



DIEGO BERMEJO (COORD.)

PASIÓN
POR LA VIDA
PASSION
FOR LIFE

Alianza editorial

DIEGO BERMEJO (ED.)

Pasión por la vida
Passion for Life

Homenaje a Francisco J. Ayala
en su 85 cumpleaños
Homage to Francisco J. Ayala
on his 85th Birthday

ALIANZA EDITORIAL



BRIDGING THE WORLDS OF SCIENCE AND RELIGION

JULIUS LUKEŠ

I heard the name Francisco J. Ayala (abbreviated FJA below) for the first time in the early 1990s, when I read the now famous paper in which he and two colleagues formulated the clonal theory of parasitic protozoa (Tibayrenc *et al.* 1990). In the upcoming years, this line of thought was highly debated (collected over 650 references until present), became very influential and was much further extended by FJA and a number of other scientists. Actually, a true revival of the discussion about the extent of sex among unicellular eukaryotes occurred very recently in the pages of the most influential journals (Tibayrenc and Ayala 2013; 2014; 2015), testifying not only of the constant importance of the clonal theory, but also its stepwise spreading to all domains of life. I am sure it will be treated in detail in other contributions to this volume.

First meeting and scientific fecundity

Ever since, I have followed what FJA was doing to various extents, yet it was only 15 years later when we met in person. From my pers-

pective, it was one of the important moments of my scientific carrier —usually one realizes the importance only with hindsight, and it was like that in this case as well. It is the privilege of a scientist that she encounters, with some frequency, interesting and knowledgeable people. Yet even the lucky ones meet extraordinary and unique people just a few times in their careers, but if one is “on guard” and realizes that in time, such meetings may have a lasting and transformative impact. My first encounter with FJA was of that caliber, of course from my perspective only.

I was lucky that way in 2006, when a consortium of several European Union laboratories, of which I was a member, assembled an interesting and extensive dataset on *Leishmania* species, and I was advised by the leader of the team, Michael Miles from the London School of Hygiene and Tropical Medicine, to contact FJA and if possible, discuss the results with him. Consequently, we met in the Hotel Intercontinental at the Pařížská street of Prague, which was a non-random place (as a matter of fact, places, people, events etc. tend to render unusual perspectives when FJA becomes involved). As I have learned much later, this particular “inter-continental” hotel is a very special one for FJA and his wife Hana, as they use to stay there at least once every year since their wedding a long time ago. Not only that, the staff treats them as old and distinguished friends as they happen to stay each and every year in the same room. Subtle but powerful symbols, that’s another thing one comes across often when meeting FJA.

But let’s return to the parasitic *Leishmania*, responsible for so much human suffering. After a year-long debate on how to select and best present the data, we published with FJA our first joint paper on how this serious human pathogen might have spread around the world. Moreover, we have found ample evidence for predominantly clonal populations with very few, but prominent signs of genetic exchange (Lukeš *et al.* 2007). While some parts of the story got eventually over-layered by much bigger datasets, the core of it still holds and the possible emergence, in Central America, of this two-host parasite of mammals and phlebotomine flies from a single-host

flagellate of some ancestral insects became further supported by new data (e.g. Kaufer *et al.* 2017).

In the course of our collaboration, we discussed the question of trypanosomes that are serious pathogens of horses and livestock and for over 100 years have been placed into two distinct species, *Trypanosoma evansi* and *Trypanosoma equiperdum*. FJA was earlier interested in them because those are trypanosome species that apparently had no chance to perform sex (at least not in the last several thousands of years, which for a creature with a generation time of 8 hours is pretty long). It is because mating of trypanosomes is confined to their tsetse fly vector, which has been eliminated from the life cycle of these two highly pathogenic flagellates, which are transmitted directly from one horse or camel to another. Interestingly, we have accumulated evidence that these are actually not separate species at all, but rather strains of *Trypanosoma brucei* that lost either parts or all of their mitochondrial DNA, also termed kinetoplast DNA (Lai *et al.* 2008). Our prediction was correct, as it was shown later that their nuclear genome is virtually identical with that of *T. brucei* (Carnes *et al.*, 2015), strongly supporting the claim that *T. evansi* and *T. equiperdum* are actually “just” *petite* mutants of *T. brucei*. This is only the second known parallel to yeast *Saccharomyces cerevisiae* and its corresponding *petite* mutants, found in an unrelated group of eukaryotes. Moreover, this finding has substantial consequences for the epidemiology and treatment of surra and dourine, two serious diseases caused by these pathogens in dozens of countries on all continents. Later, in further collaboration with FJA and Zhao-Rong Lun, we have shown that both trypanosomes emerged many times independently due to a random loss of the kinetoplast DNA. Moreover, we were able to predict the out-of-Africa migration of several strains of *T. evansi* and *T. equiperdum* (Lun *et al.*, 2010). Lately, we collaborated on a study of the most early-branching trypanosomatid, *Paratrypanosoma* (Skalický *et al.* 2017).

