USIAS

Portrait of Pascal Mayer

An innovative mind in service of today's challenges

Pascal Mayer is a biophysicist by training and an innovator. In 2022, he won the prestigious Breakthrough Prize in Life Sciences for his contribution to the development of a new DNA sequencing technique that is reliable, fast and affordable, and that has revolutionised biology and medicine.

Image: Julie C. Mayer

Today, together with his company, Alphanosos, he aspires to create eco-responsible alternatives to pharmaceutical medicines. In 2023, he has been awarded an honorary Chair at the University of Strasbourg Institute for Advanced Study (USIAS).

Pascal Mayer developed an interest in science during his early youth, which he spent in Stiring-Wendel, a small town in the Moselle region of France, tucked away in a historic mining area. At that time, he was curious about the origin of intelligence and the functioning of the brain, and this incited him to explore his desire to innovate. In high school, he programmed his first neural network on a TI 59 calculator. He saw this project as "completely useless since it was made without any learning algorithms, which were in any case impossible with that type of calculator", but the spark was ignited. This interest in complex systems directed him intuitively towards biophysics. Yet, at that time, only two universities in France offered a course in this domain: one in Paris and the other in Strasbourg. Pascal Mayer chose the capital of Alsace, which he knew from having visited it on his motorbike with friends. Also, and above all, the university already had several Nobel prize winners from within its own ranks and had enjoyed a long intellectual history from which some of the best scientists of the century emerged.

At university, he juggled between mathematics, physics, biology and organic chemistry, among other subjects. He was torn between entrepreneurship and pursuing a more academic career, and as a side-line did an accounting course which was not a great success. *"I don't think I was a very bright student"*, he recalls, humbly. After a break for his military service, during which time he discovered fluid mechanics, he studied for a diploma of advanced studies ("DEA") – equivalent to a master's degree these days – at the laboratory of Robert Fuchs and Jean-François Lefèvre. It was during one of the weekly "Journal Club" events organised by Robert Fuchs that he discovered PCR (polymerase-chain-reaction) which convinced him immediately, *"but was seen at the time as a hazy and somewhat strange new DNA amplification technique"*, he recalls.

He subsequently started a thesis under the tutorship of Jean Sturm at the Charles Sadron Institute, which was then located in the Orangerie district of Strasbourg. There, a true *"geek among geeks"* as he describes himself, he worked with first generation computers, witnessed the birth of a primitive internet and learned C+++ programming. He used these tools for his studies on DNA dynamics during pulsed field gel electrophoresis, a technique which enables mapping genomes with the help of sizeable DNA fragments. To carry out this work, he needed high-performance instruments which were relatively expensive and not within the scope of the laboratory's budget. Luckily, Pascal Mayer was a handy and resourceful DIYer and put these talents to use to fabricate an anti-vibrating optic table using a rubber mattress, a granite slab bought from an undertaker's and a flowerpot filled with soil. This strength of will and capacity to reach his objective with the available means earned him a certain notoriety at the institute. In 1991, he defended his thesis somewhat nervously: *"an experience that was something completely new to me and my circle of family and friends, since I came from a mining region and a social and family environment where nobody had ever been to university."*

He then took off to Ottawa in Canada, where he carried out a first post-doc continuing his work on DNA electrophoresis. *"At that time", he recalls with a touch of humour,*

"we still used our mouths to suck solutions containing radioactively labelled DNA into pipettes".

Within three years, he launched a technique of free-solution DNA separation, using no gel, which significantly reduced the time needed for

sequencing. Then, in 1994, he carried out a second post-doc at the CNRS Paul-Pascal Research Centre at Pessac (France). Once more, he showed his ingenuity in developing a system which served to analyse time-lapse microscopic images of widespread moving objects. Without sufficient budget to buy a dedicated computer, he linked a camera to the central computer of the laboratory and put in place a video-feedback with a 100-metre cable which he connected to a television.

After this intellectual work on technological innovation over a 10-year period, Pascal Mayer joined the Glaxo Wellcome Institute of Biomedical Research in Geneva in 1996. There he developed a new high-speed DNA sequencing technique that made it possible to read millions of DNA fragments simultaneously and a million times faster. But this was a tough project and Mayer had to do his best to navigate the stormy seas of funding problems, rapid changes in leadership and the buy-out of the institute by Serono, an Italian biotechnology company. The results that were obtained in only a few months were promising and led to his ideas being patented in April 1997. Alas, due to a lack of funding, the project was definitively suspended in 2003. The patents and know-how were eventually acquired by Illumina, an American genetic analysis company, which completed the work. Its reliable and inexpensive method of DNA sequencing (less than 1000$ for one genome) and quick (a day) has since revolutionised the worlds of biology and medicine, in particular enabling the identification of the SARS-CoV-2 DNA in the first Covid-19 patients.

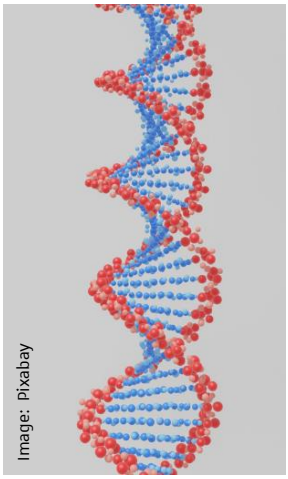

Image: Pixabay

Nearly 20 years on, in 2022, Pascal Mayer, together with Shankar Balasubramanian and David Klenerman, became the laureates of the Breakthrough Prize for Life Sciences, which recognises major advances in the world of science, notably with a shared reward of three million dollars. This distinction brings to light craftsmen and scientists who are not always recognised by other prizes. Mayer accepts this recognition with a certain modesty although he considers he has moved on to other things; he humorously adds that he has *"never actually used one of the sequencing machines that his work helped to elaborate."*

Indeed, since 2014 and the creation of his company, Alphanosos, he has concentrated on developing innovative medical treatments, by associating artificial intelligence and biological expertise. His objective is to find alternatives to pharmaceutical drugs through non-toxic solutions based on edible plant extracts, using carbon-free and eco-responsible production. A challenge that is undeniably in keeping with our times.

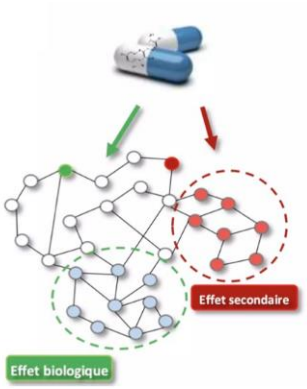

Image: Alphanosos

In 2023, Pascal Mayer has been awarded an honorary Chair at the University of Strasbourg Institute for Advanced Study (USIAS). The position is in recognition of his exceptional scientific accomplishments achieved outside of the traditional academic world and a special stimulus for exchanges between researchers on campus and scientists with other backgrounds.

"It is profoundly gratifying to be recognised in this way by the university that shaped me, and from which I have learned so much,"

he reflects. *"It is the century-old character of this establishment that led me to choose it as the place for my studies, years ago, and I am happy, proud and grateful for the prospects of collaboration that this Chair holds for me."*

Interview by William Rowe-Pirra, science journalist

05-2023