

### *THE ENDURING LEGACY OF FRANCISCO J. AYALA: BRIDGING SCIENCE, RELIGION, AND ETHICS*

### EL LEGADO PERMANENTE DE FRANCISCO J. AYALA: UN PUENTE ENTRE CIENCIA, RELIGIÓN Y ÉTICA

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Francisco J. Ayala is a towering figure whose contributions to science—particularly evolutionary biology—and the dialogue between science and religion have left an indelible mark on both fields. Ayala’s work is not only historically significant but continues to be relevant today, offering insights and frameworks that are crucial in contemporary discussions about the intersection of science, technology, philosophy, and ethics. His ability to bridge seemingly disparate domains—such as evolutionary biology and theology—underscores the profound impact of his work. This editorial seeks to highlight key contributions that reflect on Ayala’s legacy and its ongoing relevance based on the presentations and lectures, which took place at Universidad Pontificia Comillas, Madrid, in 12-13 March 2024 on the celebration of his 90<sup>th</sup> anniversary.

Robert M. Hauser’s discussion in “Francisco José Ayala and the American Philosophical Society” provides a historical perspective on Ayala’s contributions to the Society’s vast collections, particularly in genetics and evolutionary biology. Hauser underscores Ayala’s pivotal role in enhancing the Society’s resources, making it a premier repository for researchers. The

article highlights Ayala's dedication to promoting scientific knowledge while acknowledging the ethical dimensions of scientific endeavors.

Hana Ayala reflects on Francisco Ayala's profound humanitarian legacy in "Custodians and Stewards of Francisco J. Ayala's Revolutionary Contributions to Human Welfare and Human Progress." She elaborates on his significant scientific discoveries, such as the clonal reproduction of the Chagas disease parasite, and his philosophical insights into the evolution of ethical behavior. Hana emphasizes Ayala's holistic approach to science, which integrates creativity, ethics, and a commitment to human welfare.

In Sara Lumbreras' reflection, "Legacy and New Horizons: What Lies Ahead for Francisco J. Ayala's Lifework and the Center for Science Technology and Religion," the author emphasizes Ayala's role in fostering dialogue between science and religion. Lumbreras notes that Ayala's dual expertise in biology and theology uniquely positioned him as a mediator who could demonstrate that science and religion are independent yet complementary ways of understanding the world. The article also celebrates the Center's 20th anniversary, reflecting on its mission to integrate ethical considerations with advancements in science and technology, a vision deeply inspired by Ayala's work.

Jaime Tatay's piece, "The Sacredness of Nature as a Transnational Bridge Across the World's Cultures and Religions," draws on Ayala's appreciation for the interconnectedness of life. Tatay argues that the reverence for nature, a concept embedded in many faith traditions, can act as a unifying force in contemporary environmental movements. This theme resonates with Ayala's efforts to highlight the harmony between scientific inquiry and spiritual reflection, advocating for a holistic approach to environmental ethics.

Addressing a related theme, Hana Ayala points to—and expands on—a yet to be fully appreciated dimension of Francisco Ayala's trans disciplinary foresight, namely, his advocacy of art as a unique catalyst of maximizing the power of wonder to stimulate a mutually enriching confluence of science—and faith—based stewardship of nature. This dimension, she explains, entails a great promise for awakening the borderless reserves of potential scientific knowledge embedded in the earth's evolutionary and ecological fabric and packed with economic energy that could profoundly accelerate the world's journey towards sustainability.

Hesley Machado Silva, in his article, discusses Ayala's profound influence on the intersection of science and religion, particularly in the context of evolutionary education. Silva highlights Ayala's efforts to combat the rise of creationism in Brazil and the United States, and his advocacy for the teaching of evolution in Latin American schools. Ayala's commitment to promoting scientific literacy and addressing misinformation about climate change is also emphasized. Silva reflects on Ayala's mentorship and the enduring impact of his work in fostering a more scientifically informed and critically thinking society.

Julius Lukeš emphasizes the significant impact of Francisco Ayala on the field of evolutionary biology, particularly in the study of parasitic protozoa. Lukeš highlights Ayala's pioneering work in revealing the clonal reproduction mechanisms of these organisms, which has profound implications for epidemiology and public health. By exploring the evolutionary pathways of protozoa, Ayala's research provided crucial insights into combating diseases such as malaria and Chagas disease. Lukeš also notes that Ayala's passion for studying parasitic protists stemmed from his desire to help alleviate human suffering caused by these diseases.

In their article, Andrés Moya and Amparo Latorre delve into Francisco Ayala's extensive contributions to evolutionary biology and philosophy. They emphasize Ayala's pioneering research in molecular evolution and his role in addressing practical health challenges. Moya and Latorre highlight Ayala's efforts in elucidating the mechanisms of natural selection and genetic diversity, which have significantly advanced our understanding of evolutionary processes. They also explore Ayala's philosophical insights, particularly his arguments on the evolution of ethical behavior as a byproduct of intellectual abilities. The article underscores Ayala's interdisciplinary approach, integrating scientific rigor with philosophical inquiry, and his influence as a mentor to many researchers. Moya and Latorre celebrate Ayala's legacy, noting how his work continues to inspire and inform contemporary research, bridging gaps between different fields of study and contributing to a holistic understanding of life and its complexities.

Michael T. Clegg's contribution also highlights Ayala's role in advancing the field of population genetics and molecular evolution. Clegg reflects on Ayala's dedication to education and public understanding of science, noting his efforts to debunk pseudoscientific claims and promote evo-

lutionary theory as a cornerstone of biological sciences. His work exemplifies Ayala's enduring impact on both scientific research and science education.

As Robert Hauser explained, Francisco Ayala also made substantial contributions to the American Philosophical Society (APS), enhancing its status as a premier repository of scientific knowledge. His extensive collection of personal papers, which includes 201 linear feet of material, significantly bolstered the APS's resources in genetics and evolutionary biology. Ayala's involvement was instrumental in acquiring the papers of other eminent scientists, such as Walter Fitch and Theodosius Dobzhansky, thereby enriching the APS's archives. His dedication to promoting scientific inquiry and preserving historical documents helped the APS establish a comprehensive collection that spans the history of science, technology, and medicine. Moreover, Ayala's commitment to interdisciplinary dialogue mirrored the Society's founding principles of "promoting useful knowledge," originally articulated by Benjamin Franklin. By integrating his scientific expertise with philosophical and ethical reflections, Ayala reinforced the APS's mission to foster a holistic understanding of scientific and humanistic endeavors, ensuring that the APS remains a vital resource for researchers and scholars worldwide.

Together, these articles paint a vivid picture of Francisco Ayala's legacy—a legacy that continues to shape contemporary discourse in science, ethics, and religion. Ayala's work demonstrates that scientific progress and ethical reflection are not mutually exclusive but are, in fact, deeply intertwined. His contributions have laid a foundation for ongoing interdisciplinary dialogue, fostering a more integrated and holistic understanding of our world. Ayala's interdisciplinary approach and dedication to scientific inquiry serve as an enduring inspiration for the Hana and Francisco J. Ayala Center for Science, Technology and Religion.

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