1979, Arnold returned to the Soil Conservation Service in Washington, D.C., becoming director of the Soil Survey Division and federal leader for the National Cooperative Soil Survey, positions he held until 1996 when he was appointed to his current position.

Arnold is an internationally known pedologist who has served as chairman of Commission V of the International Society of Soil Science (1982-1986) and as a member of its International Programs Committee and World Reference Base Working Group. He was on the Board of Trustees of the International Board for Soil Research and Management in Bangkok from 1988 to 1994, holds honorary membership in the soil science societies of Bulgaria, Romania, and the former Soviet Union, and is a fellow of the American Society of Agronomy and the Soil Science Society of America.

**Dean B. Bennett**  
Board Member, Paul F-Brandwein Institute  
Libra Professor  
Department of Education  
University of Maine  
Farmington, Maine

Since 1981, Dean B. Bennett, PhD in resource planning and conservation, has taught science education, social studies education, curriculum and methods, and other courses at the University of Maine at Farmington, which has honored him as a distinguished scholar and awarded him its Libra Professorship. Bennett is the author of many

articles and chapters of books on environmental education and educational evaluation. He has also written and illustrated three books for the general public—*Maine's Natural Heritage*, *Allagash*, and *The Forgotten Nature of New England*. Bennett is active in issues surrounding the preservation of wild areas in the northern forests of the northeastern United States and in the management of the Allagash River. For the Maine Bureau of Parks and Lands, he and his wife Sheila are inventorying natural areas and collaborating on a natural history guide to the Allagash Wilderness Waterway.

Bennett began his teaching career in the 1960s teaching high school industrial arts and Earth science and directing an adult education program. In 1967, Bennett received a one-year fellowship from the Ford Foundation's Leadership Development Program. He went on to develop a school/community environmental education program, which received federal funding and expanded across Maine, becoming a national demonstration program. During the 1970s, Bennett wrote and directed six statewide science, social studies, and environmental education projects, served in the Maine Department of Education, and wrote and edited a Maine studies textbook, which eventually was adopted by half the state's schools. He also went as an invited participant to the first world environmental education conference in Belgrade, Yugoslavia, wrote a teacher's guide for the United Nations Educational, Scientific, and Cultural Organization, and served as coprincipal investigator for the Maine School Science and Natural History Project, which was funded by the National Science Foundation.

**Daniel Bisaccio**  
Fellow, Paul F-Brandwein Institute  
Science Teacher  
Souhegan High School  
Amherst, New Hampshire

Since 1990, as head of Souhegan's Math/Science/Technology Division, Daniel





Bisaccio has been developing and implementing a districtwide program to meet the needs of students for the 21st century. Souhegan High School, now in its seventh year, has received a number of state and national awards for offering public school students authentic research and interdisciplinary opportunities in academic areas. During the same time, Bisaccio has also won several national awards for teaching. His work is cited in George Wood's *Schools That Work* (1993) and Robert Fried's *The Passionate Teacher* (1995). In addition, he received a Toyota TAPESTRY Grant for his project HabitatNet: A Global Biodiversity Monitoring Project.

As Souhegan's science coordinator, Bisaccio currently teaches advanced biology and a senior seminar on nature and literature. He has been teaching biological field research courses to high school students for over 15 years, developing field tropical ecology courses in Costa Rica, Belize, Jamaica, and Mexico. Over the years, he has taken over 200 students to the tropics. He currently involves student researchers in three permanent biological diversity monitoring projects in New Hampshire, Mexico, and Jamaica, West Indies. On these three projects, certified in 1996 as sites in the Smithsonian Institute's Man and the Biosphere Permanent Biodiversity Project, Bisaccio and his students conduct primary biological diversity monitoring research and submit annual field reports to the Smithsonian.

**Robert Williams Brown**  
Fellow, Paul F-Brandwein Institute  
Science Teacher  
The Wheeler School  
Providence, Rhode Island

Robert Williams Brown, who has completed extensive postgraduate work in natural history and teaching, has worked at the Wheeler School since 1977 teaching environmental science to ninth graders. Brown also teaches field ecology, animal behavior, field geology, natural history, and ornithology to 11th and 12th graders.

He was funded twice by Toyota TAPESTRY grants for his project, Whole Rivers, which integrated the sciences with history, law, and economics. Under Brown's direction, students in 12 schools adopted rivers in the Naragansett Bay

watershed and did comparative studies of their various rivers. For the Wheeler School's adopted river, the Runnins, Brown's students' raised over \$200,000 from Amway, NYNEX, and Seiko between 1990 and 1994. By studying river ecology, testing water quality, and observing watershed management practices, students came to understand what affects a river along its course and how they can, in turn, positively and sustainably affect the rivers.

**John M. Byrne**  
Fellow, Paul F-Brandwein Institute  
Project Director  
The Center for a Sustainable Future  
Shelburne, Vermont

John M. Byrne, who holds a master's degree in environmental law, has worked for the Center since 1997. For 10 years before that, as executive director of River Watch Network, a national nonprofit group he cofounded, he helped to establish, organize, and strengthen community-based watershed monitoring and protection programs, providing organizational and technical assistance where needed. As executive director of the Vermont Association of Conservation Districts from 1981 to 1986, he worked with a variety of partners to develop collaborative strategies and activities that result in community-wide participation in management of water and land resources.

