

Curriculum Vitae

Robert E. Zillich

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employment

- since Aug 2015 Professor (non-tenured) at the Institute for Theoretical Physics,
Johannes Kepler Universität (JKU), Linz, Austria
- April 2012 – July 2015 Privatdozent at the Institute for Theoretical Physics, JKU
- Jan 2007 – March 2012 assistant professor (“Universitätsassistent”) at the Institute for Theoretical
Physics, JKU
- June 2004 – Dec 2006 postdoctoral fellow / researcher at the Fraunhofer Institut für Techno- und
Wirtschaftsmathematik, Kaiserslautern, Germany
research activity: development of multiscale molecular dynamics simulation
algorithms for equilibrium and non-equilibrium statistical physics
- July 2001 – May 2004 postdoctoral fellow in the Chemistry Department, University of California,
Berkeley, and Miller Institute for Basic Research in Science, Berkeley, USA
research activity: calculation of molecule spectra in superfluid helium with
quantum Monte Carlo simulations and quantum many-body theory

education

- April 2012 *venia docendi* (Habilitation) for Theoretical Physics
- 13.6.2001 PhD degree (title: Dr. techn.) at the Johannes Kepler Universität, Austria
advisor: Prof. Eckhard Krotscheck
title of thesis: Atom Scattering off Superfluid ^4He Clusters and Films
- 11.12.1997 diploma degree at the Johannes Kepler Universität, Linz
advisor: Prof. Eckhard Krotscheck
title of thesis: Scattering of ^3He off thin ^4He -films

research grants

principal investigator:

- 15.2.2015 – 15.4.2015 PRACE Preparatory Access “Atomistic Computational Fluid Dynamics”
1.7.2011 – 30.6.2016 FWF grant P23535 “Strongly Interacting Dipolar Bose Gases”
funding total: 285547 €
- 1.1.2010 – 31.12.2011 mobility grant HR 21/2010 by ÖAD: academic exchange grant with
Leandra Vranjes Markic, University of Split, Croatia
funding total: 5402 €
- 1.1.2009 – 31.12.2010 Acciones Integradas 2009-10, ES 19/2009 by ÖAD: academic exchange grant with
Dep. de Fisica i Enginyeria Nuclear, Universitat Politecnica de Catalunya, Spain
funding total: 4790 €
- 1.1.2008 – 31.12.2009 Amadée grant 2008-09, FR 14/2008 by ÖAD: academic exchange grant with
Institute of Physics, Université de Rennes, France
funding total: 5120 €

participating:

- 1.9.2009 – 31.1.2013 FWF grant P21924 “Metal Clusters in Quantum Matrices”
(PI: Eckhard Krotscheck, JKU Linz)
- 1.8.2001 – 31.7.2004 NSF grant CHE 107541: Molecular solvation phenomena in nanoscale superfluids
(PI: K. B. Whaley, UC Berkeley)
- 1.7.2003 – 30.6.2004 NSF grant NPACI 930004: Quantum Monte Carlo calculations for nanoscale
superfluids, semiconductors, and qubit arrays (PI: K. B. Whaley, UC Berkeley)
continuation: 1.7.2004 – 31.12.2005; 1.1.2006 – 31.12.2006; 1.4.2007 – 31.3.2008

awards & fellowships

- 2008 Programa de movilidad de profesores visitantes en masteres oficiales del
Ministerio de Educacion y Ciencia de Espana (mobility program for
visiting professors teaching master courses, awarded by the Spanish
Ministry of Education and Science)
- 2007 Honourable Mention – Kümmel Early Achievement Award, RPMBT14
in Barcelona, Spain
- 2001 Miller Research Fellowship for Basic Research in Science, Berkeley, California
- 1998 Wilhelm-Macke-Award for diploma thesis, Linz, Austria

