

## **WE OFFER OF A PREDOCTORAL CONTRACT:**

The PhD student will receive a multidisciplinary training with a focus on thin-film device architectures. This will include the epitaxial growth of complex oxides, the analysis and understanding of x-ray diffraction, atomic resolution electron microscopy, the preparation of devices using photolithography and the measurement of dielectric and photoresponsive properties, including nanoscale characterization of the photoresponse. The student will also collaborate jointly with the PhDs of the team. Such a stimulating environment will provide a solid scientific broad background, rather uncommon in the current highly-specialized PhDs programs. The scientific education will be framed within the PhD program of "Ciencia de Materiales" coordinated by the Physics, Chemistry and Geology departments at Autonomous University of Barcelona (UAB) and complemented with participation to appropriate schools (such as ISOE "International School of Oxide Electronics", organized every 2 years in Cargese, Corsica). Regular presentations at weekly group's meeting and international conferences shall provide adequate training.

**The training of the PhD will include:** **(1)** Stimulation to participate to International conferences. At least one/per year per PhD and Postdoc. **(2)** Short visits to foreign labs to reinforce collaborations and to help young researchers to establish a network **(3)** Regular presentations at the weekly internal research Group Meetings to contribute improving presentation, understanding and assertiveness, when exposed to peers and fellows

## CURRICULUM VITAE INVESTIGADOR PRINCIPAL DEL PROYECTO

Part A. PERSONAL INFORMATION		CV date	26/04/2024
First and Family name	Gervasi Herranz Casabona		
Social Security, Passport, ID number	43425913G	Age	53
Researcher codes	Open Researcher and Contributor ID (ORCID**)	0000-0003-4633-4367	
	SCOPUS Author ID (*)		
	WoS Researcher ID (*)	G-2770-2014	

(\*) Optional

(\*\*) Mandatory

### A.1. Current position

Name of University/Institution	Agencia Estatal Consejo Superior de Investigaciones Científicas		
Department	Institut de Ciència de Materials de Barcelona		
Address and Country	Campus de la UAB, 08193 Bellaterra, Catalonia, Spain		
Phone number	935801853	E-mail	<a href="mailto:gherranz@icmab.cat">gherranz@icmab.cat</a>
Current position	CSIC Research Scientist (Inv. Científico CSIC)	From	07/2020
Key words	Condensed Matter, Quantum transport, Light-matter interactions, transition metal oxides, correlated systems		

### A.2. Education

PhD, Licensed, Graduate	University of Barcelona	Year
Physics	University of Barcelona	2004

### A.3. General indicators of quality of scientific production (see instructions)

- Sexenios: 3; fecha última concesión: 5 June 2019
- Number of Supervised PhD: finished (7); ongoing (4).
- Number of Supervised Postdocs: finished (2); ongoing (2).
- Total n<sup>o</sup> Citations: ca. 4600 (WOS, January 2024)
- Publications in 1<sup>st</sup> Quartile journals: **76** (out of 105)
- Publications in 1<sup>st</sup> Decile journals: **29** (out of 105)
- h Index: **32** (Web of Science as of January 2024, h-index Google Scholar = 36, i-10 index = 79)

### Part B. CV SUMMARY (max. 3500 characters, including spaces)

I am a Condensed Matter Physicist working in **Light-Matter Interactions and Quantum Transport** at the Institute for Materials Science of Barcelona (ICMAB), which belongs to CSIC (Consejo Superior de Investigaciones Científicas, the Spanish National Research Council), where I am CSIC Research Scientist (Investigador Científico CSIC). My scientific activity has led to fundamental discoveries in **quantum transport in oxide quantum wells (QWs)** (mostly based on SrTiO<sub>3</sub> interfaces, but also KTaO<sub>3</sub>), related to **low-dimensional superconductivity and Rashba spin-orbit coupling** and the discovery of unusual phototransport. Recently, I have started a research line that seeks to integrate **topological materials** (WTe<sub>2</sub>, F<sub>3</sub>GeT<sub>2</sub>) into oxide QWs to investigate the spin-charge conversion problem in these systems. I am also interested in **light-matter interactions** in solids. On the one hand, I work in **topological photonic crystals**, seeking to find favorable conditions to induce topologically protected edge modes. I also investigate the problem of **spin-orbit entanglement in transition metals**. In this topic, I have developed methods to detect optically spin-orbit entanglement in light transition metals through (magneto)optical spectroscopy (in particular, Mn<sup>3+</sup> in manganite perovskites). I also develop **nonequilibrium many-body theories** to understand light-matter interactions in these materials, with focus on transient responses.

I have **supervised 7 PhD Theses** and 4 more are **currently under supervision**. In the same period, I have supervised **2 postdocs** (one in 2011-11, and a **MSCA-IF fellow** in 2017-2020) and presently I supervise **2 more postdocs** (1 **Beatriu de Pinós** fellow and 1 financed by a project). Since 2009 I delivered more than 25 invited talks (including

APS March Meeting 2009 & 2015, MRS Spring 2013, E-MRS Fall 2018, SPIE Photonics 2010 & 2019, MMM-Intermag 2012, META-conferences 2019 & 2021) and more than 70 oral communications. I am co-author of 2 **book chapters** in the field of photonics (Ed. By Royal Soc. Of Chem., 2013, ISBN: 978-1-84973-653-4) and 2DEGs (“Oxide Spintronics”, Pan Stanford Publishing, 2019, ISBN 9814774995). I have organized symposia at MRS Spring 2011 and 2013 and E-MRS Spring 2015 and I participated in the organization of the International School of Oxide Electronics 2011 (Cargèse, France). More recently I co-organized schools (Angle Resolved Photoemission Spectroscopy (<https://arpes2023.icmab.es>) and “Orbital Currents in Solids” (<https://orbitalcurrents2023.icmab.es>)). I am in the Committee of the Workshop on Complex Oxides (<https://workshopcomplexoxides.wordpress.com>). I have lectured at schools and *invited seminars* at various centers in **Europe, America** and **Asia**. I have participated in **PhD Committees across Europe** (Spain, France, the Netherlands, Switzerland, Czech Republic, Finland). I have been **Management Committee member** of EU-COST Action MP1308 “Towards Oxide-Based Electronics”.

I have published more than 100 articles. Over the **last 7 years** the list includes 1 **Nature Materials**, 1 **Nature Physics**, 2 **Nature Communications**, 1 **ACS Appl. Mater. Interfaces**, 1 **Comm. Physics** and 5 **Physical Review Letters**. Publications before 2014 include also 1 **Nature**, 1 more **Nature Materials**, 5 more **Physical Review Letters** and 1 **ACS Nano**, among many others (17 PRBs, 15 APLs, etc.). My h index is  $h = 32$  (as of January 2024) and the number of citations is ca. 4600 (WoS, January 2024).

### Part C. RELEVANT MERITS (sorted by typology)

#### C.1. Selected Publications Over the Last Five Years

*Competition between Polar and Nonpolar Lattice Distortions in Oxide Quantum Wells: New Critical Thickness at Polar Interfaces.* J. Gazquez, M. Stengel, R. Mishra, M. Scigaj, M. Varela, M. A. Roldan, J. Fontcuberta, F. Sánchez and G. Herranz, **Physical Review Letters**, 119, 106102 (2017).

