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In deep remembrance of Dr. Peter H. Raven's contributions to plant science and biodiversity conservation

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Dr. Peter Hamilton Raven was born in Shanghai on June 13, 1936, and passed away on April 25, 2026. Devoting his life to botany, biodiversity conservation, and international scientific collaboration, he will be remembered as one of the most influential scientists in the history of modern botany and conservation thought. His lifelong work connected plant systematics, evolutionary biology, botanical garden development, biodiversity conservation, environmental education, and international scientific cooperation. Few scientists have been able, as Raven was, to integrate original research, institution building, public advocacy, global biodiversity conservation, and international scientific collaboration so effectively. His legacy lies not only in the plants he studied, the institutions he led, or the works he edited, but also in the way he helped humanity recognize that plants are not merely a passive background in nature, but the living foundation upon which the entire biosphere depends (Raven, 2021b).

As one of the most important international partners of Chinese botany, Raven played a decades-long leadership role, especially in the *Flora of China* project, the English revised edition of the *Flora Reipublicae Popularis Sinicae*. As Director and President of the Missouri Botanical Garden for nearly 40 years, he transformed the institution into a major global center for plant science and conservation. At the same time, he became one of the world's most enduring and influential advocates for biodiversity conservation. In 2000, the U.S. National Science Foundation awarded him the National Medal of Science in recognition of his important contributions to plant systematics and evolution, research on coevolution, and international biodiversity conservation.

1 Reshaping Botany with Evolutionary Thinking

Raven's scientific reputation was established early through a classic paper on the coevolution between butterflies and plants, co-authored with Paul R. Ehrlich (Ehrlich & Raven, 1964). This paper described the reciprocal evolutionary relationships between butterflies and their host plants and helped introduce the concept of "coevolution" into modern biology. Raven and Ehrlich argued that interactions between plant secondary metabolites and insect adaptations could drive reciprocal adaptation and diversification, thereby providing a powerful theoretical framework for understanding how ecological interactions shape evolution. The significance of this work extended far beyond the study of butterflies and plants themselves. It encouraged evolutionary biology to move from a primary focus on individual organisms toward a greater emphasis on relationships among organisms and ecological networks. Species do not evolve in isolation; rather, they evolve through interactions with pollinators, herbivores, pathogens, competitors, mutualists, and environmental landscapes. In this sense, Raven's contribution laid an important conceptual foundation for modern studies of plant–insect interactions, chemical ecology, community evolution, and the mechanisms underlying the generation of biodiversity. It also placed plants in a more central position within evolutionary theory, demonstrating that plant chemistry and defense mechanisms are not peripheral issues, but major forces driving biological diversification.

Raven also made important contributions to plant systematics and biogeography. In the paper "Angiosperm biogeography and past continental movements", co-authored with his colleagues, he linked the distribution patterns of angiosperms to continental drift and geological history (Raven & Axelrod, 1974). This study brought historical geology, evolutionary biology, and plant geography into a unified theoretical framework. Today, when researchers reconstruct time-calibrated phylogenetic trees, infer ancestral distribution areas, and study the formation of floras at continental scales, they are, to some extent, continuing the scholarly tradition shaped by Raven's foundational contributions.

Raven's *Biology of Plants* is one of the most widely used textbooks in plant biology worldwide (Raven, 2004). Generations of students have learned plant anatomy, physiology, evolution, ecology, and diversity through this book. Textbooks may appear less prominent for some people than research papers, but they shape scientific imagination and determine how future scientists first encounter and understand a discipline.

2 Transforming the Missouri Botanical Garden into a Global Institution

Raven's scientific contributions were inseparable from his leadership of the Missouri Botanical Garden. In 1971, he became Director and President of the Missouri Botanical Garden, and he led the institution for nearly four decades thereafter. Under his leadership, the Missouri Botanical Garden developed from a regional institution into one of the world's leading centers for plant taxonomy, tropical botany, conservation biology, botanical informatics, public education, and international collaboration. The Missouri Botanical Garden's memorial article also emphasized that, during his nearly four decades as Director and President, Raven transformed the institution into a global center integrating scientific research, education, horticultural display, and sustainability (https://www.missouribotanicalgarden.org/peter-raven).

