



## **Brief history of the German-Argentine Academic and Scientific Cooperation and the Future of Science**

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## **“Brief history about the German-Argentine Academic and Scientific Cooperation and the Future of Science”**

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Lecture given by Ruben Alejandro Villaverde (\*) at the Symposium “Translational Medicine” (City of Mar del Plata, 23th November 2015)

It is a true honor for me to be sharing this space today with Dr. Kurt Wüthrich, Nobel Chemistry Laureate, and the delegation of scientists from the University of Fribourg.

I am passionate about knowledge and science in general and, specifically, about research in Quantum Physics. So, after talking to my brother Ariel, I decided to go to Buenos Aires and visit the Embassy of the Federal Republic of Germany. I was interested in inviting a Nobel Laureate to Mar del Plata. And that is how I came to contact Eng. Cristóbal Zimmermann who managed the initiative with Prof. Roland Mertelsmann and Prof. Christoph Borner, both from University of Fribourg and present here today.

I believe that today is a transcendental day for Mar del Plata and for the south of Argentina as well.

As for me, I will briefly share with you the history of scientific and technological cooperation between Argentina and Germany and I will also talk about the multi-universal quantum connection up to the next revolution called technological singularity.

Switzerland has a good share of Nobel Laureates. Just to mention a few, we have Felix Bloch who was a Swiss-born American physicist who worked mainly in the United States and who was awarded the Nobel Prize in 1952. Together with Edward Mills Purcell he worked in the development of new ways and methods for nuclear magnetic precision measurements.

Richard Robert Ernst is a chemist and university professor who was awarded the Nobel Prize in Chemistry in 1991 for the development of high-resolution nuclear magnetic resonance spectroscopy, a method used in the analysis of molecular structures.

Walter Rudolf Hess was a Swiss philosopher who won the Nobel Prize in Physiology or Medicine in 1949 for mapping the areas of the brain involved in the control of internal organs.

Wolfgang Ernst Pauli was an Austrian-born Swiss physicist who later became an American citizen. He is considered one of the pioneers of Quantum Physics and it is his the exclusion principle according to which it is impossible for two electrons –in an atom– to have the same energy, the same place, and the same quantum numbers.

As to the scientific and technological exchange between Germany and Argentina, we have to say that this is not something new. It actually goes back to the times of the Jesuits who arrived in America. In 1609 the Jesuit Missionaries introduced the first Gutenberg's press in Argentina while in Europe's awakening, Galileo showed with his telescope the moons of Jupiter to some distrustful bishops.

In 1846, former president Domingo Faustino Sarmiento visited Germany and was amazed by the level of development and progress of the country. During his stay in Berlin, Sarmiento praised the Prussian public school system as being the most advanced one in Europe. And when he was in Munich he highlighted the high level of civilization that the country had reached.

In 1862, Sarmiento was the Minister of Education. He invited German scientist Karl Hermann Konrad Burmeister to be in charge of leading the new Public Museum of Buenos Aires. By 1868, when Sarmiento became President of Argentina, he commissioned Burmeister to create the Academy of Science of the University of Cordoba.

Towards the end of the 19<sup>th</sup> century, Argentina had become a meeting point for the most renowned German-speaking scientists. For instance, Otto Krause, Argentine engineer and educator, son of German immigrants, founded in 1899 the first technical school in Argentina. On October 12 1930, the Ibero-American Institute opens in Berlin. This represented an example of continuity in this history of scientific exchange. Closer in time, regarding the world of Physics, after World War II Prof. Walter Seelmann Eggebert worked really hard in the fission and identification of isotopes formed in the partitioning of uranium.

He was a Prof. of Physical Chemistry at University of Tucuman and he became part of the National Commission of Atomic Energy (CNEA) in 1949.

