

**BRIDGING MINDS AND FRONTIERS:
AN UNCONVENTIONAL ACADEMIC
ODYSSEY WITH FRANCISCO JOSÉ AYALA**

*Uniendo mentes y fronteras: una odisea académica poco
convencional con Francisco José Ayala*

Hesley Machado Silva

Professor and researcher - University Center of Formiga/MG (UNIFORMG) - Brazil
hesley@uniformg.edu.br; <https://orcid.org/0000-0001-8126-8962>

Received: March 7, 2024

Accepted: May 21, 2024

DOI: <https://doi.org/10.14422/ryf.vol288.i1464.y2024.005>

ABSTRACT: The text recounts the author's remarkable experience in establishing contact with Francisco José Ayala, a renowned professor, researcher, author, and philanthropist. Beginning in an unusual manner, the connection transcended the conventional boundaries of academia, dispelling the notion of inaccessibility of eminent scientists. This resulted in an interview and the publication of a letter in the *Science* journal, exemplifying Ayala's generosity. The narrative highlights Ayala's extensive contribution to the understanding of evolution, his role in issues of science and religion, and his notable philanthropy. The challenges faced during a period of collaborating in California are shared, emphasizing the consolidation of a relationship of trust. Ayala's influence is evident in the author's shift towards contemporary issues such as scientific misinformation and climatic themes, reflecting the enduring legacy Ayala left on his academic journey and the positive transformation in the author's career.

KEYWORDS: Francisco José Ayala, biological evolution, science education, science and religion, academic challenges, misinformation

RESUMEN: El texto relata la extraordinaria experiencia del autor al establecer contacto con Francisco José Ayala, catedrático, investigador, escritor y filántropo de renombre. Comenzando de forma inusual, la conexión trascendió las fronteras convencionales del mundo

académico, disipando la noción de inaccesibilidad de los científicos eminentes. El resultado fue una entrevista y la publicación de una carta en la revista *Science*, que ejemplifica la generosidad de Ayala. La narración destaca la amplia contribución de Ayala a la comprensión de la evolución, su papel en cuestiones de ciencia y religión y su notable filantropía. Se comparten los retos afrontados durante un periodo de colaboración en California, destacando la consolidación de una relación de confianza. La influencia de Ayala queda patente en el giro del autor hacia cuestiones contemporáneas como la desinformación científica y los temas climáticos, lo que refleja el legado perdurable que Ayala dejó en su trayectoria académica y la transformación positiva en la carrera del autor.

PALABRAS CLAVE: Francisco José Ayala, evolución biológica, enseñanza de las ciencias, ciencia y religión, desafíos académicos, desinformación

1. INTRODUCTION: THE IDEA OF CONTACT

My contact with the iconic figure of professor, researcher, author, and philanthropist Francisco José Ayala began in an unusual and almost accidental way, establishing a connection that transcended the conventional boundaries of discourse and academic relations. I still use it today as an example of the accessibility of authors for my students, fellow professors, and researchers, so that they too can try to experience contacting those who are reference points in their field of interest. Ayala dispelled the notion that eminent scientists are inaccessible and shrouded in an aura of arrogance. Instead, despite his eminence, he made his knowledge and his wisdom available to me. The connection originated as I was conducting research for an article about human evolution and its teaching. In the various readings required, the name of Francisco Ayala consistently emerged as a prolific author and co-author in the vast relevant literature on evolution and its teaching.

As the focus of the article was on Darwinian evolution (Ayala et al., 1974; Prugnolle et al., 2010) and the unnecessary and counterproductive conflicts with evolution posed by religious views such as creation science (Ayala, 2006, 2008a) and intelligent design (Ayala, 2007; Ayala et al., 2009), Ayala's name became even more prominent in the published articles. The impressive quality, quantity, and longevity of his contributions—spanning decades and standing out in high-impact journals, as well as in engaging and relevant articles and book chapters (Avisé et al., 2008, 2016; Ayala, 2005, 2009; Stebbins et al., 1981)—captured my attention.

