CV

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The main experience in the research of the experienced researcher (ER) is functional analysis, differential equations, Riemannian geometry noncommutative geometry and the application there of to quantum physics and in particular to quantum field theory. In particular, one strong suit of the experienced researcher is strict deformation quantization, which is a mathematically strict and rigorous way to implement noncommutative geometry into quantum physics. The ER was successful in relating well-known and predicting physical phenomena by using deformation quantization, see [Muc14]. Besides predicting physical phenomena from deformation, the ER has gathered experience in quantum field theory in curved spacetimes (as one can see from the publication list). In the last two years the ER invented new methods of strict deformation and in addition gave general theorems on self-adjointness w.r.t. important unbounded operators that display, beside his physical intuition, his mathematical abilities as well.

Contributions of the ER include:

- Proved locality properties of QFT on nonconstant noncommutative spacetimes [Muc12]
- Reformulated electro-magnetism in the language of deformation quantization [Muc14]
- Provided a measurable effect of a quantum space, by deformation quantization, coming from the gravito-magnetic Landau effect, by deformation quantization [Muc14]
- Proved the essential self-adjointness of deformed self-adjoint operators under certain assumptions [Muc15]
- Studied and proven the emergence of gravity from non-commutative geometry [Muc], [Muc17]
- Proved the essential self-adjointness of the Hamiltonian for quantum field theories on **all** globally hyperbolic static spacetimes, [MO18b] and gave a general conditon for the essential self-adjointness to hold on **non-static** globally hyperbolic spacetimes
- Constructed rigorous complex structures in order to formulate quantum field theory in curved spacetimes[MO18a]

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Birth-dates

- Damascus, Syria, 23/05/1984

Address

Current Position

- Scientific Assistant, University of Leipzig, Germany, 10/2019-present

Previous Positions

- Postdoctoral Research at University of Vienna, Institute for Mathematics, 09/2013-03/2015.
- Postdoctoral Research at National University of Mexico (UNAM), Institute for Physics, 03/2015-03/2017.
- Postdoctoral Research at National University of Mexico (UNAM) Campus Morelia, Center of Mathematical Sciences, 03/2017-03/2019.
- Assistant Professor at National University of Mexico (UNAM), Institute for Mathematics, FORDECYT Project 03/2019-10/2019.

Education

- Graduation, Gymnasium Henriettenplatz Wien, Austria, 6/2002.
- Military Service, Austria, 6/2002.
- University of Vienna, Austria, study of Physics, 09/2003.
- Master's degree in Physics, University of Vienna, Austria, Advisor: Prof. Harald Grosse, 04/2009.
  - Diploma thesis: Emergent gravity in two dimensions
- University of Leipzig, Germany, Ph.D. studies, 10/2009, funded by the International Max Planck Research School at the Max-Planck-Institut for Mathematics in the Sciences.
- Submitted Ph.D., University of Leipzig, Germany, 03/2013
  - Advisors: Prof. Klaus Sibold

– Ph.D. thesis: Quantum Spacetime from QM and QFT

– Doctor's degree in Physics (magna cum laude), University of Leipzig, Germany, 07/2013.

Publications

1. Albert Much, (2012). **Wedge-local quantum fields on a nonconstant noncommutative spacetime. Journal of Mathematical Physics**, 53(8):082303, August 2012, [9 citations]
2. Albert Much, (2013). **Quantum Mechanical Effects from Deformation Theory. Journal of Mathematical Physics**, 55, 022302 (2014), [12 citations].
3. Albert Much, (2014). **Relativistic Corrections to the Moyal-Weyl Spacetime**, appeared in **Journal of Mathematical Physics** 56 (2015), no.2, 022301, [4 citations]
4. Albert Much, **Isospectral Deformations: The massive case**, appeared as an article of an invited author in **Revista de Fisica Matematica Hondureña, Vol. 6, No. 2**, 2018 [1 citation]
5. Albert Much, (2015). **Selfadjointness of Unbounded Operators**, appeared in **Journal of Mathematical Physics**, 56 (2015), [6 citations]
6. Albert Much, (2015). **Strict Almost Non-Abelian Deformations**, submitted to publication in **Physical Review Letters B**, [2 citations]
7. Albert Much, Steffen Pottel, Klaus Sibold (2016). **Preconjugate variables in quantum field theory and their use**, appeared in **Physical Review D**, Vol. 94, Iss. 6 - 15 September 2016, [2 citations]
8. Albert Much, **Curving Flat Space-Time by Deformation Quantization?**, appeared in **Journal of Mathematical Physics** 58(7), July 2017, [1 citation]
9. Albert Much, **Remarks on QFT in Coordinate Space**, appeared as an article of an invited author in **Revista de Fisica Matematica Hondureña, Vol. 6, No. 1**, 2017 [1 citation]
10. Albert Much, **Massless QFT and the Newton-Wigner Operator** , appeared as an article of an invited author in **Revista de Fisica Matematica Hondureña,Vol. 6, No. 1**, 2017 , [1 citation]
11. Albert Much, Jose David Vergara (2017). **A Poincaré Covariant Noncommutative Spacetime?**, published in **Journal of Geometry and Physics 15(6)**, arXiv:1704.07932 [math-ph], [0 citations]
12. Albert Much, M. Rosenbaum, J. D. Vergara and D. Vidal-Cruzprieto, **Quantum-Corrected Einstein Equations for a Noncommutative Spacetime of Lie-Algebraic Type**, accepted for publication in **Journal of Geometry and Physics**, arXiv:1705.03499 [math-ph], [1 citations]
13. Albert Much, C. A. Aguillón, M. Rosenbaum and J. D. Vergara, **Gravity from Quantum Spacetime by Twisted Deformation of the Quantum Poincaré Group**, appeared in **Journal of Mathematical Physics** 58(11), 112301, 2017 arXiv:1705.08959 [math-ph], [0 citations]
14. Albert Much, Robert Oeckl **Self-Adjointness in Klein-Gordon Theory on**

