MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES

CURRICULUM VITAE

AGENCIA ESTATAL DE INVESTIGACIÓN

CV date	10/01/2024

PERSONAL INFORMATION

First and Family name	Stephan Roche		
Social Security, Passport, ID number	NIE: X2854469P	Age	54
Researcher codes	WoS Researcher ID	B-1116-2012	
	SCOPUS Author ID	7005127015	
	Open Researcher and Contributor ID (ORCID)	0000-0003-0323-4665	

Current position

Name of University/Institution	Institut Català de Nanociència i Nanotecnologia (ICN2)			
Department	Head of the Theoretical & Computational Nanoscience Group			
Address and Country	Campus de la UAB, Edifici ICN2 08193 Bellaterra (Barcelona) Spain			
Phone number	34 633235991	E-mail	stephan.roche@icn2.cat	
Current position	**ICREA Research Professor**		Since	01/10/2010
Key words	Nanophysique,quantum transport, graphene,topological insulators			

Previous positions

Name of University/Institution	Researcher at Commissariat à l'Energie Atomique (2004-2009) Assistant Professor, University Joseph-Fourier (2000-2004)
Address and Country	17 Av. des Martyrs, 38000 Grenoble, France

Education

Habilitation à diriger des Recherches	Université Joseph-Fourier (France)	2004
PhD in Physics	Université Joseph-Fourier (France)	1996
Master in Theoretical Physics Magistère de Physique	Ecole Normale Supérieur de Lyon (France) Université Joseph-Fourier (France)	1993

JCR articles, h Index, thesis supervised…

S. Roche has an outstanding track-record in the fields of theoretical and computational nanoscience, with a strong expertise of quantum transport physics in Dirac materials (graphene & topological insulators) and 2D materials-based van der Waals heterostructures. He has made landmark research contributions unveiling nontrivial charge, thermal and spin transport phenomena in complex and disordered condensed matter (giant spin transport anisotropy and spin Hall effect by proximity effects, non-equilibrium laser-induced energy gaps in graphene, Anderson localization, etc). He pioneered the development of linear scaling quantum transport approaches enabling unrivalled simulations of billion atoms-scale disordered models (www.lsquant.org), a field in which is a world leader.

S. Roche has authored and co-authored over 250 journal papers (WoS), including more than 50 papers published in Physical Review Letters & Nano Letters. His **h index is 60** (75) according to WoS (Google scholar), with more than 21.600 citations (GS)). List of publications http://scholar.google.com/citations?user=91qBGI0AAAAJ&hl=en&oi=ao

All supervised Ph.D Students

– B. Gabrielly (2017-2022) ; Postdoc at Center for Quantum Information Albuquerque, USA)
– M. Vila-Tusell (2016 -2020) ; Postdoc at Berkeley University (USA)
Ph. D Thesis Recognized Outstanding Ph.D. Research & published in Springer
– A. Benitez (2016 -2020) ; Postdoc at MIT (USA)
Ph.D. Thesis awarded Best Experimental PhD Thesis Award from GEFES

– K. Song (2015 -2018) ; Postdoc at KAUST (South Arabia)
– D. Van Tuan (2011-2014) ; Research associate at Rochester University (USA)
Ph. D Thesis Recognized Outstanding Ph.D. Research & published in Springer
– N. Leconte (2009-2013) ; Postdoc at Seoul National University (Korea)
– R. Avriller (2005-2008) ; Permanent CNRS researcher at Bordeaux Univ. (France)
– A. Lherbier (2005-2008) ; FNRS researcher at Univ. Catholique Louvain (Belgium)
– A. Lopez-Bezanilla (2006-2009); Research staff at Lawrence Livermore National Lab. (USA)

