Mathieu LEWIN

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Born on November 14th, 1977, in Senlis, France

Positions

Oct. 2014 –	CNRS position (Directeur de Recherche) CEREMADE, Université Paris-Dauphine
Sept. 2017 –	Part-time Professor École Polyechnique, Palaiseau
Oct. 2005 – Sept. 2014	CNRS position (Chargé de Recherche) Mathematics Department, Université de Cergy-Pontoise
Mar. 2005 – Aug. 2005	Post-doc INRIA CERMICS, École Nationale des Ponts et Chaussées, with Éric Cancès
Aug. 2004 – Feb. 2005	EU Post-doc University of Copenhagen (Denmark), with Jan Philip Solovej

Education and Qualifications

June 2009	Habilitation à diriger des recherches, Université de Cergy-Pontoise
June 2004	Ph.D. with Éric Séré, Université Paris Dauphine
Sept. 1998 – Aug. 2002	Student of the École Normale Supérieure de Cachan

Honors and Awards

2017 – 2022	Consolidator Grant of the European Research Council (ERC)
2015	Plenary speaker at the International Congress of Mathematical Physics
2012	EMS Prize
2010 – 2015	Starting Grant of the European Research Council (ERC)

Editorial Activities

2014 – Editor for *Letters in Mathematical Physics*
2013 – Editor for *Mathematical Models and Methods in Applied Sciences (M3AS)*

Duties

July 2015 –	Elected member of the Administration Council of the French Association of Applied and Industrial Mathematics (SMAI)
Jan. 2015 –	Elected member of the Executive Committee of the International Association of Mathematical Physics (IAMP)
Oct. 2014 –	Scientific Manager for Interdisciplinarity at the CNRS Institute of Mathematics
2010 – 2014	Elected member of the Administration Council of the *Institut Henri Poincaré*
2010 – 2014	Local representative at Cergy of the SMF and SMAI
2008 – 2017	Local representative of the french network on "Quantum Dynamics" (webpage)

Committees & other duties

2015 & 2016 Member of the mathematics & computer science committee of the French National Research Agency (ANR)

2015 & 2016 President of the hiring committee for assistant professor positions in Analysis at the university of Paris-Dauphine

Networks & Grants

2017 – 2022 PI of the ERC Consolidator Grant *Mathematics of Density Functional Theory*, H2020 no. 725528.

2010 – 2015 PI of the ERC Strarting Grant *Mathematics and Numerics of Infinite Quantum Systems*, FP7/2007–2013 no. 258023.

2010 – 2014 Coordinator of the ANR project *NoNAP* (Nonlinear Methods in Atomic and Nuclear Physics)

2010 – 2011 Grant PHC-Alliance obtained in collaboration with Lyonell Boulton (Heriot Watt University, Scotland)

2005 – 2009 Member of the ANR project *ACCQUAREL* (Computational Approaches in Relativistic Quantum Chemistry)

Students

Post-Docs

Luca Nenna, Sept. 2017 – Aug. 2019

Faizan Nazar, Jan. 2017 – Aug. 2019

Jonas Lampart, Jan. 2014 – Sept. 2016

Simona Rota-Nodari, Oct. 2012 – Sept. 2013

Phan Thành Nam, Oct. 2011 – Sept. 2013

Nicolas Rougerie, Dec. 2010 – Sept. 2011

Marco Ghimenti, 2007

Guillaume Legendre (with É. Séré), Nov. 2006 – Aug. 2007

PhD students

Louis Garrigue, Sept. 2017 –

Arnaud Triay-Alcouffe, Sept. 2015 –

Raphaël Ducatez, Sept. 2015 –

Julien Ricaud, Oct. 2012 – June 2017

Salma Lahbabi, with Éric Cancès, Oct. 2010 – July 2013

Julien Sabin, Sept. 2010 – Dec. 2013

Séverine Paul, Sept. 2008 – Oct. 2012

Co-advisor of Amélie Deleurence (PhD with Éric Cancès), Sept. 2005 – Dec. 2008

Master & others

Louis Garrigue, summer 2017 (ENS)

Raphaël Ducatez, summer 2015 (ENS)

Arnaud Triay, summers 2013, 2014 & 2015 (ENS Lyon)

Thomas Dumas, summer 2013 (master Cergy)

Julien Ricaud, summer 2012 (master Paris 6)

Julien Sabin, summers 2008 & 2009 (ENS Lyon & master Dauphine)

Recent Teaching Activities

Courses

2016 – 2019	Various courses in Analysis, École Polytechnique
2007 – 2017	Master course in Mathematical Physics (with Éric Cancès), Univ. Paris Pierre & Marie Curie, `web`
2017	Master course in Mathematical Physics, Univ. Pierre & Marie Curie, `web`
2014 & 2015	Short Analysis course, École Normale Supérieure
2006 – 2016	PDE & Optimization (with Frédéric Legoll), École des Ponts - Paris Tech, `web`