*Non-reciprocal diffraction in magnetoplasmonic gratings.* Rafael Cichelero, Mikko Kataja, Mariano Campoy-Quiles, and Gervasi Herranz, **Optics Express**, Phys. Rev. Lett. 26, 34842 (2018).

*Low-Temperature Dielectric Anisotropy Driven by an Antiferroelectric Mode in SrTiO<sub>3</sub>.* Blai Casals, Andrea Schiaffino, Arianna Casiraghi, Sampo J. Hämäläinen, Diego López González, Sebastiaan van Dijken, Massimiliano Stengel, and G. Herranz, **Phys. Review Letters**, 120, 217601 (2018).

*Giant topological Hall effect in correlated oxide thin films.* Lorenzo Vistoli, Wenbo Wang, Anke Sander, Qiuxiang Zhu, Blai Casals, Rafael Cichelero, Agnès Barthélémy, Stéphane Fusil, Gervasi Herranz, Sergio Valencia, Radu Abrudan, Eugen Weschke, Kazuki Nakazawa, Hiroshi Kohno, Jacobo Santamaria, Weida Wu, Vincent Garcia & Manuel Bibes, **Nature Physics**, 15, 67 (2019).

*Gap suppression at a Lifshitz transition in a multi-condensate superconductor.* G. Singh, A. Jouan, G. Herranz, M. Scigaj, F. Sánchez, L. Benfatto, S. Caprara, M. Grilli, G. Saiz, F. Couedo, C. Feuillet-Palma, J. Lesueur, N. Bergeal **Nature Materials**, (2019).

*Photoinduced Persistent Electron Accumulation and Depletion in LaAlO<sub>3</sub>/SrTiO<sub>3</sub> Quantum Wells.* Yu Chen, Yoann Lechaux, Blai Casals, Bruno Guillet, Albert Minj, Jaume Gázquez, Laurence Méchin, and Gervasi Herranz **Phys. Review Letters**, (2020).

*Optical Plasmon Excitation in Transparent Conducting SrNbO<sub>3</sub> and SrVO<sub>3</sub> Thin Films.* Mathieu Mirjolet, Mikko Kataja, Tommi K. Hakala, Philipp Komissinskiy, Lambert Alff, Gervasi Herranz, and Josep Fontcuberta **Adv. Optical Mater.** 9, 2100520 (2021).

*Two-gap  $s\pm$ -wave superconductivity at an oxide interface.* G. Singh, G. Venditti, G. Saiz, G. Herranz, F. Sánchez, A. Jouan, C. Feuillet-Palma, J. Lesueur, M. Grilli, S. Caprara, and N. Bergeal **Phys. Rev. B** 105, 064512 (2022)

*Non-collinear and asymmetric polar moments at back-gated SrTiO<sub>3</sub> interfaces.* Fryderyk Lyzwa, Yurii G. Pashkevich, Premysl Marsik, Andrei Sirenko, Andrew Chan, Benjamin P. P. Mallett, Meghdad Yazdi-Rizi, Bing Xu, Luis M. Vicente-Arche, Diogo C. Vaz, Gervasi Herranz, Maximilien Cazayous, Pierre Hemme, Katrin Fürsich, Matteo Minola, Bernhard Keimer, Manuel Bibes, Christian Bernhard **Communications Physics** 5, 133 (2022)

*Electrical characterization and extraction of activation energies of the defect states in the LaAlO<sub>3</sub>/SrTiO<sub>3</sub> heterostructure.* Yoann Lechaux, Yu Chen, Albert Minj, Florencio Sánchez, Gervasi Herranz, Laurence Méchin, and Bruno Guillet **Appl. Phys. Lett.** 121, 081904 (2022)

*Jahn-Teller states mixed by spin-orbit coupling in an electromagnetic field.* Alejandro S. Miñarro, Gervasi Herranz **Phys. Rev. B** 106, 165108 (2022)

**C.1b. Book Chapters:** "Oxide Spintronics", Pan Stanford Publishing, 2019, ISBN 9814774995) CHAPTER 10: *Orbital Symmetry and Electronic Properties of Two-Dimensional Electron Systems in Oxide Heterointerfaces*.

**C.2. Research projects (last 5 years (2018-23), all of them as Principal Investigator)**

- **Title:** Oxide Responses Inspired by Nature/Respuestas de óxidos inspirados en la naturaleza (ORION), **Reference:** MAT2017-85232-R, **Principal Investigators:** F. Sánchez, [G. Herranz](#), **Funding Agency:** Ministerio de Economía, Industria y Competitividad **Period:** 01/01/2018-30/09/2021, **Amount:** 242 k€
- **Title:** Symmetry and Low-Dimensionality Mine-and-Craft for Efficient Spin Manipulation and Photoconversion (SymDim)/Simetría y Baja Dimensionalidad como Plataforma para Materiales Espintrónicos y Fotoconversión, **Reference:** PID2020-118479RB-I00, **Principal Investigators:** [G. Herranz](#), J. Gazquez **Funding Agency:** Ministerio de Economía, Industria y Competitividad **Period:** 01/09/2021-31/08/2024, **Amount:** 230 k€
- **Title:** Enabling Multifunctional Plasmonics on Hybrid Artificial Scale-Integrated (EMPHASIS), **Reference:** H2020-MSCA-IF-2016 nº748429, **Principal Investigator:** [G. Herranz](#) **Funding Agency:** EU-Horizon 2020 **Period:** 01/09/2018-31/08/2020, **Amount:** 158 k€
- **Title:** All-electrical control of spintronic devices, **Reference:** Beatriu de Pinós Fellowship 2019 BP 00207, **Principal Investigator:** [G. Herranz](#) **Funding Agency:** AGAUR (Generalitat de Catalunya) **Period:** 01/04/2021-31/03/2024, **Amount:** 158 k€
- **Title:** Spin Generation and Manipulation using 2D Materials and Functional Oxides SPIN2DFUN **Principal Investigator:** [G. Herranz](#) **Funding Agency:** Ministerio de Economía, Industria y Competitividad through CEX2019-000917-S Severo Ochoa Project **Period:** 01/09/2021-31/08/2023, **Amount:** 70 k€
- **Title:** Heavy Element-Free Green Electronics (HEGEL), **Reference:** TED2021-129857B-I00, **Principal Investigators:** [G. Herranz](#), J. Herrero **Funding Agency:** Ministerio de Economía, Industria y Competitividad **Period:** 01/12/2022-30/11/2024, **Amount:** 264,5 k€
- **Title:** Suport Grups de Recerca (SGR 2023-2025): "*Multifunctional and Magnetic Materials for Oxide Electronics (MUMOX)*", **Reference:** 2021 SGR 00445, **Principal Investigator:** [G. Herranz](#), **Agency:** AGAUR (Generalitat de Catalunya) **Period:** 01/01/2023-31/12/2027, **Amount:** 60 k€

**C.3. Contracts, technological or transfer merits** *Ramon y Cajal* contract Period: 01/02/2008 – 30/06/2008. At the end, I got a Tenured CSIC position (Científico Titular 2008-2020) and finally a CSIC Research Scientist position (Investigador Científico, since 2020).