CV SUMMARY

S. Roche is an ICREA Research Professor, leading the Theoretical and Computational Nanoscience Group at the Catalan Institute of Nanoscience and Nanotechnology (ICN2) in Barcelona since 2010. He has more than twenty-five years of experience concerning the theoretical study of transport theory of low-dimensional systems, including graphene, carbon nanotubes, semiconducting nanowires, organic materials, and topological insulators. He studied Theoretical Physics at the Université Joseph-Fourier (UJF) and the École Normale Supérieure in France, and then received a PhD in Physics in 1996, at the French National Centre for Scientific Research (CNRS). After several postdoctoral stays in Japan and Spain (under the support of the European Commission and Japanese Society of Promotion of Science), he was appointed Assistant a Professor at UJF, in 2000, and then as a researcher at the Commissariat à l'Energie Atomique (CEA) in 2004. During the period 2004-2010, he was working as independent CEA researcher at the Institute of Nanosciences and Cryogenics at CEA and coordinated the Quantum Simulation Platform of the programme CHEMTRONICS to foster innovation in merging nanoelectronics with chemistry. He received the French Habilitation degree to supervise Ph.D. thesis in 2004 at UJF and in 2009, he was awarded the **Friedrich Wilhelm Bessel prize** by the Alexander Von-Humboldt Foundation (Germany) in recognition of his contribution to theoretical nanoscience. He spent a two-years sabbatical between the University of TU-Dresden and the Catalan Institute of Nanoscience (ICN), and two months as visiting Professor at the Center of Advanced 2D Materials from National University of Singapore and is remained as regular visiting faculty member and collaborator since then.

He has published more than 250 papers in journals such as Review of Modern Physics, Nature (2), Nature Physics (1), Nature Nanotechnology (3), Nature Materials (1), Nature Review Physics (1), Nature Communications (3), Phys. Rev. Lett. (40+ papers), Nano Lett. (10+ papers), and he has co-authored the book on "*Introduction to Graphene-Based Nanomaterials: From Electronic Structure to Quantum Transport*" (Cambridge University Press 2020). During the past 10 years, he has been supervising about 15 postdocs and 9 Ph.D. thesis. His current research group (12 members) is engaged in forefront research on quantum (charge, spin and thermal) transport phenomena in large scale models of graphene and topological insulators, investigating complex effects of chemical and structural disorders, as well as electron-phonon coupling and spin-orbit interaction. From 2011 till 2023, S. Roche has actively involved in the Graphene Flagship project (10 years Excellence program of the European Commission-http://graphene-flagship.eu/), as a deputy leader of the Graphene spintronics workpackage which gathered the best European groups working in the field, including the group of Nobel Laureate Albert Fert from CNRS-THALES and Nobel Laureate Andre K. Geim from University of Manchester (UK). S. Roche was appointed as WP2 leader for the CORE3 funding period (April 2020-March 2023) and simultaneously Division leader and member of the management panel.

RELEVANT MERITS

Selected Publications

Z Wang, PM Perez-Piskunow, et al. **S. Roche**, J. Jung, K. Novoselov, N. Leconte
Open-orbit induced low field extremely large magnetoresistance in graphene/h-BN superlattices
Preprint arXiv:2312.07004 (submitted to **Science)**

O. Kaya, L. Colombo, A. Antidormi, M. Lanza, **S. Roche**
Revealing the improved stability of amorphous boron-nitride upon carbon doping
Nanoscale horizons 8 (3), 361-367 (2023)

H Yang, SO Valenzuela, M Chshiev, S Couet, B Dieny, Albert Fert, et al. **S. Roche**,
Two-dimensional materials prospects for non-volatile spintronic memories
Nature 606 (7915), 663-673 (2022)

MN Çınar, A Antidormi, VH Nguyen, et al- J.-Ch. Charlier, **S. Roche**, H. Sevinçli
Toward optimized charge transport in multilayer reduced graphene oxides
Nano letters 22 (6), 2202-2208 (2022)

Z Fan, JH Garcia, AW Cummings, JE Barrios-Vargas, A Harju, F. Ortmann & **S. Roche**
Linear scaling quantum transport methodologies
Physics Reports 903, 1-69 (2021)

PM Perez-Piskunow, **S. Roche**
Hinge spin polarization in magnetic topological insulators revealed by resistance switch
Physical Review Letters 126 (16), 167701 (2021)

S Hong, CS Lee, MH Lee, Y Lee, et al. **S. Roche,** M. Chhowalla, H.J. Shin, H.-S. Shin
Nature 582 (7813), 511-514 (2020)

M. Vila, J.H. Garcia, A.W. Cummings, S.R. Power, C.W. Groth, X. Waintal & **S. Roche**
Nonlocal Spin Dynamics in the Crossover from Diffusive to Ballistic Transport
Physical Review Letters 124 (19), 196602 (2020)

JH Garcia, M Vila, CH Hsu, X Waintal, VM Pereira & **S. Roche**
Canted Persistent Spin Texture and Quantum Spin Hall Effect in
Physical Review Letters 125 (25), 256603 (2020)

