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Leite Lopes and Physics in Brazil: A Personal Testimony[1]

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Leite Lopes is an example of a statistical fluctuation in Brazil. The city of Recife in the state of Pernambuco where he was born, is famous for producing remarkable painters, writers, sociologists and also physicists and mathematicians, who are likewise fluctuations in this country.

I met him in 1943 when he came to São Paulo University for graduate studies. Together with Sonja Aschauer — who worked later with P.A.M. Dirac in Cambridge — and Walter Schützer, we listened to the lectures by Gleb Wataghin and Mario Schönberg. This was just before I went to Bristol to work with the group who were developing the nuclear emulsion technique — C.F. Powell, G. Occhialini — and Leite Lopes went to Princeton University to work with W. Pauli and J.M. Jauch.

In São Paulo, in 1943, Leite Lopes started working with Schönberg on the classical theory of the point electron to which Dirac had given, a few years before, an important contribution with his definition of the radiation field as the difference between half the advanced and half the retarded fields. This work was extended to the case of particles with dipole moments later by Schönberg, W. Schützer, and me. Leite had come from Recife where he had great teachers, as Luiz Freire; after graduating as a chemical engineer in Recife, he took his undergraduate course in physics in Rio de Janeiro and after his work with Schönberg in São Paulo he went to Princeton. Already in 1943 we talked about the possibility of forming a group for research in nuclear and particle physics in Rio.

We discussed this again in 1946-1947 when Leite Lopes had already been appointed to the chair of Theoretical Physics at the University in Rio de Janeiro and I came from Bristol to expose nuclear emulsions at the Chacaltaya Laboratory, near La Paz, which is at 5,500 meters of altitude; this compared favorably for cosmic rays investigation, with the Pyrennees mountains in France which is 2,800 meters high and the first observations on

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the pions had come from the Laboratory there. As I showed Leite the first pi-mu decays obtained at Chacaltaya, he got excited as this could be a fundamental process — a view which would be confirmed after we detected about 30 such decays. Leite immediately started working on these questions and I sent him results of our measurements from Bristol and he tried to check the Møller-Rosenfeld scheme of a mixture of vector and pseudoscalar mesons. I remember that as I came from Chacaltaya on my way to Bristol I used Costa Ribeiro's microscope at the Federal University of Rio de Janeiro to see the third nuclear emulsion with a pi-mu decay. I showed this to Guido Beck and Leite and for me this was already a fundamental process.

During my stay in Bristol, on one of my trips through Rio, Leite and I talked with the Brazilian representative at the United Nations Atomic Energy Commission, Alvaro Alberto, to ask him to get the agreement from the U.S. Atomic Energy Commission for my work at the Radiation Laboratory in Berkeley where there was an accelerator for getting alpha-particles with 380 MeV. This gives 95 MeV for each nucleon and if we add Fermi's energy we could produce mesons. Leite and I checked all this and we concluded that the process was possible. This Laboratory was classified but Alvaro Alberto obtained through Mr. B. Baruch that I be allowed to work there. Leite Lopes encouraged me to go to Berkeley so that I could see whether mesons could be produced in nucleon-nucleon collisions. The detection of pions in such collisions was obtained for the first time, on February 21, 1948 with Eugene Gardner (who was very ill and died shortly afterwards); only then could we clearly see that negative pions were absorbed by nuclei to produce stars whereas the positive ones decayed in muons. This discovery had an enormous repercussion in the U.S. and also in Brazil where Leite Lopes wrote articles for the press to explain its significance to the public.

While I was at Berkeley I met Nelson Lins de Barros and we started to discuss about the possibility of creating a Center for Physics in Rio. In December 1948 I came to Rio on a visit and together, Leite and I went to talk with João Alberto Lins de Barros, Nelson's brother. João Alberto was a very influential politician in Brazil. He gave strong support to the creation of the Brazilian Center for Theoretical Physics (CBPF).