**C.4. Organization of Schools and Symposia**

Organization committee of *International School of Oxide Electronics 2011*, 3-15 October 2011, Cargèse, Corsica (France).

*2011 MRS Spring Meeting*, April 25 - 29, 2011, San Francisco, California. Symposium G: Complex Oxide Materials for Emerging Energy Technologies Symposium

*2013 MRS Spring Meeting*, April 1 - 5, 2013, San Francisco, California, Symposium XX: Oxide Thin Films and Heterostructures for Advanced Information and Energy Technologies Symposium Gervasi Herranz (lead coordinator)

*2015 EMRS Spring Meeting*, May 11-15, 2015, Lille, France. Symposium: O: Fundamentals of oxide heterostructures. Gervasi Herranz (lead coordinator)

*International School Series on Frontiers in Condensed Matter and Materials Science. (February 2023) Angle Resolved Photoemission Spectroscopy (<https://arpes2023.icmab.es>). (December 2023) "Orbital Currents in Solids" <https://orbitalcurrents2023.icmab.es>. Next edition in preparation (on the topic of Topological Interfaces, to be held in 2024).*

*Scientific Committee of the 7<sup>th</sup> Workshop on Complex Oxides(<https://workshopcomplexoxides.wordpress.com>).*

**C.5 Invited Lectures at Schools, Universities & Research Centers**

**Schools:** 6th European School on Multiferroics (ESMF6) July 21-26, 2013 Wittenberg, Germany; International School of Oxide Electronics 2013 Lectures, September 2-14, 2013, Cargèse, Corsica

**Seminars in Research Centers & Institutions:** University of Geneva (Switzerland) May 2004, SPEC-CEA Saclay (France), June 2004, Laboratoire CRISMAT, Caen (France), February 2006, Seoul National University, Seoul (South Korea) October 2007, University of Zagreb (Croatia) October 2007, Oak Ridge National Laboratory (USA) March 2008, University of Groningen (The Netherlands) May 2008, Universidad Nacional Autónoma de México (UNAM) July 2008, Chalmers University, Göteborg (Sweden) February 2010, University of Mainz (Germany) January 2012, ESPCI-ParisTech (Paris, France) November 2013, Technical University of Darmstadt, Germany, November 2014, University of the Basque Country, June 2015, Institute for Basic Science Center for Correlated Electron Systems (IBS CCES) Seoul, South Korea, December 2017; INN-CNEA, Buenos Aires, Argentina, December 2017, University of Caen Normandy, October 2019.

**Invited talks over the last years (selection):** **APS March Meeting 2015**, New Orleans (USA), March, 2015; **10<sup>th</sup> Int. Conf. on Advanced Materials and Devices (ICAMD2017)** Jeju (South Korea), December, 2017; **EMRS Fall Meeting 2018**, Warsaw, Poland, September 2018, **META 2019, 10<sup>th</sup> Intl. Conference on Metamaterials, Photonic Crystals and Plasmonics**, Lisbon, Portugal, July 2019, **SPIE Optics + Photonics**, San Diego, USA, August 2019. **META 2021, 11<sup>th</sup> Intl. Conference on Metamaterials, Photonic Crystals and Plasmonics**, online, July 2021

## HISTORIAL GRUPO DE ACOGIDA

1. **RELACIÓN DE PERSONAS QUE FORMAN EL EQUIPO.** Mencionando si tiene la calificación de grupo de investigación por parte de la entidad a la que pertenece. / **LIST OF PEOPLE WHO MAKE UP THE RESEARCH TEAM.** Indicate if it has the qualification of research group by the entity to which it belongs

### **HOST GROUP: Multifunctional Thin Films and Complex Structures (MULFOX)**

The host research group is the **Laboratory of Multifunctional Oxides and Complex Systems (MULFOX)**, <http://www.icmab.es/mulfox/>, which belongs to the **Consejo Superior de Investigaciones Científicas (CSIC)**. MULFOX has the **qualification of research group by CSIC**, with ID number 642307.

MULFOX group is located at the **Institute for Materials Science of Barcelona (ICMAB-CSIC)**, which belongs to CSIC. At present the ICMAB Institute includes about 300 people with ~60 scientists as permanent staff and is integrated in the Barcelona Nanocluster at Bellaterra (BNC-b), a virtual network of research centers integrated in the Research Park of the Universitat Autònoma de Barcelona (PRUAB). In 2020 the ICMAB Institute was granted with the prestigious **Severo Ochoa award** in Excellence for a second time, in recognition of its scientific leadership and impact at a worldwide level in the area of Materials Science and has recently submitted an application for the renewal of this award.

The specific scientific objectives of the MULFOX group are focused on the development and integration of oxides for electronics and spintronics, with emphasis on data storage and processing. These activities are also complemented with the investigation of physical properties emerging at functional oxide interfaces and surfaces, with the accent on the magnetism, ferroelectricity, optical properties and electric transport.

### **RESEARCH TEAM: Multifunctional Thin Films and Complex Structures (MULFOX):**

**HOST SUPERVISOR: Dr. Gervasi Herranz is a CSIC research scientist (“Investigador Científico del CSIC”).** Dr. Herranz is a Condensed Matter Physicist working in Materials Science, Quantum Transport and Light-Matter Interactions. Dr. Herranz has published more than 100 articles, some of them in Nature, Nature Materials, Nature Communications, Physical Review Letters, Applied Physics Letters, Physical Review B, among others. Dr. Herranz investigates the potential of transition metal oxides, a class of strongly correlated systems, to find pathways to fundamental discoveries and applications in electronics, spintronics and quantum physics. The scientific activity of Dr. Herranz has led to fundamental discoveries related to quantum transport in oxide quantum wells. Publications include Basletic et al.,



1. **RELACIÓN DE PERSONAS QUE FORMAN EL EQUIPO.** Mencionando si tiene la calificación de grupo de investigación por parte de la entidad a la que pertenece. / **LIST OF PEOPLE WHO MAKE UP THE RESEARCH TEAM.** Indicate if it has the qualification of research group by the entity to which it belongs

[Nature Mater 2008](#); Santander-Syro et al., [Nature 2011](#); Laukhin et al. [Physical Review Letters 2012](#), Herranz et al., [Sci Rep 2012](#), Pesquera et al., [Nat Comms 2012](#), Pesquera et al., [Physical Review Letters 2014](#), Herranz et al., [Nat Comms 2015](#), Gazquez et al. [Physical Review Letters 2017](#), Singh et al., [Nature Materials 2019](#), Y. Chen et al., [Physical Review Letters 2020](#). Dr. Herranz has also high-impact publications in the field of light-matter interactions in solids (Casals et al., [Physical Review Letters 2016](#), Casals et al., [Physical Review Letters 2018](#), Vistoli et al., [Nature Physics 2019](#). A.S. Miñarro and G. Herranz [Physical Review B 2022](#)). Dr. Herranz has supervised several Master Theses and seven PhD Theses (four more are in progress). Over the last 5 years he has given invited lectures in international conferences (APS March Meeting, E-MRS, SPIE, Meta conferences). He has co-authored a book chapter in the field of photonics (Ed. by Royal Soc. of Chem., 2013, ISBN: 978-1-84973-653-4) and 2DEGs (“Oxide Spintronics”, Pan Stanford Publishing, 2019, ISBN 9814774995).