A Benitez, W. Torres, J. Sierra, JH Garcia, **S Roche**, M. Costache, S.O. Valenzuela
Tunable room-temperature spin galvanic& spin Hall effects in van der Waals heterostructures
Nature Materials 19, 170–175 (2020)

A.W. Cummings, S. Dubois, J.C. Charlier, **S. Roche**
Universal spin diffusion length in polycrystalline graphene
Nano Letters 19 (10), 7418-7426 (2019)

S. Bertolazzi, P. Bondavalli, **S. Roche**, S.-Y.Choi, L. Colombo, F. Bonaccorso, P. Samorì
Nonvolatile memories based on graphene and related 2D materials
Advanced Materials 31, 1806663 (2019)

CK Safeer, J Ingla-Aynés, JH Garcia, M Vila, N Ontoso, **S. Roche**, L. E Hueso, F. Casanova
Room-Temperature Spin Hall Effect in Graphene/MoS_2 van der Waals Heterostructures
Nano letters 19 (2), 1074-1082 (2019)

J. H. Garcia, M. Vila, A.W. Cummings, and **S. Roche**
Spin Transport in Graphene/Transition Metal Dichalcogenide Heterostructures
Chem. Soc. Rev. 47, 3359-3379 (2018)

J. Aprojanz, S. Power, P. Bampoulis, **S. Roche**, A.-P. Jauho, H. Zandvliet, C. Tegenkamp
Ballistic tracks in graphene nanoribbons
Nature Communications 9 (1), 4426 (2018)

K. Song, D. Soriano, A.W. Cummings, R. Robles, P. Ordejón & **S. Roche,**
Spin proximity effects in graphene/topological insulator heterostructures
Nano letters 18 (3), 2033–2039 (2018)

M. Ribeiro, S.R. Power, **S. Roche**, L. E. Hueso and F. Casanova
Scale-invariant large nonlocality in polycrystalline graphene
Nature Communications 8, 2198 (2017)

D. Van Tuan & **S. Roche**
Spin manipulation in graphene by chemically induced pseudospin polarization
Physical Review Letters 116, 106601 (2016)

D. Van Tuan, J.M. Marmolejo-Tejada, X. Waintal, B.K. Nikolić, S.O. Valenzuela **& S. Roche**
Spin Hall effect and origins of nonlocal resistance in adatom-decorated graphene
Physical Review Letters 117, 176602 (2016)

D. Van Tuan, F. Ortmann, D. Soriano, S. O. Valenzuela **& S. Roche**
Pseudospin-driven spin relaxation mechanism in graphene
Nature Physics 10, 857-863 (2014)

MAJOR SCIENTIFIC ACHIEVEMENTS

• Prediction of superior thermal stability and mechanical properties of amorphous BN (2023)
• Giant valley-polarized spin splitting in magnetized Janus Pt dichalcogenides (2022)
• Novel resistance switch in magnetic topological insulators (2021)
• Canted spin Hall and Quantum Spin Hall effects (2020)
• Revealing nonlocal spin transport phenomena in ballistic graphene devices (2020)
• Predicting universal behavior of spin transport in polycrystalline graphene devices (2019)
• Giant spin lifetime anisotropy in graphene induced by spin-orbit proximity effect (2017)
• Understanding spin Hall effect in Dirac Matter (2016) (with Sergio Valenzuela, ICN2)
• Discovery of pseudospin-driven spin relaxation mechanism (2014)
• Prediction of proximity effects induced in graphene by magnetic insulators (2013)
• Unveiling laser-induced bandgaps formation in graphene (2011)
• Analysis and confirmation of integer quantum Hall effect in trilayer graphene (2011)
• Novel transport mobility gaps in chemically doped carbon nanotubes (2009)
• Anomalous transport in disorder-free incommensurate multiwall carbon nanotubes (2001)

Research projects and grants

Some European Commission funded projects:

GRAPHENE FLAGSHIP CORE 3 [01/04/2020-31/03/2023, *500k€*]
ULISSES: [H2020-ICT-2018-2, 01/01/2019-31/12/2022, *403k€*]
TOCHA [H2020-FETPROACT-2018-01, 01/01/2019-31/12/2023, *226k€*]
MECHANIC [FLAG ERA-JTC 2017, 2017-2020, *100k€*]
CO2 SENSORS [FLAG ERA-JTC 2017, 2017-2020, *100k€*]
GRAPHENE FLAGSHIP CORE 2 [01/04/2018-31/03/2020, *280k€*]
GRAPHENE FLAGSHIP CORE 1 [EC,01/04/2016-31/03/2018, *330k€*]