Further research I conducted revealed his crucial role in supporting evolution education in the United States and worldwide. Ayala, an unwavering advocate for science, possessed the unique ability to harmonize it with religious

perspectives (Ayala, 2008b, 2017; Ayala, 2007). He played a significant role in a U.S. trial related to the teaching of creationism (Ayala et al., 1993), vehemently supporting the teaching of Darwinian theory and ensuring a favorable decision (Pennock, 2002).

Ayala's influence extended to prestigious platforms, including lectures at the Vatican and around the world. His achievements graced the headlines of renowned newspapers, such as *The New York Times*, reflecting the magnitude of his impact, with thousands of articles in his curriculum. Ayala's academic eminence was accentuated by his philanthropy, marked by substantial donations to universities, social causes, and education. His metrics as a researcher are unparalleled; it is challenging to find benchmarks in the academic universe.

As I became more and more immersed in Ayala's work, a bold and unconventional idea took root: to contact him, even though that an email from an unknown researcher and author from a small Brazilian university might seem audacious. A recipient of the 2001 National Medal of Science, one of the highest scientific honors in the United States, and also the recipient of the 2010 John Templeton Foundation Prize for his unparalleled contributions to the intersection and reconciliation between the realms of science and religion, Ayala would presumably have more pressing matters than to answer inquiries from a relatively young Brazilian professor and researcher.

2. **CONTACT AND UNEXPECTED ATTENTION: CONTINUING THE DIALOGUE**

Unexpectedly, Ayala's response to my peculiar contact was quick (the day after my email) and friendly, establishing a sustained long-distance dialogue that transcended geographical and intellectual boundaries. This unusual exchange not only enriched my view of science but also expanded horizons, perspectives, and my understanding towards a more comprehensive potential than the initial limitations of my role as a researcher.

As the dialogues unfolded, crucial themes such as education (Black et al., 1993; Silva, 2020a), scientific education (Ayala, 1968; Silva, 2023), evolution (Ayala, 1978; McDonald et al., 1978; Silva, 2022; Silva, 2021), human evolution (Ayala, 1996; Ayala et al., 1996; Belo et al., 2017; Silva et al., 2018), religious conflicts with science (Ayala, 2017), creationism (Ayala, 2006), in-

telligent design (Ayala, 2007; Silva, 2020b) and challenges in science education emerged, providing a rich opportunity for enhancing my knowledge. However, this enrichment was not one-sided; Ayala, a renowned researcher, not only listened to me but also showed reciprocal interest and learning, something hard to believe given the disparity in experience and academic expertise.

Assuming the position of co-editor for the scientific journal of the University Center, I conceived the idea of creating an interview section in the periodical, with Ayala as the first interviewee. Uncertainty about his acceptance, given his prestige and busy schedule, lingered in the air. Surprisingly, he promptly accepted, seeming to be not only willing but even honored to be interviewed, even though our journal was virtually unknown and still seeking relevance.

This collaboration resulted in elaborate and meticulous responses, evidencing the care and affection with which Ayala embraced my proposal. Far from being concise answers, they were in-depth reflections, the result of the commitment of someone who did not limit his ability to inspire others. The responses, published in the journal (Silva, 2016), provided abundant knowledge and outstanding experiences for the small Brazilian university and city, impacting local students, teachers, and researchers.

As we approached the launch of the journal in a carefully planned ceremony, I decided to be bold once again. I asked Ayala, one of the most influential researchers in the world, for a video supporting our initiative. I was once again surprised by Ayala's kindness: he not only sent an encouraging and charming video but also extended a warm invitation, inquiring about the possibility of my spending time with him and his group in California. This surprising continuity of dialogue not only confirmed Ayala's generosity but also expanded the horizons of collaboration and mutual learning.

