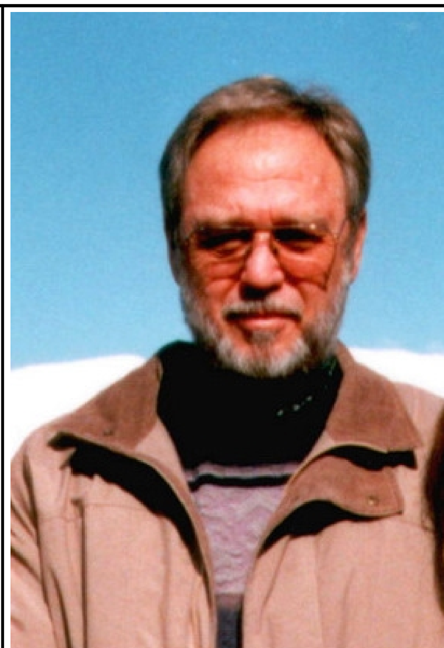
IN MEMÓRIAM:
PROF. LUIS GOMBEROFF JAIKLES (Q.E.P.D.)

The Physics Department of the “Facultad de Ciencias” of the “Universidad de Chile” regrets, with respect and acknowledgment, the passing of Prof. Luis Gomberoff Jaikles (Q.E.P.D), one of its most outstanding members.



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The distinguished scientist and professor of our Departamento de Física of the Facultad de Ciencias of the Universidad de Chile, was born on November 17, 1941, and obtained his M.Sc in Physics in our institution in 1964. In 1967 he obtained a Ph.D. in Mathematical Physics at the London University, England. He was a professor at Tel Aviv University until 1980, and he also worked in France and Princeton.

Among his many academic achievements, we can highlight:

1. "Miembro de número de la Academia” of the Chilean Academy of Science, since April 1986.
2. He won all of the Fondecyt projects (from Conicyt, the equivalent of the NSF in the USA) that he applied, which included 14 projects as a Principal Investigator.
3. He received the "Medalla al Mérito Académico Valentín Letelier" from the Dean of the University, November 22nd, 2005.
4. From 1993, he had been consecutively postulated to the National Science Award (Premio Nacional de Ciencias Exactas).
5. He is the author of more that 140 ISI publications, with more than 1000 citations. The last publication was published in 2010. The extensive list of his publications, with the appropriate statistics, can be found in

   http://www.researcherid.com/rid/F-3637-2010

Furthermore, he has an extensive list of other publications, some peer-reviewed, such as book chapters, proceedings, etc. A list of these publications can be seen in other work, adding to about 200 total publications.

Luis Gomberoff had wide ranging interesting in physics. His first contributions were in particle and quantum field theory. He went to the physics department at Tel-Aviv University in 1970 after completing his Ph.D degree in England. His aim was to continue his research in high energy physics, and developed a fruitful collaboration with Yuval Neeman and other members of the high energy group at the university. During his period at the Tel-Aviv University in Israel he made important contributions in particle physics and in plasma physics. The late 60 and early 70’s were a time of great excitement – the host of new particles discovered called for a theory of strong interactions and the first steps were attempts to formulate them in the language of quarks and current algebras. Luis’ papers on chiral symmetry breaking, on deformation of current algebra, on scaling and sum rules - show his mastery of the subject, and although many of his results have been subsumed in later more complete theories one still senses the intelligence and intellectual curiosity of his mind.

He then started working in plasmas (ionized material) when there was great hope for controlled nuclear fusion. His work in plasma physics was influenced by high energy physics which led him to work on a quantum field approach to plasma physics. It is precisely in plasma physics that he had some of his most relevant contributions, not only in controlled nuclear fusion, but also in space physics and plasma astrophysics, with important publications about the plasma in the solar wind, the Earth's magnetosphere, the neutron star magnetospheres, among others.

For more than three decades, Prof. Gomberoff has made novel contributions to the theory of linear and nonlinear waves and instabilities in magnetospheric and solar wind plasmas. A consistent theme of his work has been the inclusion of multiple ions species having different temperatures and drifting with respect to each other. This is the situation observed in the solar wind, with the additional complication that the dihttps://universodoppler.wordpress.com/2010/11/18/antimateria-atrapada-por-primera-vez-video/stribution functions of the individual species are usually not Maxwellians. Prof. Gomberoff's work has illuminated many interesting effects whereby the ions affect wave and instability dispersion relations, thereby altering how the particles interact, especially resonantly, with the electromagnetic field. This work offered possible explanations of how the ions acquire drifts, high temperatures, and non-Maxwellian distributions in the first place. He was particularly cognizant of the fact that the solar wind contains large-amplitude MHD waves, and in recent years he devoted much effort to understanding the parametric instabilities of these waves in multi-ion plasmas, and the sometimes surprising effects of the nonlinear waves on other instabilities (such as a stabilizing effect on the same linear instabilities that triggered them, or the onset of explosive instabilities). It is probably fair to say that nowadays the emphasis is on understanding MHD turbulence in the solar wind, with instabilities somewhat in the background. But here Prof. Gomberoff's work has a real future: Kinetic effects in the dissipation range almost certainly produce ion distribution functions which are unstable to a variety of velocity-space instabilities. And it is becoming evident that parametric instabilities play a role in the production and evolution of the turbulence itself, as well as the generation of nonthermal distribution functions in the solar wind plasma.