This, like many other historical-technological developments, has a line of contiguity with the origin of science through Descartes and, taking a historical quantum leap, we come to what has been mentioned above with the creation of CNEA. From 1900 to 1930 the foundations for what I like to call the Science of the Invisible were set, the most extraordinary science yet discovered, and by that I mean Quantum Physics.

More recently, the basis for scientific and technological research cooperation between Argentina and Germany was set with the agreement signed between both governments and approved by a law passed by the Argentine congress in 1969. Additional agreements between the Federal Ministry of Research and Technology and the Secretariat of Science and Technology were signed in 1997.

An agreement was signed in 2008 at the Argentine-German Mixed Commission Meeting on Science and Technology. Said protocol focuses on the following areas of cooperation: the environment, renewable energies, medicine, biotechnology, and, the most surprising one (at least for me), polar research, that is research of Antarctica and Oceania together with physics, nanotechnology, and Communication sciences.

In 2007, the government turned the Secretariat of Research into the Ministry of Science, Technology, and Production Innovation led by PhD. Lino Barañao, who worked at the Max Planck Institute of Psychiatry in Munich.

The Observatory of Cosmic Rays was opened between the years 2010 and 2011 in the Province of Mendoza. It was named after Pierre Auger, who is not that well known by people, and it is the biggest observatory in the world. It has an area of 3000 km<sup>2</sup> in which there are detectors distributed equidistantly to measure ultra-high-energy cosmic particles which, at a speed close to the speed of light, clash with the Earth's atmosphere to fall like rain to the ground. Germany and Argentina, together with other countries, collaborate at the Pierre Auger Institute in the city of Malargüe.

In 2012, the third Max Planck Society's partner Institute was opened abroad. This scientific society pays tribute to the father of Quantum Physics and it is world famous for the quality of the research it publishes, for it Nobel Laureates (18), and the more of 80 Institutes that make it up. In Shanghai, Florida (USA) and in Buenos Aires, the Max Planck Society conducts research of the highest level. For those of you who want to get to know this prestigious Institute, you can visit it at the new Scientific and Technological Pole in Buenos Aires. The institute in Buenos Aires focuses on Biomedicine and in 2013 a liaison office was opened to cater for the whole of Latin America.

In 2013, CONICET and the German Federal Agency for Cartography and Geodesy signed an agreement to create an Argentine-German Observatory for Geodesy. It is part of a global infrastructure for the observation of the Earth and the update of global references: GPS measured by the use of the very distant quasars. The aforementioned Observatory is already working at Pereyra Iraola Park in La Plata.

A Max Planck Lab of Structural Biology, Chemistry, and Biophysics was founded in Rosario, province of Santa Fe.

The construction of the Thermochronology Development Center La-Te Andes in the province of Salta was started in January 2015. Its function will be to analyze rocks by using neutron radiation.

This current year, 2015, framework agreements have been signed between the Council of Rectors of the universities from both countries to promote academic mobility and the validation of university degrees. This will, in the near future, simplify the validation of academic degrees between Germany and Argentina. I have to mention the Argentine-German University Center which has offices in Buenos Aires and in Germany. This institution fosters the union between both countries' universities for postgraduate courses such as the ones offered by the University of Fribourg and UBA, both whose representatives are present at this Symposium today.

Enough said about the historical chronology of scientific and academic cooperation between both countries although it is much richer since this cooperation has existed for over 150 years.

I did mention Rene Descartes and Galileo who, together with Isaac Newton, set the bases of the scientific method that is still used today. For me, with the impact of Quantum Physics, technological devices influenced all other sciences, especially Medicine.

I believe that today we are facing the greatest change of paradigm in the history of humanity. Today, sciences merge and intertwine, something that some years ago was not even thought of. Thus, we have the Theory of Information, Psychology, and Neuroscience which, in the future, will be widely complemented by artificial intelligence. The science of Quantum Physics is the foundation for the Theory of Information and the Theory of Complexity. Theoretical computational concepts about these issues affect and will affect our daily life in a very direct way. The so-called **quantum factor**, that is the combination of Heisenberg's Uncertainty Principle with Bohr's Principle of Complementarity, is inherent to our very nature so it is more than logical for us to assert that the quantum factor constitutes reality itself.

