

EDITORIAL

Bringing a close to 2019, and after the dramatic moments of unrest experienced by the country which had repercussions for society including our academic and scientific community, we are pleased to present another issue of the Bolivian Journal of Physics (RBF). This edition is thanks to the enthusiasm of the scientists who have generously contributed and who have entrusted the results of their research to the RBF.

In 2019, there were important national scientific achievements for physics. The increase in scientific production in Bolivia is in great part due to the continued consolidation of research groups in the country's universities. Furthermore, work has started on the set up of the ALPACA project which involves a collaboration between the Cosmic Physics Group of the Universidad Mayor de San Andrés (UMSA) and Japanese scientific groups. This project is set to generate advances in Cosmic Ray research at an international level. Also, the Atmospheric Physics group stands out for its achievements in building up an impressive range of equipment and for its publications fruit of collaborations with renowned international groups. No less praiseworthy is the activity of the Condensed Matter Physics Group which has established itself as a reference for multidisciplinary research of interest to current Bolivian opportunities and problems. The Applied Physics Group continues as an example for its interaction with society through the provision of services. While, the Theoretical Physics Group is noted for its prolific scientific production and the enthusiasm of its Non Linear Dynamics and Complex Systems Group who have converted the Bolivian Course of Complex Systems (CBSC) in a regular event now in its XVII version. The complex systems group had the challenge of organizing an event of great relevance at a Latin American and global level: The Latin American Workshop on Nonlinear Phenomena (LAWNP) in its XVI version. LAWNP took place from October 22nd to 26th, during a period of civil unrest and tension. The participants from more than 20 countries were very satisfied with the scientific and organizational skills of LAWNP organizing committee. The event constitutes a great achievement not only for the organizing group but also for UMSA as host in close collaboration with the Military School of Engineering (EMI) in whose facilities most of the activities took place. Within UMSA, of note are the participation of the Physics Department, the IIF, the Institute of Mathematics Research (IIMAT), the Max Schreier Planetarium, the Faculty of Pure and Natural Sciences both at the deanery and student level. The support of the Department of Postgraduate Research and Social Interaction (DIPGIS) was invaluable for the event. Other institutions also provided a strong collaboration for the success of the LAWNP, among which should be mentioned FUNDECO, the Bolivian Association for the Advancement of Science (ABAC), Sagittarius Graphic Arts, Mi Teleférico, the Bolivian Space Agency (ABE), the Technical University of Oruro, the Simón Patiño, University. As well as the Embassies of Uruguay and United Kingdom, Hans Seidel Foundation, the National Museum of Ethnography and Folklore (MUSEF), Terratec s.r.l., the Centro Arqueológico Tiwanaku and the "Gobierno Autonomo Municipal de La Paz" which promoted the publication of an article in the "Revista Municipal de Culturas Khana" written by Ramírez-Ávila, Oporto-Almaraz *et al.* (2019).

The 35th issue of the RBF contains three scientific research articles and a teaching section contribution. The first paper corresponds to research by Canezo-Gómez *et al.* (2017) which addresses aspects related to the action of ionising radiation on normal and effector cells in cancer cell populations, a situation that occurs in oncological radiation therapy treatments. For this paper, the authors considered the characteristic radio sensitivity of each cell type to be an essential aspect. This work is a continuation of the models analysed by Ramírez-Ávila (2017) and is the result of an interdisciplinary collaboration between UMSA's Physics and Biology Departments.

The present issue of the RBF continues with the results of the detailed description of a rotating ring, a basic model of the non-linear dynamics due to Lozada-Gobilard & Ramírez-Ávila (2019). In spite of its simplicity, the mentioned system shows a great richness of dynamics, which was explored in detail from an experimental perspective. Not only was a sphere in the rotating ring considered, but also different numbers of spheres which allowed for corroborating the equi-probability that the spheres chose one branch or the other. In addition, results are also reported in terms of working with different types of fluids, which gives an original perspective to this research. It is also worth mentioning that this work won second place in the LAWNP poster competition.

The scientific articles section closes with a bibliometric analysis of the Bolivian Journal of Physics (RBF) by Subieta-Frías, & Ramírez-Ávila (2019), for which they used complex networks that account for the diversity, the collaboration, the productivity and country of influence of the RBF authors. This paper is a further extension of the applications of the analysis of complex networks in social systems that were initiated by Subieta-Frías, & Ramírez-Ávila (2017).

Finally, Manzaneda (2019), in the physics teaching section, explains how to generate movement in a pref-

erential direction from the Brownian movement, implementing ratchet potentials that constitute the basis of Brownian engines of wide application in biological and biochemical problems. The author explains the formalism of stochastic differential equations and concludes by describing examples of molecular engines. The author is an excellent student of the UMSA's Physics Department.

We hope that the content of this issue of the RBF will be to your liking and that it will motivate the reader to study the works presented on these pages in greater depth. We also invite the scientific community to send their work to be published in the RBF.

REFERENCIAS

- Ramírez-Ávila, G.M., Oporto-Almaraz, S.A., Conde-Saavedra, G., Depickère, S. Bustos-Espinoza, R.O.E., Subieta-Frías, V., Oporto-Almaraz, Z.A., Vera-Hurtado, F., & Santamaría, J. (2019), *Revista Municipal de Culturas Khana*, **60**, 401.
- Canezo-Gómez, W.A., Rodrigo, G., & Ramírez-Ávila, G.M. (2019), *Revista Boliviana de Física*, **35**, 5.
- Ramírez-Ávila, G.M. (2017), *Revista Boliviana de Física*, **31**, 25
- Lozada-Gobilard, L.B., & Ramírez-Ávila, G.M. 2019, *Revista Boliviana de Física*, **35**, 15.
- Subieta-Frías, V., & Ramírez-Ávila, G.M. 2019, *Revista Boliviana de Física*, **35**, 24.
- Subieta-Frías, V., & Ramírez-Ávila, G.M. 2017, *Revista Boliviana de Física*, **31**, 3.
- Manzaneda-Osorio, L.A.(2019), *Revista Boliviana de Física*, **35**, 37.