This transformation was important because botany needs institutions with the capacity for global action. Plant diversity is highly concentrated in regions where taxonomic capacity, conservation funding, and scientific infrastructure are often relatively limited. Raven understood deeply that botanical gardens should not merely be places for displaying plants; they must also serve as research centers, training centers, conservation centers, germplasm repositories, public classrooms, and bridges connecting nations. In this broader vision, botanical gardens become indispensable infrastructure for biodiversity science (https://news.mongabay.com/2026/04/peter-raven-botanist-and-advocate-for-biodiversity-has-died-aged-89/).

His leadership was also marked by a profound spirit of collaboration. Raven did not regard the Missouri Botanical Garden as an isolated American institution. Instead, he actively promoted partnerships between the Garden and scientists and institutions around the world. These collaborations supported floristic surveys, taxonomic revisions, conservation projects, talent training, and data-sharing networks. In many respects, he anticipated what has now become a widely accepted view: biodiversity conservation requires globally collaborative scientific networks, rather than isolated national projects (Raven & Miller, 2020).

3 Promoting Plant Conservation a Global Priority

Raven's conservation philosophy was founded on a simple yet profound recognition: plants sustain life on Earth, yet they are often overlooked in conservation policy and public awareness. Animals, especially large mammals and birds, tend to attract greater public attention. Raven, however, repeatedly emphasized that the loss of plant diversity would affect food security, medicinal resources, ecosystem stability, climate regulation, and human civilization itself (Raven & Miller, 2020).

In his later writings, he continued to stress the critical role of plant scientists in conserving both wild plant diversity and crop genetic diversity. He pointed out that plant conservation is inseparable from human survival, because plants provide food, fiber, medicines, ecosystem services, and the biological foundation for sustainable development (Raven, 2019).

The world is simultaneously facing multiple global crises, including biodiversity loss, climate change, land degradation, food insecurity, and ecosystem collapse. Raven recognized long ago that these crises are not isolated from one another. The destruction of forests, wetlands, grasslands, and other plant-rich ecosystems not only reduces biodiversity, but also weakens carbon storage capacity, disrupts hydrological cycles, threatens the livelihoods of indigenous peoples and local communities, and undermines future advances in medicine, agriculture, and climate adaptation.

Raven had also been a strong advocate for international conservation frameworks, particularly the *Global Strategy for Plant Conservation* under the United Nations Convention on Biological Diversity (Wyse Jackson & Kennedy, 2009). This strategy drew greater global attention to the risk of losing tens of thousands of threatened plant species and established a target-oriented framework for plant conservation. Although the world has not yet succeeded in halting the loss of plant diversity, the efforts and advocacy of Raven and his colleagues have significantly elevated the status of plants within global conservation policy (Raven, 2019).

4 A Bridge Between Global Botany and Chinese Botany

Peter H. Raven's contributions to China have been especially significant. His deep scientific connections with China were established through decades of collaboration in floristics, taxonomy, and biodiversity conservation. He served as the international co-leader of the *Flora of China* project, one of the most important collaborative endeavors between Chinese scientists and the international botanical community. A commemorative article published by the Missouri Botanical Garden notes that Raven worked continuously for 35 years as co-editor-in-chief of this landmark international project (https://www.missouribotanicalgarden.org/peter-raven).

China is one of the world's most important centers

of plant diversity and endemism. Its vast territory, complex topography, monsoonal climate, long geological history, and refugial landscapes have together fostered an extraordinarily rich flora. Judged by the proportion of species in groups that we know well enough to make comparisons meaningful, China is second only to Brazil in national species richness (Raven, 2021a). Co-edited by Wu Zhengyi, Peter H. Raven, and Hong Deyuan, and completed through the efforts of more than 400 collaborators, *Flora of China* documented this richness in exceptional detail. By 2013, all 25 text volumes and 24 illustration volumes had been completed, recording 312 families, 3,328 genera, and 31,362 species of plants (Zhang & Gilbert, 2015), approximately half of which are endemic to China (Huang et al., 2011). Subsequently, the *Flora of China* at eFloras project not only made the entire work freely accessible online, but has also continued to update its content.

