MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES

AGENCIA ESTATAL DE INVESTIGACIÓN

CURRICULUM VITAE (maximum 4 pages)

CV date	09/01/2023

Part A. PERSONAL INFORMATION

First and Family name	José M. ARIAS		
Social Security, Passport, ID number	09154619K	Age	63
Researcher numbers	WoS Researcher ID	G-8988-2011	
	SCOPUS Author ID	57204578336	
	Orcid code	0000-0001-7363-4328	

A.1. Current position

Name of University/Institution	Universidad de Sevilla		
Department	Física Atómica, Molecular y Nuclear		
Address and Country	Facultad de Física, Avda. Reina Mercedes S/N, 41012 Sevilla		
Phone number	+34-954559506	E-mail	ariasc@us.es
Current position	Full professor (catedrático)	From	2004
Espec. cód. UNESCO	2207		
Keywords	Nuclear Physics, Molecular Physics, Algebraic Models, Quantum Phase Transitions		

A.2. Education

Degree	University	Year
Bachellor Degree Physics	Universidad de Sevilla	1981
PhD	Universidad de Sevilla	1985

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

6 Research six-year terms (positive national evaluation for the last 36 years).
ISI total number of publications: 175. More than 100 in the first quartile.
Summary of citations (Google scholar):

	Total	Since 2018
Citations	3826	1086
h-index	38	18
I10-index	81	36

Supervised PhD Theses: 9
Supervised PhD Theses since 2010: 3.

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

During the last 40 years my field of research has been Nuclear Physics and interacting Many-Body Physics in general. At the beginning, I was concentrated in Nuclear Structure using algebraic models. In particular, I worked on the Interacting Boson Model (IBM). In this framework, different nuclear properties were studied for even-even and odd-even nuclei: energy levels, electromagnetic transition probabilities, nuclear moments, one-nucleon transfer reactions, backbending, dipole resonances, two-nucleon transfer reactions, beta-decay, etc.

In addition, I have been also involved in studies of mixed-symmetry states in odd-even nuclei, the microscopic foundations of the IBM and, directly connected to this point, the study of mapping fermion operators onto the boson space. For many years, I studied the description of boson-femion systems from a mean-field point of view by using an intrinsic variational boson state. This provides the large-N or thermodynamic limit of the finite system under study. Still within the framework of the algebraic models, I have studied structure problems in Molecular Physics using symmetry adapted bases. Simple molecular potentials as Morse or Poeschl-Teller, together with the vibron model have been used thoroughly.

Letting the algebraic models apart, I have been also involved in the study of the pairing interaction and, more recently, in the treatment of the continuum for weakly-bound systems as exotic nuclei or highly-excited molecules. Along this line, we have proposed a pseudo-

state method based on a transformed harmonic oscillator (by a local scale transformation) that seems to work very well both in structure and reaction studies. In the last few years, this idea, originally introduced for two-body systems, has been extended to three- and four-body problems. This allows to study within this method problems of relevance in Nuclear Astrophysics. In this kind of cluster-models we have included the reaction mechanisms too, in the sense that the possible core excitation has been considered in addition to the excitation of the possible relative core-particle excitations.
Since the beginning of this century, I have been involved in research related to quantum phase transitions (QPT). In this area we have studied several two-level interacting systems of relevance in Physics: the IBM, the Lipkin and the Agassi models in Nuclear Physics, the vibron model and its u(3) version in Molecular Physics, the Jaynes-Cummings and Dicke models of relevance in Quantum Optics, the Bose-Hubbard model of use in studies of boson condensates, etc. For all of them, we have studied the phase diagram and the ground state quantum phase transitions. In some cases the quantum phase transitions in excited states (ESQPT) have also been studied.

The most active scientific collaborations are with: CSIC (Madrid), U. Complutense de Madrid, U. de Huelva, Universidad de Padova (Italia), UNAM de México, Charles University de Praga (Czech República), ATOMKI (Debrecen, Hungary).