3. THE (UNFORTUNATELY) SHORT AND (ASTONISHINGLY) RICH VISIT: CHALLENGES AND LEARNING

My trip to California (July 2017), with the purpose of personally meeting and spending a month with Ayala, was preceded by justified anxiety. Upon arrival, I immediately realized how he was an iconic figure in the academic milieu of the University of California, Irvine, revealing that I was entering an academically distinct universe from my own.

Initially, I contacted eminent scholars in the field on campus and later was introduced to the group that would work with Ayala during the period, composed of select and distinguished researchers (Dr. Michel Tibayrenc and Dr. Diego Bermejo). This contact with scholars from various parts of the world would, in itself, be a valuable experience, opening numerous doors for me, but it was only the beginning.

Ayala received me with the same kindness perceived in our remote contact; however, things were not easy. In the first week, while attempting to produce material that I deemed interesting, I noticed a lack of enthusiasm on his part, coupled with sharp criticisms of what I was proposing for activities to be carried out during that period. At the end of this frustrating week, I contemplated giving up the endeavor, confronted by the difficulty of achieving my academic and social goals.

The desire to seize the opportunity persisted, but doubt arose as to whether I was prepared for it. Ayala, a renowned scientist, seemed to have little patience for dealing with an "intruder" in the global academic elite. After the first weekend in California, marked by a certain frustration, I began the second week determined to change the course of the relationship.

Meeting Ayala again, I made another bold suggestion upon noticing two stacks of the world's most prestigious academic journals, *Science* and *Nature*, in his office. I proposed submitting a letter to one of these journals. He provocatively asked why the editors would be interested in what I was producing. Aware that it was a challenge, I replied that I would try to learn from the submission process to such a high-level journal and that even if my text were not approved, it would be an enriching experience.

This response seemed to encourage him, despite his apparent skepticism. In the last three weeks of our interaction, we developed a research project in a productive and harmonious dialogue, on issues concerning the teaching of evolution, science and religion, contemporary educational issues, among others, building a relationship of trust and admiration. On the last day of that endeavor, as I bade him farewell, Ayala inquired about when I would return with my family for a longer stay in Irvine, suggesting the consolidation of an academic and friendly relationship marked by mutual respect.

4. UNFOLDING CONVIVIALITY: TREADING CHALLENGING PATHS

Two months after the enriching period in California, I celebrated the publication of my letter in the journal *Science* (Silva, 2017). With pride, I shared this milestone with colleagues, and it was particularly gratifying to communicate with Ayala, who promptly provided positive feedback, praising the quality of the text and the achievement of publication in a highly renowned journal.

Our fruitful relationship solidified, with ideas for publications flowing constantly. I would send Ayala my new articles, realizing the impact on my academic output in the following years. Despite the failure of our joint project, which we submitted to the John Templeton Foundation, on the unnecessary conflict between science and religion in the teaching of biological evolution, the challenging period continued to resonate in my career, shaping my personal and academic worldview.

My output on the teaching of biological evolution and the threats posed by creation science and intelligent design has grown, resulting in publications in renowned journals such as *Science and Education* (Silva et al., 2020), *Evolution: Education and Outreach* (Silva et al., 2021), and *Scientific American* (Silva, 2023d), as well as book chapters in the USA (Silva, 2019; Silva et al., 2019) and Brazil (Borba et al., 2023; Silva, 2023), including the publication of my doctoral thesis (Silva, 2022).

Inspired by Ayala and our dialog, by personal and Brazilian (and global) demands, I directed my research towards scientific disinformation (Silva, 2021b), tackling scientific Fake News (Silva, 2021a), pseudosciences (Silva, 2023a, 2024), and conspiracy theories (Silva, 2021). The pandemic has broadened my interests (Silva, 2021c). I explored vaccine hesitation (Silva, 2020), influence of the anti-vaccine movement (Silva, 2023b), epidemiological impacts (Silva, 2022), and ineffective treatments for COVID-19 (Silva, 2023; Silva, 2023; Silva, 2022; Silva, 2021a), such as chloroquine for COVID-19 (Silva, 2022b). I have also written on environmental issues (Silva, 2023f), such as climate change denial, deforestation in the Amazon, and global warming (Silva, 2023a; Silva, 2021h, 2022a).