Byrne serves on a number of federal, national, and local commissions and task forces on volunteerism, water advisory matters, environmental education, and conservation service.

**Marilyn DeWall**  
Board Member, Paul F-Brandwein Institute  
Associate Executive Director for Administration  
National Science Teachers Association  
Arlington, Virginia

Marilyn DeWall oversees several of the National Science Teachers Association's departments, including personnel, public information, advertising and exhibits, special projects, and awards and recognition. She also directs its Building a Presence for Science Program and many of its industry-sponsored programs, such as those affiliated with Duracell, Shell, Sears, Toshiba, and Toyota.

In addition, she has served as editor of various Association journals and publications including *Science Scope* (for middle and junior high school

science teachers), which she launched in 1978 and edited for nine years. She has been principal investigator for several National Science Foundation-supported programs, award programs, and student science competitions. She also directed the JASON Project curriculum effort from 1989 to 1994. She has planned and coordinated two international Association conferences, was instrumental in the formation of the Academy of Mexican Science Teachers, and serves on numerous advisory boards.

**Edwin M. Everham, III**  
**Fellow, Paul F-Brandwein Institute**  
**Assistant Professor**  
**Program Director of Environmental Studies**  
**Florida Gulf Coast University**  
**Fort Myers, Florida**

Edwin M. Everham, III, PhD in environmental and forest biology, currently teaches undergraduate field-based ecology courses. In the past, he has taught high school and community college classes in biology and chemistry and graduate-level courses in community ecology and systems ecology in five states, Puerto Rico, and Malawi, Africa.

Everham's research interests in forest ecology, particularly the response of forest ecosystems to disturbance, has led him to teach and study landscape climate patterns in the Adirondack Mountains, hurricane disturbance dynamics in the Caribbean, old field and fire succession in the Blue Ridge Mountains, and, most recently, the impacts of exotic invasion and removal in forested wetlands of Florida. On these projects, he worked with high school and undergraduate students, with whom he coauthored several manuscripts.

**David M. Foord**  
**Assistant Director, Paul F-Brandwein Institute**  
**Dingmans Ferry, Pennsylvania**

David M. Foord, MS in environmental studies, joined the Brandwein Institute as assistant director in 1997. Before coming to the Institute, he studied and worked in advertising in Philadelphia and New York. In 1988, he left the ad industry to pursue his interest in film, beginning in freelance film production and working as a production assistant and lighting technician on the sets of commercials, features, and video projects.

During his New York film career, Foord's continuing commitment to conservation led him to maintain a small orchard in nearby Burlington

County, New Jersey. Eventually, he also left the film business for a career in environmental education, first working as an intern at the New Jersey School of Conservation and then entering graduate school. He has spent the last four summers as assistant director of a wilderness camp in Maine.

**Deborah C. Fort**  
**Fellow, Paul F-Brandwein Institute**  
**Freelance Writer and Editor**  
**Washington, D.C.**

Deborah C. Fort, PhD, formally trained in comparative literature, is a Washington, D.C., writer and editor working primarily in the areas of science, education, and feminism. Before turning to publishing, she taught undergraduate writing and literature courses. Recently, she has written (or cowritten) numerous papers and conference proceedings and edited (or coedited) 10 books.

She worked with Paul F-Brandwein on two of his last books, serving as association editor on *Gifted Young in Science: Potential Through Performance* (National Science Teachers Association, 1989) and editor of his posthumous *Science Talent in the Young Expressed Within Ecologies of Achievement* (National Research Center on the Gifted and Talented, 1994). She is currently at work on a book on empowering older women tentatively titled *Elegant, Wise, and Free*.

**William F. Hammond**  
**Board Member, Paul F-Brandwein Institute**  
**President**  
**Natural Context**  
**Fort Myers, Florida**  
**Associate Professor of Interdisciplinary Studies**  
**Florida Gulf Coast University**  
**Fort Myers, Florida**

For over three decades before coming to his current posts, William F. Hammond, EdD (PhD in curriculum theory and environmental education expected in 1998) was the director of curriculum development services and environmental education for the Lee County School District in Fort Myers, Florida. His career began with a decade of junior and senior high school science teaching; in the late 1960s, he became the Lee County science supervisor and



coordinator of environmental education, positions in which he continued until 1983. At that point, he became the district's director of the Department of Curriculum Services, retiring in 1993. From 1978 to the present, he has been consulting through his firm Natural Context in corporate training for several Fortune 100 companies and teaching college courses. In 1997, he joined the faculty of Florida Gulf Coast University.

During the course of his school, university, and consulting career, Hammond lectured, made presentations, and led workshops on curriculum and program development. He has presented in 50 states, Canada, England, the former Soviet Union, and 19 Caribbean nations. He advises a wide range of private and public organizations, as well as over 250 nonprofit organizations.

**Elizabeth Johnson**  
Fellow, Paul F-Brandwein Institute  
Division Chief for Research and Resource Planning  
National Park Service  
Delaware Water Gap National Recreation Area  
Bushkill, Pennsylvania

Elizabeth Johnson, MS in natural resources, has provided continuity to the Park's growing natural resource management program in northeast Pennsylvania and northwest New Jersey for 15 years. In 1993, she received the National Park Service Director's Award for her work in developing water quality protection strategies for 120 miles of the Delaware River and its tributaries.

