CURRICULUM VITAE ET STUDIORUM

Personal Data

Surname:	Hernández Bertrán
Name:	Michael Alejandro
Gender:	Male
Date and place of birth:	August 28th, 1991, Havana, Cuba
Nationality:	Cuban

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Current affiliation

Position: Ph.D. Student
Institution: Dipartimento di Scienze Fisiche, Informatiche e Matematiche "FIM", UNIMORE
Address: Via Giuseppe Campi, 213/a, 41125 Modena MO, Italy.

Education (Higher degrees)

- 2018 Máster en Ciencias Físicas (M.Sc. in Physics), Faculty of Physics, University of Havana.
 Thesis: "Effect of finite size on the density of states and Landauer conductance in graphene superlattices".
 Supervisor: Prof. Dr. Melquiades de Dios Leyva (University of Havana). Grade 4.90/5
- 2015 Licenciado en Física (Five-years course, equivalent to Laurea Magistrale in Physics, following "Bologna Process" standards), Faculty of Physics, University of Havana. Thesis: "Temporal durability of holes quasi-bound states in layered systems" Supervisor: Prof. Dr. Leovildo Diago Cisneros (University of Havana). Grade: 4.64/5

Publications

- Melquiades de Dios-Leyva, Michael A. Hernandez-Bertran, Volodymyr Akimov, Juan A. Vinasco, Alvaro L. Morales, and Carlos A. Duque, "Magneto-optical properties of Fibonacci graphene superlattices", Eur. Phys. J. B, 93, 47, (2020), 10.1140/epjb/e2020-100583-x
- Michael Hernandez, Alejandro Cabo Montes de Oca, Maurice Oliva Leyva, and Gerardo Naumis, "How water makes graphene metallic", Physics Letters A, 383, 29 (2019), 10.1016/j.physleta.2019.125904
- M. de Dios-Leyva, M. A. Hernández-Bertrán, A. L. Morales and C. A. Duque, "Quasiperiodic graphene superlattices: Self-similarity of the Landau level spectra", Solid State Communications, 284–286, 93–95 (2018), 10.1016/j.ssc.2018.09.011
- M. de Dios-Leyva, M. A. Hernández-Bertrán, A. L. Morales, C. A. Duque, and Huynh Vinh Phuc, "Optical Absorption in Periodic Graphene Superlattices: Perpendicular Applied Magnetic Field and Temperature Effects", Ann. Phys. (Berlin) 2018, 1700414 (2018), 10.1002/andp.201700414
- Melquiades de Dios-Leyva, Michael Alejandro Hernández-Bertrán, Álvaro Luis Morales, Carlos Alberto Duque, "Magneto-Optical Absorption in Graphene Superlattices: Dirac Point Effects", Phys. Status Solidi RRL 2017, 1700347, (2017), 10.1002/pssr.201700347
- C. A. Duque, M. A. Hernández-Bertrán, A. L. Morales, and M. de Dios-Leyva, "Exploring graphene superlattices: Magneto-optical properties", J. Appl. Phys. 121, 074301 (2017), 10.1063/1.4976680
- M. A. Hernández-Bertrán, C. A. Duque and M. de Dios-Leyva, "Graphene superlattices: Effect of finite size on the density of states and conductance", Phys. Status Solidi B, 254, 4 (2017), 10.1002/pssb.201600313
- 8. M. A. Hernández-Bertrán and L. Diago-Cisneros, "Quasi-bond states of holes in a layered semiconductor heterostructure: Life times and eigenenergies", Rev. Cuba Fis. 32, 20 (2015).

Awards

2017 Annual Prize of the Cuban Academy of Sciences to "Propiedades físicas de superredes de grafeno en ausencia y presencia de campos magneticos", Melquiades de Dios-Leyva, Michael A. Hernández-Bertrán, Raúl Cuan, Carlos A. Duque and Alvaro L. Morales.