As an unwelcome result, I faced reactions in Brazil from political and pseudoscientific movements on the internet, receiving almost threatening emails. I sought to respond to them satisfactorily, remembering that Ayala had also opposed anti-science movements and had met with resistance. The desire to discuss these issues with Ayala became more pronounced over time as

I realized the increasing relevance of the topics I was now addressing and publishing.

In retrospect, I realize how my role as a researcher, focused on contemporary and emerging issues, was impacted by the relatively brief period of interaction with this great researcher. The few but important interactions continue to resonate in my academic journey, guiding me on challenging and meaningful paths, inspiring me to persist in the struggle for the appreciation of science in Brazil and worldwide.

5. CONCLUSION

The future of scientific research and education faces unprecedented challenges, with the rise of new fields intertwined with persistent issues of misinformation, fake scientific news, and conspiracy theories. As I navigate my career as a researcher, Ayala's legacy becomes increasingly relevant. Beyond his contributions to the understanding of evolution, his works and teachings guide us in recognizing the crucial role of scientific education.

In a world where movements like the anti-vaccine movement gain momentum and skepticism towards climate change persists, the importance of scientific education and communication must be increasingly emphasized. Ayala, a skilled communicator, serves as a beacon for the imperative need to inform the public and guard against misinformation. His ability to bridge the gap between science and society remains crucial, especially in combating conspiracy theories that challenge established scientific knowledge.

Ayala's influence resonates in his approach to the intersection of science and religion, a topic he has passionately advocated throughout his career. This ongoing dialog is essential for shaping education and societal attitudes, especially in countries where religiosity is so important, such as Brazil and the US, for example. His commitment to this cause provides a guide for future researchers to navigate these complex issues and foster understanding.

The current prevalence of flat-Earth beliefs (Mohammed, 2019; Weill, 2022), Holocaust denial (Lipstadt, 2016) and numerous other conspiracies underscores the urgency of Ayala's teachings and influence. His wisdom and communication skills are invaluable for immunizing the population against unfounded theories. It is essential that young researchers be encouraged and

inspired by his legacy, allowing him to illuminate their paths and contribute to the enhancement of their academic journeys.

Through my personal experience of interacting with Ayala, a connection emerged from what seemed like a seemingly casual encounter but profoundly influenced my academic journey and brought me into contact with icons of biology. The opportunity to engage (albeit indirectly) with a figure like Theodosius Dobzhansky, Ayala's doctoral advisor (Ayala, 1976, 1985, 2000; Ayala et al., 1976; Barahona et al., 2005), opened doors to new horizons, cultivating a belief in unlimited possibilities as a biology teacher. Dobzhansky, after all, enunciated the maxim that "Nothing in biology makes sense except in the light of evolution" (Dobzhansky, 1964, 1973), which I learned in high school and now resonates in my biology classes and guides part of my research. And now, in the year 2024, I will publish with immense pride in one of the same journals in which this eminent geneticist expressed his maxim, *The American Biology Teacher*.

This encounter inspired me to submit bold articles and embark on new research ventures. To me, this represents the lasting legacy that Ayala left—a legacy that echoes in the influence I seek to impart to my students and mentees. If we examine the references of this text, it can be noticed how much my academic production changed in terms of quantity, quality, and scope, as a result of my interaction with Ayala: I was able not only to elevate my standing as a researcher but also to sharpen my focus on the interface between science and society. Reflecting on this transformative journey, I recall that every advancement, every research path explored, and every positive change in my academic life can be traced back to the fortuitous connection with Francisco José Ayala.

