

Among the stars

The work of César Lattes, who died at eighty, was fundamental for the detection of the pi meson

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"The working conditions here are excellent. I'm here at the invitation of the University of Bristol (professor Occhialini managed it). I receive a monthly grant and have wide freedom over the work and initiative. I can work on what really interests me and stay as long as I like. It's a real piece of cake!"

César Lattes when writing to Leite Lopes on the 21st of April 1946

"I'm perfectly happy to go to work here under conditions that are much less favorable (I'm referring to the scientific part and the material possibility of research, not to the professional part) because I believe that it's much more interesting and difficult to form a good school in a precarious environment than to earn a Nobel prize working in the best physics laboratory in the world."

César Lattes to Leite Lopes on the 12th of August 1946



Lattes on arrival at Rio in 1948: an international celebrity

CESAR E MARTHA LATTESS ARCHIVE

The two paragraphs above, written by César Lattes, have an interval of less than four months. They make up part of the letters written from Bristol, in England, to José Leite Lopes, in Rio de Janeiro. Professor Lattes was just turning twenty-three and would carry out the two studies that would shoot him into the constellation of scientific stars during the following years of 1947 and 1948. From the extracts one can notice the fascination with the working conditions found at the H.H. Wills Laboratory, at the University of

Bristol, and his concern in setting up competitive teams for physics work in Brazil, especially in Rio. César Lattes died at the age of eighty on the March 8th in Campinas as a result of a sudden heart attack, having been the most recognized Brazilian physicist who used his enormous prestige acquired through his discoveries to set up laboratories in Rio, São Paulo and Campinas,

and remained faithful to his ideas of youth. The letters are in the book *Uma história da física no Brasil* [A history of physics in Brazil], by Leite Lopes, organized by Amélia Império Hamburger (Editora Livraria da Física, 2004).

The Italian physicist Giuseppe Occhialini (cited by Lattes) had worked in Brazil, beginning in 1938 with Gleb Wataghin, the Ukraini-

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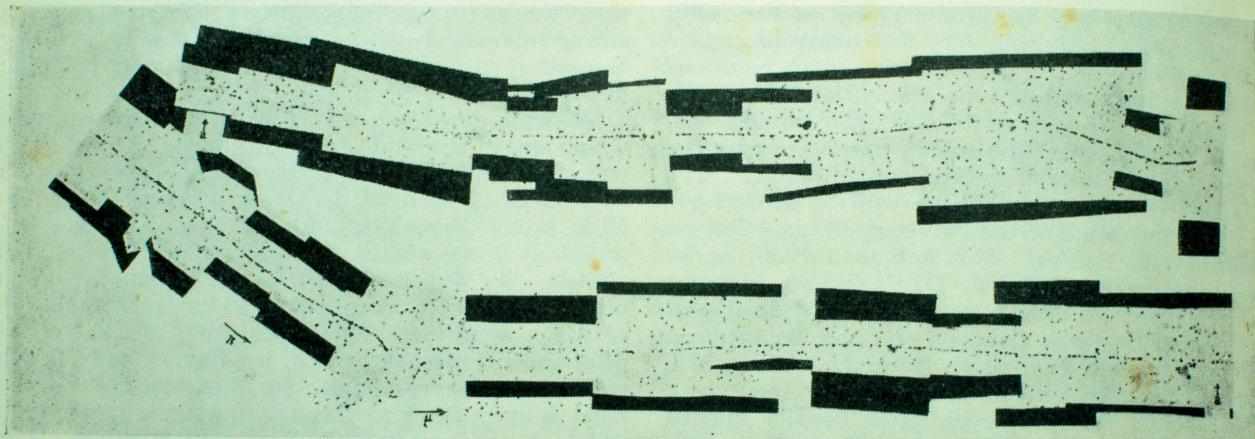