**Dr. Jaume Gázquez is CSIC tenured scientist (“Científico Titular del CSIC”).** Dr. Jaume Gázquez is CSIC tenured scientist (“Científico Titular del CSIC”). Dr. Jaume Gázquez is CSIC tenured scientist (“Científico Titular del CSIC”). His specialization lies in the advanced characterization of electron microscopy techniques, particularly in aberration-corrected Scanning Transmission Electron Microscopy (STEM) and Electron Energy-loss Spectroscopy, which allows in-depth exploration of the intricate relationships between atomic and electronic structures in complex oxide materials, unraveling key insights into their properties. He has co-authored 136 articles published in reputable journals, including 4 reviews. These publications are the result of collaborations with research groups from various countries. He has delivered 13 invited talks and presented 20 contributed orals at international conferences. Dr. Gázquez has successfully supervised 6 students, overseeing the completion of three Ph.D. theses and two ongoing, along with mentoring one master's student.

**Dr. Gabriele De Luca is a Ramón y Cajal (RyC) fellow.** He is a condensed matter physicist working in the oxide epitaxy area with a specific interest in interfaces, ferroic materials and light-matter interaction. The mixture of his experiences involves a deep knowledge of optical characterization methods (nonlinear optics) in combination with the growth of atomic-scale controlled high-quality oxide heterostructures (pulsed laser deposition, sputtering, RHEED). This expertise is complemented by the proficiency in laboratory-based structural, electric and magnetic characterization tools and the use of advanced state-of-the-art synchrotron facilities. The novelty of his findings is broadly recognized with publications in high-impact journals (3 Advanced Materials, 1 Nature Communications, 1 Physical Review Letters, Phys). Dr. De Luca has supervised (2) and mentored (2) a total of 4 PhD thesis (3 ongoing) and 5 end-of-degree thesis.

**Prof. Josep Fontcuberta, CSIC Professor *ad honorem*,** is co-author of more than 450 peer-reviewed scientific papers related to advanced thin film technologies of magnetic, ferroelectric and multiferroic oxides. He has supervised 26 PhD Thesis works and has delivered more than 400 Invited Talks at International Workshops and Conferences. Currently, Prof. Fontcuberta is Editor and/or member of the Advisory Committee of a number of scientific journals (Solid State Comm. (Elsevier); Journal of Magnetism and Magnetic Materials (Elsevier) and Advanced Electronic Materials (Wiley-VCH). He has received several prestigious awards: Premio “Epsilon de Oro” 2001 from the Spanish Society of Electroceramics; the “Salvador Velayos” award in 2012 from the Spanish Association of Magnetism; and he is 2016 distinguished Lecturer of the IEEE Magnetics Society.

## 2. **CONTRIBUCIONES CIENTÍFICO TÉCNICAS Y APORTACIONES A LA SOCIEDAD.**

Mencionando, entre otras, actividades de desarrollo tecnológico y de innovación, actividades de divulgación, colaboración con la industria y el sector privado, entidades, instituciones públicas y otros usuarios finales de la investigación. / **SCIENTIFIC-TECHNICAL ACHIEVEMENTS AND CONTRIBUTIONS TO SOCIETY.** Indicate technological development activities and innovation, dissemination, collaboration with industry and private sector, other entities, public institutions and other end users.

The activity of MULFOX members (2018-23) includes: 2 invited plenary/seminary talks, more than 30 invited talks in conferences and workshops, 4 lectures at schools and more than 50 invited lectures in Universities and Research Centers.

### **Selected publications (2017-23) of the host supervisor (Dr. Gervasi Herranz)**

*Competition between Polar and Nonpolar Lattice Distortions in Oxide Quantum Wells: New Critical Thickness at Polar Interfaces.* J. Gazquez, et al., G. Herranz, **Physical Review Letters**, 119, 106102 (2017).

*Non-reciprocal diffraction in magnetoplasmonic gratings.* R., M. Kataja, M. Campoy-Quiles, and Gervasi Herranz, **Optics Express**, Phys. Rev. Lett. 26, 34842 (2018).

*Low-Temperature Dielectric Anisotropy Driven by an Antiferroelectric Mode in SrTiO<sub>3</sub>.* B. Casals, A. Schiaffino, A. Casiraghi, S. J. Hämäläinen, D. López González, S. van Dijken, M. Stengel, and G. Herranz, **Phys. Review Letters**, 120, 217601 (2018).

*Giant topological Hall effect in correlated oxide thin films.* L. Vistoli, et al., **Nature Physics**, 15, 67 (2019).

*Gap suppression at a Lifshitz transition in a multi-condensate superconductor.* G. Singh, et al. **Nature Materials**, (2019).

*Photoinduced Persistent Electron Accumulation and Depletion in LaAlO<sub>3</sub>/SrTiO<sub>3</sub> Quantum Wells.* Y. Chen, Y Lechoux, B Casals, B Guillet, A Minj, J Gázquez, L Méchin, G Herranz **Phys. Review Letters**, (2020).

*Optical Plasmon Excitation in Transparent Conducting SrNbO<sub>3</sub> and SrVO<sub>3</sub> Thin Films.* Mathieu Mirjole, et al-, **Adv. Optical Mater.** (2021)

*Jahn-Teller states mixed by spin-orbit coupling in an electromagnetic field.* Alejandro S. Miñarro, Gervasi Herranz **Phys. Rev. B** 106, 165108 (2022)

*Electrical characterization and extraction of activation energies of the defect states in the LaAlO<sub>3</sub>/SrTiO<sub>3</sub> heterostructure.* Yoann Lechoux, Yu Chen, Albert Minj, Florencio Sánchez, Gervasi Herranz, Laurence Méchin, and Bruno Guillet **Appl. Phys. Lett.** 121, 081904 (2022)

*Two-gap s±-wave superconductivity at an oxide interface.* G. Singh, et al **Phys. Rev. B** 105, 064512 (2022)

*Dynamic control of octahedral rotation in perovskites by defect engineering.* Jiahui Jia, Xu He, Arsalan Akhtar, Gervasi Herranz, Miguel Pruneda. **Phys. Rev. B** 105, 224112, 2022

*Non-collinear and asymmetric polar moments at back-gated SrTiO<sub>3</sub> interfaces.* Fryderyk Lyzwa, et al **Communications Physics** 5, 133 (2022)

### **Book Chapters (2017-22) host supervisor (Dr. Gervasi Herranz):**

*Chapter 8: "Orbital Symmetry and Electronic Properties of Two-Dimensional Electron Systems in Oxide Heterointerfaces"*(Ed. By Royal Soc. Of Chem., 2013, ISBN: 978-1-84973-653-4) and 2DEGs ("Oxide Spintronics", Pan Stanford Publishing, 2019, ISBN 9814774995).

