Part A. PERSONAL INFORMATION

CV date	06/05/2023

First and Family name	María Carmen Gordillo Bargueño		
Social Security, Passport, ID number			
Researcher codes	Open Researcher and Contributor ID (ORCID**)	orcid.org/0000-0003-1521-483X	
	SCOPUS Author ID (*)	7003627363	
	WoS Researcher ID (*)	F-4090-2012	

A.1. Current position

Name of University/Institution	Universidad Pablo de Olavide		
Department	Sistemas Físicos, Químicos y Naturales		
Address and Country	Carretera de Utrera km 1, 41013-E Sevilla (Spain)		
Phone number	954977937	E-mail	cgorbar@upo.es
Current position	Catedrático de Universidad (Full professor)	From	12/13/2019
Espec. cód. UNESCO	221306		
Keywords:	Quantum Monte Carlo, low-dimensional systems, helium, ultracold gases , quark model		

A.2. Education

PhD	University	Year
Chemistry	Universidad Complutense de Madrid	1995

A.3. JCR articles, h Index, thesis supervised…

Number of sexenios: 5 (last one ending in 2021)
Number of Ph.D thesis supervised and successfully completed in the last 10 years: 1 (2016)
Total number of cites: ~2200 (WoS) ~2800 (Google Scholar)
Average number of cites per year in the last five years: 2017-2021 ~ 80
Number of articles in Q1 (Web of Science): 66
h-index: 26 (WoS), 27 (Scopus) 30 (Google Scholar)
Papers as sole author: 2. Phys. Rev, Lett, 4 Phys. Rev. B, 2 Phys. Rev. A, 1 J. Phys. B, 2 New J. Phys.
IP of 5 MEC/MINECO projects and 2 regional projects (Junta de Andalucía).
2% top scientist in the Standford list of career-long standardized citation indicators for 2020, 2021 and 2022. (https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/4)

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

My entire academic career was devoted to the computational modeling of classic and quantum systems. From 1992 to 1995 I worked on my Ph.D. thesis about the ordering of aluminum ions inside the three-dimensional frameworks of aluminosilicates at the ICMM (CSIC), in Madrid. Then, from February 1996 to August 1998, I was a post-doc at the University of Illinois at Urbana-Champaing, under Prof. Ceperley, my line of work being the description of low temperature quantum systems at finite temperature using the Path Integral technique. My most important result was a prediction about the possibility of para-H_2 to become superfluid at temperatures below 1 K, but I studied also the phase diagram of pure two-dimensional (2D) ^{4}He (a good model for a second layer adsorbed on graphite).

In october 1998, I came back to Spain, to Prof. Boronat's group at the Universitat Politécnica de Catalunya, in Barcelona. There, I studied the adsorption of ^{4}He, H_2 y D_2 in carbon nanotubes. This collaboration has continued up to this day, and includes modeling of the behaviour of those species adsorbed on graphite and graphene (first and second layers). All those calculations were made using diffusion Monte Carlo (DMC, what implies T=0) and their results are in good agreement with previous experimental data. At the same time, I worked with Prof. Boronat, I started a collaboration with Prof. Martí at the same institution, but performing classical simulations on water adsorbed on carbon nanotubes and graphene. That line of work has generated 19 works in different journals, the first one with more than 250 cites. During that period, I published one article in Phys. Rev. B as a sole autor.

In 2000, I joined the staff at the Universidad Pablo de Olavide (UPO), my current institution. Here, I have continued to work with Prof. Boronat, publishing also several papers on my own (2 Phys. Rev. Lett, and 3 Phys. Rev. B) on the absorption of quantum gases on carbon substrates. This line was improved to include the study of ^{3}He (a fermion) both on clean and ^{4}He-preplated graphite. The results have allowed us to bridge the gap between the experimental results and previous theoretical calculations. At present, this line continues with the study of the possible supersolids of ^{4}He and H_2 adsorbed on ordered and disordered carbon substrates.

I have also opened a new research line on ultracold atoms loaded in optical lattices. The principal difference with previous theoretical treatments was the use of continuous Hamiltonians (instead of the discrete Hubbard models). Boson and fermion systems were dealt with, basically in (quasi)-one dimensional environments. Recently, I introduced a new wave function (a modified geminal) that allows the description of SU(6) (^{173}Yb) x SU(2) (^{171}Yb) species. The difficulty was in dealing with mixtures of attractive and repulsive fermions with more than two spin types. In this line of work, I have published five works as a sole author (2 PRA, 1JPB and 2NJP).

Last, I have recently started a new line of work that uses my previous expertise in DMC to solve the Hamiltonians that describe multiquarks in the framework of quark model. The DMC algorithm was improved to introduce the spin, color and flavour degrees of freedom of those particles. I have also developed an approximation that allow for the easy scalability of the DMC method to an arbitrary number of quarks. This have already produced four publications in Phys. Rev. D.

Part C. RELEVANT MERITS

C.1. Publications (including books)

The following are the more relevant papers on quantum liquids and solids in the last 10 years. They range from collaborations with experimental groups to descriptions of systems that allowed to bridge the gap between the experimental information and previous theoretical studies.

- M.C. Gordillo and J. Boronat. "Superfluid and supersolid phases of ^{4}He on the second layer of graphite" Phys. Rev. Lett. **124** 205301 1-5 (2020).

- A. Noury, J. Vergara-Cruz, P. Morfin, B. Plaçais, M. C. Gordillo, J. Boronat, S. Balibar, and A. Bachtold. "Layering Transition in Superfluid Helium Adsorbed on a Carbon Nanotube Mechanical Resonator" Phys. Rev. Lett.**122** 165301 1-6 (2019).