Johnson started her career with the National Park Service in its Washington, D.C., office as a natural resource specialist in 1980. During her two and a half years there, she served in various capacities, including aquatic specialist,

integrated pest management

coordinator, Man and the

Biosphere Program assistant,  
and fisheries specialist. At

the same time, she  
worked with the

Coastal Barrier Island  
Task Group, an

assignment that

resulted in legislation protecting coastal barrier islands on the Atlantic and Gulf coasts from development. Before receiving her bachelor's degree, she studied field biology at many field stations in the Northeast and the Virgin Islands.

**Elissa R. Levine**  
Fellow, Paul F-Brandwein Institute  
Soil Scientist  
Biospheric Sciences Branch  
Goddard Space Flight Center  
National Aeronautics and Space Administration  
Greenbelt, Maryland

Elissa R. Levine, PhD in agronomy, has held her current post since 1986. Her major research efforts include mathematical modeling of soil processes within ecosystems and interpretation of remotely sensed imagery. Her work utilizes simulation modeling, neural network analysis, and geographic information systems. Since 1994, she has been the principal investigator for the White House's Soil Characterization Investigation of the Global Learning and Observations to Benefit the Environment (GLOBE) program. As part of this activity, she has designed the protocol for soil field and laboratory measurements, developed complementary learning materials, participated in GLOBE training worldwide, and taken part in many related educational outreach activities.

Levine also teaches a master's-level class entitled Soils in Natural and Anthropogenic Ecosystems at Johns Hopkins University (Baltimore). She is a member of the Standing Committee on Education in Soil Science of the Soil Science Society of America, chair of the Terrestrial Ecosystems Working Group, and the lead scientist for the National Aeronautics and Space Administration Global Change Master Directory.

**John Padalino**  
Executive Director, Paul F-Brandwein Institute  
President  
Pocono Environmental Education Center  
Dingmans Ferry, Pennsylvania

John Padalino, MS in field natural history, MS in conservation education, and PhD candidate in science education, has been working at the Pocono Environmental Education Center (PEEC) since 1972, assuming his current post in 1986. PEEC, which cooperates with the National Park Service, is the largest residential center for the study of the environment in the Western Hemisphere. Before coming to PEEC, he taught precollege science and social science and directed Headstart programs. Since 1992, with support from the Rockefeller Foundation, Padalino has been providing technical assistance to education specialists from nature preserves in the former Soviet Union.

Padalino wears a number of other hats as well. In the late 1960s and early 1970s, he was a Trainer of Teacher Trainers at New York University. In the early 1980s, he was principal investigator on two National Science Foundation-sponsored initiatives in field science, science leadership, and science for persons with disabilities. Late in the decade, he led a Wheels of the Mind project sponsored by the Apple Corporation. He is president of the John Burroughs Association and past president of three national science and education organizations. He is also an active member of the National Science Teachers Association and a fellow of the American Association for the Advancement of Science. Padalino has received numerous awards, most recently the Thomas P. Shelburne Environmental Leadership Award from the Pennsylvania Environmental Council (1997).

**Larry Peterson**  
**Fellow, Paul F-Brandwein Institute**  
**Facilitator and Director of the Florida**  
**Design Initiative**  
**School of Architecture**  
**Florida A & M University**  
**Tallahassee, Florida**

Larry Peterson has long had an interest in the relationship between energy and architecture. In 1969, while teaching in the School of Architecture at the University of Florida, he led a research effort to study development options along the Fort Myers-Naples coastline. He also focused upon the impact of Disneyworld on central Florida. Working with faculty at the University of Florida during the next five years, he helped to develop an energy-based land use and infrastructure analysis methodology using a computerized analysis process linked to a simulation model of the area's energy systems. For the next decade, Peterson left academia and Florida to focus on energy issues in the political arena. He worked first for the governor of Oregon and then for California's secretary of resources on pieces of legislation mandating statewide comprehensive planning at the city and national level and protecting, preserving, and enhancing state resource bases.

Returning to Florida in 1985, Peterson joined Florida A & M as associate dean of the School of Architecture, moving to his current research post in 1991. He works, in cooperation with the Department of Community Affairs/Florida Energy Office and the Department of Management Services, to promote improved energy efficiency in

public and private buildings. The Florida Design Initiative publishes a national Web site, <http://www.e-designOnline>.

**Joseph M. Russo**  
**Fellow, Paul F-Brandwein Institute**  
**President**  
**ZedX, Inc.**  
**Boalsburg, Pennsylvania**

Joseph M. Russo, PhD in agricultural meteorology, is cofounder and president of ZedX, Inc., a 10-year-old information technology company that specializes in custom weather databases and decision support algorithms for the agricultural and environmental industries. He has created databases and algorithms compatible with geographic information systems and other data management programs. Russo's research duties call for participation in the design phases of university, government, and private projects that require information from meteorological and other environmental data sets. From 1981 to 1988, Russo was an assistant professor of agricultural climatology at the Pennsylvania State University. His research efforts were in theoretical aspects, experimental designs, and database needs of agricultural production systems.