*Another one in 2013: Responsive Photonic Nanostructures (Smart Nanoscale Optical Materials)* Edited by Royal Society of Chemistry 2013, Editor: Prof. Yadong Yin, ISBN: 978-1-

84973-653-4, DOI:10.1039/9781849737760 Oana Pascu, Gervasi Herranz and Anna Roig.  
CHAPTER 10: *Chemical Routes to Fabricate Three-Dimensional Magnetophotonic Crystals*

**Invited Lectures at Schools, Universities & Research Centers, host supervisor (Dr. Gervasi Herranz)**

**Schools:** 6th European School on Multiferroics (ESMF6) July 2013 Wittenberg, Germany; International School of Oxide Electronics 2013 Lectures, September 2-14, 2013, Cargèse,

**Seminars in Research Centers & Institutions** University of Geneva (Switzerland) May 2004, SPEC-CEA Saclay (France), June 2004, Laboratoire CRISMAT, Caen (France), February 2006, Seoul National University, Seoul (South Korea) October 2007, University of Zagreb (Croatia) October 2007, Oak Ridge National Laboratory (USA) March 2008, University of Groningen (The Netherlands) May 2008, Universidad Nacional Autónoma de México (UNAM) July 2008, Chalmers University, Göteborg (Sweden) February 2010, University of Mainz (Germany) January 2012, ESPCI-ParisTech (Paris, France) November 2013, Technical University of Darmstadt, Germany, November 2014, University of the Basque Country, June 2015, *Institute for Basic Science Center for Correlated Electron Systems (IBS CCES) Seoul, South Korea, December 2017; INN-CNEA, Buenos Aires, December 2017.*

**Invited talks over the last five years (selection):** **10<sup>th</sup> Int. Conf. on Advanced Materials and Devices (ICAMD2017)** Jeju (South Korea), December, 2017; **EMRS Fall Meeting 2018**, Warsaw, Poland, September 2018, **META 2019, 10<sup>th</sup> Intl. Conference on Metamaterials, Photonic Crystals and Plasmonics**, Lisbon, Portugal, July 2019, **SPIE Optics + Photonics**, San Diego, USA, August 2019. **META 2021, 11<sup>th</sup> Intl. Conference on Metamaterials, Photonic Crystals and Plasmonics**, online, July 2021. **6<sup>th</sup> International Workshop on Complex Oxides** held in the island of Spetses, Greece, 12 - 17 June, 2023.

**Outreach activities.** **F. Fontcuberta, G. Herranz and J. Gazquez** have participated in the Program "Un investigador a l'Escola" of ICMAB, by delivering lectures at high schools around Barcelona. We will continue to participate in the ICMAB program to explain its research to school visits at the institute. **J. Fontcuberta** was Distinguished Lecturer by IEEE Magnetic (2016). He participated in the Nit de La Recerca 2019 and 2018 (CosmoCaixa, Barcelona) and several Lectures for broad audience on Materials for Nanotechnology (2019) (Universitat Catalana d'Estiu, Universitat Popular I Formació continua (Caldes de M.). Lectures for broad audience on the Periodic Table 150 anniversary. I.E. Catalans, Universitat Girona, etc. Lecture at EXPOMINER 2018 (El magnetisme dels imants). **G. Herranz**, participated at the Centre of Contemporary Culture of Barcelona (CCCB) within the Quantum Exhibition at CCCB 2019 and at the 13<sup>th</sup> "Science Festival" in Barcelona. **J. Gazquez**, was member of the jury of the XX EXPORECERCA JOVE, an international research where secondary school students from all over the world can present their research projects for three days.

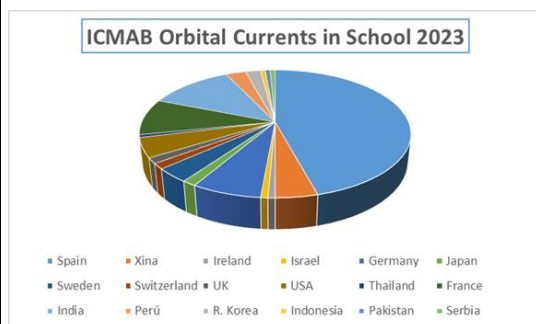
**Digital and electronic media:** The host group MULFOX web page (<http://departments.icmab.es/mulfox/>) is updated regularly with news about publications, conferences and the scientific progress.



## 2. CONTRIBUCIONES CIENTÍFICO TÉCNICAS Y APORTACIONES A LA SOCIEDAD.

Mencionando, entre otras, actividades de desarrollo tecnológico y de innovación, actividades de divulgación, colaboración con la industria y el sector privado, entidades, instituciones públicas y otros usuarios finales de la investigación. / **SCIENTIFIC-TECHNICAL ACHIEVEMENTS AND CONTRIBUTIONS TO SOCIETY.** Indicate technological development activities and innovation, dissemination, collaboration with industry and private sector, other entities, public institutions and other end users.

**International Schools:** We have organized International Schools: “Technologies for Oxide Electronics (2018)” (<https://school-oxideelectronicstobe.icmab.es>), “OPTOFEM: Optically controlled Ferroelectric Memristors” (2020) (<https://optofem2020.icmab.es/>), ARPES (<https://arpes2023.icmab.es>). Based on these experiences we have promoted the creation, within ICMAB, of a series of Schools on Frontiers on Condensed Matter and Materials Science. Our recent school on “Orbital Currents in Solids” (<https://orbitalcurrents2023.icmab.es>)



was the first example and this will continue, which had a participation of ~70 attendants in-person and ~110 online, with a wide geographical distribution of the participants (Figure). DreamFun plans to take the compromise to organize 2/3 more International schools in this Series of Schools over the next 3 years. Indeed, the next school is already in view, and will be held in 2024 on the topic of “Topological Interfaces”.

**Laboratories.** The host supervisor (Gervasi Herranz) has been responsible for setting up several laboratories of the MULFOX group at ICMAB-CSIC:

**Magneto-optic spectroscopy lab** Magneto-optic spectroscopy from UV to near IR Measurements of Kerr/Faraday rotation and ellipticity and magnetic circular dichroism from 8 K up to 320 K, and with magnetic fields up to ~ 2 Tesla.

**Confocal microscopy lab.** High-resolution imaging (below the micron) based on confocal microscopy with polarized light contrast. It allows obtaining mappings of rotation/ellipticity and circular dichroism, as well as linear dichroism effects.

**Optical reflectance spectrometer** Reflectance spectra in the visible range as a function of the angle of incidence. From these plots we can obtain the dispersion relationship  $\omega-k$  (frequency versus wavevector) of light.

**Two-dimensional heterostructure transfer lab** Allows transfer of exfoliated van der Waals flakes on surfaces of other materials (e.g. patterned oxide quantum wells). The equipment consists of fully motorized micromanipulators operating under a high-resolution microscope. We have developed lithography to contact specific flakes.

**Development of magnetotransport facilities** allowing to measure electronic properties under electrostatic gating, including bilinear magnetoresistance (BMR) and quadratic magnetoresistance (QMR) methods.

**Development of nonequilibrium many-body methods).** We have developed numerical code to implement non-equilibrium Green's function formalism to obtain the dynamic evolution of manybody quantum states <https://github.com/lexschz13/NEGF-GW>

**3. RELACIÓN DE PROYECTOS NACIONALES DE I+D+i.** Indicando título, entidad financiadora y convocatoria, nombre del/de la investigador/a principal y entidad de afiliación, fecha de inicio y de finalización, cuantía de la ayuda. / **NATIONAL RESEARCH PROJECTS.** Indicate title, funding body and call for proposals, name of the principal investigator and his/her institution affiliation, date of start and end of the project and amount granted.