Ayala, Czechia and science

FJA has a special relationship with the Czech Republic (by some called Czechia more lately; I have to ask FJA what his preference is), which initiated in the times when it used to be Czechoslovakia or Czechoslovak Socialist Republic. I believe it is worth elaborating on how this relationship, rather unusual for a well-known US scientist, started. Until the collapse of the Soviet bloc in 1989, The Czechoslovak government was a loyal part of it, hostile to “the West” and the United States in particular. This meant th Czechoslovak citizens —including the author of these lines— were trapped behind the Iron Curtain, indoctrinated in various ways and with very limited connections to the Western Europe. Following the Soviet system, research was being performed at two institutions only: the Czechoslovak Academy of Sciences, which was seen as some kind of elite institution, and at the universities that were, however, supposed to primarily teach, so any funding for science was very limited there. As a whole, research was poorly funded and organized, isolated from the West, focused on a limited number of subjects, centrally planned and therefore very rigid and static. Moreover, the Communist party, the unlimited ruler of the country, kept a watchful eye over the scientists, who were generally considered as subjects with a tendency to be disloyal to the regime. As someone who did his studies in those days, I know well. It was very rare that a Western scientist would be allowed to visit the Czechoslovak Academy, it was close to impossible for a Czechoslovak scientist to go to conferences outside of the Soviet bloc, and very few international meetings with the participation of Western scientists were organized in Czechoslovakia till the 90s.

Interestingly, there were few exceptions. One of them was evolutionary studies of all kinds, as this subject particularly was endorsed by the theoreticians of the so-called “Marxism and Leninism”, the core ideology of the Soviet bloc. As almost everything, the communists got it wrong though. For them evolution was principally the unstoppable development of the society, in the Marxist doctrine from capitalism to socialism and eventually to communism. More-

over, for them the most important aspect of Darwin's theory was, even at the end of the 20th century, its usefulness as an anti-religious teaching. Hence, it was a scientific domain for which the regime was willing, and perhaps even eager, to organize international meetings. Still, few Western scientists would attend such meetings, due to the notorious difficulties with visa and permissions, as well as quite likely permanent surveillance. Yet, some still decided to come because they thought it was interesting and/or challenging and maybe even inspiring in some way. The fact that FJA decided to attend a conference on evolution in the socialist Czechoslovakia, even at that time under highly unusual circumstances and obstacles, reflect nicely on his unorthodox manners, courage, curiosity and exploratory behavior. I dare to guess that for the same reasons he became deeply interested in Chinese culture (and as it is with FJA, became an expert on the subject) when China was a no-go place, allowing him to collect, and that way preserve for posterity, precious cultural artifacts that would most likely have perished during the madness of the so-called cultural revolution or just due to negligence in the following years.

But let's get back to that Czechoslovak trip, which turned out to have a major impact on FJA's life. As a curious and courageous man, who did not hesitate to travel to obscure and/or difficult countries in difficult times, FJA decided to check out what the view on Darwinism was in the countries of the so-called Socialist camp. A restless and at that time well-known biologist with interest in insect hormones and also a high-ranking communist, Vladimír J.A. Novák started to organize international symposia on natural selection in the beginning of the 70s. The leitmotif was the (re-)interpretation of Darwinism from the perspective of Marxism-Leninism (Novák 1978) and, interestingly, even a limited number of "Western" scientists were allowed to participate along with old academicians such as the famous Russian theoretician on the primordial soup, Alexander Oparin. Novák was a deeply convinced communist but also had a reputation of a fair person who genuinely cared about science (e.g. he used to work in Cambridge under the famous British entomologist