Since 1993, Russo has been active in the International Geosphere-Biosphere Programme, which conducts research worldwide on how climate change will impact global biogeochemical cycles and life support processes. He also participates in the Biospheric Aspects of the Hydrological Cycle program and the Data and Information System committee. As part of the former program, Russo is cooperating with an international team of scientists evaluating numerous collected and generated climatological and environmental data sets for incorporation into ecological and hydrological models. These evaluations are being published.

**Alan R. Sandler**  
**Board Member, Paul F-Brandwein Institute**  
**Director**  
**Operations and Education Programs**  
**American Architectural Foundation**  
**Washington, D.C.**

Alan R. Sandler has been heading elementary and secondary education programs for the



American Institute of Architects and the American Architectural Foundation since 1979. In 1996, he assumed responsibility for the Foundation's operations, including budget, scholarships, and public programs. The Foundation's precollege program, Learning By Design, annually offers information, activities, and workshops on architecture and its role in the environment to over 250,000 educators and architects. Sandler also publishes on environmental education and serves as contributing editor to several journals and magazines. He is the Foundation's link to public television, working in tandem with the Public Broadcasting Corporation to produce programs like *Pass It Along*, *America by Design*, *Pyramid*, and *Roman City*.

Before coming to Washington, D.C., Sandler worked as an administrator for environmental education in several Florida school districts (1972-1976) and in the Florida governor's office (1977-1979). He consults with school systems nationwide.

**John A. Smallwood**  
Fellow, Paul F-Brandwein Institute  
Assistant Professor of Vertebrate Ecology  
Department of Biology  
Montclair State University  
Upper Montclair, New Jersey

Since 1994, John A. Smallwood, PhD in zoology, has been in his current post teaching biology to undergraduates and graduate students. Continuing the work on breeding threatened Southeastern American kestrels he began as a postdoc at the University of Florida (1988-1994), Smallwood set up a similar nest box program at Montclair State specifically designed to provide students the opportunity for field work. From the 2 pairs of kestrels that bred in 1995, Smallwood and his students in 1997 have increased the numbers to 25 pairs.

Smallwood participates on the board and in the leadership of a number of ornithological societies, including the Kestrel Working Group, which he helped to organize in 1994. He has published 14 papers and made numerous presentations at scientific meetings.

**Cynthia Hart Stevens**  
Fellow, Paul F-Brandwein Institute  
Teacher  
W. C. Mallett School  
Farmington, Maine

Cynthia Hart Stevens, BS in education, has been teaching the first three grades of elementary school since 1975. She has been at Mallett since 1989, teaching multiage groups for the past several years. Stevens believes that "science and literacy are not separate issues," so she "teaches everything through science."

When she needed support for her science program, she turned to faculty members at the local branch of the University of Maine, with whom she has shared several grants. (She is currently co-coordinating a grant in environmental education with the University.) Over the past decade, she has also received several grants from business and the state for projects in science and education. Stevens is active in district science curriculum work and consults and speaks at a variety of New Hampshire and Maine schools on topics such as the vice president's GLOBE program, for which she is lead teacher at her school. She has won numerous local and national teaching awards, including Soil and Water Conservation Teacher of the Year in the Northeastern United States (1991), the National Science Teachers Association/National Aeronautics and Space Administration program (1992), and Maine Honor Teacher for the Presidential Awards in Math and Science (1995).

**Calvin Whitney Stillman**  
Fellow, Paul F-Brandwein Institute  
Professor Emeritus  
Rutgers University [New Jersey]  
St. Petersburg, Florida

Calvin Whitney Stillman, PhD in economics, retired from Rutgers as professor of environmental resources in 1978, a position he had held for the previous decade. After serving in the U.S. Army during World War II, he taught for 20 years at several postsecondary institutions, including Roosevelt College (Illinois), the University of Chicago, and the New School for Social Research (New York).

He has also consulted for the Maryland Department of Education and served as commissioner of the Hudson River Valley Commission (New York). He sat on a number of advisory boards, including that of the Pocono





Environmental Education Center. Stillman is the author of numerous papers in economics, politics, education, conservation, the environment, and other subjects. After retiring, he worked as a volunteer at the Grey Towers National Historic Landmark (administered by the U.S. Forest Service).

**Frank William Taylor**  
Fellow, Paul F-Brandwein Institute  
Science Teacher  
Radford High School  
Radford, Virginia

Frank William Taylor, MS in zoology, has received numerous local and national teaching and environmental education awards. He has also won several funded grants, including an Access Excellence Fellowship, a Toyota TAPESTRY grant, and the Presidential Award National Science Foundation grant.

Taylor has also written and contributed to several books, including *Model Inquiries into Nature in the Schoolyard and Biology: A Community Context*. A regular contributor to state and national science teaching conferences, Taylor in addition serves science education as a reviewer, panelist, and committee member of local advisory boards.

**John Michael Trimble**  
Fellow, Paul F-Brandwein Institute  
Science Teacher  
Corona Del Sol High School  
Tempe, Arizona

John Michael Trimble, MS in education, has taught biology at Corona del Sol High School for 20 years. He also teaches classes for dual high school and college credit in biology and environmental science and courses in human ecology at local colleges.