Lectures for young researchers

July 2017	*An introduction to critical point theory, with applications to quantum mechanics* (6h), Summerschool on *Current topics in Mathematical Physics*, Univ. Zürich, Switzerland
2016	Graduate Analysis Course, Université Paris-Dauphine
June 2015	Lecture at IHES (in French) on *Nonlinear Gibbs measures and their derivation from quantum mechanics*, can be seen on `youtube`
Feb. 2015	*Open quantum systems and effective equations* (6h), Winterschool, Research Training Group 1838 on *Spectral Theory and Dynamics of Quantum Systems* (Univ. Stuttgart & Tübingen), Freudenstadt, Germany
July 2013	*Mathematical foundations of quantum mechanics* (4h), Summerschool "Mathématiques – Chimie – Calcul Haute Performance", Institut du Calcul et de la Simulation (Univ. P. & M. Curie), Roscoff, France
Jan. 2012	*Nonlinear equations with fractional powers of the Laplacian and applications to quantum mechanics* (8h with Enno Lenzmann), Università di Pisa, Italy
Aug. 2011	*Geometric methods for nonlinear many-body quantum systems* (4h), Summerschool on *Current topics in Mathematical Physics*, Erwin Schrödinger Institute, Vienna, Austria

Organization of events

Long Programs

15 Apr. – 13 July 2013	(with Maria J. Esteban) Thematic Trimester *Variational and Spectral Methods in Quantum Mechanics*, Institut Henri Poincaré, `web`
2008	Coordinator of the semester *Systèmes Quantiques, Systèmes Complexes*, Université de Cergy-Pontoise

Conferences

30 June – 4 July 2014	(with R. L. Frank), Conference *Effective Equations in Mathematical Physics*, Mittag Leffler Institute, Stockholm, Sweden
14 – 18 Apr. 2014	(with P. D'Ancona, M.J. Esteban, L. Fanelli, L. Vega & N. Visciglia), Conference *Analysis of Relativistic and Non-Relativistic models in Quantum Mechanics*, La Sapienza, Roma, Italy
6 – 10 Aug. 2012	(with M. Griesemer) Session *Quantum many-body theory and condensed matter physics*, International Congress on Mathematical Physics, Ålborg, Denmark
21 – 25 June 2010	(with É. Séré) Conference *Mathematical Aspects of Quantum Electrodynamics*, Institut Henri Poincaré, Paris, France
28 May 2009	Session *Applications to Quantum Chemistry*, Conference SCICADE 09, Beijing, China
21 – 25 Apr. 2008	Conference *Quantum Statistical Physics and Information Theory*, Université de Cergy-Pontoise
31 Jan. – 1 Feb. 2008	(with F. Germinet & L. Bruneau) Conference *Spectral Problems in Quantum Mechanics*, Université de Cergy-Pontoise
July 2007	(with G. Turinici) Session *Computational issues in Relativistic Quantum Chemistry*, ICIAM, Zurich, Switzerland
3 – 6 Sept. 2006	(with J.M. Barbaroux, F. Dunlop, F. Germinet, P. Hislop & F. Klopp) Conference *Transport and Spectral Problems in Quantum Mechanics* in honor of Jean-Michel Combes, Université de Cergy-Pontoise

Schools

3 Aug. – 7 Aug. 2015	(with C. Hainzl, R. Seiringer, E. Stockmeyer, J. Tan & R. Tiedra), Summerschool *Current topics in Mathematical Physics*, Federico Santa María Technical University, Viña del Mar, Chile
2 – 7 Sept. 2013	(with M.J. Esteban & R. Seiringer), Summerschool *Current topics in Mathematical Physics*, CIRM Marseille, France

Seminars

2017 –	Co-organizer of the working group in Analysis and Probability, with Laure Dumaz
2014 –	Co-organizer of the monthly seminar on "Spectral Problems" of the GDR Quantum Dynamics, Institut Henri Poincaré
2005 – 2014	Co-organizer of the Mathematical Physics seminar, Université de Cergy-Pontoise

Others activities

2016–17	Talks about ERC grants in mathematics at the Polish Academy of Science (2016), for a training of CNRS managers (2017) and at the celebration of the 10 years anniversary of ERC at CNRS, with EU13 countries (2017), `webpage`
2014	Member of a communication team at CNRS about the year of cristallography

PUBLICATIONS

Preprints

[1] M. Lewin, P. T. Nam, and N. Rougerie. Blow-up profile of rotating 2D focusing Bose gases. *ArXiv preprint*, 2018. arXiv:1802.01854.

[2] M. Lewin. Semi-classical limit of the Levy-Lieb functional in Density Functional Theory. *ArXiv e-prints*, 2017. arXiv:1706.02199.

[3] M. Lewin, P. Nam, and N. Rougerie. Gibbs measures based on 1D (an)harmonic oscillators as mean-field limits. *ArXiv e-prints*, 2017. arXiv:1703.09422.

[4] M. Lewin, P. Nam, and N. Rougerie. Bose Gases at Positive Temperature and Non-Linear Gibbs Measures. In *Proceedings of the International Congress of Mathematical Physics*, 2015. ArXiv e-prints. arXiv:1602.05166.