**PROJECTS GRANTED OVER THE LAST YEARS (2018-23)**

**Title of the Project:** Oxide Responses Inspired by Nature/Respuestas de óxidos inspirados en la naturaleza (ORION), **Reference:** MAT2017-85232-R, **Principal Investigators:** F. Sánchez, [G. Herranz](#), **Funding Agency:** Ministerio de Economía, Industria y Competitividad **Period:** 01/01/2018-30/09/2021, **Amount:** 242 k€

**Title of the Project:** Symmetry and Low-Dimensionality Mine-and-Craft for Efficient Spin Manipulation and Photoconversion (SymDim), **Reference:** PID2020-118479RB-I00, **Principal Investigators:** [G. Herranz](#), J. Gazquez **Funding Agency:** Ministerio de Economía, Industria y Competitividad **Period:** 01/09/2021-31/08/2024, **Amount:** 230 k€

**Title of the Project:** Suport a Grups de Recerca (SGR 2017-2019): *Òxids Multifuncionals i Estructures Complexes (MULFOX)*, **Reference:** 2017 SGR 1377, **PI:** J. Fontcuberta **Agency:** AGAUR **Period:** 01/01/2017-31/12/2021, **Amount:** 36 k€

**Title of the Project:** Desenvolupament de dispositiu magnètic per l'emmagatzematge d'informació amb seguretat millorada, **Reference:** 2019 LLAV 00050, **Principal Investigator:** J. Fontcuberta **Funding Agency:** AGAUR (Generalitat de Catalunya) **Period:** 24/07/2020-24/04/2021, **Amount:** 21 k€

**Title of the Project:** Enabling Multifunctional Plasmonics on Hybrid Artificial Scale-Integrated (EMPHASIS), **Reference:** H2020-MSCA-IF-2016 n°748429, **Principal Investigator:** [G. Herranz](#) **Funding Agency:** EU-Horizon 2020 **Period:** 01/09/2018-31/08/2020, **Amount:** 158 k€

**Title of the Project:** All-electrical control of spintronic devices, **Reference:** Beatriu de Pinós Fellowship 2019 BP 00207, **Principal Investigator:** [G. Herranz](#) **Funding Agency:** AGAUR (Generalitat de Catalunya) **Period:** 01/04/2021-31/03/2024, **Amount:** 158 k€

**Title of the Project:** Spin Generation and Manipulation using 2D Materials and Functional Oxides SPIN2DFUN **Principal Investigator:** [G. Herranz](#) **Funding Agency:** Ministerio de Economía, Industria y Competitividad through CEX2019-000917-S Severo Ochoa Project **Period:** 01/09/2021-31/08/2023, **Amount:** 70 k€

**Title:** Heavy Element-Free Green Electronics (HEGEL), **Reference:** TED2021-129857B-I00, **Principal Investigators:** [G. Herranz](#), J. Herrero **Funding Agency:** Ministerio de Economía, Industria y Competitividad **Period:** 01/12/2022-30/11/2024, **Amount:** 264,5 k€

**Title of the Project:** Suport a Grups de Recerca (SGR 2023-2025): *"Multifunctional and Magnetic Materials for Oxide Electronics (MUMOX)"*, **Reference:** 2021 SGR 00445, **Principal Investigator:** [G. Herranz](#), **Funding Agency:** AGAUR (Generalitat de Catalunya) **Period:** 01/01/2023-31/12/2027, **Amount:** 60 k€

**DESCRIPCIÓN DE LA CAPACIDAD FORMATIVA PRE Y POSDOCTORAL DEL EQUIPO DE INVESTIGACIÓN.** Incorporando relación de tesis realizadas o en curso, incluyendo la fecha prevista de lectura de tesis, descripción del desarrollo científico y profesional de los doctores egresados del equipo, así como el contexto científico-técnico en el que se incorpora el candidato/a y todas aquellas actividades o programas formativos que se desarrollan en el seno del mismo. / **DOCTORAL AND POST-DOCTORAL TRAINING CAPACITY OF THE RESEARCH GROUP.** Indicate a list of defended thesis or in progress, including the expected date of defense, description of the scientific and professional development of the team's graduated doctors, as well as the scientific-technical context in which the candidate is incorporated and all those activities or training programs carried out.

**DOCTORAL TRAINING. 4 PhD THESIS over the last 6 years (supervised by the host supervisor, Dr. Gervasi Herranz):** (1) **2017 Blai Casals.** “Magneto-optical spectroscopy and domain imaging of functional oxide systems” Supervisor: G. Herranz. University: UAB. Present position: PostDoc, University of Cambridge, now at CIN2; (2) **2019 Rafael Cichelero** “Diffractive multifunctional plasmonic Systems”. Supervisors: G. Herranz. University: UAB. Present position: Postdoc, University of Gothenburg, Sweden; (3) **2019. Yu Chen** “Artificial Synapses based on the Photoconductance of LaAlO<sub>3</sub>/SrTiO<sub>3</sub> QuantumWells”. Supervisors: G. Herranz. University: UAB. Present position: Postdoc, CNR-SPIN, Naples, Italy. (4) **2023. Jiahui Jia.** “Defect and strain engineering for modulating structure and magnetism in perovskites”. Supervisors: G. Herranz and Miguel Pruneda. University: UAB. Present position: Postdoc, University of Liège, Belgium

**4 ONGOING PhD Thesis** (supervised by the host supervisor, Dr. Gervasi Herranz): (1) Alejandro Sánchez Miñarro, Supervised by G. Herranz, [defense expected for 2025](#); (2) Ondrej Novak, Supervised by G. Herranz/M. Veis (Charles Univ. Prague), [defense expected for 2025](#); (3) [Fereshteh Masoudinia](#), Supervised by G. Herranz and Gyanendra Singh, defense expected for 2026; (4) [Yingjie Zhu](#), Supervised by G. Herranz and Gabriele De Luca, defense expected for 2027

**POSTDOCTORAL TRAINING (since 2017, supervised by the host supervisor, Dr. Gervasi Herranz):** (1) **2017-20 Dr. Mikko Kataja** (coming from Aalto University, Finland). Postdoctoral contract (2017-18) and Marie-Sklodowska Fellow (2018-20). Current position: Optical Engineer / OptoFidelity Oy (company in Finland). [Supervisor: Gervasi Herranz](#) (2) **(since 2021) Dr. Gyanendra Singh** (coming from ESPCI-Paris Tech and Chalmers University, Sweden). Beatriu de Pinós Fellow. [Supervisor: Gervasi Herranz \(since 2023\)](#) **Dr. Janine Gückelhorn** (coming from Walther-Meissner-Institute, Germany). Postdoc Fellow financed by the project Heavy Element-Free Green Electronics (HEGEL). [Sup: Gervasi Herranz](#)