invited research stays

- Jan. – March 2013 program “Fundamental Science and Applications of Ultra-cold Polar Molecules”,
Kavli Institute for Theoretical Physics, Santa Barbara, USA
- Aug. 2010, March 2011 invited professor at the Institute de Physique, Université de Rennes 1, France
- Feb. 2008 invited professor at Universitat Politecnica de Catalunya, Barcelona,
Spain (see “awards”)
- July 2007 invited assistant professor at Palms SIMPA, Université de Rennes 1, France
(J.-M. Launay and A. Viel): Rb-He exciplex formation
- Oct. – Nov. 2002 Konkuk University, Seoul, South Korea, invited by Prof. Yongkyung Kwon:
development of path integral Monte Carlo code
- June – Aug. 1998 University of Minnesota, invited by Prof. Charles E. Campbell:
atomic transmission through thin superfluid films
- July – Aug. 1997 Texas A&M University, College Station, invited by Prof. Eckhard Krotscheck

conferences (invited and selected talks)

- 2016 ECT* workshop Advances in transport and response properties of strongly interacting systems, Trento, Italy (invited)
- 2015 Recent Progress in Many-Body Theories, Buffalo, USA (invited)
Quantum Fluid Clusters, Toulouse, France (invited)
- 2014 Physics at the Falls: Phase Transitions in reduced Dimensions, Buffalo, USA (invited)
Quantum Critical Matter, Obergurgl, Austria (selected)
- 2013 Int. Conf. on Quantum Fluid Clusters, QFC2013, Regensburg, Germany (invited)
Jahrestagung der Österr. Physikalischen Gesellschaft, Linz, Austria (invited)
Cold and Ultracold Molecules Workshop, Granada, Spain (selected)
- 2011 IMAMPC 2011, Rennes, France (invited)
482. Wilhelm and Else Heraeus Seminar: Helium Nanodroplets, Bad Honnef, Germany (invited)
- 2010 QFS 2010 Satellite Workshop, Grenoble, France (invited)
3rd mK Day, Barcelona, Spain (invited)
- 2009 High-order actions and their applications in many-body, few-body, classical problems, Barcelona, Spain (invited)
- 2008 APS March Meeting, New Orleans, Louisiana
EGAS'08 Conference, Graz, Austria (selected)
LT 25, Amsterdam, Netherlands (selected)
- 2007 Recent Progress in Many-Body Theory 14, Barcelona, Spain (selected)
- 2006 Workshop on New Developments in Quantum Monte Carlo, Tempe, Arizona (invited)
- 2005 343rd WE-Heraeus-Seminar on helium nanodroplets, Germany (invited)
- 2002 Workshop on Rare Gas Clusters, Telluride, Colorado
Vth Workshop on Quantum Fluid Clusters, Trento, Italy

referee activity

since 2006 Phys. Rev. Lett., Phys. Rev. B, J. Chem. Phys., J. Phys. Chem.,
J. Low Temp. Phys., New J. of Phys., J. Comp. Phys.; The Royal Society, UK.
J. Phys. B, Ann. Phys., J. Phys. Chem. Lett.

seminars (since 2002)

