



ISSN: 2007-9656

**LATINMAG**  
**LETTERS**

January 2013 - Volume 3 - Number 3  
LL13-0301Rv

REVIEW PAPER

Published on behalf of the Latin American Association of Paleomagnetism and Geomagnetism by the Instituto de Geofísica, Universidad Nacional Autónoma de México.

## **The Birth of Paleomagnetism in Latin America: Argentina**

Juan F. A. Vilas

20 pages, 20 figures

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## The Birth of Paleomagnetism in Latin America: Argentina

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Recibido: Octubre 2012; Revisado: Noviembre 2012; Aceptado: Diciembre 2012; Publicado: Enero 2013

**Abstract.** Paleomagnetic activities in Latin America started with the first field trip of the young Ken Creer in 1957. In the early sixties, and by initiative of the by then Director of the Department of Geological Sciences at the University of Buenos Aires, Feliz Gonzalez Bonorino; the engineer Daniel A. Valencio is hired to start the teaching of Geophysics to the undergraduate students of Geology and to begin with the Paleomagnetic research in Argentina. The Paleomagnetic Laboratory of Buenos Aires was created in 1964 and rapidly became an internationally recognized center, promoter of research in the emergent theory of Plate Tectonics and a spreading center of Paleomagnetism in Latin America. The network of friends across the continent and the unselfish cooperation among colleagues from different Latin American countries helped in building up the first laboratories in Brazil and Mexico. Despite several vicissitudes that conspired against its survival along the last five decades, the Paleomagnetic Laboratory "Daniel A. Valencio" continues in full activity honoring the tradition of unselfish and friendly collaboration that shaped its beginnings.

**Keywords:** *Paleomagnetism, Paleomagnetic research, Paleomagnetic laboratories, History*

**Resumen.** El Paleomagnetismo surge en América Latina con el primer viaje de campo del joven Ken Creer en 1957. A principios de la década de 1960, y por iniciativa del entonces director del Departamento de Ciencias Geológicas de la Universidad de Buenos Aires, Felix Gonzalez Bonorino, es contratado el Ingeniero Daniel A. Valencio para iniciar la enseñanza de la Geofísica a los alumnos de Geología e iniciar las investigaciones paleomagnéticas en Argentina. El Laboratorio de Paleomagnetismo de Buenos Aires es creado en 1964 y se constituye rápidamente en un centro reconocido internacionalmente, promotor de las investigaciones en la naciente Teoría de Tectónica de Placas y difusor del paleomagnetismo a nivel continental. Las redes de amistades que se generan a través de la colaboración desinteresada entre colegas de varias naciones latinoamericanas ayudan a la construcción de los laboratorios en Brasil y México. A pesar de numerosos avatares que conspiraron contra su supervivencia a lo largo de estas cinco décadas, el "Laboratorio de Paleomagnetismo Daniel A. Valencio" continúa plenamente activo y honrando la tradición de colaboración amistosa y desinteresada que signara su nacimiento.

**Palabras Clave:** *Paleomagnetismo, investigación paleomagnética, laboratorios paleomagnéticos, Historia*



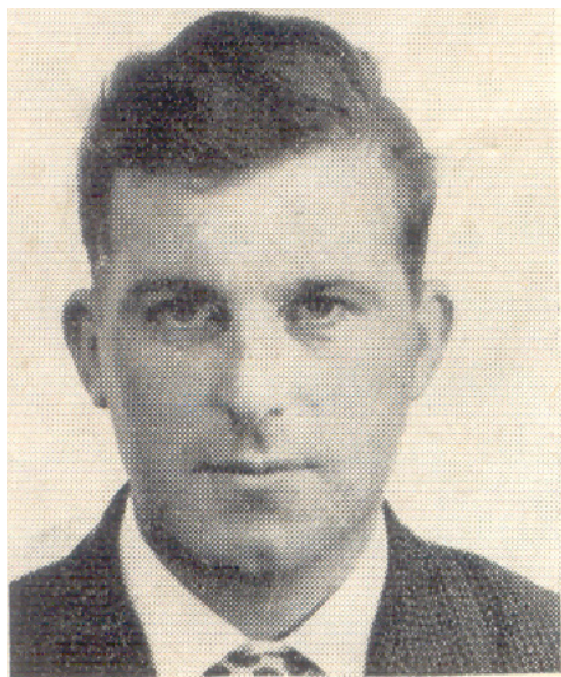
## 1. The first steps

The history of paleomagnetism in Latin America starts in 1957 and is strongly tied to a young 32 year-old physicist (Fig.1), Dr. Kenneth M. Creer, who was at the time a professor and researcher at the University of Newcastle upon Tyne (UNUT) in Great Britain.

The project Creer was working on back then was to test Wegener's "Continental Drift Theory" utilizing Apparent Polar Wander curves obtained from paleomagnetic studies in different continents. "This is the fundamental principle on which stands on the initial application of palaeogeographic reconstructions, first and fundamental contribution of physical parameters to the, up to then, debated and delayed theory of continental drift" (Valencio, 1970).

Creer projected his paleomagnetic studies to take place in Palaeozoic formations in South America, and in 1957 he carried out the first field trips to collect oriented paleomagnetic rock samples in Argentina and Brazil. In Argentina Creer went to the field to La Rioja and Jujuy Provinces with Dr. E. Holmberg, a regional geologist who worked for the General Direction of Mines and Geology of Argentina. The results of these pioneer works can be found in Creer (1964).

Another history also began during the 1950's in Argentina, a history that one decade later would converge with that of Creer's: the history of Daniel Alberto Valencio a 25 year-old Aeronautical Engineer, recently graduated from the National University of La Plata (UNLP), (<http://www.fcen.uba.ar/segb/historia/lamensula/lamensula>) who in 1953 started working in geophysical prospecting for the Argentine national oil company: the YPF (Fig. 2). After 5 years of a successful career in oil geophysical prospecting in Patagonia (Argentina), where he applied and innovated with methods such as magnetometry, gravimetry, reflection and refraction seismic, and exploration and exploitation well logging; he was forced to left the state owned



**Figure 1.** Professor Kenneth Creer in its 30's.

YPF after a company reorganization by the national government (President Arturo Frondizi 1958-1962). This consisted on the termination of most of the prospecting and research projects undertaken by this emblematic national company. The aeronautical engineer, turned into a geophysical prospecting expert, was about to lose his job. While in Argentina heated debates about Frondizi's energy policy were taking place, Valencio decided to answer the call of an Argentine committed in the generation of a new model of society. It was Ernesto "Che" Guevara, who had assumed control of the island of Cuba with Fidel Castro. Having control over the Industry Department and later over the Industry Ministry, Guevara intended to take Cuba out of an economy based on sugar-cane growing and to explore new production areas. In such context, the Oil Institute was created, and citizens from all over Latin America took part in the search of this vital product to ensure Cuba's



**Figure 2.** Daniel A. Valencio when he was 24 years old.

political sovereignty. Valencio went to live in Cuba as the leader of the oil geophysical prospecting team of the island. Everything was yet to be done; he organized and started oil exploration in Cuba, he put all his knowledge to adapt equipment to do magnetometric and gravimetric surveys and, when the relationship between Cuba and the U.S. got worse, he went with the “Che” to the Soviet Union to buy seismic prospecting equipment and started the second phase of his explorations.