Trimble, a native Arizonan who grew up close to desert and farmlands, brings his outdoor experience—camping, hunting, horse packing, scuba diving, canoeing—both into his classrooms and into field work. He has developed several courses that include substantial outdoor experiences. These include a biology program that trains students in wilderness survival, independent field research, oceanography, and diving, as well as applied anatomy and physiology and a summer field program emphasizing partnerships with working scientists in wildlife management, riparian ecology, and so forth. He has received numerous

grants to develop and implement these and other programs and won various awards for his work.

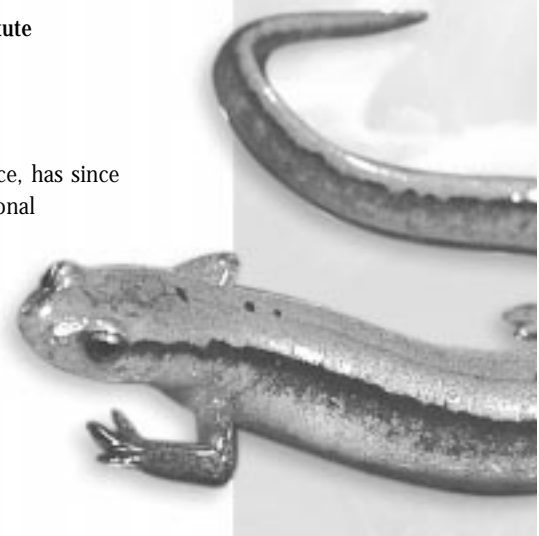
**Randolph Richard Tully, Jr.**  
Fellow, Paul F-Brandwein Institute  
Resource Teacher  
Lee County School District  
Fort Myers, Florida

Randolph Richard Tully, Jr., has been in his current post with the Curriculum Services Department specializing in environmental education for 17 years. As part of his duties, he coordinates field trips in environmental education districtwide, last year organizing over 1,400 expeditions K-12. He also teaches a full-year seminar for 11th and 12th graders that involves students in positive local action relevant to environmental issues. Over the years, his students created a manatee observation park, established a local ordinance to protect bald eagle nesting habitat, initiated recycling in the local school district, and conducted numerous environmental awareness programs for students and the community. Since 1989, Tully has coordinated a local rivers project in water quality monitoring associated with the Global Rivers Environmental Education Network.

Before coming to Florida, he worked from 1973 to 1981 with a federally funded project in southeast Pennsylvania schools to encourage student action to improve the environment. The project was part of the National Diffusion Network, and he conducted training sessions nationwide from 1975 to 1981. From 1971 to 1973, he ran environmental programs in two Pennsylvania school districts and served as an interpretive naturalist at Platt National Park (Oklahoma). Tully is the recipient of several local and national awards.

**Keith A. Wheeler**  
Board Member, Paul F-Brandwein Institute  
Director  
The Center for a  
Sustainable Future  
Shelburne, Vermont

Keith A. Wheeler, MS in soil science, has since 1997 directed the Center, an international nongovernmental organization whose mission is to educate learners of all ages to act sustainably on personal, family, community, and global scales. He was the first executive



director of the 136-nation Global Rivers Environmental Education Network, an organization aiming to create formal and informal educational programs and networks that focus on watershed sustainability and stewardship (1993-1997). As the assistant director for the Adirondack Park Agency (New York, 1987-1993), he worked for sustainable development and sensible land use of the state's natural resources, both public and private. He has also worked in research, policy, and management capacities for the U.S. Department of Agriculture and as a research soil scientist for Cornell University (New York).

Wheeler has also served as member and leader of many international, federal, national, and local organizations working for education for sustainability and the environment, for conservation, for science education, and for watershed protection. In addition, he consults in national and international policy settings to encourage creation of sustainable programs in developing areas. He contributes publications and makes presentations dealing with resource issues, education, and sustainability and is currently at work on a book tentatively titled *Education for Sustainability: A Paradigm for the 21st Century*.

**Brad Williamson**  
**Fellow, Paul F-Brandwein Institute**  
**Biology Teacher**  
**Olathe East High School**  
**Olathe, Kansas**

Brad Williamson, MS in systematics and ecology, has taught junior and high school science for the past 22 years in rural and suburban Kansas schools. For the past six years at Olathe East he has been teaching primarily college biology classes for dual high school and college credit. In the early 1990s, with the help of a Toyota TAPESTRY grant, he developed a collaborative research project, the Kansas Environmental Monitoring



Network (KEMNET), through which students statewide analyzed leaf stomatal densities on cottonwood trees statewide in an attempt to establish baseline data for global warming. One of the collaborative projects evolving from KEMNET is the Monarch Watch, a project Williamson cofounded that now involves thousands of students, teachers, and amateur and professional scientists in three countries. Using modern communication technology (its Web site is <http://www.MonarchWatch.org>), Monarch Watch serves as an excellent example of scientific collaboration as volunteers study the migration of monarch butterflies.

Through projects like these, Williamson gives students the opportunity to do valuable, authentic work, proving that young people can make significant contributions to their local and scientific communities. Participation is intrinsically motivating for the students: They learn science, and they do science.