References

- Avise, J. C., Bowen, B. W., & Ayala, F. J. (2016). In the light of evolution X: Comparative phylogeography. *Proceedings of the National Academy of Sciences*, 113(29), 7957-7961. <https://doi.org/10.1073/pnas.1604338113>
- Avise, J. C., Hubbell, S. P., & Ayala, F. J. (2008). In the light of evolution II: Biodiversity and extinction. *Proceedings of the National Academy of Sciences*, 105(suppl._1). <https://doi.org/10.1073/pnas.0802504105>
- Ayala, Francisco J. (1968). Biology as an autonomous science. *American Scientist*, 56(3), 207–221.

- Ayala, Francisco J. (1976). Theodosius Dobzhansky: the man and the scientist. *Annual Review of Genetics*, 10(1), 1–7.
- Ayala, Francisco J. (1978). The mechanisms of evolution. *Scientific American*, 239(3), 56–69.
- Ayala, Francisco J. (1985). Theodosius Dobzhansky: January 25, 1900–December 18, 1975. *Biographical Memoirs. National Academy of Sciences (US)*, 55, 163–213.
- Ayala, Francisco J. (1996). Response: Gene lineages and human evolution. *Science*, 272(5266), 1363–1364.
- Ayala, Francisco J. (2000). Theodosius Dobzhansky: a man for all seasons. *Resonance*, 5(10), 48–60.
- Ayala, Francisco J. (2005). The structure of evolutionary theory: On Stephen Jay Gould’s monumental masterpiece. *Theology and Science*, 3(1), 97–117.
- Ayala, Francisco J. (2006). Evolution vs. creationism. *History and Philosophy of the Life Sciences*, 28(1), 71–82.
- Ayala, Francisco J. (2007). Darwin’s greatest discovery: design without designer. *Proceedings of the National Academy of Sciences*, 104(suppl._1), 8567–8573. <https://doi.org/10.1073/pnas.070107210>
- Ayala, Francisco J. (2008a). Darwin and intelligent design. *HTS Theological Studies*, 64(1), 668–669.
- Ayala, Francisco J. (2008b). Science, evolution, and creationism. *Proceedings of the National Academy of Sciences of the United States of America*, 105(1), 3–4. doi: 10.1073/pnas.0711608105
- Ayala, Francisco J. (2009). Darwin and the scientific method. *Proceedings of the National Academy of Sciences*, 106(suppl._1), 10033–10039. <https://doi.org/10.1073/pnas.0901404106>
- Ayala, Francisco J. (2017). Science and Religion: Conflict or Concert? *The Wiley Blackwell Companion to Religion and Ecology*, 146–162. <https://doi.org/10.1002/9781118465523.ch12>
- Ayala, Francisco J, & Black, B. (1993). Science and the courts. *American Scientist*, 81(3), 230–239.
- Ayala, Francisco J, & Campbell, C. A. (1974). Frequency-dependent selection. *Annual Review of Ecology and Systematics*, 5(1), 115–138.
- Ayala, Francisco J, & Escalante, A. A. (1996). The evolution of human populations: a molecular perspective. *Molecular Phylogenetics and Evolution*, 5(1), 188–201.
- Ayala, F. J. & Prout, T. (1976). In memoriam: Theodosius Dobzhansky 1900–1975. *Social Biology*, 23(2), 101–107.
- Ayala, F. J. & Rodríguez, M. Á. C. (2009). *Darwin y el diseño inteligente*. Mensajero.
- Ayala, F. J. (2007). *Darwin’s Gift to Science and Religion*. Washington, DC: Joseph Henry Press. doi: 10.17226/11732