Before his first official trip to the URSS, during the first days of 1961, a hopeful “Che” announced: “we have found some small reserves of oil close to the Jatibonico, and another one close to La Habana, but the amounts still represent less than 1% of Cuba’s national consumption” (Guevara, 1970). Then the political situation put USA and Cuba on the verge of a war and in 1961, after the Bahia de los Cochinos failed invasion event, Valencio decided to end his Cuban experience.

## 2. The creation of the Paleomagnetic Laboratory at the University of Buenos Aires

Meanwhile previously described events were happening, at the University of Buenos Aires (UBA) there was an atmosphere that has been usually described as “the golden years” of the University. At that time, the university directed was by Risieri Frondizi (Fig. 3), the dean of the Exact and Natural Sciences School (FCEN) was Rolando Garcia, and the chair of the Department of Geological Sciences was Felix Gonzalez Bonorino, who was one of the leading figures in the Argentine geological community during the second half of the 20th century. It was an epoch of explosion of new intellectuals in Argentina, who generated an environment of intense activity and openness to new ideas. In such properly fertilized soil, Bonorino decided to launch a geophysics-specialized area within the Department of Geological Sciences.

Bonorino was a restless person who had a deep understanding of geological phenomena. When he met Ken Creer, he had the idea that the FCEN should not stay apart from the new lines of thought that were appearing, so he made a call to cover an Associated Professor position that would be the first to emphasize the teaching of Geophysical Prospecting within the Geological Sciences program. Through academic channels, the news made their way to Cuba, and Valencio decided to return to the country. He had two possible jobs in mind: 1) Exploration Manager at Shell Argentina



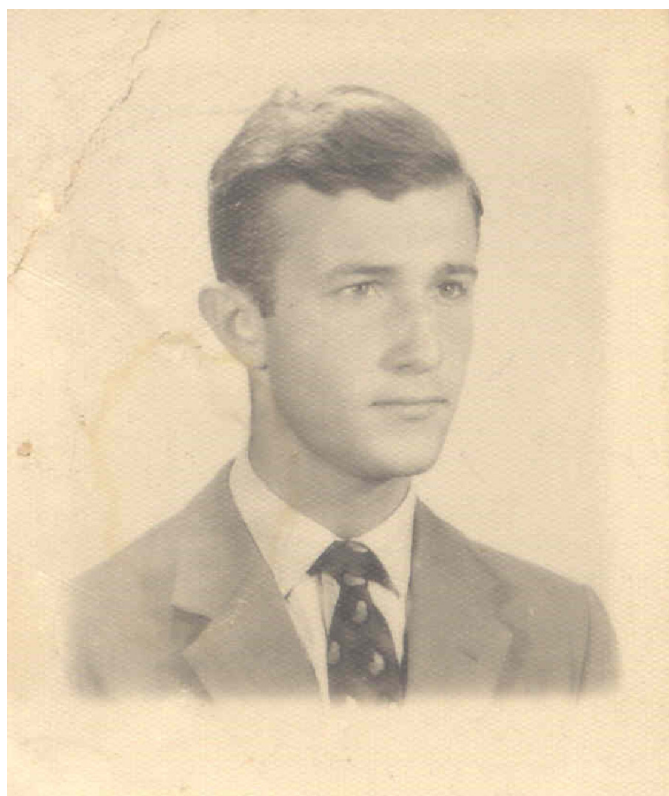
**Figure 3.** Risieri Frondizi (1910-1985), rector of the University of Buenos Aires (1957-1962).





and 2) Associated Professor at UBA, with a salary just 20% smaller. After his difficult experience of almost 10 years devoted to oil exploration, Valencio decided to follow the academic path, which would allow him more time to be with his young family (wife, two little daughters and a third on the way). In 1962 he was already installed at UBA after winning the Associate Professor position. He started to develop the teaching of geophysical prospecting for geologists; a formidable task considering that at the time, geologists did not have a solid enough mathematic preparation. In 1963, Bonorino suggested Valencio that Paleomagnetism was a desirable research topic, and put him in contact with Creer. Valencio obtained economic support from the National Council for Scientific and Technical Research (CONICET) in Argentina to work on paleomagnetic research topics under the supervision of Ken Creer, who suggested him to start with the study of the chronology of the Earth's Magnetic Field (EMF) polarity changes in the Late Cenozoic. For this purpose, by the end of 1963, Valencio went to the field to collect oriented samples from Cenozoic basalts in the Neuquen and Mendoza Provinces (Valencio, 1965a and 1965b) with the logistic and geologic support of YPF. By the beginning of 1964 he shipped the basalt samples to Newcastle upon Tyne, and went to settle in the UK for three months in order to start studying the samples under Creer's supervision. During his stay in the UK, Valencio and Creer developed the idea of building a Paleomagnetic laboratory at UBA.

