Selbyana 25(1): 166–169. 2004.

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SELBY GARDENS: A BIOLOGICAL CROSSROADS

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Calaway Dodson (founding director of Selby Gardens and current senior scientist), Robert Dressler (founding and current member of *Selbyana* Editorial Board), Carl Luer (founding and current member of Selby Gardens Board of Trustees and founding Editor of *Selbyana*), John Atwood (*Selbyana* Editorial Board member and former director of Selby Gardens Orchid Identification Center), and others with links to Selby Gardens also are associated with the Missouri Botanical Garden. It might well be said then that the orchid operation at Missouri is here in Sarasota!

Selby Gardens exists today because half a century ago, Marie Selby built a garden on the Sarasota bayfront. She could not have imagined the development that would occur in this region of Florida, but because of her initiative and her advisors, her garden has grown into an institution that ranks among the cultural and aesthetic features of the state. Selby Gardens has become a center for learning about plants, especially epiphytes; for disseminating information about plants—first technically to scientific audiences, then to the general public and the local community.

The maturation of Florida has come about through development of institutions such as Selby Gardens. As a crossroads of the Western Hemisphere, Florida is increasingly significant for Latin America, just as it is for the United States, as a place where cultural currents gather to advance civilization, based on mutual understanding, trade, and participation in resolving global problems.

The maturation of Selby Gardens is linked to the tropical forests of the world, in whose canopies grow a quarter of the world's plants. As epiphytes, lianas, and other plant forms, they grow in the sunlit upper regions of the forests, putting forth dazzling flowers of diverse hues, flowers pollinated and visited by an array of animals engaged in biological interactions complex beyond imagination. As part of the most intricate evolutionary lineages in the world, tropical plants respond to ecological trends that we only dimly understand. The survival of these plants and the forests in which they occur, the survival and flourishing of institutions such as Selby Gardens, the ability of Florida and the United States to resolve environmental problems will depend on whether we join with countries around the world in a global journey toward a stable and sustainable future.

Burning a Library We've Never Read

Entering the third millennium, we face an accelerated extinction rate of species, including plants, animals, fungi, and microorganisms. The longevity of species can be measured by considering groups well represented in the fossil record, such as vertebrates and shell mollusks. In the 65 million years since the Great Extinction Event in which the world said goodbye to dinosaurs, the average rate of extinction was one to ten species each year. These species, however, were being replaced by the process of evolution that was building more species at approximately the same or at an even greater rate than they were disappearing. Consider now the disappearance of species of vertebrate animals and plants

since the beginning of the Industrial Revolution in the mid 18th century in the United Kingdom, northwestern Europe, and the United States. Out of the estimated 10 million species of organisms on Earth (only 1.6 million of which have been named), the extinction rate has accelerated to hundreds or thousands of species per year. We can predict, on the basis of the relationship between habitat size and species number, that the extinction rate is likely to accelerate drastically over the course of the century we have just entered, to a point at which tens of thousands and even hundreds of thousands of species, out of our basic stock of 10 million, are likely to disappear every year.

In the 25 years since I had the honor of presenting the inaugural address at the dedication of Selby Gardens, 2 billion people have been added to the world population. During the lifetime of Selby Gardens, a 50-percent increase has occurred. Expanding populations and the technologies that we use to mine the Earth's renewable and non-renewable resources have caused enormous changes. In a world where some of us have become so much more affluent, the rate of consumption per person is likewise a significant factor. On the average, we who live in the United States consume 25–40 times as much per person as poor people in developing countries, and the impact is obvious. The loss of about a quarter of all the topsoil and a fifth of all the agricultural land in the world is subjecting us to salinization, desertification, and urban sprawl. The loss of about a third of the forests in the world (without replanting them) is contributing to an increase in carbon dioxide (the major greenhouse gas in the atmosphere) by about a sixth, and a projected increase in global temperatures during this century of 2.5° to 10° Fahrenheit.

If the natural world is viewed as a bank account on which the human race is drawing, then we are living on principal rather than interest. The concept of sustainability or sustainable development requires the inhabitants of the Earth to live on the interest—on natural productivity—leaving the principal to produce for the future. The American conservationist, George Schaller, put it this way: "We cannot afford another century like the past one." The world does not contain the natural resources to sustain us on the reckless adventure of burning up our assets at the rate we did in the 20th century.

