Guest columnist and Garden board member Peter Crane, Ph.D., explains how looking to the past to help us understand the present sharpens our view of the glories of nature

# Glorious Mysteries in the World of Plants

*The giant Amazonian waterlily* (Victoria amazonica)*, with its magnificent leaves beautifully arrayed like giant solar panels in the tropical sun*

Popular culture moves in strange ways. Since the release of the eponymous movie, the idea of a "bucket list" has quickly become part of our modern vernacular. My botanical bucket list includes plants like the ancient bristlecone pines of Nevada and the cobra-lilies of northern California. Recently, in the Peruvian Amazon, I checked off my list the giant Amazonian waterlily. I've seen it many times before; it is grown all over the world. But coming across it in an Amazonian backwater, untended by people, is quite a different experience.

Plants like Amazonian waterlilies, bristlecone pines, and cobra-lilies have a presence. Even brief contemplation invokes a sense of wonder, and sometimes an emotional, even spiritual, connection. These charismatic plants are tangible expressions of the glory and mystery of nature. And paradoxically, that sense of mystery is undiminished by scientific understanding. As Einstein once said, "What I see in Nature is a magnificent structure that we can comprehend only very imperfectly, and that must fill a thinking person with a feeling of 'humility'."

The Amazonian waterlily is one of the botanical wonders of the world, but look closely and every plant has its own mysterious life story full of evolutionary twists and turns. Whether in the garden, in the forest preserve, or along the roadside, even the most inconspicuous weed is a twig atop the gnarled and much-ramified tree of life. Every plant is a living expression of the vicissitudes of thousands, often millions, of years of history.

Over the past three decades the evolutionary tree of plant life has come into clearer focus, as we have learned more about living plants, including about their genomes. We have also learned more about plants of the past by exploring their fossil record. **There is still much that remains beyond our grasp, but scientists at the Chicago Botanic Garden are at the forefront of current research, including efforts to integrate information from fossils and living plants toward a more complete understanding of plant evolution.** And viewing the world's plants through an evolutionary lens only accentuates our sense of wonder. The leaves and the flowers of the Amazonian waterlily are massively increased in size and complexity compared to those of its diminutive precursors, which begs further questions about why and how such dramatic changes occurred.

To borrow a phrase from Darwin, "There is grandeur in this view of life." Such perspectives, rooted in deep history, emphasize the power and glory of evolution over vast spans of geologic time, as well as its remaining mysteries. In the face of rapid contemporary environmental change, they also underline the need for enlightened environmental management. Looking to the past to help us understand the present sharpens our view of the glories of nature. It also reminds us of our place in the world, and the value of humility as we together influence the future of our planet.

*Renowned botanist Sir Peter Crane is the Carl W. Knobloch, Jr. Dean, Yale University School of Forestry & Environmental Studies and former director of the Royal Botanic Gardens, Kew. Dr. Crane received the 2014 International Prize for Biology, administered by the Japan Society for the Promotion of Science, for his work on the evolutionary history of plants. The award, created in 1985, is one of the most prestigious in the field of biology.*

**Acceptance Speech – Peter R. Crane**

Thank you for this opportunity to express my appreciation for the Award of the International Prize for Biology. I am honored to receive this Prize in the presence of Their Majesties the Emperor and Empress, and in the field of Systematic Biology and Taxonomy that His Majesty has advanced through his research on the taxonomy of gobioid fishes. All of us engaged in the science of biological diversity are privileged to be able to count His Majesty as a colleague. I am also deeply grateful to the directors and committee members of The Japan Society for the Promotion of Science for this recognition.

I first visited Japan as a young man almost 45 years ago. Already by then I had been exposed to the thrill of making original discoveries that shine new light on the past. Very early I also benefited from training in the systematics of living plants, as well in palaeobotany. Ever since, I have been fortunate in the institutions with which I have been associated, the teachers and mentors who have supported me, and the colleagues with whom I have been privileged to work. It is an honor for me to have so many of those colleagues and other friends here today, along with my unfailingly supportive wife Elinor.

A pervasive theme in my research, which has also seen greater emphasis in palaeobotany as a whole over the past few decades, has been the integration of information from fossils and living plants toward a more complete understanding of botanical evolutionary history. Such integration has been facilitated by the development of phylogenetic methods, but also requires fossils that are preserved sufficiently well to allow meaningful comparison with living counterparts.

In the case of early land plants, advances in research on Silurian and Devonian fossils eventually made it possible to combine palaeobotanical discoveries with insights from living “green algae”, “bryophytes” and vascular plants into a new and more comprehensive understanding of the initial diversification of plants on land.

In the case of angiosperms, pioneering research on exquisitely preserved ancient flowers by Else Marie Friis in the early 1980s opened up a new and unexpected field of study. In particular, the material that Else Marie Friis, Kaj Raunsgaard Pedersen and myself have investigated from the Early Cretaceous of eastern North America and Portugal, combined with improved knowledge of living angiosperms, has provided a more detailed glimpse into the early evolution of flowering plants than would previously have been thought possible. The same approaches are also providing new insights into other extinct seed plants, some of which are undoubtedly relevant for understanding angiosperm origins.

In paleontology we rely heavily on using the present to interpret the past. Yet at the same time, the importance of contingency and extinction, both in ecology and evolution, reminds us that understanding the present also requires understanding history. The value of paleontology lies not simply in extrapolating the present back into the past, but in expanding knowledge, by illuminating ancient worlds that often differed in important ways from the world of today. Such perspectives, rooted in deep history, emphasize the grandeur of evolution over vast spans of geologic time. They also underline the need for enlightened environmental management in the face of rapid contemporary environmental change. In honoring how the past helps us understand the present The Japan Society for the Promotion of Science reminds us of our place in the world, and the value of humility as we together influence the future of our planet.