The *Flora of China* project brought together Chinese institutions, international botanists, herbarium resources, taxonomic expertise, and publishing platforms. This collaborative model remains an exemplary paradigm for biodiversity science in the twenty-first century.

Raven helped build bridges between Chinese botanists and the global botanical community. His work demonstrated that biodiversity science must transcend administrative boundaries, because plants, ecosystems, evolutionary histories, and conservation challenges could not be confined neatly to national borders. Through collaboration, training, editorial leadership, institutional development, and mutual respect, he helped Chinese botany gain greater international visibility and influence, while also enabling the global botanical community to better understand China's extraordinary plant diversity. This has been crucial for conservation. Poorly documented regions are easily underestimated, and species lacking formal names, distributional knowledge, or clear taxonomic status are difficult to protect. Raven consistently argued that biodiversity-rich countries should become scientific leaders rather than merely sources of specimens (Raven, 2019).

He also wrote directly to Zhou Guangzhao, then President of the Chinese Academy of Sciences, recommending that the herbarium of the Institute of Botany of the Academy be designated as the Chinese National Herbarium. In his letter, he stated that "it is in fact a world-class institution that can benefit all botanists", and that such a designation "would properly reflect the institution's national and international standing" (Raven, 1996).

Raven's support for China extended well beyond botany itself. He played an important role in helping China launch biodiversity research not far behind the international developments. He personally introduced international advances in biodiversity conservation and research to the leadership of the Chinese Academy of Sciences, and promptly provided the Academy with the latest version of the draft text of the Convention on Biological Diversity prepared under the leadership of the International Union for Conservation of Nature (Draft Articles Prepared by IUCN for Inclusion in A Proposed Convention on the Conservation of Biodiversity and for Establishment of Fund for That Purpose, Draft 6, June 1989 [Final]). He also advised that the Chinese Academy of Sciences should rapidly begin biodiversity research (Xu, 2015).

In November 2008, Raven visited Institute of Botany, Chinese Academy of Sciences, and delivered a lecture entitled "Encyclopedia of Life (EOL)", introducing in detail the concept, historical background, and implementation progress of the EOL project (Fig. 1). In July 2009, he visited the Institute again and engaged in extensive discussions concerning the organizational structure, data integration, and technical coordination of the China node of the EOL initiative (Fig. 2). These visits and discussions strongly promoted the establishment of the "Encyclopedia of Life China Regional Center (EOL-China)" project in China.

Fig. 1 On November 14, 2008, Dr. Peter Raven visited the Institute of Botany, Chinese Academy of Sciences, and dilivered a presentation on Encyclopedia of Life (EOL).

Fig. 2 On July 10, 2009, Dr. Peter Raven visited the Institute of Botany, Chinese Academy of Sciences again, and participated in the working meeting of EOL-China project.

In recognition of Raven's contributions to the Chinese Academy of Sciences, Chinese botany, and biodiversity science more broadly, he was awarded the 2009 International Science and Technology Cooperation Award of the Chinese Academy of Sciences and the 2010 Friendship Award of the People's Republic of China, the highest honor granted by the Chinese government to foreign experts.

5 Concluding Remarks

Peter H. Raven's contributions can be understood on four levels. Scientifically, he reshaped evolutionary biology through the theory of coevolution and through a wide range of influential works in botany, plant taxonomy, biogeography, ecology, environmental science, and biodiversity conservation, thereby advancing botany and related disciplines. Institutionally, he transformed the Missouri Botanical Garden into a global center for plant science and conservation. At the global level, he worked tirelessly to ensure that plants received a stronger voice within biodiversity policy and conservation ethics (Raven et al., 2020). For China, he helped establish one of the most important botanical achievements in history, *Flora of China*, promoted extensive exchanges and collaborations between Chinese scientists and their international counterparts, and facilitated the initiation of biodiversity research in China.

To commemorate Peter H. Raven is to remember that botany and biodiversity science are sciences concerned with the very foundations of life. They connect evolution, ecology, climate, agriculture, medicine, culture, and human survival. Plants carry the history of the Earth, and they also carry the future of humanity. The work of his lifetime reminds us to continue exploring the living world, protecting biodiversity, and building a civilization worthy of this living planet.

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