Employment Experience

- 2018-2021 Instructor (Faculty of Physics, University of Havana)
- 2015-2018 Trainee (Faculty of Physics, University of Havana)
- 2013-2015 Assistant Student (Faculty of Physics, University of Havana)

Teaching Experience

- 2018-2021 Optics and Modern Physics (Practicals and Labs), Faculty of Biology, University of Havana. - Introduction to Mathematical Logic (Practicals), Faculty of Physics, University of Havana
 - Mechanics (Practicals and Labs), Faculty of Biology, University of Havana
- 2015-2018 Electromagnetism (Practicals), Faculty of Physics, University of Havana.
 - Optics and Modern Physics (Practicals and Labs), Faculty of Biology, University of Havana.
 - Mechanics (Practicals and Labs), Faculty of Biology, University of Havana
- 2013-2015 Electromagnetism (Labs), Faculty of Biology and Faculty of Geography, University of Havana.

Scientific Meetings and Schools

- 1. 4th BIG-MAP Biannual Project Meeting, 07/09-08/09 (2022), Copenhagen, Denmark.
- 2. Psi-k 2022 Conference, 22/08–25/08 (2022), Lausanne , Switzerland. Poster: "Simulations of X-ray spectra on Li/C structures."
- YOUNG RESEARCHER'S WORKSHOP ON MACHINE LEARNING FOR MATERIALS, 09/05-13/05 (2022), Trieste, Italy.
- 4. Ab-initio Many-Body Methods and Simulations with the Yambo Code, 04/04-08/04 (2022), ICTP, Italy.
- MaX School on Advanced Materials and Molecular Modelling with Quantum ESPRESSO, 17/05-28/05 (2021), Italy.
- 6. Symposium of the Cuban Society of Physics, Havana, Cuba (2020). Poster: "How water makes graphene metallic".
- 7. CAM Conference, Laurentian University, Sudbury, Ontario, Canada 24/07-27/07 (2019). Poster: "Effect of finite size on the density of states and Landauer conductance in graphene superlattices".
- STARS2017 and SMFNS2017 pre-school: "Modeling matter under extreme conditions", Prof. Dr. Matthias Kaminski (University of Alabama), Prof. Dr. David Blaschke (University of Wrocław & JINR Dubna), Prof. Dr. Marcus Bleicher (Goethe University Frankfurt), May 2017.
- 9. LIX National Congress of Physics, Leon, Mexico 2/10-7/10 (2016). Poster: "Phase and lifetime interplay for biased hole systems".
- 10. 9th Workshop of Condensed Matter and Molecular Physics, Cuernavaca, Mexico, 11/01-12/01 (2016). Poster: "Lifetime and phase time interplay for quasi-bound hole states."

Languages skills

Spanish (native), English (good)

Programming Languages and Computational tools

Programming:	C/C++, Fortran, Python, Mathematica
Computational tools:	Quantum ESPRESSO, AiiDA
Others:	Gnu/Linux, I₄T _F X

Computational skills and Scientific Research Experience:

I started my research work in the study of <u>quantum transport of holes in low dimensional semiconductor systems</u> as part of my diploma in Physics. During this period, I worked extensively with the <u>Luttinger-Kohn Hamiltonian</u> combined with Transfer and Scattering Matrix formalisms. I developed *ad hoc* codes in Mathematica.

Throughout my time as a master student, <u>I studied electronic and magneto-optical properties of periodic and finite Graphene Superlattices (GSL)</u> under the supervision of Prof. Melquiades de Dios. I got familiarized with the <u>Tight-Binding (TB)</u> approach and the Dirac-like Hamiltonian for massless particles, the Gauss-Kronrod quadrature and the complex transmission coefficient. Additionally, I extended my master's work to study the self-similarity of the Landau level spectra in Fibonacci GSL.

I got involved in the research focused on the <u>electronic properties of Graphene-based systems in particular</u> <u>water doped Graphene</u>. This work was related with the development of a <u>theoretical model to describe prop-</u> <u>erly the strongly correlated Mott systems, using the Hartree Fock approximation, including crystal symmetry</u> <u>breaking and spin non-collinear states</u>. This work was developed under the supervision of Prof. Alejandro Cabo (ICIMAF) in collaboration with the Complex System Department at the Institute of Physics of the UNAM, Mexico.

Currently I am a Ph.D Student supervised by Prof. Elisa Molinari (UNIMORE) working in the field of Computational Materials Science with research interests on DFT, Many Body Theory and Simulations of Electronic and Spectral properties of materials. In particular I'm perfoming X-ray spectroscopies simulations (XPS, XAS and XRS) from first principles along with the implementation of high-throughput workflows and Machine Learning methods in order to study the atomistic properties of anodes, cathodes and SEI in the context of batteries research.