- Barahona, A., & Ayala, F. J. (2005). Theodosius Dobzhansky's role in the emergence and institutionalization of genetics in Mexico. *Genetics*, 170(3), 981–987. <https://doi.org/10.1093/genetics/170.3.981>
- Belo, L. L. A., TELES, K. I., & Silva, H. M. (2017). Efeitos da alimentação na evolução humana: uma revisão. *Conexão Ciência*, 12(3), 93-105.
- Black, B., Ayala, F. J., & Saffran-Brinks, C. (1993). Science and the law in the wake of Daubert: A new search for scientific knowledge. *Tex. L. Rev.*, 72, 715.
- Borba, R. C. do N., & Silva, H. M. (2023). El Laicismo En La Educación Y La Enseñanza De Las Ciencias Y La Biología: Cuestiones Inquietantes Ante Retos Ineludibles. In A. Mendonça, D. Sepulveda, & J. A. Sepulveda (Eds.), *Laicismo en la educación: políticas, conceptos y prácticas*. Ciencia Scripts.
- Dobzhansky, T. (1964). Biology, molecular and organismic. *American Zoologist*, 443–452.
- Dobzhansky, T. (1973). "Nothing in Biology Makes Sense Except in the Light of Evolution". *The American Biology Teacher*, 35(3), 125-129.
- Lipstadt, D. (2016). *Denying the Holocaust: The Growing Assault on Truth and Memory*. Penguin; UK ed. edition.
- McDonald, J. F., & Ayala, F. J. (1978). Gene regulation in adaptive evolution. *Canadian Journal of Genetics and Cytology*, 20(2), 159-175.
- Mohammed, S. N. (2019). Conspiracy Theories and Flat-Earth Videos on YouTube. *The Journal of Social Media in Society*, 8(2), 84-102.
- Pennock, R. T. (2002). Should creationism be taught in the public schools? *Science & Education*, 11, 111-133.
- Prugnolle, F., Durand, P., Neel, C., Ollomo, B., Ayala, F. J., Arnathau, C., Etienne, L., Mpoudi-Ngole, E., Nkoghe, D., & Leroy, E. (2010). African great apes are natural hosts of multiple related malaria species, including *Plasmodium falciparum*. *Proceedings of the National Academy of Sciences*, 107(4), 1458-1463. doi: 10.1073/pnas.0914440107
- Silva, H. M. (2016). Interview with Francisco J. Ayala. *Revista Conexão Ciência I*, 11.
- Silva, H. M. (2017). Intelligent design endangers education. *Science*, 357(6354), 880.1-880. doi: 10.1126/science.aao3245
- Silva, H. M. (2019). Rescuing Darwin in Brazil: How a General Population Sample Views the Teaching of Creationism and Biological Evolution. In A. W. Cook, Kristin L.; Oliveira (Ed.), *Evolution Education and the Rise of the Creationist Movement in Brazil* (1st ed., p. 260). Lexington Books.
- Silva, H. M. (2020). The historic success of vaccination and the global challenge posed by inaccurate knowledge in social networks. *Patient Education and Counseling*. doi: 10.1016/j.pec.2020.09.006
- Silva, H. M. (2020b). Ark of Absurdities: Creationism Comes to Brazil. *Skeptical (Altadena, CA)*, 25(2), 26–31.