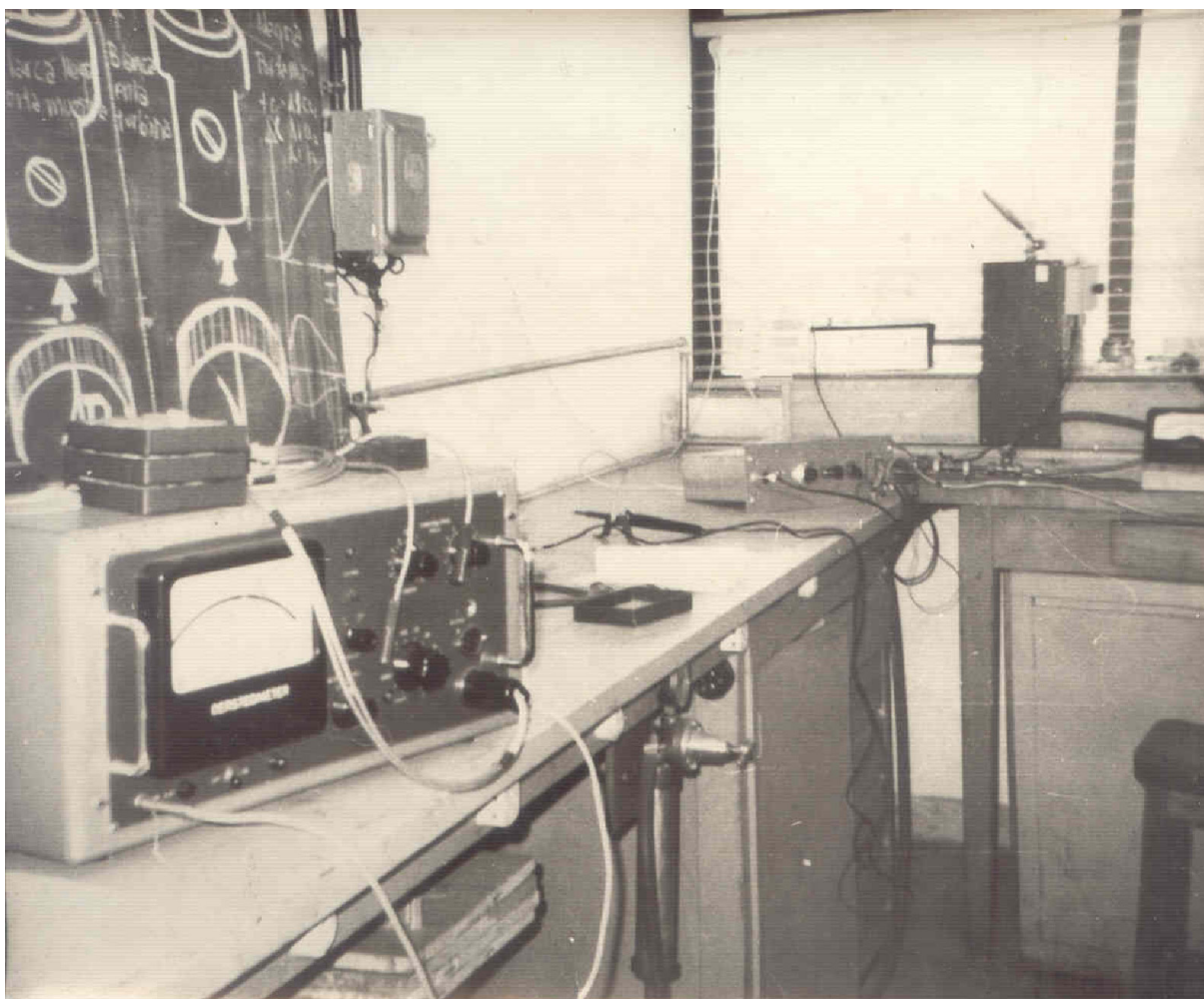
By 1964, I was halfway through my Electronic Engineering degree and had already finished my degree at the Physics Department at UBA (Fig. 4). At those times, I asked the legendary Argentine physicist Juan Jose "Bocha" Giambiagi to recommend me a thesis advisor. At the Physics Department there were many highly talented theoretical physicist, but I wanted to do something more close to the applied side of Physics;



**Figure 4.** The author when he was an undergraduate student of Physics and Engineering at the University of Buenos Aires in 1964.

so "Bocha" suggested me to go and meet either with Carlos Varsarsky, who was setting up the Radioastronomy Institute, or with a guy named Valencio, who was going around with some new ideas in Geophysics.

By that time, Valencio had already consolidated the teaching of Geophysics and, with Bonorino's support, was already delineating future research paths. When I went to visit him (my first encounter with my future mentor), he was with Creer. They told me about the Continental Drift Theory. I came to know that same day that an important part of the geological community were still supporting "immovable" postulates as opposed to the great horizontal movements of the continents proposed by the Continental Drift Theory and that Physics, through the ferrimagnetism theory, could help to test. I came out from that



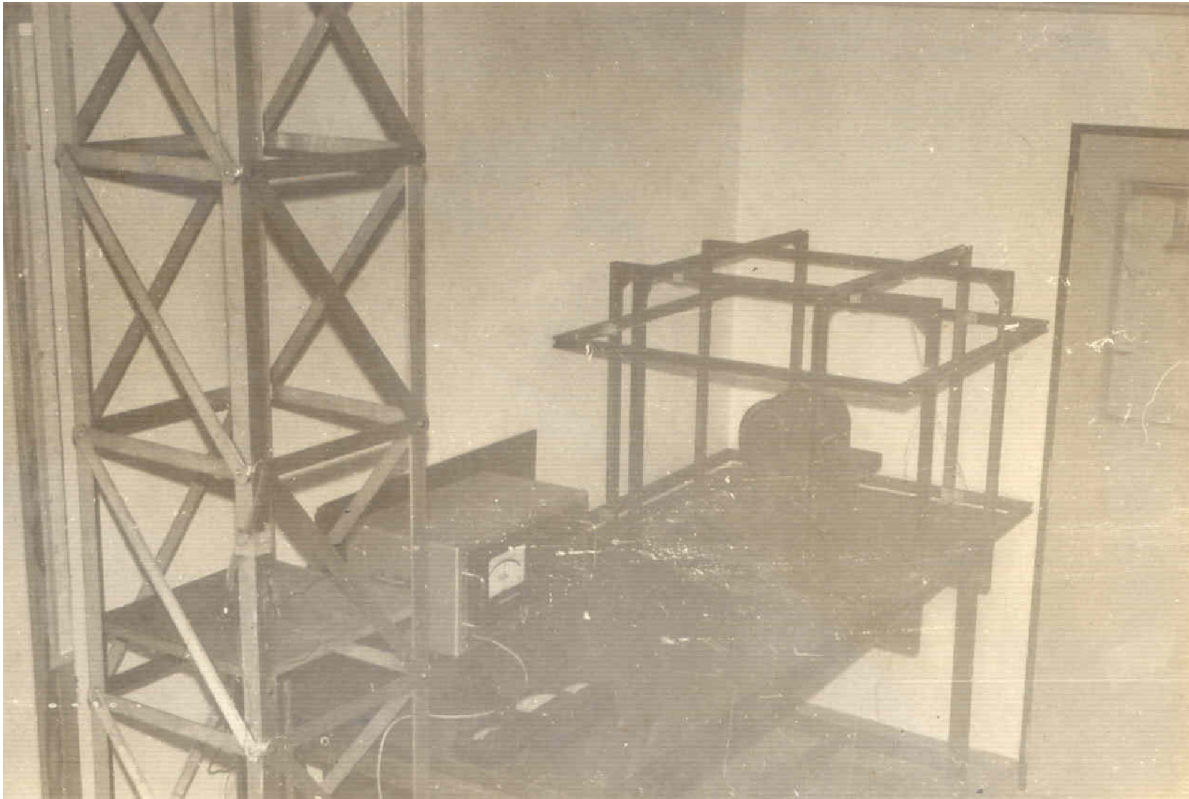
**Figure 5.** The first spinner magnetometer built at the Laboratory of Paleomagnetism of Buenos Aires.

meeting fascinated about what I had just heard. I knew nothing about the specific topic, nor about geology, but the Aeronautical Engineer and the British Physicist captivated me with their projects. They offered me the possibility of being hired for the construction of the Paleomagnetism Laboratory in the roof of the FCEN, which at the time was located in what today is the “Manzana de las Luces” (located in 222 Peru St., in between Alsina and Moreno, downtown Buenos Aires). I was hired in August 1964 and there I built and put to work the following equipment:

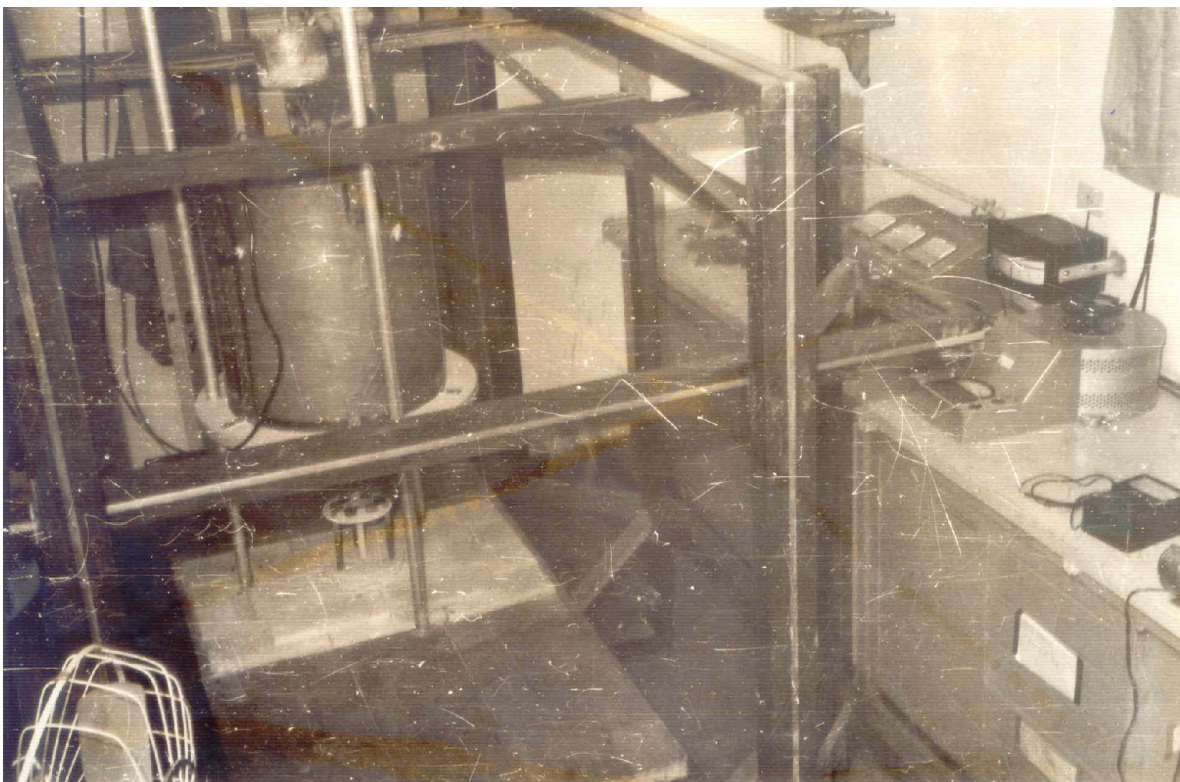
- Bench drill used to obtain pmag samples from oriented hand samples.
- Portable field drill.
- Rock saw.
- A Spinner 300 Hz magnetometer with a Pick-up and a 18000-rpm compressed air turbine magnetometer. The magnetometer sensitivity was  $10^{-4}$  SI (Fig. 5, Vilas and Valencio, 1969).
- AF demagnetizing equipment (Fig. 6, Vilas 1966).
- Thermal demagnetizing equipment (Fig. 7).

Valencio also built an astatic magnetometer, with a sensitivity of  $5 \times 10^{-3}$  SI.





**Figure 6.** First AF demagnetizing equipment at the Laboratory of Paleomagnetism of Buenos Aires.



**Figure 7.** Thermal demagnetization equipment built at the Laboratory of Paleomagnetism of Buenos Aires.



**Figure 8.** Media coverage about the state visit of the US Secretary of State to Argentina in 1965 (Diario La Prensa, Buenos Aires, Nov.16th 1965). In the text, the article mentions that "...demonstrations by over 100 students against the foreign visitor ....and that two students were arrested: J. F. A. Vilas, 24 years old and A. M. Bufano, 22 years old..")

On November 15th 1965, all my activities as a free citizen were suddenly and brutally interrupted, when I was taken to jail because of protesting in public against the Vietnam War (during the visit of the US Secretary of State, David Dean Rusk to Buenos Aires, Fig. 8). In Argentina's weak democracy I was deeply involved in political student activities, where the public university (UBA) and the scientific system (CONICET) protected me: I didn't lose my job, and the days I could not go to the office were not discounted from my paycheck. Even more, I did not lose my condition of regular student in the courses I was taking at the Engineering and Physics schools at UBA. However, my activities were registered by the Government Intelligence Agency, in it was later on a difficult task to get my passport during the civic-military dictatorship times in Argentina.

### 3. Rapid growth and international recognition

By mid-1966 the Paleomagnetism Laboratory at UBA was completely operational. In July of that same year, a sudden collapse struck the University of Buenos Aires, during the tragic so-called "Noche de los bastones largos" ("The night of long sticks", Fig. 9), when the emergent military government intervened the university. It was an authentic disaster: the loss of a university full of brilliant intellectuals with an unprecedented and contagious enthusiasm. Only 139 people, from the School of Exact and Natural Sciences, were jailed. In the face of it, most of the professors and young researchers decided to quit. Ken Creer invited us to leave and move to Newcastle upon Tyne. We discussed with Valencio about what to do. We were already at a point where we were about to be able to put into practice all of what we had developed. We decided to stay.

In 1967, under Valencio's leadership and with my help, an apparatus to measure rock magnetic susceptibility with a sensitivity of  $6 \times 10^{-7}$  emu/cm-3/ $\mu$ A was built. (Fernandez Gianotti, 1968, Fig. 10).

In 1967, with all the above described equipment already working at the Paleomagnetism Laboratory at UBA, Valencio and Creer decided to start a new project to define the apparent polar wander path (APWP) of South America during Late Paleozoic times. The people involved were: myself (Valencio's advisee) and Brian Embleton from UNUT, who was jointly advised by Creer and Valencio through an agreement with the Royal Society. At the same time they decided to continue with research in the EMF polarity changes for the last 5 Ma. For this project, Paulina Nabel, an undergraduate geology student at UBA, joined the group. Her thesis was the first one in the Geology Department to be devoted to paleomagnetism (Nabel, 1970). Also in





**Figure 9.** Two pictures of the military dictatorship intervening the University of Buenos Aires on July 29th 1966. Over one hundred professors and students are brutally arrested by the police during the event known as "The night of the long sticks" (La Noche de los Bastones Largos). In the bottom-center Prof. Carlos Varsavsky watch astonished at his umbrella.





1967, Valencio helped to organize the very first Gondwana Symposium in Mar del Plata (Gondwana I, Mar del Plata, Argentina, 1967).

By 1968, Valencio and I had decided to extend the original project on the South American APWP to also include the Mesozoic. With that objective in mind, I selected the Chon-Aike volcanites (Santa Cruz Province, Argentina) for paleomagnetic studies, which allowed us to obtain the first robust results to establish the age of the beginning of the separation of South America from Africa (Valencio and Vilas, 1969, 1970).