## Issues

### A. Exploring some areas of consensus of Paul F-Brandwein Institute conferees about its purpose

1. The audience for the Brandwein Institute is teachers, students, parents, administrators, and the local community.
  - a) Teachers come again, providing continuity, while students come and go.
  - b) the Paul F-Brandwein Institute will involve local politicians, politics, and policy in its science projects.
2. Among the projects of the Paul F-Brandwein Institute will be baseline studies of the lands making up the Rutgers Creek Wildlife Conservancy and the Loch Lomond Farmstead. the Paul F-Brandwein Institute will
  - a) gather data both from background sampling—changes in land use, patterns in the landscape, and managed regrowth—and from historic information
  - b) use the data collected as the basis for studies of individual organisms or species in relation to the environment
  - c) in some places, sustainably manage the land in the light of particular goals and experimental designs; in others, monitor change without intervention
  - d) study issues that take a lot of time to investigate—for example, the consequences of agriculture—as well as undertake short-term research
  - e) balance the needs of the Delaware Water Gap National Recreation Area with human needs—people need food for sustenance as well as wilderness for their spirits
  - f) maximize the return on natural assets
  - g) simultaneously ask holistic, large-system questions and thoroughly investigate local places
3. the Paul F-Brandwein Institute will balance the need for long-term research with students' immediate needs. the Paul F-Brandwein Institute will
  - a) conduct long-term basic research while allowing learner-driven science
  - b) create intimate—but transferable—knowledge of the sites into studies and presentations
  - c) offer support and resources for student-driven questioning and research in combination with specific local issues
  - d) set projects in long-time horizons
  - e) recognize that the schedules of outside agencies and institutions will not always jibe with academic calendars
4. The best time frames for work at the Paul F-Brandwein Institute will vary with the programs offered. the Paul F-Brandwein Institute will
  - a) offer resident programs for teacher-student collaborations
  - b) provide students with the experience of daylong field trips
  - c) give teachers on-site opportunities for professional development of varying durations
5. the Paul F-Brandwein Institute will establish a close relationship with schools in the area. On some occasions, the Paul F-Brandwein Institute will
  - a) ask that teachers and students receive training at their home institutions prior to coming to the Paul F-Brandwein Institute
  - b) provide, in concert with the Pocono Environmental Education Center, an introduction to field-based science
  - c) become part of class projects
  - d) ask schools or districts to select and support teams, including faculty and students K-12, parents, and administrators, to come to the Paul F-Brandwein Institute



## B. Agreeing on certain scientific priorities

### 1. To compile a history of the uses of the Rutgers Creek Wildlife Conservancy and the Loch Lomond Farmstead with a detailed disturbance regime taking into account both changes resulting from natural forces such as fire, flood, wind, and ice and anthropogenic variations from land use and the introduction of exotic species by

- a) assessing formally, gathering baseline data on the ecologies of the sites
- b) monitoring the surrounding landscapes, noting their glacial history, differing vegetation patterns, and the presence and absence of water
- c) collecting oral and written histories of the sites
- d) mapping habitats, soils, and wetlands
- e) compiling species lists of plants, wildlife, and birds
- f) monitoring populations and tracking indicator species such as lichens, salamanders and frogs, bats, spiders, small mammals, birds, and aquatic invertebrates
- g) noting species of special concern such as bog turtles and keystone species appropriate for focused studies
- h) studying forest dynamics, litter production, coarse woody debris, tree mortality, and seedling densities
- i) pursuing herbivore exclusion experiments and examining the impact of hunting
- j) sampling for evidence of pollution
- k) making comparisons among the sites
  - l) testing for water quality with protocols developed by the National Park Service

### 2. To use scientific strategies and approaches to

- a) develop transferable strategies for getting to know a locale
- b) design workable sampling plans
- c) understand systems
- d) learn how energy moves along a landscape
- e) understand processes

(1) to find what processes underlie systems thinking

(2) to realize that the whole—the system—may emerge piecemeal

(3) to learn that systems are more important than species

### 3. To balance human needs with those of natural nonanthropocentric ecologies by

- a) experimenting at Rutgers Creek Wildlife Conservancy with sustainable agriculture, using the best management practices for dairy farming and other activities
- b) reconstructing the environments so that the land can heal itself to make sure that the land serves humans in an age of worldwide pressure on resources
- c) examining current building and exploring further building on the sites
- d) addressing global issues

## C. Discussing the elements of effective teaching and learning

### 1. The Paul F-Brandwein Institute will encourage students by

- a) creating a learner-driven program and a community of learners
- b) empowering student-generated questions and methodology that go beyond data collection
- c) meeting long-term research needs while allowing learner-driven science
- d) having them pursue their own interests within the research program by building their own experimental designs
- e) helping them to come asking questions and to leave taking out new ones
- f) supplying them with options so they are equipped to learn on their own
- g) guaranteeing that their experiences at the Institute will be doing real science
- h) teaching them through their work at the Institute to address the ecologies of their local communities
- i) challenging them to design their own investigations driven by local conditions or ecologies