Fig. 1. OBSERVATION BY MRS. I. POWELL. COOKE X 95 ACHROMATIC OBJECTIVE; C2 ILFORD NUCLEAR RESEARCH EMULSION LOADED WITH BORON. THE TRACK OF THE μ -MESON IS GIVEN IN TWO PARTS, THE POINT OF JUNCTION BEING INDICATED BY *a* AND AN ARROW

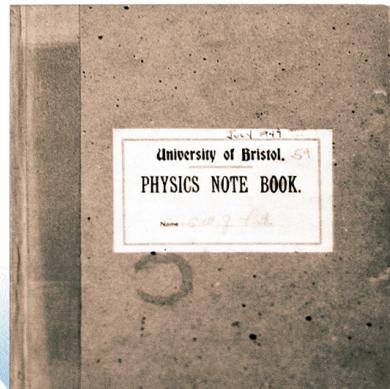
meson, produced in a process of the type which we observe, will remain within the emulsion, of thickness 50μ , for a distance greater than 500μ . If we assume, as a first approximation, that the trajectories are rectilinear, we obtain a value for the probability of 1 in 20. The marked Coulomb scattering of mesons in the Nuclear Research

If mesons of lower range are sometimes emitted in an alternative type of process, they must occur much less frequently than those which we have observed; for the geometrical conditions, and the greater average

an naturalized Italian, who had already given lectures at the University of São Paulo (USP) right from its foundation, in 1934. With professor Wataghin and a group of highly talented Brazilians, such as Mário Schenberg from the state of Pernambucano and Marcello Damy de Souza Santos and Paulus Aulus Pompéia, from the state of São Paulo, among various others, professor Occhialini carried out research into cosmic rays and was one of Lattes' teachers. The original name of the Brazilian was, in reality, Cesare Mansueto Giulio Lattes, born in the city of Curitiba on the 11th of July 1924, the son of the Italian immigrants Giuseppe and Carolina.

His father, then living in São Paulo, perceived César's inclination towards mathematics and physics and in-

Images of the plates with pi mesons, published in *Nature* in 1947 and the notebook of Lattes' annotations: decisive participation



PHOTOGRAPH BY CÁSSIO LEITE VIEIRA

troduced him to professor Wataghin, whom he knew. Making use of a loophole in a government judicial directive, young Lattes skipped a few years and enrolled in the at that time Philosophy, Science and Arts School (FFCL/USP). By the age of nineteen he had graduated and joined Wataghin's team as his third assistant.

It was the first and only college level course that he took. Professors Wataghin

and Occhialini carried out physics of the highest quality at the FFCL during the 30s and 40s. They kept the library updated, there was continuous exchange programs with the largest research centers in the world and they made every effort to send their Brazilian disciples abroad.

"It wasn't England or the United States that gave me my physics education. It occurred in São Paulo, with

Wataghin and Occhialini and of course Damy", said professor Lattes in an interview published in the magazine Ciência Hoje in August of 1995. "That is to say, I learned nothing from them apart from the English language." In 1945, Occhialini went to Bristol to work with Cecil Powell, who was using common photographic plates for the study of the reactions in the atom's nucleus. One year later, Lattes followed the same pathway and joined professor Powell's team.