With support from UBA and CONICET, in 1969 Valencio and Creer decided to apply the  $^{40}\text{Ar}/^{40}\text{K}$  geochronology method to date the Cenozoic basalts of Neuquen and Mendoza that were subject to paleomagnetic studies. Their objective was to precisely establish the EMF polarity reversals column for the last 5 Ma. To achieve their objective they obtained the collaboration of Dr. Umberto Cordani, creator and director of the Geochronology Laboratory at the University of Sao Paulo, Brasil. This collaboration created strong academic and friendly bonds between both research groups. The Geology Department at UBA designated Dr. Enrique Linares to take charge of the development of this new laboratory. Linares, in turn, asked two young men to assist him setting up the new facilities. They were the physicist Leonardo Kleiner and the electronic engineer Leopoldo Magram. In 1970, the Instituto de Geocronología y Geología Isotópica (INGEIS) was born (Cordani, 1970).

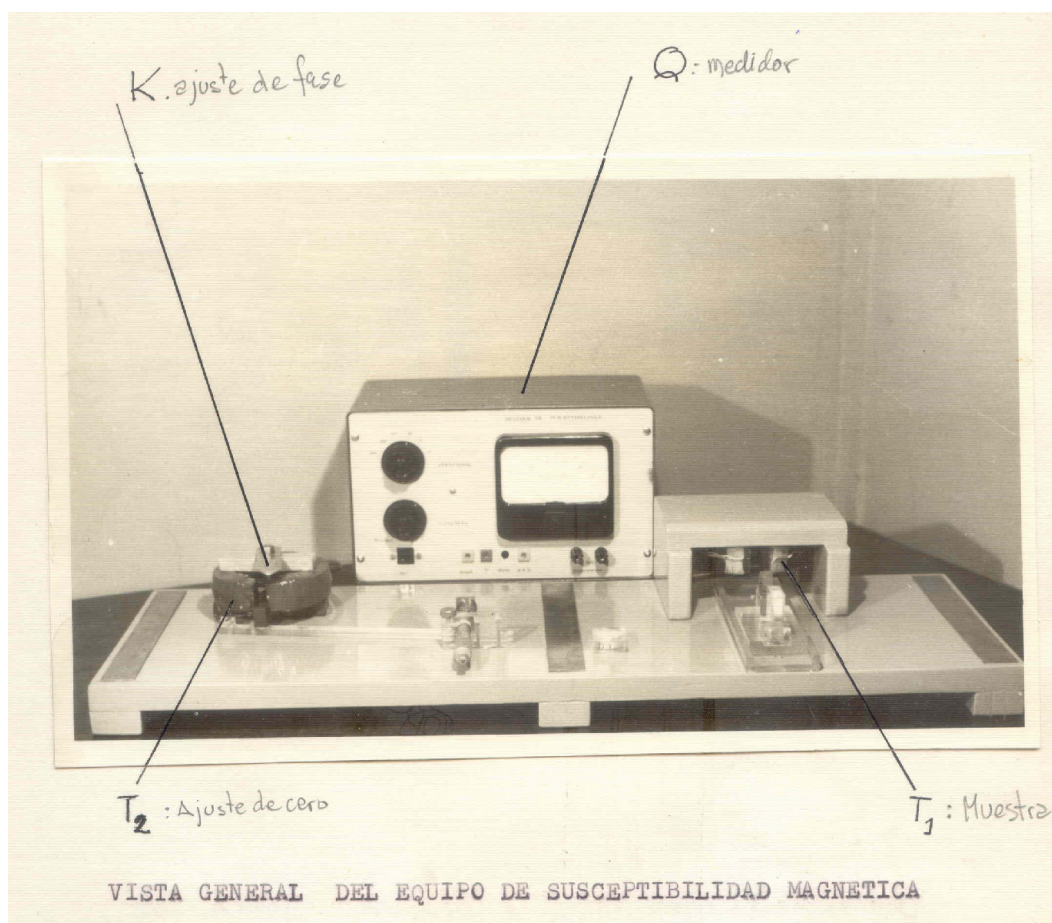
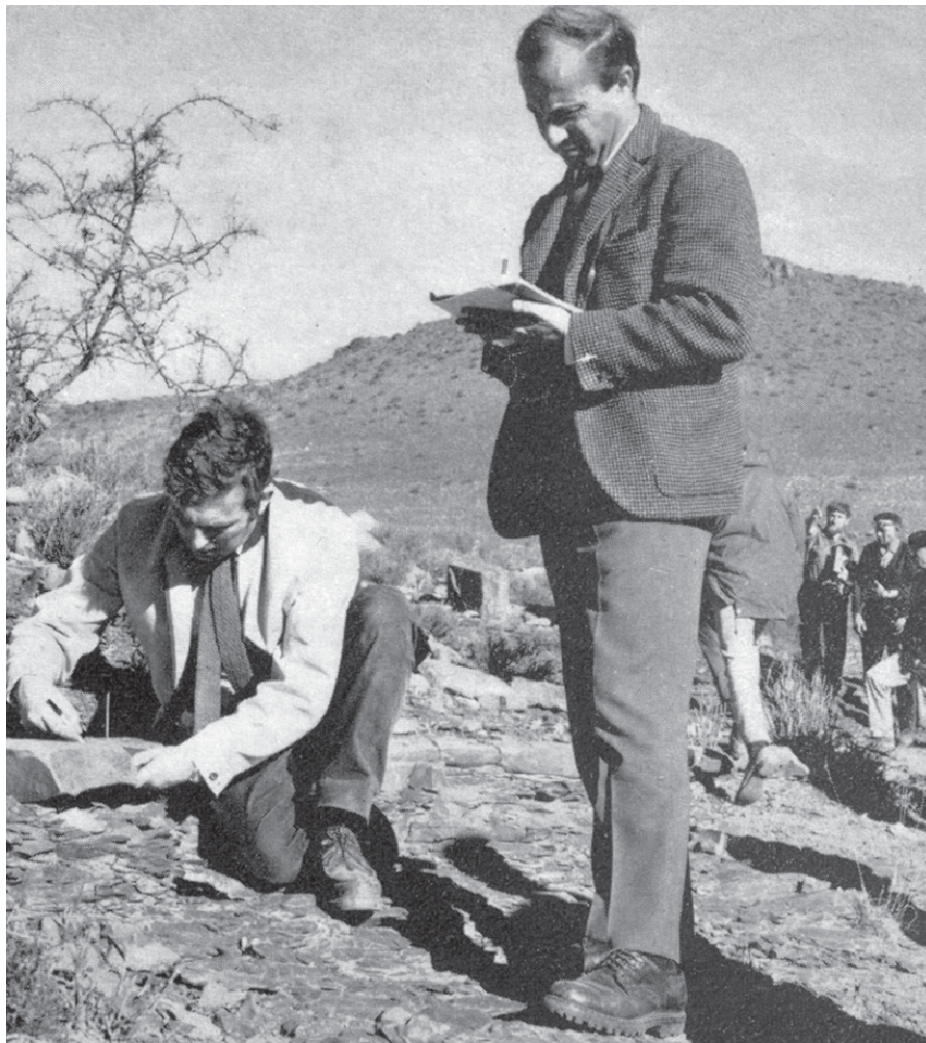


Figure 10. First susceptibility bridge built in the Paleomagnetic Laboratory of Buenos Aires.