- Silva, H. M. (2021). The xenophobia virus and the COVID-19 pandemic. *Éthique & Santé*, 18(2), 102–106. doi: 10.1016/j.etiqe.2021.03.002
- Silva, H. M. (2021a). Antibiotics against viruses: Brazilian doctors adrift. *Infection Control & Hospital Epidemiology*, 1–5. doi: 10.1017/ice.2021.434
- Silva, H. M. (2021b). Medicines and Illusions in the fight against COVID-19 in Brazil. *Ethics, Medicine and Public Health*, 16(November 2020), 100622. doi: 10.1016/j.jemep.2020.100622
- Silva, H. M. (2021d). The (in) competence of the Bolsonaro government in confronting Covid-19. *Infection Control & Hospital Epidemiology*, 1–3. doi: 10.1017/ice.2021.431
- Silva, H. M. (2021e). The Brazilian Scientific Denialism Through The American Journal of Medicine. *The American Journal of Medicine*, 2019–2020. doi: 10.1016/j.amjmed.2021.01.003
- Silva, H. M. (2021f). The danger of denialism: lessons from the Brazilian pandemic. *Bulletin of the National Research Centre*, 45(1), 55. doi: 10.1186/s42269-021-00516-y
- Silva, H. M. (2021h). Wildfires and Brazilian irrationality on social networks. *Ethics in Science and Environmental Politics*, 21, 11–15. doi: 10.3354/esep00194
- Silva, H. M. (2022). Pope Alexander VII, President Bolsonaro, and pandemics: When humanity goes back. *Ethics, Medicine and Public Health*, 21, 100721. doi: 10.1016/j.jemep.2021.100721
- Silva, H. M. (2022a). Information and misinformation about climate change: lessons from Brazil. *Ethics in Science and Environmental Politics*, 22, 51–56. <https://doi.org/10.3354/esep00201>
- Silva, H. M. (2023a). Brazilian amazon : environmental and economic tragedy. *Revista Sertão Sustentável*, 5, 90–99.
- Silva, H. M. (2023b). A plausible hypothesis for the higher Covid-19 mortality in Brazil. *African Health Sciences*, 23(4), 48–50.
- Silva, H. M. (2022c). *Professores de Biologia e Ensino de Evolução: uma perspectiva comparativa entre Estado e Igreja na América Latina*. Generis Publishing.
- Silva, H. M. (2023d). Bolsonaro and drugs without scientific evidence: An old relationship. *Atencion Primaria*, 55(5). doi: 10.1016/j.aprim.2023.102618
- Silva, H. M. (2023f). Religion and science must work together on behalf of the environmental movement. *PLURA, Journal for the Study of Religion*, 14(2), 216–222. doi: 10.29327/256659.14.2-12
- Silva, H. M. (2023h). Secularism, biology teachers, and evolution teaching: a comparative analysis of the Brazilian phenomenon. *Journal of Biological Education*, 1–16. <https://doi.org/10.1080/00219266.2023.2226684>
- Silva, H. M. (2023i). Will Creationism Continue to Flourish in Brazil ? *Scientific American*.

- Silva, H. M. & Mortimer, E. F. (2019). Brazilian High School Biology Teachers' Perception of Evolution and Its Teaching. *Evolution Education and the Rise of the Creationist Movement in Brazil*, 69.
- Silva, H. M. & Mortimer, E. F. (2020). Teachers' Conceptions about the Origin of Humans in the Context of Three Latin American Countries with Different Forms and Degrees of Secularism. *Science and Education*, 29(3), 691-711. doi: 10.1007/s11191-020-00124-8
- Silva, H. M., Peñaloza, G., Tomasco, I. H., & Carvalho, G. S. (2018). Chimpanzee included in the genus Homo? How biology teachers from three Latin American countries conceive it. *Journal of Biological Education*. doi: 10.1080/00219266.2018.1501408
- Silva, H. M., Peñaloza, G., Tomasco, I. H., & Carvalho, G. S. (2018). Chimpanzee included in the genus Homo? How biology teachers from three Latin American countries conceive it. *Journal of Biological Education*. doi: 10.1080/00219266.2018.1501408
- Silva, H. M., Oliveira, A. W., Belloso, G. V., Díaz, M. A., & Carvalho, G. S. (2021). Biology teachers' conceptions of Humankind Origin across secular and religious countries: an international comparison. *Evolution: Education and Outreach*, 14(1), 1–12. doi: 10.1186/s12052-020-00141-9
- Stebbins, G. L., & Ayala, F. J. (1981). Is a new evolutionary synthesis necessary? *Science*, 213(4511), 967-971.
- Weill, K. (2022). *Off the Edge: Flat Earthers, Conspiracy Culture, and why People Will Believe Anything*. Algonquin Books.