Part C. RELEVANT MERITS
C.1. Publications (including books)

Publication in Journal. A. Sáiz, J.E. García-Ramos, J.M. Arias, L. Lamata,and P. Pérez-Fernández. 2022. A digital quantum simulation of an extended Agassi model: Use of machine learning for identification of different phase-diagram regions. **Physical Review C**106, 064322. DOI:https://doi.org/10.1103/PhysRevC.106.064322

Publication in Journal. M. Rodríguez-Arcos, M. Bermúdez-Montaña, R. Lemus, J.M. Arias, and J.Gómez-Camacho. 2022. Configuration Localised States from Orthogonal Polynomials for effective potentials in 3D systems vs algebraic DVR approaches.
Molecular Physics , e2044082. **https://doi.org/10.1080/00268976.2022.2044082**

Publication in Journal. J. Gamito, J. Khalouf-Rivera, J.M. Arias, P. Pérez-Fernández, and F. Pérez-Bernal. 2022. Excited-State Quantum Phase Transitions in the anharmonic Lipkin-Meshkov-Glick Model: static aspects. **Physical Review E**106, 044125.
DOI:**https://doi.org/10.1103/PhysRevE.106.044125**

Publication in Journal.P. Pérez-Fernández, J.M. Arias, J.E. García-Ramos, and L. Lamata. 2022. A digital quantum simulation of the Agassi model. **Physics Letters B**829, 13713. https://doi.org/10.1016/j.physletb.2022.137133

Publication in Journal. G. Levai, Geza; J.M. Arias. 2021. Extended analytical solutions of the Bohr hamiltonian with the sextic oscillator. **J. of Phys. G: Nuclear and Particle Physics 48** 085102 (28 pages). https://doi.org/10.1088/1361-6471/abcdf6

Publication in Journal. J.E. Garcia-Ramos; J.M. Arias, and A. Vitturi, 2020. Two-neutron transfer reactions as a tool to study the interplay between shape coexistence and quantum phase transitions. **Chinese Physics C** 44: 124101 (11 pages).
doi: 10.1088/1674-1137/abb4ca

Publication in Journal. J. Dukelsky, J.E. García-Ramos, P. Pérez-Fernández, J.M. Arias, and P. Schuck. 2019. Number conserving particle-hole RPA for superfluid nuclei. **Physics Letters B** 795: 537-541.

Publication in Journal. J.E. Garcia-Ramos, J. Dukelsky, P. Perez-Fernandez, J.M. Arias. 2018. Phase diagram of an extended Agassi model. **Physical Review C** 97, 054303.

Publication in Journal. A Arazi, J Casal, M Rodríguez-Gallardo, JM Arias, R Lichtenthäler Filho, … 2018. 9Be + 120Sn Scattering at Near-Barrier Energies with a Four-Body Model. **Physical Review C** 97 (4), 044609.

Publication in Journal. M.M. Estévez-Fregoso, J.M. Arias, J. Gómez-Camacho, R. Lemus. 2018. An approach to establish a connection between algebraic and configuration spaces: *su*(ν + 1) algebraic model for vibrational excitations. **Molecular Physics** 116, 2254-2269.

C.2. Research projects and grants

Ciencia Frontera con Tecnologías Cuánticas (US-1380840 - Equipo de Investigación). Responsable: Pedro Pérez Fernández / Lucas Lamata Manuel. Tipo de Proyecto/Ayuda: Proyectos I+D+i FEDER Andalucía 2014-2020. Referencia: US-1380840. Fecha de Inicio: 01-01-2021; Fecha de Finalización: 31-12-2022

Procesos de dispersión fuerte, electromagnética y débil con núcleos a energías bajas e intermedias (PID2020-114687GB-I00 - Equipo de Investigación). Responsable: Manuela Rodríguez Gallardo / Juan Antonio Caballero Carretero. Tipo de Proyecto/Ayuda: Plan Estatal 2017-2020 Generación Conocimiento - Proyectos I+D+i. Referencia: PID2020-114687GB-I00. Fecha de Inicio: 01-09-2021; Fecha de Finalización: 31-08-2024.

Reacciones y Estructura nucleares: interacción neutrino-núcleo, Abundancias elementales del Cosmos, evolución Estelar y procesos Radiativos (RENACER) (P20-01247 - Equipo de Investigación). Responsable: Manuela Rodríguez Gallardo. Tipo de Proyecto/Ayuda: PAIDI 2020: Proyectos I+D+i. Referencia: P20-01247. Fecha de Inicio: 05-10-2021; Fecha de Finalización: 31-12-2022.

Implementation de Hamiltonianos Nucleares en Simuladores Cuánticos (PID2019-104002GB-C22 - Equipo de Investigación). Proyectos Ministerio de Economía y CompetitividadI+D . IP: Pedro Pérez Fernández y Clara E. Alonso. 2020-2022.

Estudios de Procesos de Dispersión Fuerte y Electrodébil con Núcleos a Energías Bajas e Intermedias, Plan Estatal 2013-2016 Excelencia - Proyectos Ministerio de Economía y CompetitividadI+D (FIS2017-88410-P). Moro, Antonio M. y Caballero-Carretero, Juan Antonio (Universidad de Sevilla). 2018-2021.