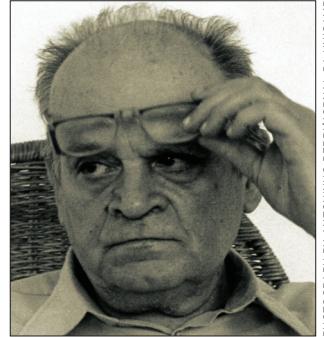
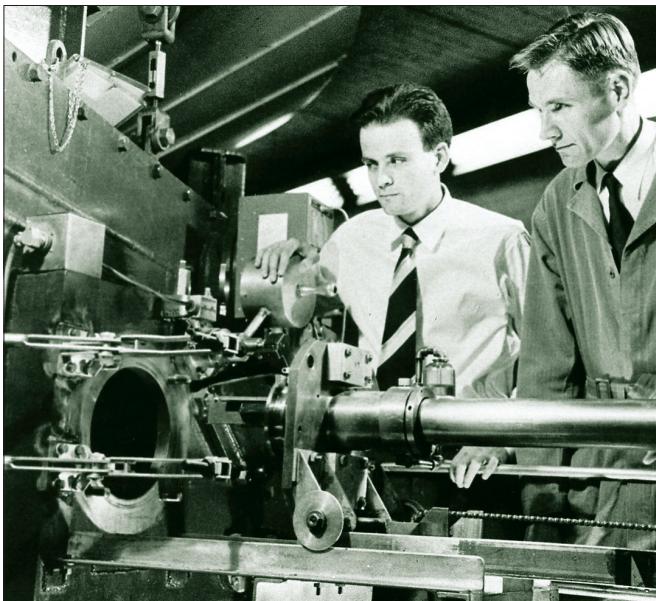
The procedure for the detection of particles was to expose the plates, covered in emulsion, to the open air (similar to common photographic film). The emulsion detects the passage of the highly energetic particles, electrically charged.

After developing, the plate shows the particle's

trajectory (observable under the microscope) through the sequence of grains containing metallic silver along its course of direction. It so happens that the particles that come from space (cosmic rays) collide with particles of the earth's atmosphere creating other particles that are difficult to be detected. For this reason, Occhialini and Lattes concluded that, besides the need for having plates with a more sensitive emulsion, it was also necessary to reduce the exposure time.

It would be necessary to carry out the experiments at places of very high altitude, where the air is rarified. Occhialini carried out the first high altitude experiment in France atop the mountain Pic du Midi, at 2,800 meters in 1946. On developing the plates, in January of 1947, he found some particles and wrote a note for Nature exalting the advantages of the emulsion plates. It so happened that the major leap forward had not only been to expose the plates at altitude but as well in professor Lattes' suggestion of covering some of them with borax (sodium tetraborate), which allowed the conservation of the particles' marks for more time on the plate before they decayed into other particles. The Brazilian and the Italian had been in search of mesons, subatomic particles that carry out the interaction between neutrons and protons, forecast by the Japanese physicist Hideki Yukawa in 1935. On seeing the result of the plates from the Pic du Midi — and also the note of Occhialini in Nature — the Brazilian asked to repeat the experience on Mount Chacaltaya, some 20 kilometers from

CESAR E MARILDA LATTESS ARCHIVE



PHOTOGRAPH BY ANTONINHO PERRI/JORNAL DA UNICAMP

Gardner (right) and Lattes in Berkeley in 1948 and in the decade of the 80s (above)

La Paz, in Bolivia, where there was a meteorological station at 5,600 meters. Professor Lattes did not want to stay out of the discovery of which he had relevant participation.

In the Andes, at that altitude, the plates received 100,000 times more cosmic particles than in France. Everything worked out: the pi meson was clearly detected.

"Particle physics began here", explains Igor Pacca, from the Astronomy, Geophysics and Atmospheric Sciences Institute (IAG/USP), who worked with professor Lattes between 1961 and 1966. César Lattes wanted more. In 1948 he exchanged Bristol for Berkeley University in the United States. This time the idea was to use a particle accelerator to de-

CBPF'S ARCHIVE



Yukawa (standing in the center) with Lattes and other Brazilian physicists

tect mesons artificially created. Just two weeks after having arrived at Berkeley, Lattes and the American physicist Eugene Gardner detected the particle. In truth, the pi mesons had already been produced artificially since November 1946, what had not been known was how to identify them. The news elevated professor Lattes to a position of major highlight on the world scientific scenario. When his scholarship to Berkeley was completed, he already knew what he wanted to do: to work at the recently created Brazilian Center of Physics Research (CBPF), in Rio, which he had helped to found. "The presence of César Lattes was used to bring value to science in Brazil", wrote the historian and researcher from the Museum of Astronomy and Related Sciences (Mast), Ana Maria Ribeiro de Andrade in her book *Físicos, mésons e política — a dinâmica da ciência na sociedade* [Physicists, mesons and politics — the dynamics of science in society] (Hucitec/Mast/CNPq, 1999). Lattes was also important in the founding of the National Research Council, currently the National Council for Scientific and Technological Development (CNPq).