The tropical rain forests of the world, home to about half the world's species and more than half the world's plant species, have been reduced by human activities to about half their original size. They now occupy, in the three major tropical areas of the world, an area about the size of the United States east of the Mississippi River. At the present rate, by mid-century, perhaps only 5 percent of the tropical rain forests will remain.

When tropical rain forests are destroyed, it is important to remember that some 19 out of 20 of the kinds of organisms in them have never been given a name and have never been seen by a scientist. They are completely unknown. For the 1 out of 20 organisms in the tropical forests that have a scientific name, our knowledge is so limited as to be a pathetic reflection of the evolutionary lineage and ecological standing of these plants and animals. We are, in other words, burning a library that we've never even read.

Botanical Knowledge: The Basis for Plant Conservation

The importance of the contribution made by Selby Gardens to scientific knowledge as the basis of conservation must never be underestimated. About 250,000 kinds of plants in the world seem to have valid names. Basing this deduction on the discovery of new plants during taxonomic expeditions and the rate at which new ones are being described, it is likely that about another 50,000 species, an additional one fifth, remain to be detected in the world. About 1 out of 6 species of plants in the world has yet to be catalogued, yet to receive a scientific name. Botanical knowledge is the basis for conservation action or any other treatment of those plants. The conservation of plants is a far more feasible prospect than is the conservation of animals. Of the 250,000 species of plants that have been named, about 80,000 are in cultivation in botanical gardens, with another 5000 in cultivation outside of botanical gardens. Thus about 1 out of 3 of the named plants are in cultivation. To be sure, the cultivation may consist of a single individual or a couple of individuals, not genetically adequate to really assure the perpetuation of the species, but nevertheless representing that species in a condition in which it might be expected to last for some time into the future, which is a lot better than not having it there at all.

Because of the feasibility of conserving plants and because of the value of plants for human welfare, many botanists are advocating a worldwide commitment to the preservation of plants, through measures such as the Convention on Biological Diversity. This treaty calls for efforts to be made worldwide by nations, each operating its own conservation strategies on a regional basis. Knowledge about plants would need to be accelerated rapidly through the kind of expeditionary efforts undertaken by Selby Gardens scientists. An Internet database would need to be

built to reflect the current state of knowledge of plants throughout the world, with data on plants in nature, in cultivation, or in seed banks readily accessible. The rarer plants and those not well represented in protected areas in nature would need to be identified and brought selectively into cultivation.

Given a worldwide concerted effort and a partnership between rich and poor nations, the combination of preservation in nature, careful monitoring, and preservation in botanical gardens and seed banks has the potential to assure that virtually all plants now in existence could remain in existence for the benefit and enjoyment of our children and grandchildren and their grandchildren on into the future. Try to imagine a more priceless gift for those who will come after us. Consider the arrogance of thinking that we can drive to extinction so many of our living companions on this planet without regard to future generations. From a moral sense or any other sense, it is time we reversed these trends.

The preservation of plants or any part of biodiversity, however, will come about only as human beings develop better strategies for living together in a sustainable world. The trends of the past 50 years make it clear that new ways of thinking are necessary to construct a sustainable planet for the future. The division between rich and poor countries around the world and the different expectations about consumption make this impossible, if we go on operating as we now do.

In 1947 when India was about to win its independence from Britain, Mahatma Gandhi (1869–1948) was in London, when a reporter said, "Well, Mr. Gandhi, now that India's becoming independent, are you going to start living in the same style as we do in the U.K.?" Gandhi responded, "When I look at a map of the Earth, I notice that Great Britain controls half the Earth, and draws its wealth from half the Earth in order to supply its standard of living; and it's not very clear to me how India, a much larger country, could aspire to that same kind of standard of living." Follow that with another Gandhi saying, "The world has plenty to satisfy every man's need, but never enough to satisfy their greed."

Although 80 percent of the world's population lives in developing countries, only 10 percent of the world's scientists do. That 80 percent of the world's population represent 20 percent of consumed coal, oil, and gas; 15 percent of consumed iron or steel; and 15 percent of the money in the world. About 1 out of 4 people in the world live on less than a dollar a day; about half of them, about 1 out of 8 people in the world, 800 million people, are chronically malnourished, with anemic mothers and low birth weight babies, many starving from birth.