Globally Hyperbolic Spacetimes, arXiv:1804.07782 [math-ph], [1 citations], accepted for publication in **Journal of Mathematical Physics**

15. Albert Much, Diego Vidal-Cruzprieto **A New Algorithm for the Inverse of Matrices with Noncommuting Entries**, arXiv:1805.01733, submitted to publication in **Journal of Geometry and Physics** [math-ph],[math-ra], [0 citations]
16. Albert Much, Robert Oeckl **Complex Structures for Klein-Gordon Theory on Globally Hyperbolic Spacetimes**, arXiv:1812.00926 [math-ph], [0 citations], accepted for publication in **SIGMA**
17. Felix Finster, Albert Much, Robert Oeckl **Stationary Spacetimes and Self-Adjointness in Klein-Gordon Theory**, arXiv:1910.05322 [math-ph], [0 citations], submitted to publication in **Journal of Geometry and Physics**

Preprints and Work in Progress

1. Albert Much, Felix Finster **Curved Stationary Spacetimes and Self-Adjointness in Klein-Gordon Theory**
2. Albert Much, Robert Oeckl **Topological Quantum Field Theory in Globally Hyperbolic Space-Times**
3. Albert Much, Detlev Buchholz. **The resolvent algebra with an X^4 potential**, in preparation
4. Albert Much, Robert Oeckl. **On the equivalence between AQFT and TQFT**, in preparation

Fellowships, Awards and Funding

- Awarded grant money (FORDECYT) to conduct research as an Assistant Professor, 03.2019-03.2020
- Award Level I from the System of National Investigation (SNI, CONACYT, Mexico), **SNI LEVEL 1**, in form of additional grant money to symbolize the distinct quality of scientific contributions made by the ER, 2018-2021
- Performance scholarships from the University of Vienna 2005-2009
- Awarded a scholarship grant from the Max Planck institute in Leipzig, Germany 2009-2013
- Awarded a postdoctoral grant from UNAM in Mexico City called the DGAPPA, 2015-2017

Teaching

Lectures

- Courses in Analysis, 2009

- Lecture on Quantum Field Theory, 2011 Leipzig
- Lecture on Noncommutative Geometry, 2015 UNAM ICN
- Lecture on Algebraic Quantum Field Theory, 2017 UNAM CCM

Exercise session at University of Vienna

- Tutorial Analysis I, Winter, 2006
- Tutorial Analysis II, Spring, 2007
- Tutorial Mathematical Methods in Physics I, Winter, 2008

University of Leipzig

- Assisted the following students during the Diploma thesis: Steffen Pottel, Leander Fiedler, Christoph Matern

UNAM

- Supervision of Master student: Diego Vidal-Cruzprieto (Currently PhD student at York under the supervision of Dr. Chris Fewster)
- Co-Supervision of PhD Student of Dr. Marcos Rosenbaum: Cesar A. Aguillón
- In the defense committee (one member out of five) of Diego Vidal-Cruzprieto and Cesar A. Aguillón

Reviewer

The ER is a frequent Reviewer for

- Journal of Mathematical Physics
- Math Reviews
- zbMATH Reviewer Database
- Physical Review D
- Physical Letters A
- Results in Physics

References

[MO18a] A. Much and R. Oeckl. Complex Structures for Klein-Gordon Theory on Globally Hyperbolic Spacetimes. *ArXiv e-prints:1812.00926*, 2018.

[MO18b] A. Much and R. Oeckl. Self-Adjointness in Klein-Gordon Theory on Globally Hyperbolic Spacetimes. *ArXiv e-prints:1804.07782*, April 2018.

[Muc] Albert Much. Emergent Gravity in two dimensions.

[Muc12] Albert Much. Wedge-local quantum fields on a nonconstant noncommutative spacetime. *Journal of Mathematical Physics*, 53(3):022302, August 2012.

[Muc14] Albert Much. Quantum Mechanical Effects from Deformation Theory. *Journal of Mathematical Physics*, 55(8):082303, February 2014.

[Muc15] Albert Much. Self-Adjointness of Deformed Unbounded Operators. *Journal of Mathematical Physics*, 56(9):093501, September 2015.

[Muc17] Albert Much. Curving Flat Space-Time by Deformation Quantization? *J. Math. Phys.*, 58(7):072303, 2017.