Estructura de Núcleos, Moléculas y Hadrones y su Dinámica en Procesos de Dispersión Fuerte y Electrodébil. Ministerio de Economía y Competitividad. FIS2014-53448-C2-1-P. Moro, Antonio M. y Caballero-Carretero, Juan Antonio (Universidad de Sevilla). 2015-2017. 72600 EUR.

European Nuclear Science and Application Research 2 (ENSAR2), Europeo-Action RIA. H2020-INFRAIA-2014-2015 (Horizon 2020). M Harakeh (GANIL, Caen, Francia). 2015-2019.

La Física Nuclear Fuera del Valle de Beta-Estabilidad: Sus Implicaciones en Astrofísica. JUNTA DE ANDALUCÍA - CONSEJERÍA DE INNOVACIÓN, CIENCIA Y EMPRESAS. P11-FQM-7632. Lozano-Leyva, Manuel Luis (Universidad de Sevilla). 2013-2017. 176918,3 EUR.

Física con Sistemas de Fermiones Correlacionados: Estudios en Física Nuclear y Extensión a Otros Campos. MINISTERIO DE CIENCIA E INNOVACIÓN. FIS2011-28738-C02-01. Caballero-Carretero, Juan Antonio (Universidad de Sevilla). 2012-2015. 71390 EUR.

Sistemas de fermiones fuertemente correlacionados: estructura, dispersión y aplicaciones. MINISTERIO DE CIENCIA E INNOVACIÓN. FIS2008-04189. Arias-Carrasco, Jose Miguel (Universidad de Sevilla). 2009-2011. 107690 EUR.
Teorías de muchos cuerpos para sistemas de fermiones fuertemente correlacionados. MINISTERIO DE CIENCIA E INNOVACIÓN. FIS2005-01105. JOSE MIGUEL ARIAS CARRASCO (Universidad de Sevilla). 2006-2008. 78540 EUR.

C.3. Contracts: No

C.4. Patents: No

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

Director of the Atomic, Molecular and Nuclear Physics at Uuniversidad de Sevilla for 8 years, from June 2009 to June 2017.

Referee of the following Journals: Physical Review A, Physical Review C, Physical Review Letters, Review of Modern Physics, Physics Letters A, European Journal of Physics A, Journal of Quantum Chemistry, Few-Body Systems, Nuclear Physics A.

External evaluator for postdoc contracts for the agency AQUIB (Agencia de Qualitat Universitaria de les Illes Balears).

External evaluator for postdoc contracts for the agency FWO Research Foundation Flanders of Belgium.

External evaluator for research projects PAPIIT at UNAM, México.

External evaluator for research bilateral Israel-EEUU (US-Israel Binational Science).

Main responsible in the Organizing committee of 7 International summer schools in topics related to Nuclear Physics and part of the organization of 7 workshops in quantum phase transitions (QPT).

Responsible investigator of the Unidad Asociada of the Departamento de Física Atómica, Molecular y Nuclear de la Universidad de Sevilla to the Spanish Research Council (CSIC), Institute of Structure of Matter (IEM, Madrid) years: 2007-2009, 2010-1012, 2013- 2016).

National coordinator of the Spanish Inter-University Master in Nuclear Physics by Universidades de Sevilla, Autónoma de Madrid, Barcelona, Complutense de Madrid, Granada and Salamanca. The Spanish Reasearch Council (CSIC) through IEM (Madrid) and IFIC (Valencia) and the National Center CIEMAT (Madrid) are also involved in this Master degree. Since 2009-until January 2020.

General coordinator of the Master ERASMUS MUNDUS JMD in Nuclear Physics, which is coordinated by Universidad de Sevilla with the participation of the Universities: Autónoma de Madrid, Barcelona, Basse-Normandie- Caen (Francia), Catania (Italia), Complutense de Madrid, Padova (Italia) y Salamanca. There are around 30 associated centers, among them CERN, GSI, GANIL, Lab. Naz. Legnaro, Frascati and Catania, CIEMAT, CNA, TANDAR, TRIUMF, ELI-NP, UNAM-México, etc. First project 2017-2021, second project approved 2020-2025.

Teaching excellence diploma from the Universidad de Sevilla in 2001-2002.

Elected Member of the Consejo de Gobierno of University of Seville for 6 years.

PI of the Research Group “Física Nuclear Básica”, FQM-160 of Junta de Andalucía, since 2018. Around 25 Nuclear Physics researchers.

Member of the Instituto Interuniversitario Andaluz de Investigación “Instituto Carlos I (iC1) de Física Teórica y Computacional” since its starting date.