[5] M. Lewin. Mean-field limit of Bose systems: rigorous results. In *Proceedings of the International Congress of Mathematical Physics*, 2015. ArXiv e-prints. arXiv:1510.04407.

[6] S. Fournais, M. Lewin, and J. P. Solovej. The semi-classical limit of large fermionic systems. *ArXiv e-prints*, 2015. arXiv:1510.01124.

Published or Accepted Articles

[1] M. Lewin, E. H. Lieb, and R. Seiringer. Statistical Mechanics of the Uniform Electron Gas. *J. Éc. polytech. Math.*, 5: 79–116, 2018. arXiv:1705.10676.

[2] M. Lewin. Existence of Hartree-Fock excited states for atoms and molecules. *Lett. Math. Phys.*, online first, 2017. arXiv:1708.00287, DOI.

[3] M. J. Esteban, M. Lewin, and E. Séré. Domains for Dirac-Coulomb min-max levels. *Rev. Mat. Iberoam.*, in press, 2017. arXiv:1702.04976.

[4] P. Gravejat, M. Lewin, and É. Séré. Derivation of the magnetic Euler-Heisenberg energy. *J. Math. Pures Appl.*, in press, 2017. arXiv:1602.04047, DOI.

[5] M. Lewin, P. Thành Nam, and N. Rougerie. A note on 2D focusing many-boson systems. *Proc. Amer. Math. Soc.*, 145(6): 2441–2454, June 2017. arXiv:1509.09045, DOI.

[6] S. Fournais, J. Lampart, M. Lewin, and T. Østergaard Sørensen. Coulomb potentials and Taylor expansions in Time-Dependent Density Functional Theory. *Phys. Rev. A*, 93(6): 062510, June 2016. arXiv:1603.02219, DOI.

[7] J. Lampart and M. Lewin. Semi-classical Dirac vacuum polarisation in a scalar field. *Ann. Henri Poincaré*, 17(8): 1937–1954, 2016. arXiv:1506.00895, DOI.

[8] M. Lewin, P. T. Nam, and N. Rougerie. The mean-field approximation and the non-linear Schrödinger functional for trapped Bose gases. *Trans. Amer. Math. Soc*, 368(9): 6131–6157, 2016. arXiv:1405.3220, DOI.

[9] X. Blanc and M. Lewin. The Crystallization Conjecture: A Review. *EMS Surv. Math. Sci.*, 2(2): 219–306, 2015. arXiv:1504.01153, DOI.

[10] J. Lampart and M. Lewin. A many-body RAGE theorem. *Comm. Math. Phys.*, 340(3): 1171–1186, 2015. arXiv:1503.00496, DOI.

[11] M. Lewin, P. T. Nam, and N. Rougerie. Derivation of nonlinear Gibbs measures from many-body quantum mechanics. *J. Éc. polytech. Math.*, 2: 65–115, 2015. arXiv:1410.0335, DOI.

[12] M. Lewin and E. H. Lieb. Improved Lieb-Oxford exchange-correlation inequality with gradient correction. *Phys. Rev. A*, 91(2): 022507, 2015. arXiv:1408.3358, DOI.

[13] M. Lewin and S. Rota Nodari. Uniqueness and non-degeneracy for a nuclear nonlinear Schrödinger equation. *NoDEA Nonlinear Differential Equations Appl.*, 22(4): 673–698, 2015. arXiv:1405.1165, DOI.

[14] M. Lewin, P. T. Nam, and N. Rougerie. Remarks on the quantum de Finetti theorem for bosonic systems. *Appl. Math. Res. Express (AMRX)*, 2015(1): 48–63, 2015. arXiv:1310.2200, DOI.

[15] M. Lewin and J. Sabin. The Hartree equation for infinitely many particles. I. Well-posedness theory. *Comm. Math. Phys.*, 334(1): 117–170, 2015. arXiv:1310.0603, DOI.

[16] M. Lewin, P. T. Nam, and B. Schlein. Fluctuations around Hartree states in the mean-field regime. *Amer. J. Math.*, 137(6): 1613–1650, dec 2015. arXiv:1307.0665, DOI.

[17] M. Lewin, P. T. Nam, S. Serfaty, and J. P. Solovej. Bogoliubov spectrum of interacting Bose gases. *Comm. Pure Appl. Math.*, 68(3): 413–471, march 2015. arXiv:1211.2778, DOI.

[18] M. Lewin and J. Sabin. The Hartree equation for infinitely many particles. II. Dispersion and scattering in 2D. *Analysis & PDE*, 7(6): 1339–1363, 2014. arXiv:1310.0604, DOI.

[19] M. Lewin and J. Sabin. A family of monotone quantum relative entropies. *Lett. Math. Phys.*, 104(6): 691–705, 2014. arXiv:1309.4046, DOI.

[20] R. L. Frank, M. Lewin, E. H. Lieb, and R. Seiringer. Strichartz inequality for orthonormal functions. *J. Eur. Math. Soc. (JEMS)*, 16: 1507–1526, 2014. arXiv:1306.1309, DOI.