The quantum factor is an indivisible part of the wave function both in the physical and in the holistic sense. I will come back to this very important topic in a while.

This powerful quantum factor penetrates the neuronal structure of the nervous system. Today it is even said that quantum fluctuations may be part of consciousness and decision-making.

The whole multiverse is an **open** quantum system, from the elementary particles and biomolecules to the very logical process of thinking and even of creating ideas. Many front-runners of the world of Physics in the 20<sup>th</sup> century have verified the almost mental character of quantum reality and the most surprising thing is that scientists are becoming more willing to use non-observable entities, known as virtual states, to explain and understand observable phenomena: quantum information of virtual and random processes, which would be Kant's noumenon. This is of utmost importance. The most extraordinary thing in these quantum experiments is that quantum entities which are known as particles are shown to change their behavior when what we know about them changes. This means that quantum systems can react to the information flow. And if we talk about information, I have to mention the remarkable book by biologist Martin Schönberguer, Nobel Prize in Chemistry in 1969, who, in 1979, wrote a book called *I Ching and the Genetic Code*.

In this book the author asks himself if it is possible for it to exist a relation between DNA and the language of I Ching. Schönberger states that I Ching's DNA molecule is and/or would be a perfect system of information, a quantum computer that could provide essential data on consciousness and, why not, the mind as a computational quantum reference.

I am passionate about the interrelation and intertwining of sciences and Quantum Physics is, without a doubt, the one that has caused and still is part of the most extraordinary scientific, technological, and social revolution since the very origin of science in Ancient Greece. This is the leitmotif that goes from Socratic/Platonic "know thyself" to Descartes' "cogito ergo sum" (I think, therefore I am.)

The issues of consciousness, perception, and memory belong both to Neuroscience and to Psycho-Cosmogony, being this the union between mythos and logos. So I have to ask myself the following questions:

Has consciousness evolved from complex calculations between the brain's neurons, as it is agreed upon by a large number of scientists?

Or is it that consciousness, somehow, has been here all along, such as spiritual approaches assert? Hameroff and Penrose ask this question as they state that "this opens a potential Pandora's Box, but our theory accommodates both these views, suggesting consciousness derives from quantum vibrations in microtubules, protein polymers inside brain neurons, which both govern neuronal and synaptic function, and connect brain processes to self-organizing processes in the fine scale, 'proto-conscious' quantum structure of reality."

I would expand on it: can these two visions, one more materialistic, another more spiritual/holistic, become unified and be solved by Quantum Physics?

Potential possibilities of human cloning, organ harvesting, DNA and human genome deciphering, advances made in neuroscience and pharmacology, or in IT engineering and in artificial intelligence, which I call Bio-spintronic intelligence, constitute, all of them, examples of the opportunities that come with modern biotechnologies to alter human nature leading us to a post-human state.

There might be a relation that is still unknown between the spin of subatomic particles with the fluctuations of the cosmological vacuum and of the quantum processes that are produced, according to physicist Roger Penrose, in the depths of our brains. The relation between the spin and the fluctuation of vacuum becomes more noticeable if we think of the

DNA-RNA code in relation to quantum gravity and hyperspace vacuum. Subatomic particles, these mysterious tendencies to exist which are not absolutely real until observed, still have a lot of enigmas to be decoded. As to me, I am currently researching the intimate relation between Quantum Geometry and the Identity of Indiscernibles for the creation of a new field of study, the Compared Quantum Philosophy.

I will now give the word to Prof. Kurt Wüthrich, Nobel Laureate, and I thank you for your attention.

(\*) Ruben Alejandro Villaverde is an independent researcher who was born in Mar del Plata and has attended the National Universities of La Plata and Mar del Plata (Astronomy and Quantum Physics)