- M.C.Gordillo and J. Boronat. "Liquid and solid phases of ^{3}He on graphite". Phys. Rev. Lett. **116** 145301 1-5 (2016).

- A. Tavernakaris, J. Chaste, A. Eishler, G. Ceballos, M.C. Gordillo, J. Boronat and A. Bachtold. "Atomic monolayer deposition on the surface of nanotube mechanical resonators" Phys. Rev. Lett. **112** 196103 1-5 (2014).

Those are works in the research line involving one-dimensional fermions. They consider the behaviour of mixtures of fermions with different interactions and total number of spin species, ranging from 2 (NJP, (2016)) to 6. The first two papers include mixtures of fermions both attractive and repulsive. This meant the introduction of a new type of wavefunction, a modified determinant, to describe the system.

- M.C. Gordillo “Metal and insulator states of SU(6) × SU(2) clusters of fermions in one dimensional optical lattices” New. J. Phys. **23** 063034 1-11 (2021).

- M.C. Gordillo "Pairing in SU(6) x SU(2) one-dimensional fermionic clusters" Phys. Rev. A **102** 023335 1-6 (2020).

- M.C. Gordillo "One-dimensional SU(N) clusters of fermions in optical lattices" New. J. Phys. **21** 103020 1-8 (2019).

- C. Carbonell-Coronado, F. de Soto and M.C. Gordillo. “Ordering in one-dimensional few-fermion clusters with repulsive interactions” New. J. Phys. **18** 025015 1-6 (2016).

Those are the most relevant works about my last line of reseach on quark model:

- M.C. Gordillo, F. de Soto and J. Segovia. "Diffusion Monte Carlo calculations of fully-heavy multiquark bound states" Phys. Rev. D **102** 114007 1-20 (2020).

- M.C. Gordillo, F. de Soto and J. Segovia. “Structure of the X(3872) as explained by a diffusion Monte Carlo calculation” Phys. Rev. D **104** 054036 (2021).

C.2. Research projects and grants

Granted proposals in the last 10 years

- Referencia del proyecto (Grant code): FIS2010-18356

Título (title): Estudio de las transiciones de fase en sistemas bosónicos de baja dimensionalidad: sólidos, líquidos y gases densos en sistemas reales. *Study of phase transitions in confined bosons: solids, liquids and gases in real setups.*

Head of the group: María Carmen Gordillo Bargueño
Granting institution: MICINN
Duración (dates) (01/01/2011 - 30/06/2014)
Financiación recibida (budget) (euros):25000

- Referencia del proyecto (Grant code): FQM-5987

Título (title): Estudio computacional de los fenómenos de superfluidez, supersolidez y condensación de Bose-Einstein en fluidos y sólidos de baja dimensionalidad
Computational study of superfluidity, supersolidity and Bose-Einstein condensation in low-dimensional fluids and solids.

Head of the group:María Carmen Gordillo Bargueño
Granting institution: Junta de Andalucía
Duración (dates) (15/03/2011- 14/03/2015):
Financiación recibida (budget) (euros):144497 (including Ph.D. student salary)

- Referencia del proyecto (Grant code): FIS2014-56257-C2-2-P

Título (title): Fermions in low-dimensional environments: spin-imbalanced clusters, optical lattices and corrugated substrates

Head of the group:María Carmen Gordillo Bargueño
Granting institution: MINECO
Duración (dates): (01/1/2015 - 31/12/2018):
Financiación recibida (budget) (en euros):20000

- Referencia del proyecto (Grant code): FIS2017-84114-C2-2-P

Título (title): Novel quantum phases of matter: from a possible hexatic fluid in 2D ^{4}He to the study of cold fermionic gases with SU(N) symmetry

Head of the group:María Carmen Gordillo Bargueño
Granting institution: MINECO
Duración (dates): (01/1/2018 - 30/09/2021):
Financiación recibida (budget) (en euros):8300

- Referencia del proyecto (Grant-code) PID2020-113565GB-C22:

Título (title) "Supersolidity and other quantum novel phases in non-conventional systems: H_2 on carbon nanotubes and glassy surfaces and mixtures of SU(N) fermions and bosons".

Head of the group:María Carmen Gordillo Bargueño
Granting institution: MINISTERIO DE CIENCIA
Duración (dates): (09/1/2021 - 31/08/2024):
Financiación recibida (budget) (en euros):8300

- Referencia del proyecto (Grant-code) UPO-FEDER 1380159

Título (title) " Infuenciadel entorno externo en superfuidos y supersólidos: efecto de la baja dimensionalidad,el desorden y la corrugación en la aparición de correlaciones en sistemas cuánticos".

Head of the group:María Carmen Gordillo Bargueño
Granting institution: Junta de Andalucía
Duración (dates): (07/1/2021 - 30/06/2023):
Financiación recibida (budget) (en euros):20630

C.5, C.6, C.7… (e. g., Institutional responsibilities, memberships of scientific societies…)

XXI Congreso Nacional de Física Estadística (Statistical Physics Spanish meeting), Fises'17. March, 20th – April 1st, 2017. Member of the organizing committee.

Quantum Fluids and Solids 2015. Member of the program committee.

Head of the Plan Andaluz of Reseach (PAI) group, FQM-205, Statistical Physics of liquids. (2011-2018)

Ph.D. Thesis supervisor of C. Carbonell Coronado. "Computational study of low-dimensional quantum systems". Universidad Pablo de Olavide de Sevilla, defended on 05/23/2016.