Some NATIONAL funded projects:

Proyecto I+D (MINECO): AI4LSQUANT [2023-2027]; *170,000€*
Proyecto I+D (MINECO): ECONWHET [2020-2023]; *156,000€*
Proyecto I+D (MINECO): MASPINDIRAC [2016-2018]; *47,432€*
Proyecto I+D (MINECO): MAT2012-33911 - MQTGRAPHTI [2014-2016]; *73,710€*
Proyecto I+D (AGAUR): 2014 SGR 58 [2013-2015]; *19k€*

Other contracts

Industrial Contracts:

Research contract (**MULTIVERSE**) "*development of AI-models for acceleration optimisation problems*" [2023-2024]; budget 75*k€*

Research contract (**SAMSUNG**) "*simulations of amorphous Boron-Nitride membranes*" [2021-2023]; budget: *200k€*

GRO 2012 (**SAMSUNG**) "*simulation of charge transport properties in polycrystalline graphene"* [2013-2015]; budget: *300k€*

Contract from King Abdullah University of science & Technology (KAUST): Core Research Program (CRG 2019) "*Next Generation Ultralow Power Spin-Orbit Memories"* (2019-2022, budget: *384k€)*

FELLOWSHIPS AND AWARDS

2009	**Friedrich Wilhelm Bessel Award** received from *Alexander von Humboldt Foundation*
1999 – 2000	EU-fellowship, Dept de Física Teórica; Universidad de Valladolid, Spain
1996 – 1999	EU-JSPS & EU-STF fellowships, Dept of Applied Physics; University of Tokyo, Japan

INSTITUTIONAL RESPONSIBILITIES

2020 – 2023	**Workpackage leader** of WP2 Spintronics (**Graphene Flagship)** https://graphene-flagship.eu/about/first-10-years/core-3-work-packages/work-package-2-spintronics/
2018 –	**Editor in Chief of J. Phys. Materials** (Institute of Physics, UK) Editorial board - IOPscience - Publishing Support
2013 –2019	**Deputy leader** of the Spintronics Workpackage (**Graphene Flagship)**
2009 –	Member of the International Scientific Committee of GDR HOWDI

REVIEWING ACTIVITIES

2023	Committee Member ERC Consolidator -panel PE3
2020	Reviewer of H2020-FETPROACT-2020-01, Neuromorphic computing
2012 – 2017	Scientific Advisory Board of Centre of the Excellence in Computational Nanophysics (COMP), Aalto University, Finland
2013	Reviewer of SPP "*Topological Insulators*" and SPP "*Graphene*", Deutsche Forschungsgemeinschaft (DFG) Germany
2014 –	Editorial Board, **2D Materials**, IOP, United Kingdom
2015 – 2017	Editorial Board, **Rivista del Nuovo Cimento**, Società Italiana de Fisica, Italy
2016 – 2017	Editorial Board, **Graphene Technology**, Nature-Springer, Germany
2014 – 2016	Scientific Advisory Board of the Dresden Center for Computational Material Science (DCCMS) TU-Dresden, Germany

MEMBERSHIPS OF SCIENTIFIC SOCIETIES

2016 –	Member of the Real Sociedad Española de Física (Spain)

ORGANISATION OF SCIENTIFIC MEETINGS

2024	**AI4AM** "Artificial Intelligence for Advanced Materials" (Barcelona, July 2024)
2021 –	**QUANTUM 20XX** conferences (Bilbao 2021, Barcelona 2022, Madrid 2023, San Sebastian 2024) http://www.quantumconf.eu
2020	SPICE- online workshop on *2D van der Waals Spin Systems*,

University Mainz, Germany

2011 – 2022 **GRAPHENE 20XX** International conferences Series www.grapheneconf.com/ Madrid (2024); Manchester (2023); Aachen (2022); Grenoble (2021); Grenoble (2020); Roma (2019); Dresden (2018); Barcelona (2017); Genoa (2016); Bilbao (2015); Toulouse (2014); Bilbao (2013); Brussels (2012); Bilbao (2011)

2015 *ICREA Workshop on Graphene Biosensors*, Barcelona http://graphsense.icn2.cat/

2013 *New Trends in Topological Insulators* NTTI2013, Sant Feliu de Guíxols, Spain

2011 International workshop *Carbon-based Spintronics-CSPIN11*, Max Planck Institute, Germany

2011 *First principles computational methodologies for 2D Materials*, Lancaster University, UK