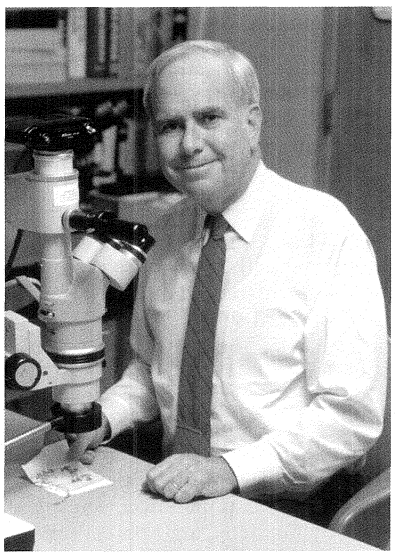

FIGURE 1. Peter Raven, keynote speaker at the Silver Anniversary of the Marie Selby Botanical Gardens.

One could argue cogently that we ought to approach global hunger as a matter of social justice but also because it is the deepest form of ignorance. By having 1 out of 8 people in the world living in a state of chronic starvation, we are simply denying ourselves the ability of those people to contribute to our common future. Women and children in the poorest sectors of the world who spend their entire lives going and gathering fresh water and firewood, often 15 miles away from where they live, cannot achieve any degree of intellectual or economic participation in their societies.

Projections have the world adding another 2 billion people in the next 30 years (even though the rate has slowed), and perhaps another 50 percent increase in the next 50 years to 9 billion, following which populations may stabilize. Such projections make it shockingly clear that we need new ways of thinking and new ways of operating to build a sustainable world for our grandchildren and their grandchildren.

The United States is the richest nation that has ever existed on the face of the Earth, and the 135 million people added to the U.S. population since the end of World War II consume at about 30 times the level of the same number of people who live in rural Brazil or rural Indonesia. Those 135 million people in the United States have the same consumption rate of the world's resources as would 4 billion people added to the population of the developing world.

Symbolizing Our Celebration of Life on Earth

The flora and fauna displayed in the canopies of tropical forests exemplify the biological values, the beauty, and the wonder of this planet, which we have inherited. We don't really buy anything by squandering these natural resources, and it is an illusion to think that we do. The display of tropical organisms here at Selby Gardens, a symbol of our celebration of life on Earth, can challenge us to do even better, to think more creatively, to share, and to understand the common challenge that we face.

Selby Gardens, an institution at a biological crossroads, has the ability to do an extraordinary amount of good. Selby Gardens has had slower and faster periods and ups and downs, but looking at the progress that has been made, it is nothing short of spectacular.

About the author. Among the world's leading botanists, Peter Raven has served as director of the Missouri Botanical Garden for the past 33 years. For his work in biodiversity and tropical rain forest conservation, he was named a Hero of the Planet by *Time* magazine. A recipient of the National Medal of Science, he has served on the President's Commission on Science and Technology. He also advises the Pope on scientific and technical matters, as a member of the Pontifical Academy of Scientists. In 1977, he was elected to the U.S. National Academy of Sciences and subsequently has been selected as a member of the academies of more than 20 countries around the world. Born in Shanghai, Dr. Raven co-chairs the *Flora of China* Editorial Committee. He has an A.B., University of California–Berkeley, and a Ph.D., University of California–Los Angeles. He is the Engelmann Professor of Botany at Washington University–St. Louis, and his publications include the internationally best-selling botany textbook, *The Biology of Plants,* now in its 6th edition. Dr. Raven chairs the Research and Exploration Committee of the National Geographic Society, serves as president of the American Association for the Advancement of Science, and is president of Sigma Xi. He specializes on the Onagraceae, the plant family that includes the evening primrose. To date, Dr. Raven has delivered three keynote addresses at the Marie Selby Botanical Gardens: one on the occasion of the 1975 opening dedication, another on the 10th Anniversary, and most recently on the 25th Anniversary. This essay is based on his address delivered at ceremonies held in January 2001 to mark the Silver Anniversary of Selby Gardens.