- 2016 “(Non)equilibrium dynamics in quantum many-body systems”, invited by Arthur Ernst, Max Planck Institute, Halle, Germany
- 2014 “Dipolar Multilayers”, invited by Ferran Mazzanti, UPC, Barcelona, Spain
- 2013 “Spectroscopy in Helium Nanodroplets”, invited by Henrik Stapelfeldt, Department of Chemistry, Aarhus University, Denmark
“Rotons, Stripe Phases, Dimerization: Condensed Matter Physics with Dipolar Molecules”, invited by KITP, Santa Barbara, USA
- 2012 “Cold Molecule Spectroscopy and Ultracold Molecular Quantum Gases”, Linz, Austria
- 2010 “Condensed Matter Theory of Dipolar Quantum Gases”, invited by Rudi Grimm, IQOQI, University of Innsbruck, Austria
“Dipolar quantum gases”, invited by J. Boronat, UPC, Barcelona, Spain
“Atoms, Molecules and Clusters in Helium Nanodroplets, invited by W. Ernst, Graz, Austria
- 2008 “Helium Clusters, Exciplexes, and Dipolar Quantum Gases”, invited by K. Yamashita, Department of Chemical System Engineering, University of Tokyo, Japan
- 2007 “Helium in Confinement”, invited by Matthias Troyer, Institut für Theoretische Physik ETH, Zürich, Switzerland
“Dynamics of Molecules in ^4He : Path Integral and Correlated Basis Function Studies”, invited by J. M. Launay, Institute of Physics, Univ. Rennes, France
- 2006 “Bose Einstein Kondensation: Physik im Bereich von Picokelvin”, seminar for physics teachers at the HTL Steyr, Austria
- 2004 “Spectroscopy of Molecules in Superfluid ^4He Clusters”, Miller Institute, Berkeley, USA
- 2003 “Correlations, Fluctuations, and Dissipation: Rotation Spectrum of Molecules in ^4He ”, Cal HeII meeting, UC Berkeley, USA
- 2002 “Scattering at ^4He clusters/films”, Cal HeII meeting, USC, California, USA
“Simulations of Many-Body Quantum Systems: Doped Superfluid Helium-4 Clusters”, Miller Symposium, Tomales Bay, California, USA
“Rotation of Molecules in Superfluid Helium-4 Clusters”, invited by Yongkyung Kwon, Department of Physics, Konkuk University, Seoul, Korea

Teaching Activities by Robert E. Zillich

At the Johannes Kepler University, Linz, Austria:

(teaching implied by student supervision (“Theoretikum”, “Privatissimum”) not listed)

position	year	course	
Prof.	SS 2016	Advanced Quantum Mechanics B, lecture class	
		Advanced Quantum Mechanics B, exercise class	
		Computational Physics II, lecture class (english)	
		Computational Physics II, exercise class (english)	
WS 2015	Electrodynamics I and II, lecture class	Electrodynamics I and II, exercise class	
		Electrodynamics I and II, exercise class	
ass. / PD	SS 2015	Advanced Quantum Mechanics B, exercise class	
		Statistical Physics, exercise class	
	WS 2014	Advanced Quantum Mechanics A, lecture class (english)	Advanced Quantum Mechanics A, exercise class (english)
			Advanced Quantum Mechanics A, exercise class (english)
	SS 2014	Computational Physics II, lecture class (english)	Computational Physics II, exercise class (english)
			Statistical Physics, exercise class (english)
			Statistical Physics, exercise class (english)
	WS 2013	Bose-Einstein condensation and cold Fermi gases, lecture class	
	SS 2013	Computational Physics II, lecture class (english)	
	SS 2012	Computational Physics II, lecture class (english)	
		Theoretical Physics II: Quantum Mechanics, exercise class	
	WS 2011	Theoretical Physics V: Advanced Quantum Mechanics, exercise class	
		Besprechung neuerer Arbeiten	
	SS 2011	Computational Physics II, lecture class (english)	Computational Physics II, exercise class (english)
			Computational Physics II, exercise class (english)
			Besprechung neuerer Arbeiten
	SS 2010	Computational Physics II, lecture class (english)	Computational Physics II, exercise class (english)
			Computational Physics II, exercise class (english)
	WS 2009	Bose-Einstein condensation and cold Fermi gases, lecture class	Theoretical Physics I: Mechanics, 2 exercise classes
			Theoretical Physics I: Mechanics, 2 exercise classes
	SS 2009	Computational Physics II, lecture class (english)	Computational Physics II, exercise class (english)
			Computational Physics II, exercise class (english)
			Theoretical Physics IV: Thermodynamics & Statistical Physics, exercise class
	WS 2008	Theoretical Physics II: Electrodynamics, 2 exercise classes	
	SS 2008	Computational Physics II, lecture class (english)	Computational Physics II, exercise class (english)
			Computational Physics II, exercise class (english)
			Theoretical Physics V: Advanced Quantum Mechanics, exercise class
WS 2007	Bose-Einstein condensation and cold Fermi gases, seminar class	Theoretical Physics I: Mechanics, exercise class	
		Theoretical Physics I: Mechanics, exercise class	
SS 2007	Computational Physics II, lecture class (english)	Computational Physics II, exercise class (english)	
		Computational Physics II, exercise class (english)	
		Theoretical Physics IV: Thermodynamics & Statistical Physics, exercise class	

