Part A. PERSONAL INFORMATION

CV date	05/19/2022

First and Family name	María Carmen Gordillo Bargueño		
Social Security, Passport, ID number	52094633R	Age	53
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		

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) ~2700 (Google Scholar)
Average number of cites per year in the last five years: 2017-2021 ~ 90
Number of articles in Q1 (Web of Science): 65
h-index: 26 (WoS), 26 (Scopus) 29 (Google Scholar)
Papers as sole autor: 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 and 2021. (https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/3)

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 field 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 more than 20 works in different journals, the first one with more than 250 cites. During that period, I published an 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 bundles of carbon nanotubes and on the influence of considering the displacement of the carbon atoms on the graphene sheets on the respective phase diagrams of those quantum species. This line has been recently updated 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. We showed that that introduction of the substrate corrugation stabilized the experimentally observed very low-density liquid, instead of the gas phase obtained in previous calculations.

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 started recently a collaboration with professors J. Segovia and F. de Soto, both in my institution, about the description of tetraquarks in the framework of quark model. This have already produced two publications in Phys. Rev. D.

Part C. RELEVANT MERITS

C.1. Publications (including books)

The following are the more relevant papers on quantum liquids in the last 10 years.

- 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).

- 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).

The last two are collaborations with an experimental group on the adsorption of noble gases and ^{4}He on the external surface of single carbon nanotubes. Using classical and quantum Monte Carlo, we were able to understand the corresponding phase diagrams, in particular to distinguish between commensurate and incommensurate solids as functions of the adsorbed species and the tube diameter. The first one is a recent calculation on the phase diagram of the second layer of ^{4}He on graphite that permited to bridge the experimental and theoretical disagreements and stablished the reality of a 7/12 registered supersolid phase.

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

- M.C.Gordillo and J. Boronat “^{3}He on preplated graphite” Phys. Rev. B. **94** 145301 1-5 (2016).

- M.C. Gordillo and J. Boronat. ”Fluid and registered phases in the second layer of ^{3}He on graphite” Phys. Rev. B Rapid Communications **97** 201410(R) 1-5 (2018).

In those works we calculated the phase diagram of ^{3}He (a fermion) adsorbed on graphite, both clean and ^{4}He- and ^{3}He-preplated using fixed-node diffusion Monte Carlo (FN-DMC, a tecnique to deal with fermions). We considered both substrates to be corrugated. We showed that corrugation was the missing ingredient to reproduce the experimental results and the previous theoretical descriptions. In particular, we were able to explain the existence of a gas-liquid coexistence in the first case and the estability of a low-density liquid in the second. The third case was a gas.

- 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 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 geminal, to describe the system.

Recently, I started a another line of research about the description of tetraquarks within the framework of the quark model. This has already produced two publications:

- 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):8000

- 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.