

## **Unit Name**

Quantum Gravity Unit

## **Collaborations**

Masahiro Hotta, Tohoku University, Japan, Probability vector representation of the Schrödinger equation and Leggett-Garg-type experiments

Peter West, King's College London, UK, Bosonic M-theory in the E11/K27 approach

Kasia Rejzner, University of York, UK, Algebraic quantum field theory on non-Hausdorff spacetimes

## **Research Personnel**

Mirian Tsulaia, Staff Scientist

Keith Glennon, Postdoctoral Scholar

Subhajit Mazumdar, Postdoctoral Scholar

Sebastian Murk, Postdoctoral Scholar

David Thomas O'Connell, PhD Student

Julian Lang, PhD Student

Theodora Kaskitsi, Research Intern

Paul Luis Roehl, Visiting Research Student

## **Scholarly Contributions and Creative Productions (by Faculty)**

### **Journal Article**

1. Neiman, Yasha, and David O'Connell. 2024. "Topology Change from Pointlike Sources." *Physical Review D*.
2. Neiman, Yasha. 2024. "Higher-Spin Self-Dual General Relativity: 6d and 4d Pictures, Covariant vs. Lightcone." *Journal of High Energy Physics* 2024.
3. Lang, Julian, and Yasha Neiman. 2024. "N = 2 Supersymmetry in the Twistor Description of Higher-Spin Holography." *Journal of High Energy Physics* 2024.
4. Neiman, Yasha. 2024. "Self-Dual Gravity in de Sitter Space: Light-Cone Ansatz and Static-Patch Scattering." *Physical Review D*.

### **Presentation at Conference**

1. Neiman, Yasha. 2024. "Unified Lagrangians for GR and Yang-Mills." *Quantum Extreme Universe: Matter, Information and Gravity*.
2. Neiman, Yasha. 2024. "Scattering in the Static Patch." *Cosmological Correlators in Taiwan*.

### Scholarly Contributions (by Unit Members)

Name of Unit Member	Type	Title	Outlet	Publisher	Year Pub
Sebastian Murk	Journal Article	Light rings and causality for nonsingular ultracompact objects sourced by nonlinear electrodynamics	Physical Review D		2024
Sebastian Murk	Journal Article	Categorical quantum volume operator	Physical Review D		2024
Sebastian Murk	Journal Article	Probability vector representation of the Schrödinger equation and Leggett-Garg-type experiments	Physical Review A		2024
Keith Glennon	Journal Article	K27 as a symmetry of closed bosonic strings and branes	International Journal of Modern Physics A		2025
Alessandro Alberto Trani	Journal Article	pAGN: the one-stop solution for AGN disc modelling	Monthly Notices of the Royal Astronomical Society		2024
Alessandro Alberto Trani	Journal Article	Merging hierarchical triple black hole systems with intermediate-mass black holes in population III star clusters	Monthly Notices of the Royal Astronomical Society		2024
David O'Connell	Journal Article	Vector bundles over non-Hausdorff manifolds	Topology and its Applications		2024
Sebastian Murk	Journal Article	Gravity-induced birefringence in spherically symmetric spacetimes	Physical Review D		2025
Sebastian Murk	Other Scholarly Work	European Cooperation in Science and Technology (COST) Action CA23115 — Relativistic Quantum Information			
Sebastian Murk	Poster Presentation at Conference	Probability vector representation of the Schrödinger equation and Leggett-Garg-type experiments	2nd Vienna Quantum Foundations Conference		
Mirian Tsulaia	Presentation at Conference	Supersymmetric Quantum Mechanics	MATHS-PHYSICS NSYSU MEETING		
Sebastian Murk	Presentation at Conference	Photon trajectories in curved spacetimes from a covariant spin optics approximation	Australian Institute of Physics Congress		
Sebastian Murk	Presentation at Conference	Polarization-corrected photon trajectories in curved spacetimes	14th Annual Conference on Relativistic Quantum Information (North)		
Sebastian Murk	Presentation at Conference	Polarization-corrected light propagation in gravitational field	17th Marcel Grossmann Meeting		
David O'Connell	Presentation at Conference	Quantum Fields on non-Hausdorff Backgrounds	Causal Worlds	Perimeter Institute	2024
Sebastian Murk	Presentation at Conference	Probability vector representation of the Schrödinger equation and Leggett-Garg-type experiments	11th International DICE Workshop — Spacetime, Matter, Quantum Mechanics		

Name of Unit Member	Type	Title	Outlet	Publisher	Year Pub
Mirian Tsulaia	Seminars	N=2 Supersymmetric Quantum Mechanics, Continuous and Discretized	National Sun Yat-sen University, Taiwan		
Mirian Tsulaia	Seminars	Massive Higher Spins and Black Hole Interactions	University of Mons, Belgium		
David O'Connell	Seminars	Quantum Fields on non-Hausdorff Backgrounds		University of Pavia	
Mirian Tsulaia	Seminars	Description of Interactions Between Kerr Black Holes in Terms of Higher Spin Fields	Australian Institute of Physics		
Mirian Tsulaia	Seminars	Description of Black Hole Interactions in Terms of Higher Spin Fields	National Taiwan University		
Sebastian Murk	Seminars	Light rings and causality for nonsingular ultracompact objects sourced by nonlinear electrodynamics	Cosmology, Fundamental Physics, and Strings Seminar		
Mirian Tsulaia	Seminars	N=2 Supersymmetric Quantum Mechanics, Continuous and Discretized	Tbilisi State University		
David O'Connell	Seminars	The Topology, Geometry and Physics of non-Hausdorff Manifolds		SISSA	
David O'Connell	Seminars	The Topology, Geometry and Physics of non-Hausdorff Manifolds		YITP	
David O'Connell	Seminars	Non-Hausdorff Differential Geometry		Osaka Metropolitan University	
David O'Connell	Seminars	Colimits of $C^*$ algebras in Quantum Field Theory		RIMS, Kyoto University	
David O'Connell	Seminars	The Topology, Geometry and Physics of non-Hausdorff Manifolds		iTHEMS, RIKEN	
David O'Connell	Seminars	Colimits of $C^*$ algebras in Quantum Field Theory		University of Tokyo	

#### Other Institutional Service

2024 - Ongoing      Internal Seminar, (University)

#### Workshops and Seminars (Organized and Hosted by Faculty/Units)

Speaker Name(s)	Title	Location	Date
Yair Mulian	Scattering amplitudes for entangled states	OIST	2024
Rennan Barkana	Cosmology with radio waves: from dark matter to the dark ages	OIST	2024
José M.M. Senovilla	Singularity theorems in gravitation	OIST	2024
Heng-Yu Chen	Exploring complex saddles and geometries through holography	OIST	2024

Speaker Name(s)	Title	Location	Date
Peter Koroteev	Opers - What they are and What they are good for	OIST	2024
Ritankar Chatterjee	Tensionless Strings in a Kalb-Ramond Background	OIST	2024
Igor Klebanov	1+1 Dimensional Gauge Theory: Lattice vs. Continuum	OIST	2024
Paul Luis Roehl	The Giant Graviton Expansion	OIST	2024
Adi Armoni	't Hooft model as a String Theory	OIST	2024
Igor Bandos	On amplitudes and superamplitudes of 10D SYM and 11D Supergravity	OIST	2024