At the Universitat Politecnica de Catalunya, Barcelona, Spain:

position	year	course
invited prof.	Feb. 2008	master course on “Hypernetted-Chain/Euler-Lagrange Theory and the Correlated Basis Function Method for Strongly Interacting Bosons”

publications

1. Robert E. Zillich, Michael Kobler, and Giuseppe Carleo: “Many-body Localization after Interaction Quench to Rotons”, in preparation
2. Michael Rader, Martin Hebenstreit, and Robert E. Zillich: “The Multi-component Correlated Basis Function Method and its application to Multilayered Dipolar Boses Gases”, in preparation
3. M. Renzler, M. Daxner, L. Kranabetter, A. Kaiser, A. Hauser, W. Ernst, A. Lindinger, R. E. Zillich, P. Scheier, and A. Ellis: “Dopant-induced solvation of alkalis in liquid helium nanodroplets”, accepted by J. Chem. Phys.
4. G. E. Astrakharchik, R. E. Zillich, F. Mazzanti, and J. Boronat: “Gapped spectrum in pair-superfluid bosons”, submitted to Phys. Rev. A
5. E. Krotscheck, R. E. Zillich: “Solvation of Mg in Helium-4: Are there Meta-stable Mg Dimers?”, submitted to J. Chem. Phys.
6. L. Vranješ Markić, P. Stipanović, I. Bešlić, and R. E. Zillich: “Solidification of ^4He clusters adsorbed on graphene”, Phys. Rev. B, **94**, 045428 (2016)
7. M. Hebenstreit, M. Rader, and R. E. Zillich: “Dipolar Bilayer with Antiparallel Polarization – a Self-Bound Liquid”, Phys. Rev. A, **93**, 013611 (2016)
8. H. H. Fan, E. Krotscheck, T. Lichtenegger, D. Mateo, and R. E. Zillich: “Correlations in the low-density Fermi gas: Fermi-liquid state, dimerization, and Bardeen-Cooper-Schrieffer pairing”, Phys. Rev. A, **92**, 023640 (2015)
9. R. E. Zillich: “Combination of the pair density approximation and the Takahashi-Imada approximation for path integral Monte Carlo simulations”, J. Comp. Phys., **301**, 111 (2015)
10. J. Höller, E. Krotscheck, R. E. Zillich: “Mg and Na clusters in a helium matrix”, Eur. Phys. J. D **69**, 198 (2015)
11. J. Höller, E. Krotscheck, R. E. Zillich: “Superfluidity of helium-4 around a Mg_{11} cluster”, Eur. Phys. J. D **68**, 372 (2014)
12. L. Vranješ Markić, P. Stipanović, I. Bešlić, R. E. Zillich: “ ^4He clusters adsorbed on graphene”, Phys. Rev. B, **88**, 125416 (2013)
13. D. Hufnagl, R. E. Zillich: “Stability and excitations of a bilayer of strongly correlated dipolar bosons”, Phys. Rev. A, **87**, 033624 (2013)
14. A. Macia, D. Hufnagl, F. Mazzanti, J. Boronat, R. E. Zillich: “Excitations and Stripe Phase Formation in a 2D Dipolar Bose Gas with Tilted Polarization”, Phys. Rev. Lett., **109**, 235307 (2012)
15. D. Hufnagl, R. Kaltseis, V. Apaja, and R. E. Zillich: “Roton-roton crossover in strongly correlated dipolar Bose-Einstein condensates”, Phys. Rev. Lett. **107**, 065303 (2011)
16. B. P. Abolins, R. E. Zillich, and K. B. Whaley: “A Ground State Monte Carlo Approach for Study of Dipolar Systems with Rotational Degrees of Freedom”, J. of Low Temp. Phys., **165**, 249 (2011)
17. J. Egger, E. Krotscheck, R. E. Zillich: “Bose and Fermi Gases with Lennard-Jones Interactions”, J. of Low Temp. Phys., **165**, 275 (2011)
18. R. E. Zillich and K. B. Whaley: “Homogeneous Bose Gas of Dipolar Molecules in the Mean Field Approximation”, Phys. Chem. Chem. Phys. **13**, 18835 (2011)
19. A. Macia, F. Mazzanti, J. Boronat, and R. E. Zillich: “Microscopic description of anisotropic low-density dipolar Bose gases in two dimensions”, Phys. Rev. A **84**, 033625 (2011)
20. G. Guillon, A. Zanchet, M. Leino, A. Viel, and R. E. Zillich: “Theoretical study of Rb_2 in He_n : potential energy surface and Monte Carlo simulations”, J. Phys. Chem. A **115**, 6918 (2011)

