PUZZLES IN THE QG LANDSCAPE 2026

14-18 Sept 2026 | Graz, Austria

Puzzles in the QG landscape 2026

Important information

14–18 September 2026 • Graz, Austria

Welcome to the Puzzles in the QG landscape 2026 conference!
On this page, you will find useful information about the conference, its format, and the scheduled events.

Locations

Registration
Registration will be next to the conference room, on Monday from 8:00.

Conference venue
All talks and discussions will take place in the Lecture Hall 05.01.
Universitätsplatz 5, ground floor, room number 0020.

Coffee breaks
Coffee breaks will be served in the Seminar Room 05.11.
Universitätsplatz 5, first floor, room number 0040.

Lunches
Lunches will take place at Café Erde.
Universitätsstraße 15 Building D, first floor.

Welcome reception and poster session
Monday 14th, 18:00-21:00
Mozartgasse 3, ground floor.

Pizza&Career for young researchers – requires sign up
Tuesday 15th, 18:00-20:00
Universitätsplatz 5, ground floor, room number 0020.

Conference dinner – sign up here
Thursday 17th, 19:00-21:00
Pizzaiolo – Karmeliterplatz 1.

Conference format: talks, questions, and discussions

The conference is designed to encourage interaction and discussion among participants.

Talks
Each invited talk consists of a 30-minute review, followed by 10 minutes for technical questions.

Discussion sessions
Dedicated discussion sessions are a main focus of the programme. We encourage all participants to contribute questions, comments, and reflections on the connections between the different topics presented during the conference. In particular:

- **Open discussions** are scheduled in the mornings and involve all speakers presenting on that day. They provide an opportunity to raise broader questions, either for individual speakers or, especially, about connections, tensions, or discrepancies emerging between different fields and approaches.
- **Panel discussions** are scheduled in the afternoons and focus on specific topics or open problems. They begin with short opening statements from the panellists and then develop into a broader discussion involving the audience. Questions and comments are warmly welcomed and encouraged.

Practical information

Program
A program is available in this information booklet and on the conference webpage. Any last-minute changes will be announced during the conference and communicated by email. Please arrive a few minutes before the beginning of each session so that the programme can run on schedule.

Wi-Fi
Network: eduroam / UNIGRAZguest
Access information: your own / username: Physics-Guest; password: 2984SPWs

Contacts
For questions or assistance during the conference, please contact one of the organizers:

Benjamin Knorr knorr@thphys.uni-heidelberg.de
Alessia Platania alessia.platania@nbi.ku.dk
Marc Schiffer marc.schiffer@ru.nl

Conference webpage
https://indico.global/event/17643/overview

Puzzles in the QG landscape 2026

Time	Mon 14	Tue 15	Wed 16	Thu 17	Fri 18
8:45–9:00	Welcome *8:45–9:00*				
9:00–9:40	**Eichhorn** *9:00–9:40*	**Loll** *9:00–9:40*	**Dittrich** *9:00–9:40*	**Raclariu** *9:00–9:40*	**Salvio** *9:00–9:40*
9:40–10:20	**Francia** *9:40–10:20*	**Freidel** *9:40–10:20*	**Sahlmann** *9:40–10:20*	**Bjerrum-Bohr** *9:40–10:20*	**Emparan** *9:40–10:20*
10:20–10:50	Coffee & cakes *10:20–10:50*	Coffee & cakes *10:20–10:50*	Coffee & cakes *10:20–10:50*	Coffee & cakes *10:20–10:50*	Coffee & cakes *10:20–10:50*
10:50–11:30	**Lizzi** *10:50–11:30*	**Dall'Agata** *10:50–11:30*	**Davis** *10:50–11:30*	**Tourkine** *10:50–11:30*	**Aspelmeyer** *10:50–11:30*
11:30–12:00	**Gielen** *11:30–12:10*	**Gnecchi** *11:30–12:10*	**Tokareva** *11:30–12:10*	**Open discussion** *11:30–12:00*	**Open discussion** *11:30–12:00*
12:00–12:10				**Dowker** *12:00–12:40*	**Percacci** closing talk *12:00–12:40*
12:10–12:40	**Open discussion** *12:10–12:50*	**Open discussion** *12:10–12:50*	**Open discussion** *12:10–12:50*		
12:40–12:50				Lunch *12:40–14:15*	Lunch *12:40–14:15*
12:50–14:15	Lunch *12:50–14:15*	Lunch *12:50–14:45*	Lunch *12:50–14:45*		
14:15–14:45	**Gong show** *14:15–14:45*			**Poster prize talk** *14:15–14:45*	**Panel** ***What should the next decade of QG research look like?*** Aspelmeyer, Eichhorn, Francia, Gielen *14:15–15:45*
14:45–15:45	**Panel** ***Key open problems in QG: can we agree?*** Emparan, Freidel, Gnecchi, Percacci *14:45–16:45*	**Panel** ***EFT and the swampland: what are the universal features of all QGs?*** Dall'Agata, Dittrich, Lizzi, Tokareva *14:45–16:45*	**Panel** ***What would falsify your QG approach? Theory vs observations*** Davis, Held, Sahlmann, Tourkine *14:45–16:45*	**Panel** ***Key (observable) observables in QG: what do we need to compute?*** Bjerrum-Bohr, Loll, Raclariu, Salvio *14:45–16:45*	
15:45–16:00					**Closing remarks** *15:45–16:00*
16:00–16:45					Coffee & cakes *16:00–18:00*
16:45–18:00	Coffee & cakes *16:45–18:00*	Coffee & cakes *16:45–18:00*	Coffee & cakes *16:45–18:00*	Coffee & cakes *16:45–18:00*	
18:00–19:00	**Poster session & reception** *18:00–21:00*	**Pizza & career** for young researchers *18:00–21:00*			
19:00–21:00				**Conference dinner** *19:00–21:00*	