**BACHELOR THESES (since 2017, supervised by the host supervisor):** **Llorenç Benaches Magraner**, UAB Degree on Physics. Supervisor: G. Herranz January 2023 ; **Ariadna Soro Álvarez**. UAB. Mathematics & Physics. Sup.: M. Kataja/ G. Herranz June 2018 **Jordi Rubio Serrano**. UAB. Degree on Physics. Supervisor: G. Herranz; July 2019 **Óscar Díaz Duran**. UAB. Degree on Physics. Supervisor: G. Herranz; July 2019 **Xavier Domingo Soldado**. UAB. Degree on Physics. Supervisor: G. Herranz; July 2019 **Guillem Müller Rigat**. UAB. Degree on Physics. Sup.: M. Kataja/G. Herranz; July 2019 **Genís Guillem Mimó**. UAB. Degree on Physics&Chemistry. Sup.:/G. Herranz; July 2020 **Llorenç Benaches**, UAB. Double Degree on Physics&Chemistry.; Feb 2023

**INTERSHIPS, PhD students (2018- supervised by the host supervisor, Dr. Gervasi Herranz):** **Kevin Ferradas**, Master in Quantum Science and Technology, University of Barcelona, Nov 2023- Jan 2024 **M. Desseaux**, Univ. Montpellier, 2023 Sup.: J. Fontcuberta, G. Herranz, G. Singh **Lluís Nocete**, JAE-CSIC Intro fellowship, April – September 2023 **Rubén Llorente**, JAE-CSIC Intro fellowship, September 2023 – April 2024 **Ayan Banerjee**, Master in Quantum Science and Technology, University of Barcelona, Jan

2023- June 2023 **Quentin Minon**, Polytech. Nantes (France), June-July 2022 **Ondrej Nowak**. Charles U. in Prague, Czech Republic Supervisor: G. Herranz, September 2019

## **CAREER PATHS OF FORMER MEMBERS SUPERVISED BY Dr. Gervasi HERRANZ** **FORMER PhD STUDENTS**

### **GRADUATE DOCTORS PRESENTLY IN ACADEMIC POSITIONS:**

**Dr. Jiahui Jia**, Jiahui Jia (PhD 2023) “Defect and strain engineering for modulating structure and magnetism in perovskites”. Supervisors: [G. Herranz](#), M. Pruneda. Presently PostDoc Univ. Liège, Belgium (Philippe Goshez). **Dr. Rafael Cichelero** graduated in Physics from Universidade Federal do Rio Grande do Sul. He joined ICMAB in 2015 and defended his Thesis in 2019. Now he is doing a postdoc at Chalmers University (Sweden) in the group of Prof. A. Dmitriev. [rafael.cichelero@physics.gu.se](mailto:rafael.cichelero@physics.gu.se) **Dr. Chen Yu** is a graduated and master student of Condensed Matter Physics of Chinese nationality in Shanghai University (SHU) and a PhD fresh student of Communication and Information Engineering in SHU. He joined ICMAB in in 2015 and defended his Thesis in 2019. He worked on LaAlO<sub>3</sub>/SrTiO<sub>3</sub> Quantum Wells. He got at the Autonomous University of Barcelona (UAB) with Prof. Jordi Sort and now he is in Marco Salluzzo’s group at CNR-SPIN, in Naples, Italy. [yu.chen@spin.cnr.it](mailto:yu.chen@spin.cnr.it) **Dr. Blai Casals** studied Physics at the University of Barcelona and defended his PhD Thesis in 2017. He worked as postdoc with Prof. Eckhard Salje at the University of Cambridge in 2018-20. Later he moved to the University of Barcelona, with Prof. F. Macià. Afterwards he got a position in Gustau Catalán’s group at ICN2, Barcelona. Now he is a Professor Lector at the Faculty of Physics at the University of Barcelona. [blaicasals@gmail.com](mailto:blaicasals@gmail.com) **Dr. José Manuel Caicedo** defended his PhD Thesis in 2012 (co-supervised with Prof. Josep Fontcuberta). He is working now as a Research Engineer at ICN2, Barcelona. [jose.caicedo@icn2.cat](mailto:jose.caicedo@icn2.cat) **Dr. Oana Pascu** defended his PhD Thesis in 2012

### **GRADUATE DOCTORS PRESENTLY IN INDUSTRY POSITIONS:**

**Dr. Mateusz Scigaj** defended his PhD Thesis “Functional oxide films and interfaces: ferroelectric BaTiO<sub>3</sub> films on Si(001) and conducting (110) and (111) LaAlO<sub>3</sub>/SrTiO<sub>3</sub> interfaces” in 2016 (co-supervised with Dr. Florencio Sánchez). He is working at Saule Technologies, Inkjet-Printed Perovskite Solar Cells (Poland). [mateusz.scigaj@gmail.com](mailto:mateusz.scigaj@gmail.com) **Dr. Ondrej Vlasin** defended his PhD Thesis “Spectroscopy and Confocal Imaging of Complex Ferroic Systems” in February 2014. He worked at Seagate Technologies (Ireland) and presently at Oxsensis Ltd company at UK. [ondrej.vlasin@gmail.com](mailto:ondrej.vlasin@gmail.com)

### **CAREERS FORMER POSTDOCS (SUPERVISED BY Dr. Gervasi Herranz)**

**Dr. Mikko Kataja** did his PhD in Aalto University (Finland). He joined our team in 2017, to work in magnetoplasmonics. He got subsequently a Marie Skłodowska-Curie Action 2018-20 under supervision of Dr. G. Herranz. Then he moved to the Institute of Photonics at University of Eastern Finland. Presently he holds an industry position, at the [Pixieray company in Finland](#), specialized in hardware and software for human vision applications. [mikko.kataja@gmail.com](mailto:mikko.kataja@gmail.com). **Dr. Miguel Rubio Roy** worked as a postdoc in our lab in 2011-12. He has spent other postdocs at th Georgia Institute of Technology (Georgia Tech) in Atlanta, GA (USA), CEMES, Toulouse (France) . Since 2014, Miguel has been working as a Research Engineer at LLR – IN2P3 – CNRS, Palaiseau (France) and now he is at [Spintec-Grenoble](#), working the with Materials team at Materials–Instrumentation–Nanofabrication cluster.



4. **DESCRIPCIÓN DE LA CAPACIDAD DE INTERNACIONALIZACIÓN.** Incorporando la participación o dirección de proyectos internacionales, colaboración con organismos y grupos internacionales, así como la capacidad del equipo de investigación en la atracción de talento. / **INTERNATIONAL ACTIVITIES.** Indicate the most important international projects in which the team has participated, the international collaborations, as well as the practices for talent attraction.

#### **ORGANIZATION OF CONFERENCES, SYMPOSIA, SCHOOLS (2017-2023)**

2018 Technologies for Oxide Electronics School 2018, Sant Feliu de Guixols March 2018, <https://icmab.es/15-17-mar-technologies-for-oxide-electronics-school-2018-organized-by-icmab>. CHAIRS: Josep Fontcuberta, Fabio Mileto and Mariona Coll

OPTOFEM 2020. Summer School on Photoferroelectrics (ICMAB) 100 attendants. Chairs; Josep Fontcuberta, Ignasi Fina. <https://optofem2020.icmab.es/>

STEM2021 New workshop on the Fundamentals of Scanning Transmission Electron Microscopy (STEM) Imaging and Spectroscopy (Jaume Gazquez). December 2021. ICMAB-CSIC. <https://www.icmab.es/new-workshop-on-the-fundamentals-of-scanning-transmission-electron-microscopy-stem-imaging-and-spectroscopy>

COST TO-BE Spring Meeting "Towards Oxide Electronics" Roadmap on oxide electronics, Sant Feliu de Guixols Spain 12-14th March 2018, <https://www.icmab.csic.es/12-14-mar-cost-to-be-spring-meeting-towards-oxide-electronics>, CHAIRS: Josep Fontcuberta, Fabio Mileto and Mariona Coll

Scientific Committee of the 7th Workshop on Complex Oxides (<https://workshopcomplexoxides.wordpress.com>). Management Committee (G. Herranz, J. Fontcuberta) TO BE EU-COST ACTION MP 1308 "Towards Oxide Base Electronics". Josep Fontcuberta edited the compendium "Towards Oxide Electronics: a Roadmap" published in Applied Surface Science. The article counts with 28 contributions from 56 authors of 42 academic institutions and industries from Europe, USA and Japan.