[21] M. Lewin, P. T. Nam, and N. Rougerie. Derivation of Hartree's theory for generic mean-field Bose systems. *Adv. Math.*, 254: 570–621, March 2014. arXiv:1303.0981, DOI.

[22] M. Lewin and S. Paul. A Numerical Perspective on Hartree-Fock-Bogoliubov Theory. *ESAIM: M2AN*, 48(1): 53–86, 2014. arXiv:1206.6081, DOI.

[23] E. Lenzmann and M. Lewin. Dynamical ionization bounds for atoms. *Analysis & PDE*, 6(5): 1183–1211, 2013. arXiv:1207.6898, DOI.

[24] P. Gravejat, C. Hainzl, M. Lewin, and E. Séré. Construction of the Pauli-Villars-regulated Dirac vacuum in electromagnetic fields. *Arch. Rat. Mech. Anal.*, 208(2): 603–665, May 2013. arXiv:1204.2893, DOI.

[25] É. Cancès, S. Lahbabi, and M. Lewin. Mean-field models for disordered crystals. *J. Math. Pures Appl.*, 100(2): 241–274, 2013. arXiv:1203.0402, DOI.

[26] M. Lewin and N. Rougerie. On the binding of polarons in a mean-field quantum crystal. *ESAIM Control Optim. Calc. Var.*, 19(3): 629–656, July 2013. arXiv:1202.5103, DOI.

[27] M. Lewin and N. Rougerie. Derivation of Pekar's Polarons from a Microscopic Model of Quantum Crystals. *SIAM J. Math. Anal.*, 45(3): 1267–1301, 2013. arXiv:1108.5931, DOI.

[28] C. Hainzl, M. Lewin, and C. Sparber. Ground state properties of graphene in Hartree-Fock theory. *J. Math. Phys.*, 53: 095220, 2012. Special issue in honor of E.H. Lieb's 80th birthday. arXiv:1203.5016, DOI.

[29] X. Blanc and M. Lewin. Existence of the thermodynamic limit for disordered quantum Coulomb systems. *J. Math. Phys.*, 53: 095209, 2012. Special issue in honor of E.H. Lieb's 80th birthday. arXiv:1201.4670, DOI.

[30] M. Lewin. Comment on 'Solutions to quasi-relativistic multi-configurative Hartree-Fock equations in quantum chemistry', by C. Argaez and M. Melgaard. *Nonlinear Analysis: Theory, Methods & Applications*, 75: 2988–2991, 2012. arXiv:1111.4491, DOI.

[31] R. L. Frank, M. Lewin, E. H. Lieb, and R. Seiringer. A positive density analogue of the Lieb-Thirring inequality. *Duke Math. J.*, 162(3): 435–495, 2012. arXiv:1108.4246, DOI.

[32] L. Boulton, N. Boussaid, and M. Lewin. Generalised Weyl theorems and spectral pollution in the Galerkin method. *J. Spect. Theory*, 2(4): 329–354, 2012. arXiv:1011.3634, DOI.

[33] E. Lenzmann and M. Lewin. On singularity formation for the L^2-critical Boson star equation. *Nonlinearity*, 24(12): 3515, 2011. arXiv:1103.3140, DOI.

[34] R. L. Frank, M. Lewin, E. H. Lieb, and R. Seiringer. Energy Cost to Make a Hole in the Fermi Sea. *Phys. Rev. Lett.*, 106(15): 150402, Apr 2011. arXiv:1102.1414, DOI.

[35] M. Lewin. Geometric methods for nonlinear many-body quantum systems. *J. Funct. Anal.*, 260: 3535–3595, 2011. arXiv:1009.2836, DOI.

[36] P. Gravejat, M. Lewin, and É. Séré. Renormalization and asymptotic expansion of Dirac's polarized vacuum. *Commun. Math. Phys.*, 306(1): 1–33, 2011. arXiv:1004.1734, DOI.

[37] M. J. Esteban, M. Lewin, and A. Savin. Symmetry breaking of relativistic multiconfiguration methods in the nonrelativistic limit. *Nonlinearity*, 23: 767–791, 2010. arXiv:0910.3932, DOI.

[38] C. Hainzl, E. Lenzmann, M. Lewin, and B. Schlein. On blowup for time-dependent generalized Hartree-Fock equations. *Ann. Henri Poincaré*, 11(6): 1023–1052, 2010. arXiv:0909.3043, DOI.

[39] É. Cancès and M. Lewin. The dielectric permittivity of crystals in the reduced Hartree-Fock approximation. *Arch. Ration. Mech. Anal.*, 197(1): 139–177, 2010. arXiv:0903.1944, DOI.

[40] M. Lewin and É. Séré. Spectral pollution and how to avoid it (with applications to Dirac and periodic Schrödinger operators). *Proc. London Math. Soc.*, 100(3): 864–900, 2010. arXiv:0812.2153, DOI.