V. Wigglesworth). As it happened, Novák was supervising a young lady Hana, who did a PhD in evolutionary biology. From all I know, FJA and Hana fell in love during the conference and intended to spend the rest of their lives together which, hard to believe now, was still virtually unimaginable in the early 80s. After some brave and very risky tricks, Hana was eventually able to cross the Iron Curtain and arrived in the US. Hana and FJA got married and have been happy together ever since, making a truly unique couple.

*Evolution is not “devil’s discovery”
and Darwin is not “a bad guy”*

It is well known that around 50% of the US citizenship still does not recognize evolution of humans and other organisms as an overwhelmingly supported theory and rather prefers unscientific narratives of humans being created by God a few thousand years ago (Ayala 2015). After all, my personal experience is similar. Many years ago, when I tried to explain to my mother what I was doing as an evolutionary biologist, she became genuinely worried about the direction of my life, as the only thing she remembered about evolution was what she was told by a priest who in a small South Bohemia village during the World War II taught her —evolution is devil’s discovery and that its proponent Charles Darwin is a bad guy. It was no easy task to eventually convince my mother that the truth is dramatically different.

Yet Francisco took upon himself the super-ambitious task to convince the big nation of the United States (and as a collateral bonus other nations as well) about exactly the same thing. What some would see as disadvantages for such a noble ambition —namely studies at a religious school and ordainment as an erstwhile Dominican priest, his origin from [at that time] deeply Catholic Spain, his strong Spanish accent [which I suspect he retains intentionally]—FJA’s elegance in speech, writing and behavior turned these into downright advantages. He argued that “science and religious faith

need not be in contradiction. Science concerns processes that account for the natural world. Religion concerns the meaning and purpose of the world and of human life, the proper relation of humans to their Creator and to each other, the moral values that inspire and govern people's lives" (Ayala 2010). Elsewhere he said "Science and religious beliefs need not be in contradiction. If they are properly understood, they *cannot* be in contradiction because science and religion concern different matters..." (Ayala 2007). This way FJA and few others were able to shift the dialogue between science and religion from a centuries-long conflict, which was further nurtured by contemporary "theories", such as the intelligent design, probably intentionally widening the gap between science and religion so that it could easily become unsurmountable.

Although this is without any hard evidence, I dare say that FJA's teaching might have had a significant influence on the stand of The Vatican towards evolution. It was Pope Benedict XVI who clearly stated that "...there are so many scientific proofs in favor of evolution which appears to be a reality we can see and which enriches our knowledge of life and being as such" (Benedict XVI 2007). But on the other side, the doctrine of evolution does not answer every query, especially the great philosophical question: where does everything come from? And how did everything start which ultimately led to man? Both the Pope and influential Catholic thinkers, such as FJA and Kenneth R. Miller believe these are questions of utmost importance and repeatedly stated that the evolutionary theory implies questions that must be assigned to philosophy and which are beyond the realms of science (e.g. Miller 2014; Ayala 2007).

These efforts certainly did not remain unnoticed. In 2010 FJA won the Templeton Prize, one of the most prestigious awards, which is intended for "entrepreneurs of the human spirit". At the occasion, FJA mentioned his deep beliefs in our free will and elsewhere stressed the contradiction with atoms that have no free will (Ayala 2007). On the occasion of the Templeton award, he stated that "I have been arguing for years, and I continue to argue in all possible ways that are accessible to me, that there need not be contradiction between

science and religion. Properly they cannot be in contradiction because they deal in different subjects. They are like two windows through which we look at the world; the world is one and the same, but what we see is different". Indeed, removing the deeply entrenched antagonism between these two domains is clearly FJA's mission.