Puzzles in the QG landscape 2026

Poster presenters and titles

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Presenter	Title
Gabriel Assant	Spectral Functions of Lorentzian Quantum Gravity
Daniele Berruti	Horndeski Gravity in Asymptotically Safe Gravity: Bridging UV with IR
Francesca Campani	Unnaturalness of Starobinsky inflation within Asymptotic Safety
Francesco Del Porro	Charting GLOBs in Asymptotically Safe Gravity
Gabriele Donati	Subleading corrections to F-terms in the Large Volume Scenario
Tim Lukas Eckert	Asymptotically safe scalar-scalar-graviton vertex at leading order
Álvaro Fernández Madrid	Top mass induced constraints on the Quantum Gravity scale
Francesco Ferrarin	Asymptotic safety is not generic
Mario Flory	Holographic Approach to Area Metrics
Moritz Gessner	On the Structure of the Fermion Sector in the Asymptotically Safe Standard Model
Angelo Hartmann	Can a Clifford connection be treated as a non-Abelian gauge field?
Stijn Hennissen	Using machine learning to explore asymptotically safe cosmologies
Hari K	Photon-graviton scattering and quantum interference: New window into the quantum nature of gravity
Šimon Knoška	Perturbative approach to quadratic gravity

Presenter	Title
Lidia Marino	Scalarized Black Holes in Asymptotically Safe Gravity
Sebastian Murk	Classical-quantum gravity as quantum gravity in disguise
Kota Numajiri	Compact Star Physics in the Effective Field Theory of Gravity
Albert Petrov	Dynamical Lorentz symmetry breaking in a scale-free theory of gravity
Ali Riahinia	Quantum Gravity in Static Spherically Symmetric Spacetime
Abhijith Peringara Sajeev	Higher Order Cosmological Perturbations from Quantum Gravity
Paul Philip Sprenger	Gauge-Invariant and Background-Indepedent Quantum Gravity
Ayushi Srivastava	Improved Null Energy Condition
Jesse van der Duin	Scalar Correlators in Nonperturbative Lorentzian Quantum Gravity
Samreen Zaman	Spins Across the Throat: Geometry Driven Ordering and Classical Two-sided Correlations on the Euclidean Section of the Wormhole Background
Kirill Zatrimaylov	Warp Drives, Black Holes, and Wormholes
Martin Zeiß	Towards the Continuum in Quantum Gravity: A Coarse-grained Model for Loop Quantum Gravity

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Titles and abstracts

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Monday 14 September

Astrid Eichhorn

09:00–09:40

Challenges for quantum gravity - a perspective from asymptotic safety

ABSTRACT

In this talk, I will highlight some of the key challenges that quantum gravity is facing. I will then discuss them through the lens of asymptotic safety, pointing out recent progress as well as potential broader implications for the field as a whole.

Dario Francia

09:40–10:20

Higher Spins: Past, Present, and Puzzles

ABSTRACT

Higher-spin theories lie at the crossroads of modern quantum field theory, string theory, holography, and scattering amplitudes. Dating back to the 1930s, they constitute one of the oldest research programs in theoretical physics that remains at the forefront of current research. Their underlying gauge symmetries may offer clues to the ultraviolet finiteness of quantum gravity, while their spontaneous breaking may give rise to a string-like spectrum. Higher-spin theories also find applications in condensed matter physics, cosmology, and black-hole physics, and provide examples of flat-space holography in which both sides of the correspondence are relatively explicit. Yet long-standing conundrums concerning the structure of their interactions continue to pose challenges of both a technical and conceptual nature. I will review the basics of the subject together with some recent developments, emphasizing the interplay between its historical foundations, current directions, and enduring puzzles.

Fedele Lizzi

10:50–11:30

Quantum spacetime, from geometry to symmetries to observers

ABSTRACT

Quantization of gravity may require quantization of spacetime as well, leading to a quantum spacetime described by a noncommutative, "pointless" geometry. The symmetries of a quantum spacetime will be in general deformed as well, via quantum groups/Hopf algebras. This point of view has led to development of various flavours of noncommutative geometries, with ensuing field theories. Finally I will tackle the issue of quantization of observers/reference frame, a puzzling "information frontier" which may be a key issue in the quantization of gravity.