In 1970, the second Gondwana meeting took place in South Africa. Valencio and Creer took advantage of the opportunity and went together into a field trip to collect oriented samples from the Kaoko basalts (Fig. 11). On the basis of these preliminary results, Creer planned a field campaign with the objective of collecting more oriented samples for paleomagnetic studies and dating the basalts. The paleomagnetic pole and the radiometric Cretaceous age obtained for the South African basalts proved them to be coetaneous with the Sierra Geral basalts in Brazil, which allowed for a more detailed reconstruction of the APWPs of both Africa and South America at the time of the onset of the continental break-up.

Also in 1970, the young geologist Jose Ernesto "Joe" Mendia joined the Valencio-Vilas group, making it an even more interdisciplinary group, as it then had a physicist, an engineer and a geologist. By the end of the 60's, and under Valencio's direction, the geophysics group celebrated its first 5 years of intense work. International scientific organizations, such as the International Union of Geodesy and Geophysics (IUGG) and the International Union of Geological Sciences (IUGS) acknowledged Valencio's efforts. Their support



**Figure 11.** Daniel Valencio and Ken Creer collecting paleomagnetic samples in the Karoo Basin (South Africa) in 1970.



was one of the main pillars that allowed Buenos Aires to host the Conference on Solid Earth Problem (CSEP) and the "Symposium on the Results of Upper Mantle Investigations with Emphasis on Latin América", of the Internacional Upper Mantle Project, in October of 1970. I consider pertinent to copy here the recommendation made by the CSEP, which would mark the future of paleomagnetic research in Latin America: "The Laboratory for paleomagnetic research at the University of Buenos Aires is presently the only paleomagnetic laboratory operating in Latin America. This well-equipped laboratory is the logical base from which to initiate research in other countries of Latin America."

In the discussion forum at CSEP the paradigm shift that took place in the 60's in our understanding of Earth Sciences became evident. This shift was supported by paleomagnetic studies: on one hand the new paleomagnetic data for different continents marked the rebirth of the "Continental Drift" theory. On the other, the systematic paleomagnetic and geochronologic study of Late Cenozoic rocks allowed the establishment of a chronology of the Earth's Magnetic Field reversals for that period of time. This chronology became the backbone of the Sea Floor Spreading theory (Hess, 1962). The main controversy in this geosciences forum came from those who supported the previously established theories (whom from now on I will call "verticalists"). They proposed that mountain formation was the geological manifestation of great vertical movements (Geosyncline Theory). This theory was contested by another group (the "horizontalists") who supported the view that mountain building was fed by globe-scale horizontal movements (Continental Drift and Sea Floor Spreading theories). When the International Project for the Upper Mantle came to an end in 1970, a new program was born in Buenos Aires: the "International Geodynamic Program." Valencio was named Chairman of the Working Group 10: "Global Synthesis of Evidence Leading to the Reconstruction of Distribution of Continent and Oceans." However, most of the well-known and distinguished Argentine geologists at the time would continue supporting the verticalists, for at least one more decade. An anecdote of those times may work as a good illustration of such peculiar geologic environment in Argentina. During the second semester of 1972, one of the most prestigious Argentine geologists, Dr. H. J. Harrington, who was a firm advocate of the verticalists' theories, presented a post-graduate course at the Geology Department of UBA (Fig. 12). With the purpose of showing the inconsistencies and contradictions of the Plate Tectonics Theory with many world's geological aspects (which he knew in depth) he started the course named "Sheet Tectonics". Eleven students signed up for the class: ten geologists (Dr. C. Cingolani and Dr. R. Varela, were among the classmates) and I, a physicist, who attended with the only goal of generating debate. In one of his classes, Harrington showed Africa's extensional-dominated recent geology as an insurmountable contradiction with Plate Tectonics theory. According to Harrington's views, Africa's geology contradicted what was to be expected according to Sea Floor Spreading, because the continent had the Atlantic mid-ocean ridge to the west, and the Indian Ocean ridge to the east. This meant that the continent was sandwiched in between the jaws of two expanding dorsals press, which should have been reflected in a compressional dominated geology.

The following class I carried with me the 60 cm diameter globe that I used at the time for paleogeographic reconstructions. This globe was covered with a series of acrylic plates that represented tectonic plates (Fig. 13). I showed Harrington that mid-ocean ridges and ocean crust production sites were also mobile,





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Señor Decano:

En la ciudad de Buenos Aires, siendo las 16 horas del día 10 del mes de Octubre del año mil novecientos 72 los que suscriben procedieron a tomar examen de Geología a los alumnos que se indican a continuación por orden alfabético:

	Apellido/s y Nombre/s	Calificación		L.U.	Observ.
		Numerica	Letras		
1	García, Jorge R.	10	Reg	66-28	0235 H
2	Gelín, Peter	10	Reg	65-10	0125 H
3	Gómez, Pablo A.	10	Reg	65-10	0570 H
4	González, Leonardo A.	10	Reg	65-10	0100 H
5	Marcelli, Jorge R.	10	Reg	2863	H
6	Rossi, Juan E.	8	Reg	64-10	0435 H
7	Murillo, Pablo	8	Reg	-	H
8	Velasco, Juan E.	10	Reg	63-10	0423 H
9	Zagorin, Pablo E.	10	Reg	64-10	0149 H
10					
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Consta la presente acta de 10 alumnos examinados: Regulares 9 Libres 1

Sobresaliente:	10	2
Distinguido:	9	2
Bueno:	8	2
Aprobado:	7	2
Insuficiente:	6	2
Reprobado:	5	2
Total de exámenes:	4	9

**FIRMAS:** H. H. HARRINGTON J. C. H. TURNER

**Aclaración de Firmas:**

Jefe Dpto. Alumnos

**Figure 12.** Official final examination act of the Course "Sheet Tectonics" by H. H. Harrington, at the Department of Geological Sciences of the University of Buenos Aires in 1972.

something he had not taken into account in his explanation. In his model both ridges were tacitly assumed to be fixed to the Upper Mantle. By using the globe and its acrylic plates, we were able to observe the different types of plate boundaries and the geophysical phenomena associated with them, both at a regional and global scale (geodesy and gravimetry, geomagnetism and paleomagnetism, seismology, geothermal flux and volcanology). Both Harrington and the rest of the students would become convinced of the consistency of this "Unified Theory of Earth Sciences." By this, unorthodox way, the class came to be the first Geotectonic course at UBA. In 1973, Dr. Harrington unexpectedly died, truncating the possibility of repeating the teaching of such course until 1983.



**Figure 13.** Acrylic globe used at the Laboratory of Paleomagnetismo Daniel Valencio to perform global paleogeographic reconstructions.