- j) offering follow-up activities after they have left the sites

**2. The Paul F-Brandwein Institute will encourage teachers by**

- a) enabling them to guide students to analyze community issues and design research questions to solve problems
- b) allowing them to perform field research
- c) engaging their students in data collection
- d) providing them with opportunities to appreciate the environment
- e) bringing scientists and teachers together online and face-to-face in order to share information and expertise

**3. The Paul F-Brandwein Institute will encourage mentoring by**

- a) developing two-way mentoring relationships
- b) investigating the relationship between mentoring and citizenship
- c) building bridges between communities and schools

**D. Coming to consensus on a number of philosophical and practical items**

**1. Fellows agreed that the Paul F-Brandwein Institute would emphasize certain kinds of content:**

- a) To approach studies inclusively through a creatively interdisciplinary methodology—including art, philosophy, literature, and history as well as formal scientific study
- b) To forge connections between outside and inside
- c) To base studies on the fact that human systems and natural systems interact
- d) To amass systemic local knowledge and understanding

**2. Fellows agreed that the Paul F-Brandwein Institute would emphasize certain methods of teaching and learning:**

- a) recognizing that no one is gifted until s/he has given a gift
- b) striving to achieve learner-driven science

- c) having students generate questions and research protocols
- d) integrating math skills into research programs
- e) providing access to scientists, teachers, and other mentors
- f) encouraging teacher-supported, question-driven field science
- g) linking science investigations with real-world environmental issues
- h) understanding that, because timelines for good science and successful political intervention are not necessarily complementary, compromises are essential
- i) working together in teams

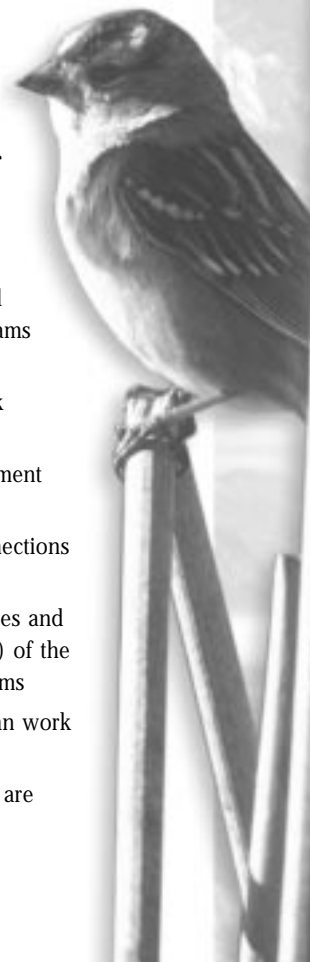
**3. Fellows agreed that the Paul F-Brandwein Institute would work toward certain practical aims including**

- a) future meetings of Institute Fellows on site and at professional meetings
- b) support for teaching about the environment in schools
- c) using the Conservancy and the Farmstead sustainably
- d) proceeding slowly and with care rather than precipitantly

**E. Examining future priorities for the Paul F-Brandwein Institute**

**1. Making local connections by**

- a) collaborating with the school and the community to develop programs in conservation education
- b) joining some of the National Park Service's many ongoing projects
- c) participating in land use management
- d) focusing on locally grounded environmental projects with connections to national scientific projects
- e) investigating the particular qualities and identifying the resources (people) of the region to support training programs
  - (1) finding local teachers who can work with teachers and students
  - (2) identifying local farmers who are



willing to experiment with—or are already utilizing—Best Management Practices (agricultural techniques)

- f) serving as a national center guiding teachers in local research

**2. Broadening the scope of the Paul F-Brandwein Institute, perhaps**

- a) expanding the program strategically through selection and reinforcement over the next three to five years
- b) creating a program with which teachers can grow
- c) encouraging mentors who can reach out to others
- d) identifying the best teachers of teachers who can share their skills with others
- e) making the Brandwein mailing list widely available

**3. Maintaining communication among the Paul F-Brandwein Institute Fellows and board members. the Paul F-Brandwein Institute will**

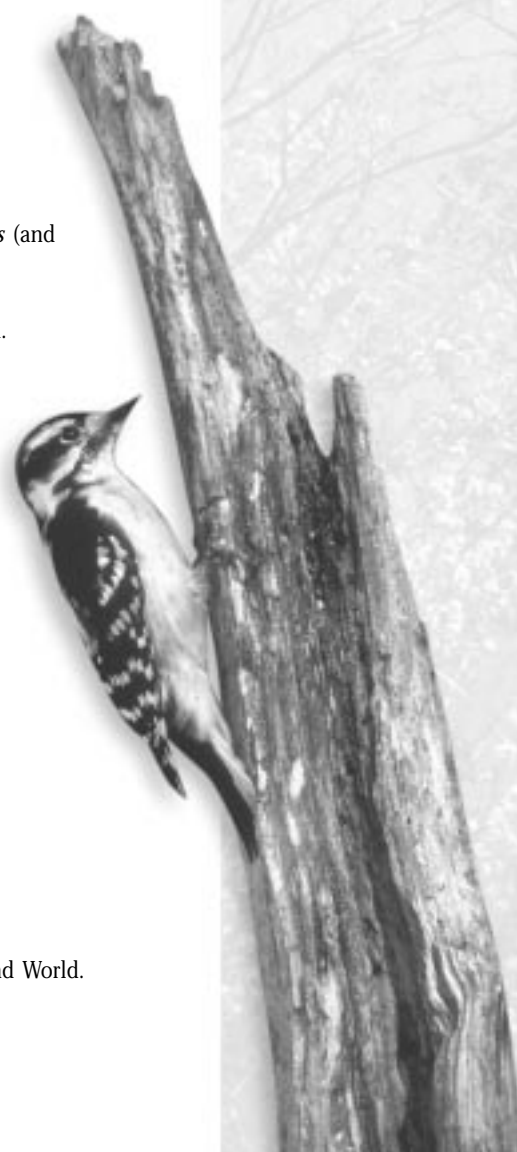
- a) use the Internet by creating a listserve or Web page forum with discussions of reality-based problems
- b) sustain its network