[41] E. Lenzmann and M. Lewin. Minimizers for the Hartree-Fock-Bogoliubov theory of neutron stars and white dwarfs. *Duke Math. J.*, 152(2): 257–315, 2010. arXiv:0809.2560, DOI.

[42] C. Hainzl, M. Lewin, and É. Séré. Existence of atoms and molecules in the mean-field approximation of no-photon quantum electrodynamics. *Arch. Ration. Mech. Anal.*, 192(3): 453–499, 2009. arXiv:math-ph/0606001, DOI.

[43] M. Lewin and R. Seiringer. Strongly correlated phases in rapidly rotating Bose gases. *J. Stat. Phys.*, 137(5-6): 1040–1062, Dec 2009. arXiv:0906.0741, DOI.

[44] C. Hainzl, M. Lewin, and J. P. Solovej. The thermodynamic limit of quantum Coulomb systems. Part II. Applications. *Advances in Math.*, 221: 488–546, 2009. arXiv:0806.1709, DOI.

[45] C. Hainzl, M. Lewin, and J. P. Solovej. The thermodynamic limit of quantum Coulomb systems. Part I. General theory. *Advances in Math.*, 221: 454–487, 2009. arXiv:0806.1708, DOI.

[46] M. Ghimenti and M. Lewin. Properties of periodic Hartree-Fock minimizers. *Calc. Var. Partial Differential Equations*, 35(1): 39–56, 2009. arXiv:0803.3269, DOI.

[47] P. Gravejat, M. Lewin, and É. Séré. Ground state and charge renormalization in a nonlinear model of relativistic atoms. *Commun. Math. Phys.*, 286(1): 179–215, 2009. arXiv:0712.2911, DOI.

[48] J. Dolbeault, P. Felmer, and M. Lewin. Stability of the Hartree-Fock model with temperature. *Math. Models Methods Appl. Sci.*, 19(3): 347–367, 2009. DOI.

[49] É. Cancès, A. Deleurence, and M. Lewin. A new approach to the modelling of local defects in crystals: the reduced Hartree-Fock case. *Commun. Math. Phys.*, 281(1): 129–177, 2008. arXiv:math-ph/0702071, DOI.

[50] C. Hainzl, M. Lewin, and R. Seiringer. A nonlinear model for relativistic electrons at positive temperature. *Rev. Math. Phys.*, 20(10): 1283 –1307, 2008. arXiv:0802.4054, DOI.

[51] M. J. Esteban, M. Lewin, and É. Séré. Variational methods in relativistic quantum mechanics. *Bull. Amer. Math. Soc. (N.S.)*, 45(4): 535–593, 2008. arXiv:0706.3309, DOI.

[52] É. Cancès, A. Deleurence, and M. Lewin. Non-perturbative embedding of local defects in crystalline materials. *J. Phys.: Condens. Matter*, 20: 294213, 2008. arXiv:0706.0794, DOI.

[53] C. Hainzl, M. Lewin, and J. P. Solovej. The mean-field approximation in quantum electrodynamics: the no-photon case. *Comm. Pure Appl. Math.*, 60(4): 546–596, 2007. arXiv:math-ph/0503075, DOI.

[54] C. Hainzl, M. Lewin, É. Séré, and J. P. Solovej. A minimization method for relativistic electrons in a mean-field approximation of quantum electrodynamics. *Phys. Rev. A*, 76: 052104, 2007. arXiv:0706.1486, DOI.

[55] É. Cancès, M. Lewin, and G. Stoltz. The electronic ground-state energy problem: a new reduced density matrix approach. *J. Chem. Phys.*, 125(6): 64101, 2006. arXiv:quant-ph/0602042, DOI.

[56] M. Lewin. Solution of a mountain pass problem for the isomerization of a molecule with one free atom. *Ann. Henri Poincaré*, 7(2): 365–379, 2006. DOI.

[57] É. Cancès, H. Galicher, and M. Lewin. Computing electronic structures: a new multiconfiguration approach for excited states. *J. Comput. Phys.*, 212(1): 73–98, 2006. DOI.

[58] C. Hainzl, M. Lewin, and É. Séré. Self-consistent solution for the polarized vacuum in a no-photon QED model. *J. Phys. A*, 38(20): 4483–4499, 2005. arXiv:physics/0404047, DOI.

[59] C. Hainzl, M. Lewin, and C. Sparber. Existence of global-in-time solutions to a generalized Dirac-Fock type evolution equation. *Lett. Math. Phys.*, 72(2): 99–113, 2005. arXiv:math-ph/0412018, DOI.

[60] C. Hainzl, M. Lewin, and É. Séré. Existence of a stable polarized vacuum in the Bogoliubov-Dirac-Fock approximation. *Commun. Math. Phys.*, 257(3): 515–562, 2005. arXiv:math-ph/0403005, DOI.

[61] M. Lewin. Solutions of the multiconfiguration equations in quantum chemistry. *Arch. Ration. Mech. Anal.*, 171(1): 83–114, 2004. DOI.

[62] M. Lewin. A mountain pass for reacting molecules. *Ann. Henri Poincaré*, 5(3): 477–521, 2004. DOI.