#### 4. The creation of the Paleomagnetic Laboratories in Brazil and Mexico

The Upper Mantle International Project (1970) produced a great impulse to the advancement of geosciences, and in particular for Latin America, its "Recommendations in Paleomagnetism" promoted the development of this discipline across the continent. One of the first results of this initiative was the invitation of the University of Sao Paulo for Valencio to teach a course in Paleomagnetism in 1971. At the same time that Valencio was traveling to Brazil, amidst of a military dictatorship in Argentina, the historical and legendary 222 Peru St. building (Fig. 14) of the FCEN was shut down.

The excuse was that its structure was unstable. In a hurry, I was forced to move the Paleomagnetic Laboratory to its current location, at Pabellón 2 in Ciudad Universitaria (Fig. 15). Once the old building was evicted (Fig. 16), the Major of the city of Buenos Aires usurped it and ordered its demolition, remaining as an empty lot until today. He integrated it to the city as the "Manzana de las Luces" ("The Square of the Lights"), in an attempt to erase the footprints of the intellectuals that once worked there, including more than one Nobel awarded prizes.

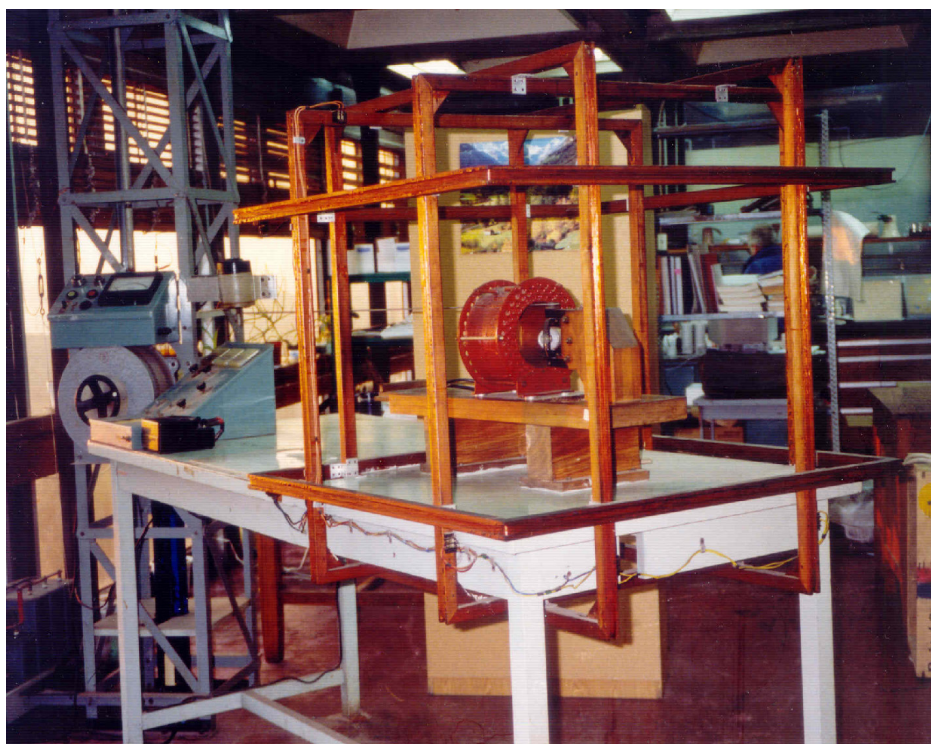
Valencio's paleomagnetism course at USP was found very interesting by the assistants. Especially the physicist (specialized in cosmic radiation) Igor Pacca, who decided to embrace the new discipline. He visited the lab at UBA to complete his formation as a paleomagnetist. Among the samples he brought to the lab were some varves from the Itu Formation (Late Paleozoic from Brazil).

By the end of 1971, Ana M. Sinito (Fig. 17), a Physics student, came to the lab to work in her graduate thesis. She would later establish, during the 1990s, the Paleomagnetism Laboratory at the Arroyo Seco Physics Institute (IFAS) of the "Universidad Nacional del Centro de la Provincia de Buenos Aires", Argentina. In our meeting, Valencio and I assigned her as her thesis project the paleomagnetic analysis of the Itu varves brought by Igor Pacca. The objective was to study the secular variations of the CMT during the Late Paleozoic (Sinito, 1973). In 1972 I put at work the high sensitivity 8Hz UBA magnetometer (Vilas, 1980), which I had developed and built. It worked without interruptions for almost 25 years (Fig. 18).

The already mentioned recommendations of the Upper Mantle International Project, along with the intense and creative activity taking place at the Paleomagnetism Laboratory at UBA, motivated the "Universidad Nacional Autónoma de Mexico" (UNAM) to get its own paleomagnetic expertise (see Urrutia



Figure 14. View of part of the Department of Geological Sciences at its first location in 222 Perú St. This picture was taken days before the Paleomagnetic Lab and all other premises had to be moved to Ciudad Universitaria. The man on the left is Joe Mendía, member of our lab



**Figure 15.** The AF demagnetizing equipment installed at the new location in Ciudad Universitaria, where the Laboratory has been since 1971





**Figure 16.** Recent picture of the area where the Faculty of Sciences of the University of Buenos Aires functioned until 1971.



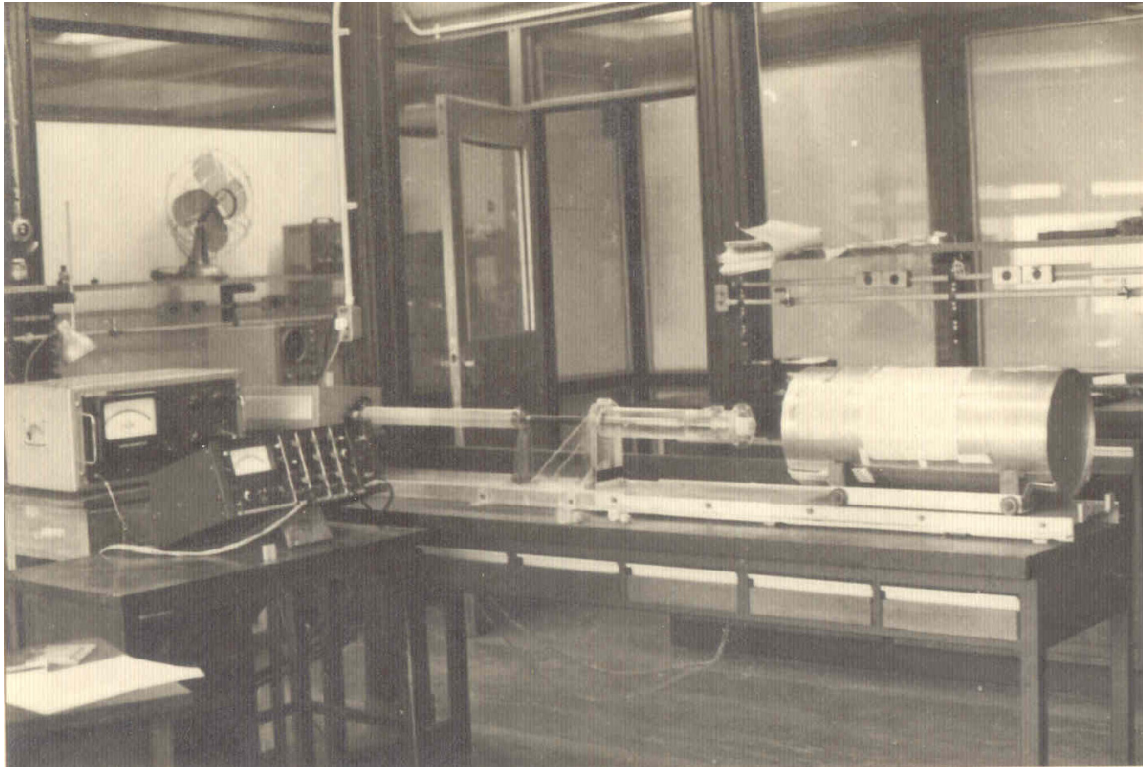
**Figure 17.** Prof. Ana María Sinito at her early twenties during her first years at the Laboratory of Paleomagnetism of Buenos Aires.