International School Series on Frontiers in Condensed Matter and Materials Science. (February 2023) Angle Resolved Photoemission Spectroscopy (<https://arpes2023.icmab.es>). (December 2023) "Orbital Currents in Solids" <https://orbitalcurrents2023.icmab.es>). Next edition in preparation (on the topic of Topological Interfaces, to be held in 2024).

#### **COLLABORATIONS WITH INTERNATIONAL GROUPS (2016-23) (host supervisor, Dr. Gervasi Herranz)**

ESPCI-ParisTech, France (Dr. Bergeal, Prof. Lesueur). 2D-superconductivity of oxide 2DEGs This collaboration has led to several publications over the last years: G. Herranz et al., **Nature Communications** 6, 6028 (2015); G. Singh et al., **Nature Materials** 18, 948–954 (2019); Two-gap s<sup>+</sup>-wave superconductivity in an oxide interface, . G. Singh, et al **Phys. Rev. B** 105, 064512 (2022). This collaboration had financial support from PICS CNRS-CSIC 2018-2020 grant.

IPCMS-Strasbourg, France (Dr. S. Chérifi), Optical study of magnetoelectric coupling at multiferroic interfaces (Publication: Vlasin et al., **ACS Appl. Mater. Interfaces**, 2016).

Unité Mixte Physique CNRS-Thales, France (Dr. M. Bibes). Magneto-optics at 2DEGs at oxide interfaces. This collaboration has resulted in publications: L. Vistoli et al., **Nature Physics** 15, 104 (2019).

Aalto University (Prof. S. van Dijken), Finland. Optical imaging of magnetoelectric systems. Blai Casals et al., **Phys. Rev. Lett.** 120, 217601 (2018); Blai Casals et al., **Phys. Rev. Research** 1, 032025(R) (2019)

Aalto University (Prof. S. van Dijken), Finland. Optical imaging of magnetoelectric systems. Blai Casals et al., **Phys. Rev. Lett.** 120, 217601 (2018); Blai Casals et al., **Phys. Rev. Research** 1, 032025(R) (2019)



Normandie Univ, UNICAEN, ENSICAEN, CNRS, GREYC, Lechaux et al., **Appl. Phys. Lett.** 121, 081904 (2022)

### **INTERNATIONAL COLLABORATIONS OTHER MEMBERS**

R. Jaramillo Massachusetts Institute of Technology, USA, Photovoltaic polar materials, S. Filippone, et al., Physical Review Materials 4, 091601(R).

Prof. A. Rape University of Pennsylvania, USA, Photovoltaic ferroelectrics. Theory, Y. Sheng, A. M. Rappe et al.; Phys. Rev. B 104, 184116 (2021)

Prof. R. Valentí, Institut für Theoretische PhysikGoethe-Universität Frankfurt am Main, Germany, Electron-phonon coupling. Theory and electronic structure, M. Mirjolet, R. Valentí et al.; Adv Science 8, 2004207, (2021), M. Mirjolet, R. Valentí, et al.; Phys. Rev. Materials 5, 095002 (2021)

Dr. P. Marsik Faculty of Science and Medicine University of Fribourg, Switzerland, Optical spectroscopy, M. Mirjolet, R. Valentí et al.; Adv Science 8, 2004207, (2021)

Prof. M. Gospodinov, Institute of Solid State Physics, Bulgarian Acad. of Sci., Bulgaria, Single Crystal growth, Y. Shen. M. Gospodinov et al Appl. Phys. Lett. 118, 232902 (2021)

Prof. L. Alff Institute of Materials ScienceTechnische Universität Darmstadt, Germany, Thin film growth M. Mirjolet, L. Alff et al, Adv. Optical Mater.2021, 9, 2100520

Prof. F. Rivadulla Departamento de Química-Física Universidad de Santiago de CompostelaSantiago de Compostela, Spain, Thermoelectric characterization, M. Mirjolet, R. Valentí et al.; Adv Science 8, 2004207, (2021)

Prof. Felix Casanova CIC nanoGUNE Donostia-San Sebastian, Basque Country, Spain Spintronics, J. Fontcuberta, F. Casanova: Adv. Mater. Interfaces 2019, 6, 1900475

**INTERNATIONAL VISITORS:** Prof. Kyle Shen, from Univ. Cornell, USA. Sabbatical leave 2022-23.

**TALENT ATTRACTION. The host supervisor (Dr. Gervasi Herranz) has attracted talented researchers:**

**2017-20 Dr. Mikko Kataja** (coming from **Aalto University**, Finland). Postdoctoral contract (2017-18) and **Marie-Sklodowska Fellow** (2018-20). Supervisor: Gervasi Herranz. Current position: Optical Engineer / OptoFidelity Oy (company in Finland).

**2021-24 Dr. Gyanendra Singh** (from **ESPCI-Paris Tech** and **Chalmers University**, Sweden), Finland). **Beatriu de Pinós Fellowship**. Supervisor: Gervasi Herranz

**2019 Dr. Miguel Romera** (coming from **Unité Mixte CNRS-Thales**, Palaiseau, France). Marie Skłodowska Curie project 797004 SAW-SPIN (**Cancelled**, because Dr. Romera obtained an "Atraccion de Talento" Research Fellow at Complutense University of Madrid.

**2023. Dr. Janine Gückelhorn** (from **Walther-Meissner-Institute**, Germany), under project Heavy Element-Free Green Electronics (HEGEL), TED2021-129857B-I00

**2023. Dr. Emanuele Longo** (from **CNR-IMM Agrate-Brianza**, Italy), under project Heavy Element-Free Green Electronics (HEGEL), TED2021-129857B-I00

**2022(Ondrej Novak)** in co-tutelle supervision with Prof. M. Veis at **Charles University in Prague**, Czech Republic, in the field of topological photonic crystals.

**Participation of the host supervisor (Dr. Gervasi Herranz) in PhD Committees**

Univ. Complutense (2024), Univ. Paris-Sud (**France**) in 2020 (also in 2015) , CIN2 (**Spain**) in 2016, ICFO (**Spain**) in 2023 (also in 2019), Univ. Paris-Sud/Charles University Prague (**Czech Rep.**) in 2019, TU Delft (**The Netherlands**) in 2019, Univ. of Geneva (**Switzerland**) in 2019, Aalto University (**Finland**) in 2019, Univ. Paris-Sud (**France**) in 2022 (April 2022).