[63] M. Lewin. The multiconfiguration methods in quantum chemistry: Palais-Smale condition and existence of minimizers. *C. R. Math. Acad. Sci. Paris*, 334(4): 299–304, 2002. DOI.

Book Chapters

[1] M. Lewin and É. Séré. *Many-Electron Approaches in Physics, Chemistry and Mathematics*chapter Spurious Modes in Dirac Calculations and How to Avoid Them, 31–52. Mathematical Physics Studies. Springer International Publishing, 2014. arXiv:1306.5401, DOI.

Proceedings

[1] P. Gravejat, C. Hainzl, M. Lewin, and E. Séré. Deux modèles effectifs pour les champs électromagnétiques dans le vide de Dirac. In *Séminaire Laurent Schwartz – EDP et applications* Exp. no. 14, 2015-2016.

[2] M. Lewin. A nonlinear variational problem in relativistic quantum mechanics. In R. Latala, A. Rucinski, P. Strzelecki, J. Swiatkowski, D. Wrzosek, and P. Zakrzewski, editors, *Proceedings of the 6th European Congress of Mathematics, Krakow (Poland), July 2012*. EMS, 2014. arXiv:1209.2786.

[3] P. Gravejat, C. Hainzl, M. Lewin, and E. Séré. Two Hartree-Fock models for the vacuum polarization. In *Proceedings of the "Journées E.D.P.", June 4–8, 2012, Biarritz (France)*, 2012. arXiv:1209.6338.

[4] É. Cancès, S. Lahbabi, and M. Lewin. Mean-field electronic structure models for disordered materials. In A. Jensen, editor, *XVIIth International Congress on Mathematical Physics* 549–557. World Sci. Publ., 2012. arXiv:1203.0402, DOI.

[5] M. Lewin. Gaz de bosons dans le régime de champ moyen : les théories de Hartree et Bogoliubov. In *Séminaire Laurent Schwartz – EDP et applications*. IHÉS, 2012-2013. Exp. no 3. DOI.

[6] É. Cancès, M. Lewin, and G. Stoltz. The microscopic origin of the macroscopic dielectric permittivity of crystals: A mathematical viewpoint. In B. Engquist, O. Runborg, and Y. Tsai, editors, *Numerical Analysis of Multiscale Computations*, volume 82 of *Lecture Notes in Computational Science and Engineering* 87–125. Springer, 2011. Proceedings of a Winter Workshop at the Banff International Research Station 2009. arXiv:1010.3494, DOI.

[7] M. Lewin. Renormalization of Dirac's polarized vacuum. In P. Exner, editor, *Mathematical Results In Quantum Physics* 45–59. World Scientific Publishing, 2011. Proceedings of the QMath 11 Conference, Hradec Kralove, Czech Republic, 6 –10 September 2010. arXiv:1010.0075.

[8] M. Lewin. How much energy does it cost to make a hole in the fermi sea? *Oberwolfach Reports*, 8(2): 1790–1793, 2011. Workshop "Mathematical Methods in Quantum Chemistry".

[9] M. Lewin. Sur l'effondrement dynamique des étoiles quantiques pseudo-relativistes. In *Séminaire Laurent Schwartz*. École Polytechnique, April 2011. DOI.

[10] C. Hainzl, M. Lewin, and J. P. Solovej. The thermodynamic limit of quantum Coulomb systems: A new approach. In I. Beltita, G. Nenciu, and R. Purice, editors, *Mathematical results in Quantum Mechanics: Proceedings of the QMath10 Conference*. World Scientific, 2008. arXiv:0806.2436, DOI.

[11] M. Lewin. On the computation of excited states with MCSCF methods. *J. Math. Chem.*, 44(4): 967–980, 2008. Conference "Mathematical Methods for Ab Initio Quantum Chemistry", Nice (FRANCE), Nov. 2005. DOI.

[12] M. Lewin. The thermodynamic limit of Quantum Coulomb Systems. *Oberwolfach Reports*, 4(1): 399–400, 2007. Workshop "Multiscale and Variational Methods in Material Science and Quantum Theory of Solids".

[13] M. Lewin. On the computation of excited states with MCSCF methods. *Oberwolfach Reports*, 3(4): 2833–2836, 2006. Workshop "Mathematical and Numerical Aspects of Quantum Chemistry Problems".

[14] M. Lewin. Solutions of the multiconfiguration equations in quantum chemistry. *Oberwolfach Reports*, 1(3): 1541–1586, 2005. Workshop "Calculus of variations" June, 2004.

General Audience Articles

[1] M. Lewin. Bretzels, bagels, donuts et... topologie. CNRS Le Journal, 2017.

[2] M. Lewin. Limite de champ moyen et condensation de Bose-Einstein. *Gazette des Mathématiciens*, 139: 35–49, Jan 2014. Société Mathématique de France.

[3] M. Lewin. Des cristaux et des maths. CNRS Le Journal, 2014.

Thesis

[1] M. Lewin. Large Quantum Systems: a Mathematical and Numerical Perspective. Habilitation à Diriger des Recherches, University of Cergy-Pontoise, June 2009.