21. M. Leino, A. Viel, and R. E. Zillich: "Electronically excited rubidium atom in helium clusters and films. II. Second excited state and absorption spectrum", *J. Chem. Phys.* **134**, 024316 (2011)
22. R. E. Zillich, J. M. Mayrhofer, and S. A. Chin: "Extrapolated High-Order Propagators for Path Integral Monte Carlo Simulations", *J. Chem. Phys.* **132**, 044103 (2010)
23. R. E. Zillich and K. B. Whaley: "Rotational spectra of methane in helium", *J. Chem. Phys.* **132**, 174501 (2010)
24. D. Hufnagl, E. Krotscheck, and R. E. Zillich: "Polarized dipolar Bose gas with strong interactions", *J. of Low Temp. Phys.* **158**, 85 (2010)
25. F. Mazzanti, R. E. Zillich, G. E. Astrakharchik, and J. Boronat: "Dynamics of a two-dimensional system of dipoles", *Phys. Rev. Lett.* **102**, 110405 (2009)
26. M. Leino, A. Viel, and R. E. Zillich: "Electronically excited rubidium atom in helium clusters and films", *J. Chem. Phys.* **129**, 184308 (2008)
27. R. E. Zillich and K. B. Whaley: "Rotational Spectra in Helium-4 Clusters and Droplets: Size Dependence and Rotational Linewidth", *Recent Progress in Many-Body Theories*, J. Boronat, G. E. Astrakharchik, F. Mazzanti (eds.), World Scientific Publ. (2008)
28. E. Krotscheck and R. E. Zillich: "Hydrogen and ^3He Atoms on ^4He Surfaces: Bound states and scattering features", *Phys. Rev. B* **77**, 094507 (2008)
29. R. E. Zillich, K. B. Whaley, and K. van Haeften: "Line shape of rotational spectrum of CO in ^4He droplets", *J. Chem. Phys.* **128**, 094303 (2008)
30. R. E. Zillich and K. B. Whaley: "Solvation structure and rotational dynamics of LiH in ^4He clusters", *J. Phys. Chem. A* **111**, 7489 (2007)
31. H. M. Böhm, V. Apaja, E. Krotscheck, and R. E. Zillich: "Quantum Reflection, Evaporation, and Transport Currents in ^4He ", *J. of Low Temp. Phys.* **148**, 115 (2007)
32. E. Krotscheck and R. E. Zillich: "Dynamics of atom scattering from ^4He nanoclusters", *EPJ D* **43**, 113 (2007)
33. V. Apaja, E. Krotscheck, A. Rimnac, and R. E. Zillich: "Quantum Reflection, Evaporation, and Transport Currents in ^4He ", *Recent progress in many-body theories*, S. Hernandez and H. Cataldo (eds.), World Scientific, Singapore (2007)
34. K. van Haeften, S. Rudolph, I. Simanovski, M. Havenith, R. E. Zillich, and K. B. Whaley: "Spectroscopy of CO isotopomers in ^4He droplets", *Phys. Rev. B* **73**, 054502 (2006)
35. V. Apaja, E. Krotscheck, A. Rimnac, and R. E. Zillich: "Quantum reflection, evaporation, and transport currents at ^4He surfaces", *Int. J. Mod. Phys. B* **20**, 5047 (2006)
36. R. E. Zillich, F. Paesani, Y. Kwon, and K. B. Whaley: "Path integral methods for rotating molecules in superfluids", *J. Chem. Phys.* **123**, 114301 (2005)
37. F. Paesani, R. E. Zillich, Y. Kwon, and K. B. Whaley: "OCS in para-hydrogen clusters: Rotational dynamics and superfluidity", *J. Chem. Phys.* **122**, 181106 (2005)
38. R. E. Zillich, Y. Kwon, and K. B. Whaley: "Roton-Rotation Coupling of Acetylene in ^4He ", *Phys. Rev. Lett.* **93**, 250401 (2004)
39. R. E. Zillich and K. B. Whaley: "Quantum Rotation of HCN and DCN in ^4He ", *Phys. Rev. B* **69**, 104517 (2004)
40. F. Paesani, R. E. Zillich, and K. B. Whaley: "OCS in small para-hydrogen clusters: Energetics and structure with $N = 1 - 8$ complexed hydrogen molecules", *J. Chem. Phys.* **119**, 11682 (2003)
41. R. E. Zillich and K. B. Whaley: "Comparison of rotational energies and rigidity of OCS-paraH₂ and OCS- ^4He complexes", *Chem. Phys.* **295**, 275 (2003)