During the 70’s and 80’s Dr. Luis Gomberoff published several seminal papers on the convective growth of electromagnetic ion cyclotron waves in the multi-ion magnetospheric plasma. Specifically, he showed how the combination of cold and hot ions in the medium influences both the excitation and the propagation characteristics of these important magnetospheric waves. This work, which is still referred to today, has had a major impact on our understanding of the processes that affect dynamical changes in the Earth's radiation belts.

Luis developed an analytical method in the context of the broadband electrostatic noise in the Magnetotail, which provided a simple way (without the need of complicated numerical simulations) to understand many aspects of the role of ion-ion instabilities and the ion-acoustic instability depending on various parameters. The same ideas were then applied in the context of electrostatic bursts in the Comet Giacobini-Zinner.

The effect of large-amplitude waves on linear instabilities, the occurrence of parametric decays of electromagnetic waves stimulated by ion beams (mentioned above), as well as the influence of damping, was studied in a larger context, and in several areas, such as: fusion plasmas where the parametric coupling between Alfven wave and plasma with deuterium, tritium, and α particle ions were applied in Tokomaks; or (b) in electron-positron plasmas, which are considerably different from standard electron-ion plasmas since there are no high and low frequency scales, where used to explain some aspects of the radiation coming from pulsars, suggesting that the electromagnetic waves are self modulated.

The study of multicomponent plasmas and ion cyclotron waves was in part motivated from his early studies in plasma physics His first interest was the effects of a cold plasma component on the ion-cyclotron instability under magnetospheric conditions. He found the conditions for the maximal enhancement of the instability and showed that the presence of heavier particles like lithium may lead to increase in the relevant growth rates. Luis then went on and calculated optimal lithium concentrations for active space experiments in which the magnetosphere is modified by particle injection. Related to that topic, Luis also got interested in multi-streams instabilities. That interest was motivated by the observed half- harmonic shifted electric emission from various areas in the magnetosphere. Thus, Luis and his coworkers showed that that emission is due to the resonance interaction of the cyclotron modes in each of the electron beams as well as the resonance interaction of the beam-cyclotron modes and the stationary background plasma modes. Luis went on and investigated such effects as the temperature of the various electron beams as well as the background plasmas, and the non-resonant interaction between the various plasma components. In particular, when ISEE1 measurements indicated that the electron distribution function is closer to a shell shape rather than the loss-cone one that was expected to generate the half-harmonic electrostatic emission, Luis and his coworkers devised a sophisticated scheme, in which the shell-shape distribution is modeled by a discrete series of beams along the pitch angle, where each pair of beams gives rise to the observed emission, due to the resonance interaction of the cyclotron modes in each of the individual beams.

Another field of interest of Luis is connected with a series of papers about convection in cylindrical current carrying plasmas, with or without boundaries, caused mostly by resistivity (sometimes by viscosity) and thermal conductivity. Hall currents where also considered. This convection is in complete analogy to fluid convection with an onset determined by a Reyleigh number.

Due to his scientific achievements, The Journal of Geophysical Research-Space Physics selected him as a permanent editor, which is a selected group of scientists that determine which articles can be published in the journal.

Luis was also one of the pioneers of plasma physics education in our country and in Latinoamerica, with important participations in scientific and educational conferences and workshops. A large number of graduate, and undergraduate students took his plasma courses in our physics department. Furthermore, he produced a significant number of master and PhD students. Some of them have now academic positions in important national and international universities.

Some appearances in the national media can be seen in news section of the web page of the Facultad de Ciencias of the Universidad de Chile, and in the news section web page of the Departamento de Física of the Facultad de Ciencias of the Universidad de Chile.

Joe Hollweg, University of New Hampshire
Bernie Vasquez, University of New Hampshire
Richard Thorne, University of California at Los Angeles
Michael Mond, Ben-Gurion University of the Negev, Israel.
Armando Brinca, Universidade Técnica de Lisboa, Portugal.
Nathan Andrei, Rutgers University, USA
Juan A. Valdivia, Universidad de Chile

A few personal comments by colleagues:

Armando Brinca : "I first got acquainted and impressed with Prof. Gomberoff through his frequent and thoughtful scientific publications. When the opportunity arrived, I invited him to join a research project that lasted until my retirement and proved very fruitful. The periodic meetings in Santiago and Lisbon permitted peering into the human being beyond the plasma physics man and contributed to the consolidation of my profound admiration for Luis Gomberoff."

Michael Mond: …"Luis became fascinated with plasma physics and especially with its application to space physics. That encounter changed the course of his scientific career as in the mid 70's he turned to his new found interest and embarked on what eventually became his lifelong passion that lead to seminal contributions to the field of space plasma physics." …. "Even though Luis loved living in Israel and enjoyed his interaction and collaboration with younger scientists, due to personal reasons went back to Chile in 1980. This, as time has proven, was a great loss to Israeli science and an important gain to Chile and South America."

Luis Gomberoff is survived by his wife Fanny, his daughters Nili and Katia, and his 5 grandchildren, Anat, Tamar, Igal, Eitan and Michal.