Fucugauchi, last paper of Latinmag Letters volume 2). To attain it, in 1974 they invited Valencio to teach a course about the subject and to start a project involving paleomagnetic studies in Mexico. Among the students who attended Valencio's course was a young Mexican physicist, Jaime Urrutia Fucuganchi. He decided to embrace the techniques of Paleomagnetism, and in 1975 he went to UBA's lab for a three month stay under Valencio's supervision.

From May 25, 1973 to March 24, 1976, there was a flash of democracy in Argentina. It allowed deep and passionate discussions at every sphere of intellectual realm. After that brief democratic period, a military regime led by General Jorge R. Videla (Fig. 19) took control of the government. Darkness and silence would dominate the country until 1983.

In 1978, Valencio, Cordani, Pacca, Linares





**Figure 18** Spinner magnetometer UBA 8Hz that started working in 1972 (Vilas, 1980).



**Figure 19.** Dictator Jorge Videla meeting some of the establishment “verticalist geologists” in 1977 (Diario La Nación, Nov. 16th 1977, page 6).



and I organized the First Latin-American Course on Paleomagnetism and Isotopic Geology, with the support of UBA and the Panamerican Institute for Geography and History (IPGH). Fifteen students from several Latin-American countries assisted.

By the end of the 1970s (Fig. 20), the XVII IUGG General Assembly took place in Canberra, Australia. It was the end of the "International Geodynamics Program" and Mike McElhinny and Valencio (1981) presented the Final Report of Working Group 10 of the Inter-Union Commission on Geodynamics: "Global Synthesis and Paleoreconstructions." Also during that Assembly, the International Association of Geomagnetism and Aeronomy (IAGA) elected Valencio as member of its executive committee (for the 1979-1983 period).



**Figure 20.** Daniel Valencio in 1979.

## 5. Close to the abyss

By the end of the 70s the military dictatorship that had been systematically practicing State Terrorism was still in power in Argentina. During those times a rarefied atmosphere existed among the members of the "establishment" of the Argentine geological community, who were in a large majority still verticalists.

There was a mixture of professional jealousy and political distrust towards Valencio. Among them there were very few if any researcher with Valencio's prestige. Many of them were irritated with this professor who was still using, in his courses for undergraduate students, the geophysical maps of the island of Cuba and who, every now and then, would share his memories about the Che and the Cuban Revolution.

In that atmosphere, the "Law for the Reorganization of the National Universities" (Law 22.208) was proposed and later passed by the military government. It established that full professors had to be confirmed in their position, and those who were not confirmed would be immediately fired. Valencio was the only Full Professor of the Geological Sciences Department at UBA who was not included in the initial list of "confirmed" professors. As a consequence of the precarious conditions in which this situation left the whole Paleomagnetic Group at UBA, Dr. Pacca offered Valencio and the rest of us to relocate our lab within the Paleomagnetic Laboratory at the University of Sao Paulo, which at the time was fully equipped and running.

We remained in this precarious situation for around one year. Fifteen days before the law became effective, on April 15, 1980, Valencio was finally confirmed in his position. This initiative to make Valencio and his group disappear from the Argentine scientific community almost succeeded. The anguish and indignation that this political and intellectual action against our group caused an irreversible and sudden deterioration in Valencio's health, in spite of which he was to continue with a vigorous creative activity for over seven years



more, until his death on May 28, 1987.

## 6. A new generation

In those seven years the group grew significantly, incorporating five younger minds who later became leaders of different research groups on a varied set of subjects. They were: Jose Sellés Martinez (1979, 1992), Maria Julia Orgeira (1981, 1988), Augusto E. Rapalini (1989), Eduardo S. Oviedo (1989), who unfortunately passed away on July 19, 2010, and Haroldo Vizán (1993).

Professor Victor Ramos, a specialist in Argentine Geology and Tectonics, who had initially been part of the institutional establishment of verticalist geologists, embraced the modern paradigms of the Unified Theory of Earth Sciences at the beginning of the 80s. With Valencio support, Ramos was appointed in 1983 Professor of the Geological Sciences Department at UBA. The following year Valencio, Ramos, Arturo Amos, Horacio Camacho, Carlos Urien and I began to jointly teach a course on Geotectonics. This course became part of the permanent curriculum of that Department since then. The Plate Tectonics Theory had finally started to be accepted by the Argentine geological establishment.

After 20 convulsed years, since established in 1964, the group of paleomagnetism and geophysical prospecting led by Valencio entered a new and politically stable phase on December 10, 1983, with the return of democracy to the country. It allowed a creative bloom that still persists.

In 1985 the Laboratory entered the digital era: IBM provided it with 2 brand-new computers, printers, 8-channel plotters and peripherals with A/D converters. In return, the Lab gave advice to IBM and measured the magnetic field associated to several large-size printers that were being manufactured in Argentina. The Lab also made studies to establish whether the magnetic fields associated with those printers complied with IATA's safety requisites regarding possible interference with airplane instruments, in order to allow the air export of the printers. Also in 1985, Valencio and his group, in collaboration with Igor Pacca, Jaime Urrutia-Fucugauchi and William MacDonald from SUNY University organized and taught the Second Latin-American Course on Paleomagnetism (Buenos Aires, July 15-30, 1985). The course had support from UBA and the International Center for Theoretical Physics of Trieste, Italy.

## 7. Valencio's death: his legacy

On May 28th, 1987, 30 years after Ken Creer's first trip to Argentina, Daniel Valencio unexpectedly passed away due to a heart failure. He was the creator of the Paleomagnetic Laboratory at UBA, a research center of excellence that participated from its very beginning in the development of the Plate Tectonics Theory and the start-point of several other research groups in all Latin America.

The generosity of these creators, who shared their scientific ideas, created a fertile ground for friendship and scientific exchange. That fertile ground still remains among Latin-American research groups, and LATINMAG is a good example of that.

## Acknowledgement

I would like to give special thanks to Carlos Borches, who helped me to bring back accurately details lost in the midst of my memory. Thanks to Eduardo Diaz de Gijarro and Vicente Bianchi for the invaluable photographic material that they facilitated. Sebastián Ramirez carefully translated the original version to



English. Augusto Rapalini helped in the final edition.

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