42. E. Krotscheck, V. Apaja, A. Rimnac, and R. Zillich: “Quantum liquids in confinement: the microscopic view”, *J. Phys. Cond. Mat.* **15**, S95 (2003)
43. E. Krotscheck and R. Zillich: “Dynamics of He-4 droplets”, *J. Chem. Phys.* **115**, 10161–10174 (2001)
44. E. Krotscheck, M. D. Miller, and R. Zillich: “Dynamics of Helium in restricted geometries”, *Physica B* **280**, 59 (2000)
45. R. Zillich and E. Krotscheck: “Elastic and Inelastic Scattering off ^4He Droplets”, *Physica B* **284–288**, 154 (2000)
46. R. Zillich and E. Krotscheck: “Atom and Neutron Scattering at ^4He Droplets”, *J. de Physique IV* **10**, 173 (2000)
47. S. Kilic, E. Krotscheck, and R. Zillich: “Binding of Two Helium Atoms in Confined Geometries”, *J. of Low Temp. Phys.* **116**, 245 (1999)
48. E. Krotscheck and R. Zillich: “Atom Scattering from Helium Droplets”, G. S. Anagnostatos (ed.), 23rd Workshop on Condensed Matter Theories 1999, Nova Science Publishers (2000)
49. K. Schörkhuber, E. Krotscheck, J. Paaso, M. Saarela, and R. Zillich: “Fermi Liquid Properties of ^3He - ^4He Mixtures”, D. J. Ernst (ed.), 22nd Workshop on Condensed Matter Theories 1998, Nova Science Publishers (2000)
50. E. Krotscheck and R. Zillich: “Scattering of ^3He Atoms from ^4He Surfaces”, *Phys. Rev. B* **58**, 5707 (1998)
51. E. Krotscheck, M. Saarela, K. Schörkhuber, and R. Zillich: “Concentration Dependence of the Effective Mass of He3 Atoms in ^3He - ^4He Mixtures”, *Phys. Rev. Lett* **80**, 4709 (1998)
52. E. Krotscheck, J. Paaso, M. Saarela, K. Schörkhuber, and R. Zillich: “Single Particle and Fermi Liquid Properties of ^3He - ^4He Mixtures”, *Phys. Rev. B* **58**, 12282 (1998)
53. M. Saarela, E. Krotscheck, J. Paaso, K. Schörkhuber, and R. Zillich: “Fermi Liquid Properties of ^3He - ^4He Mixtures”, *J. of Low Temp. Phys.* **113**, 993 (1998)
54. E. Krotscheck and R. Zillich: “Scattering of ^3He and ^4He atoms from ^4He clusters”, *J. of Low Temp. Phys.* **113**, 387 (1998)