In 1949 Leite came to the Institute for Advanced Study in Princeton and we met with him and with the Brazilian physicists Jayme Tiomno, W. Schützer and H.G. Carvalho to talk about physics in Brazil.

With my return from the United States, João Alberto Lins de Barros obtained some funds for the provisional location of the Center; Richard Feynman and Cecília Morette came to Rio and gave lectures in June-July, 1949. With Leite, we invited personalities and university professors from other parts of Brazil to join us as sponsors of the new laboratory, and I was appointed to the recently created Chair of Nuclear Physics at the Federal University of Rio de Janeiro, a proposal made by Leite Lopes and Costa Ribeiro. Tiomno returned from Princeton and joined us; Guido Beck who was in Argentina and had visited Rio before, came to CBPF permanently. We strove to obtain founds from private sources; a newspaperman, Lourenço Borges, helped us with the publicity. A grant from private sources allowed us to build a small house for our laboratory on the University Campus. The first scientific work of CBPF was done by Elisa Frota Pessoa and Neusa Margem. They stablished the first experimental bound on the meson decay into electrons. UNESCO sent us a scientific mission integrated by the physicists G. Occhialini,

Ugo Camerini, Gert Molière and the specialists in electronics and high vacuum, G. Hepp.

We were helped by our Ambassador to UNESCO, Paulo Carneiro, in the acquisition of bonuses from UNESCO to buy books and scientific journals. In 1951, the National Research Council of Brazil was created, with Alvaro Alberto as its President, and we received grants from it. A Symposium on Research Techniques in Physics was held in Rio and in São Paulo and we were visited by I.I. Rabi, E.P. Wigner, S. de Benedetti, Emilio Segrè, John and Leona Marshall, H.L. Anderson, R. Gans, Manuel Vallarta and many other physicists.

At that time, Rabi suggested that as São Paulo already has a Van de Graaf, we should build a high-energy machine in Rio, like the one existing in Chicago at the time, for 400 MeV particles, and the idea was taken up by the National Research Council and its President, Alvaro Alberto. A political crisis in 1954 interrupted this project which was already under way. This crisis has deeply affected my health even up to today.

In 1960, Leite Lopes became Scientific Director do CBPF — a position previously held by myself, by Oliveira Castro and by Guido Beck — and proposed that a Latin American Center for Physics be created by UNESCO with the support of the Latin American Governments. The CLAF was indeed created a few years later and Leite indicated Gabriel Fialho to be its Director.

Leite Lopes has, in my opinion, two basic qualities: he is an excellent teacher, who gives beautiful lectures; and he has made original research work, as he has very good intuition. His most important contribution to physics, I believe, was his paper of 1958 in which he propose that the coupling constant of vector bosons with weak charged current is equal to the electric coupling. This is already a suggestion of electroweak unification since, if the photon, which is vectorial, interacts with the electric current at the same intensity as vector bosons with the weak currents, they belong to the same family. But I remember that he was disturbed by the high value of the mass of the vector boson obtained when $g = e$, because it would be difficult to understand a multiplet with such a heavy particle and a vanishing mass photon. In any case, I think it was he who first suggested the electroweak unification and proposed the neutral vector boson and experiment to detect it.

After Feynman came to Rio in 1949, invited by Tiomno, who was in Princeton, he was called again by Leite to CBPF (where he came several times) in 1951 for (while sabbatical) year, at which time they worked together. Leite was always interested in inviting good physicists to our institute; that is why he organized the Latin American School of Physics in Rio in 1960.

Many students from other states of Brazil and from other countries of Latin America were attracted to CBPF and several of them worked under the direction of Leite Lopes.

Leite has great work capacity, imagination and great culture; he loves painting and poets like Rilke. I rather prefer Kafka, who, although not a poet, is more profound.

But above all he is a good friend. I can say that besides Gleb Wataghin and Giuseppe Occhialini, Leite Lopes has had a great influence on my scientific career.

At the occasion of his 70th birthday, I wish him great success in his multiple activities.

(This testimony was taken by the Editors
from a recorded talk with C.M.G. Lattes)