The following day after the private ceremony at Buckingham palace, where he received the prize from the hands of His Royal Highness Prince Philip, the Duke of Edinburgh, FJA and Hana flew to Prague and in the evening arrived at our home in České Budějovice, or Budweis for those familiar with the beer. While the previous day must have been one of the highlights of their lives, I vividly remember them both as civil and modest as always. During the dinner, my wife Jana carefully inquired about their plan, what to do with the prize, which stands at the staggering one million U.K. pounds, to which FJA responded something like: it is just good behavior to donate the whole sum to my home institution, the University of California in Irvine, with the intention of supporting graduate education. And that was apparently it for him, the point was made, the topic exhausted. Especially for someone from the former socialist camp like us, pretty impressive "capitalist" behavior indeed. We later learned from FJA and Hana that there were practical reasons behind the decision to aim the money at PhD students. As a matter of fact, Irvine is one of the most expensive cities in the US and the university has to compete for the best students with other UC campuses which, however, are located in cheaper places, an important thing for a graduate student, when he/she considers how to make the ends meet. It is a smart way of distributing the money so that many will benefit from it, both individuals as well as the institution.

I have to admit that that evening was unforgettable for me, as well as highly motivating and refreshing. At least that's how I generally felt and still do about my encounters with the Ayalas. The next day FJA was awarded an honorary professorship at our local University of South Bohemia, with the small advantage of having the ceremony in the historical renaissance town hall of České Budějovice. I

am glad that in his busy schedule FJA found time not only for the festivity, but also for giving a talk and consulting with our students.

A respected and fit Champion of Darwinism

It is well known that for decades now belonged FJA to the most visible and respected protagonists of Darwinism in the US (and this can most likely be extended to the rest of the world) and there is no doubt that he retains this position at present. One has to consider that his vigorous defense of Darwinism in the early days was happening in the background of a still widespread religious prudishness, which could have easily transformed into its militant version(s), even turning to hostility and violence. So I dare say that especially in the 60s and 70s to keep firm stance required personal courage. And I don't even mention that the pro-Darwinist position had to compete with financially generously supported views such as "intelligent design" and the likes. Moreover, other outstanding and outspoken personalities took the Darwinist stand, such as Ernst Mayr and Stephen J. Gould, to name just two that deeply impressed the author of this contribution. Yet FJA succeeded in finding his unique ways of interpreting Darwinism for as wide a public audience as possible, and undoubtedly became a personality forever associated with modern teaching of this doctrine, absolutely crucial for any progress in biological sciences. It seems to me that another strength of FJA was that he managed to antagonize neither his opponents nor his competitors. He either transformed them into those who deeply respected him, regardless of whether they accepted his views or not, or as it was in the case of Mayr and Gould (and I am sure many others), simply turned them into close friends. This actually brings another interesting layer to being a friend of FJA. When you shake hands with him, you touch a parade of top scientists, US presidents, wine connoisseurs, well-known artists, or other women and men of wisdom with whom FJA is good friends.

Let me mention a small personal experience with the proponents of the intelligent design, which may illustrate how difficult a

discussion with them can be. After our paper on irremediable complexity was published (Gray *et al.* 2010), we got a very positive feedback from the proponents of intelligent design, as they confused their postulation of irreducible complexity, widely criticized by FJA and others, with our argumentation. This is despite the fact that there cannot be a greater difference between both views.

One other aspect that I have to say is that I have never seen FJA tired and/or complaining. One has to realize that most of the time we two have met in Prague, usually a day or two after his arrival from distant places, such as Argentina or California. No jetlag, no headaches, no tiredness, FJA always looked like he just walked out of his house, he was in a good mood, and apparently enjoying the day. I vaguely remember that when he was already well over 80, FJA still spent easily 100 nights a year on a plane, somewhere in transit or simply on travels. FJA has his ways of avoiding jetlag, tiredness and probably other feelings that drag us, regular mortals, down. My secret suspicion is that it is the excellent wine from the Ayala vineyards. Indeed, FJA considers it the “elixir of life” (Ayala 2011).

All this would not be unusual for a young person, but for someone in his 80s, this is truly exceptional and in fact amazing. Knowing that FJA co-organized in 2005 a celebratory conference on the occasion of the 100th birthday of Ernst Mayr, who actively attended from his hospital bed, I want it to be known that I have already secured for myself the same privilege for the 100th birthday of FJA. I am willing, however, to accept interested parties in helping me organize such an extraordinary event in 15 years from now, as this shall be big!