[2] M. Lewin. *Some nonlinear models in Quantum Mechanics*. PhD thesis, University of Paris-Dauphine, June 2004.

Others

[1] M. Lewin. Éléments de théorie spectrale : le Laplacien sur un ouvert borné. Notes de cours de Master 2, 2017.

[2] M. Lewin. Post-Hartree-Fock Methods and Excited States Modeling. Encyclopedia of Applied and Computational Mathematics, Springer-Verlag, 2012.

TALKS

International Conferences (selection)

2017	Sept.	Workshop on *Quantum Field Theory*, Oberwolfach, Germany
	Aug.	Conference on *Mathematical challenges in classical & quantum statistical mechanics*, Venice, Italy
	May	Workshop *Optimal Transport meets Density Functional Theory*, Jyväskylä, Finland
	Mar.	Workshop on *Macroscopic limits of quantum systems*, TU Munich, Germany
	Feb.	Conference *New trends in Mathematical Physics at the interface of Analysis and Probability*, London, UK
	Jan.	Workshop on *Applications of Optimal Transportation in the Natural Sciences*, Oberwolfach, Germany
2016	Dec.	Workshop on *Evolution Equations*, Valdivia, Chile
	Oct.	Workshop on *Synergies between Mathematical and Computational Approaches to Quantum Many-Body Physics*, ESI Vienna, Austria
	Sept.	Workshop on *Many-Body Quantum Systems and Effective Theories*, Oberwolfach, Germany
	Aug.	Conference on *Methods of Modern Mathematical Physics* (Young Researcher Symposium on the Occasion of the 70th Birthday of Barry Simon), Fields Insitute Toronto, Canada
	June	Conference on *New challenges in mathematical modelling and numerical simulation of superfluids*, CIRM Marseille, France
	June	Conference on *Spectral Theory and Mathematical Physics*, Univ. Cergy-Pontoise, France
	June	Conference on *Mathematical Many-Body Theory and its Applications*, BCAM, Bilbao, Spain
	May	Workshop on *Quantum Dynamics & Control*, Institut Henri Poincaré, Paris, France
	May	Symposium on *Trends in Mathematical Crystallisation*, Warwick University, UK
	Jan.	*Indo-French conference in Mathematics*, Chennai, India
2015	Oct.	Conférence "États de la recherche" on *Supraconductivity, superfluidity & Vortices*, IHP Paris, France
	July	Plenary speaker at the *International Congress of Mathematical Physics*, Santiago de Chile
	June	ANR Meeting on *Spectral and scattering theories in Quantum Field Theory*, Porquerolles, France
	June	Workshop on *Mathematical Methods in Quantum Molecular Dynamics*, Oberwolfach, Germany
	Apr.	Chemistry workshop on *Advances in electronic structure theory*, Jussieu, Paris, France
	Mar.	Séminaire *Monde Quantique*, I.H.E.S, France
	Feb.	Opening lecture of the *Mary Cartwright lecture* by Maria J. Esteban, London Mathematical Society, London, UK
	Jan.	*6th itinerant meeting in PDE*, SISSA, Trieste, Italy
2014	Oct.	*Spectral Theory* Workshop to celebrate the 70th birthday of Brian Davies, King's College London, UK
	Oct.	Conference on *Nonlinearity, Transport, Physics, and Patterns*, Fields Institute, Toronto, Canada
	Sept.	Conference *Scaling Limits and Effective Theories in Classical and Quantum Mechanics*, ESI Vienna, Austria
	Apr.	Conference *Theoretical and Numerical Aspects of Quantum Transport*, Ålborg, Denmark
	Mar.	Conference *Mathematical and Numerical Methods for Complex Quantum Systems*, Univ. Illinois Chicago, USA
	Mar.	Warwick EPSRC Symposium on *Statistical Mechanics: Many-Body Quantum Systems*, UK
2013	Oct.	Workshop on *Disordered Quantum Many-Body Systems*, Banff, Canada
	Oct.	Conference *Mathématiques pour le graphène*, Univ. Joseph Fourier, Grenoble, France
	Sept.	Conference *Analytical and quantum mechanical aspects of Schrodinger and Dirac operators*, Pisa, Italy
	June	Journées E.D.P., Biarritz, France