## Paul F-Brandwein (1912–1994)

### Books at the U.S. Library of Congress

- (1939). *Manual of biology* (and Douglas Marsland). New York: H. Holt and Company.
- (1940). *Infection studies on the covered smut of oats*. Lancaster, PA.
- (1950). *Science for better living, complete course*. New York: Harcourt, Brace.
- (1952). *Science for better living, complete course*. New York: Harcourt, Brace.
- (1953). *You and your inheritance: Science for better living*. New York: Harcourt, Brace.
- (1953). *You and your world: Science for better living*. New York: Harcourt, Brace.
- (1955). *The gifted student as future scientist: The high school student and his commitment to science*. New York: Harcourt, Brace.
- (1955). *You and science: Science for better living*. New York: Harcourt, Brace.
- (1956). *You and your inheritance: Science for better living*. New York: Harcourt, Brace.
- (1956). *You and your world: Science for better living*. New York: Harcourt, Brace.
- (1958). *Teaching high school science: A book of methods*. New York: Harcourt, Brace.
- (1958). *Your future in science: The challenging opportunities awaiting you in exciting new fields* (and Morris Meister). Chicago: Science Research Associates.
- (1960). *Teaching science through conservation* (and Martha E. Munzer). New York: McGraw-Hill.
- (1960). *You and science: Science for better living* (New ed.). New York: Harcourt, Brace.
- (1960). *You and your resources: Science for better living*. New York: Harcourt, Brace.
- (1960). *You and your world: Science for better living* (New ed.). New York: Harcourt, Brace.
- (1962). *Teaching high school biology: A guide to working with potential biologists*. Washington, DC: American Institute of Biological Sciences.
- (1962). *The teaching of science: The teaching of science as enquiry*. Cambridge, MA: Harvard University Press.
- (1964). *Exploring the sciences*. New York: Harcourt, Brace, and World.
- (1964). *The world of living things*. New York: Harcourt, Brace, and World.
- (1964). *The world of matter—Energy*. New York: Harcourt, Brace, and World.
- (1965). *Substance, structure, and style in the teaching of science*. New York: Harcourt, Brace, and World.





- (1966). *A sourcebook for the biological sciences* (and Evelyn Morholt) (2d ed.). New York: Harcourt, Brace, and World.
- (1966). *Notes towards a general theory of teaching*. New York: Harcourt, Brace, and World.
- (1968). *Energy: Its forms and changes*. New York: Harcourt, Brace, and World.
- (1968). *Life: Its forms and changes*. New York: Harcourt, Brace, and World.
- (1968). *Substance, structure, and style in the teaching of science* (Rev. ed.). New York: Harcourt, Brace, and World.
- (1969). *Toward a discipline of responsible consent: Elements in a strategy for teaching the social sciences in the elementary school*. New York: Harcourt, Brace, and World.
- (1970). *Invitations to investigate: An introduction to scientific exploration (1st ed.)*. New York: Harcourt, Brace, Jovanovich.
- (1970). *The social sciences: concepts and values*. New York: Harcourt, Brace, and World.
- (1971). *Teaching elementary science through investigation and colloquium* (and Brenda Lansdown). New York: Harcourt Brace Jovanovich.
- (1971). *The permanent agenda of man: The humanities: A tactic and strategy for teaching the humanities in the elementary school*. New York: Harcourt Brace Jovanovich.
- (1975). *Teaching gifted children science in grades seven through twelve*. Sacramento: California State Dept. of Education.
- (1977). *The reduction of complexity: Substance, structure, and style in curriculum*. New York: International Center for Educational Advancement.
- (1980). *The United States: Living in our world*. San Francisco: Center for the Study of Instruction; New York: Harcourt Brace Jovanovich.
- (1981). *Memorandum: On renewing schooling and education*. (1st ed.). New York: Harcourt Brace Jovanovich.
- (1986). *A sourcebook for the biological sciences* (and Evelyn Morholt) (3rd ed.). San Diego: Harcourt Brace Jovanovich.
- (1989). *Gifted young in science: Potential through performance* (Ed. with A. Harry Passow, Deborah C. Fort, and Gerald Skoog) (1st ed.). Washington, DC: National Science Teachers Association.
- (1995). *Science talent in the young expressed within ecologies of achievement*. Storrs, CT: National Research Center on the Gifted and Talented.



The Paul F-Brandwein Institute  
R.R. 2, Box 1010  
Dingmans Ferry, PA 18328  
Phone: 717-828-8953