Laboratory at Mount Chacaltaya, during the 50s: continuity of research

REPRODUCTION GÊNEROS DA HUMANIDADE/EDITORIAL BLOCH

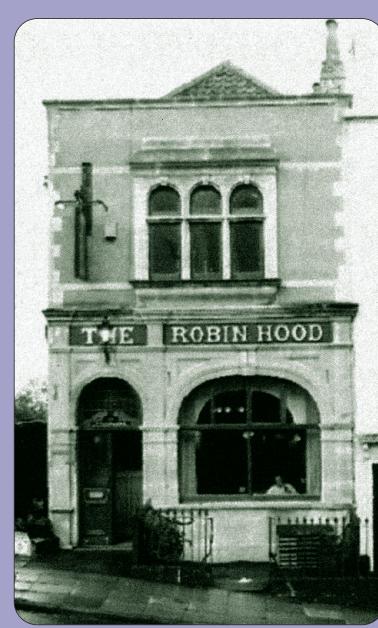
During his period at the CBPF, he set up the Cosmic Physics Laboratory at Chacaltaya and made other lines of research possible. However, in 1955 he left, having discovered financial irregularities at the center. Lattes went to the United States and worked at the universities of Chicago and Minnesota. He returned to USP in 1960 and mounted the Photographic Emulsion Laboratory. He actively participated in the International Cooperative Emulsion Flight, an international project for the analysis of part of a block of 80 liters of emulsion exposed by balloon in the Caribbean.

And from this period came the start of collaboration with Japanese researchers to study emulsions exposed at Chacaltaya. During 1967 he transferred to the State University of Campinas (Unicamp) and there he organized and directed the Cosmic Rays Department and the Nuclear Emulsions Laboratory. César Lattes is almost always remembered as the Brazilian who came closest to winning a Nobel

Prize. For his work during 1947, signed by him and Occhialini and Cecil Powell, who wound up winning the prize by himself in 1950. Powell headed the laboratory and had won for having developed a photographic method for the study of the nuclear process during the decade of the 40s and for the discoveries made using this method.

It is considered that he was to bring visibility to the work, to explore the potentiality of his group, reusing the results and, according to author Ana Maria Ribeiro, he had the talent to convince crowds. Lattes could also have won for his detection of the artificial pi meson, but his co-author, Eugene Gardner, died suddenly in 1950, and the Royal Aca-

The Bristol physicists, Lattes among them, relaxed at the Robin Hood pub



PHOTOGRAPH BY ALICIA VIANNE/EVICH

demy of Sciences of Stockholm did not award prizes to dead scientists. Apparently, the Brazilian did not get upset with the situation. Carola Dobrigkeit Chinellato, a professor at the Physics Institute of Unicamp, who took her doctorate degree under his guidance, stated that the accuracy with the physicist was not limited to physics. Lattes complained when he saw a text that was badly written. "He would say: 'Go home and read Graciliano Ramos. When you learn to correctly use adjectives you can write it out again and show it to me.'" According to people who were in daily contact with him, at times Lattes would alternate moments of extreme excitement during which he would forget to eat and sleep and would spend the whole night working, with periods of deep depression. One of the rare criticisms that was made of him is that of not having left followers — the same as is said of other great physicists such as professors Mário Schenberg and Oscar Sala. Such a vision is contested by Amélia Hamburger, a physicist at the Physics Institute of USP who has worked on the history of science: "Lattes and the others formed research groups and set up laboratories at various centers in Brazil and that work obviously left seeds". The point about which there is no discussion is the genius of the scientist, according to Igor Pacca: "In physics he will always be placed ahead of the others as he saw a long way beyond the others". •