	May	Conference on *Conical Intersections in Mathematical Physics*, Institut Henri Poincaré, Paris
	May	Workshop on *Analytical Aspects of Mathematical Physics*, ETH Zürich, Switzerland
	Apr.	Workshop on *Numerical Challenges in Relativistic Quantum Chemistry*, Institut Henri Poincaré, Paris, France
	Apr.	*EMS Weekend*, session on *Partial Differential Equations and Applications*, Århus, Denmark
	Mar.	Conference *Analysis and Stochastics in Complex Physical Systems*, Leipzig, Germany
	Feb.	5th meeting of the GDR "Quantum Dynamics", Lille, France
2012	Oct.	Conference on *Recent Developments in the Mathematical Analysis of Large Systems*, Erwin Schrödinger Institute, Vienna, Austria
	Sept.	Conference on *New Perspectives in Nonlinear PDEs*, Rome, Italy
	Aug.	VMS–SMF Joint Congress, Session on PDE, Hue, Vietnam
	Aug.	Workshop on *New developments in relativistic quantum mechanics and applications*, Newton Institute, Cambridge, UK
	July	*Mathematics of Many-Particle Systems* (conference in honor of Elliott H. Lieb, on the occasion of his 80th birthday), Berlin, Germany
	July	*6th European Mathematical Congress* **(EMS Prize talk)**, Krakòw, Poland
	May	Workshop on *Mathematical and Numerical Analysis of Electronic Structure Models*, Beijing, China
	May	Workshop on *Quantum Many-Body Systems*, Montréal, Canada
	Apr.	*Spectral Days*, Munich, Germany
2011	Oct.	*EMS Week End*, session on *PDEs and applications to mechanics and physics*, Bilbao, Spain
	July	Thematic Minisymposia on *Quantum Modeling in Molecular Simulation* and on *Current interests in Mathematical Physics*, *International Congress on Industrial and Applied Mathematics* (ICIAM 2011), Vancouver, Canada
	July	Conference *Intellectual Challenges in Multiscale Modelling of Solids*, University of Oxford, UK
	June	Workshop *Mathematical Methods in Quantum Chemistry*, Oberwolfach, Germany
	Feb.	Fourth School and Workshop on *Mathematical Methods in Quantum Mechanics*. Bressanone, Italy
2010	Sept.	Conference on *New Approaches in Many-Electron Theory*, Max-Plank-Institut für Polymerforschung, Mainz, Germany
	Sept.	QMATH11 **(plenary speaker)**, Hradec Králové, Czech Republic
	Aug.	ICM 2010 Satellite Conference on *Quantum Systems*, Chennai, India
	June	Workshop on *Matter and Radiation*, Erwin Schrödinger Institute, Vienna, Austria
	May	*SIAM Conference on Mathematical Aspects of Material Sciences*, Session on *Electronic structure*, Philadelphia, USA
	Apr.	*2010 British Mathematical Colloquium* and *British Applied Mathematics Colloquium*, Session *Spectral Theory*, Edinburgh, Scotland
	Mar.	*Annual meeting of the German Math. Society (DMV)*, Session *Mathematical methods in quantum chemistry and electronic structure theory*, Munich, Germany
2009	Sept.	*International Conference on Numerical Analysis and Applied Mathematics*, Symposium on *Numerical methods and their applications in molecular simulation*, Rethymnon, Crete
	Sept.	Conference *Mathematics of Complex Quantum Systems*, Oberwolfach, Germany
	Sept.	IMA Annual Program Year Workshop *Mathematical and Algorithmic Challenges in Electronic Structure Theory*, Minneapolis, USA
	July	*XI Encuentro de Matematica y sus Aplicaciones* **(plenary speaker)**, Quito, Ecuador
	June	*Canadian-French Conference*, Montréal, Canada
2007	Sept.	*QMATH 10*, Moeiciu, Romania
	Aug.	4th Danish Symposium on *Applied Analysis*, Copenhagen, Denmark
	July	*International Conference on Scientific Computation and Differential Equations* (SciCADE 2007). Symposium *Applications to Chemistry*, Saint-Malo, France
	Mar.	*Relativistic Effects in Heavy Elements*, Ottrott, France
	Feb.	Workshop *Multiscale and Variational Methods in Material Science and Quantum Theory of Solids*, Oberwolfach, Germany
	Jan.	Conference *Semi-classical Days XIV*, CIRM, Marseille, France

2006	Oct.	Conference *Mathematical and Numerical Aspects of Quantum Chemistry Problems*, Oberwolfach, Germany
	July	Conference *Mathematics in Chemistry*, Lisbon, Portugal
	June	Workshop on *Quantum Mechanics of Complex Systems*, Erwin Schrödinger Institute, Vienna, Austria
2005	Dec.	Conference *Topological and Variational Methods in Partial Differential Equations*, Guanajuato, Mexico
	Nov.	Conference *Mathematical Methods for Ab Initio Quantum Chemistry*, Nice, France
	Apr.	Fourth international conference on *Analysis and Quantum*, Münich, Germany
2004	Dec.	Conference of the 2004-2005 Warwick EPSRC Symposium on *Mathematical challenges in quantum chemistry*, Warwick, UK
	Aug.	Conference of the 2004-2005 Warwick EPSRC Symposium on *Large many-body systems*, Warwick, UK
	July	Satellite conference of the 4th European Congress of Mathematics (ECM), *Spectrum and Quantum Mechanics*, Stockholm, Sweden
	June	Workshop on *Calculus of variations*, Oberwolfach, Germany
2003	Dec.	Meeting of the EU network "Analysis and Quantum", ESI, Vienna, Austria
	Feb.	*Applied Mathematics and Applications of Mathematics* (AMAM), Symposium of *Quantum Chemistry*, Nice, France