Steffen Gielen

11:30–12:10

Overview of group field theory

ABSTRACT

Group field theory (GFT) is an approach to quantum gravity that has strong connections to loop quantum gravity and spin foams, but has developed into its own area of research. From a technical point of view, GFT is an unusual type of quantum field theory, which can be studied using perturbative path integral methods, a canonical quantisation or the renormalisation group. A key

physical idea is that spacetime emerges from a "condensate" phase away from the perturbative (background-independent) GFT vacuum, in which no spacetime geometry is present. In this talk I will attempt a brief overview of developments in GFT, focusing on the historical context, areas of connection to other approaches, and possible implications of GFT for cosmology.

Tuesday 15 September

Fay Dowker 09:00–09:40

New Forks in the Road on the way to Quantum Gravity

ABSTRACT

In his 1997 paper “Forks in the Road, on the Way to Quantum Gravity” Rafael Sorkin set out a number of decisions that need to be taken, in his opinion, as one looks forward from known physics towards a unifying theory of quantum gravity. To these, we may add the Donoghue fork: either there is novel physics at the Planck scale or it is continuum spacetime geometry all the way. I will very briefly assess causal set quantum gravity, using the Forks, focussing on the biggest challenges that remain for the future.

Renate Loll 09:40–10:20

CDT: Lattice Quantum Gravity Reloaded

ABSTRACT

Without experimental data to guide our search for a theory of quantum gravity, nonperturbative lattice simulations provide a unique window on the properties of quantum spacetime and full, four-dimensional quantum gravity on Planckian scales. Contemporary lattice quantum gravity in terms of Causal Dynamical Triangulations (CDT) works with lattices that are curved, dynamical and causal, thereby combining the fundamental principles of quantum field theory and general relativity in an intrinsic way. This well-tested and powerful tool enables us to compute the path integral and evaluate physical quantum observables nonperturbatively. A steadily increasing set of data collected by lattice experiments gives us unprecedented insights into the physics of this highly nonclassical regime, including a de Sitter-like nonperturbative ground state. Equally importantly, it gives us a new perspective on "solving" quantum gravity and on (frequently overblown) expectations on what such a theory will be able to deliver. I will describe current progress in relating Planckian physics to early-universe cosmology and hopes for the future.

Gianguido Dall’Agata 10:50–11:30

Quantum vacua of string theory on Riemann flat manifolds

ABSTRACT

I will review a simple and unexpected way to try and address the hierarchy problems via string theory compactifications on flat spaces. Recent developments in the math and physics literature allow us to use these spaces as interesting toy models where fully analytical calculations can be carried out, retaining full control on the physical setup.

Alessandra Gnecchi 11:30–12:10

An EFT Perspective on Gravity and Black Holes (and What Is Wrong with It)

ABSTRACT

Recent advances in our understanding of gravitational systems in string theory have relied on the possibility of working within a low-energy gravitational EFT. I will review how such controlled EFT

descriptions allow us to test proposed principles of quantum gravity, and discuss how black holes are instead driving us towards a different framework for characterizing their quantum properties.

Wednesday 16 September

Bianca Dittrich 09:00–09:40

tba

ABSTRACT

tba

Hanno Sahlmann 09:40–10:20

From groups and graphs to black holes and big bounce - principles and current perspectives of loop quantum gravity

ABSTRACT

Loop quantum gravity is an unusual QFT for gravity. I will explain some principles of LQG and their consequences for the description of quantum gravity. I will sketch areas of current interest, links to other approaches, and some of my own recent work. Finally I will speak about problems and open questions in this approach.

Anne-Christine Davis 10:50–11:30

Screened Modified Gravity, Theory and Tests

ABSTRACT

Models of scalar-tensor gravity theories will be presented. Such models could potentially be the dark energy particle. It will be shown how such models screen potential fifth forces such that solar system constraints are satisfied. Parameter constraints will be discussed. An axio-dilaton model will be briefly discussed. I will end with open questions and problems.

Anna Tokareva 11:30–12:10

Consistency constraints on effective field theories coupled to gravity

ABSTRACT

Not every low-energy effective field theory (EFT) can descend from a consistent, UV-complete theory. Requiring the ultraviolet completion to be unitary, causal, Lorentz-invariant, and local translates into sharp constraints on the Wilson coefficients of the low-energy theory. I will review how these constraints are extracted from dispersion relations and the analytic structure of the scattering amplitudes — from the positivity bounds to the two-sided, compact bounds captured by the "EFThedron" and the theory of moments — and how the picture changes once massless loops are included. I will then turn to the central difficulty of coupling the EFT to gravity: the graviton t-channel pole obstructs the usual dispersive arguments, and I will describe how to go around this problem by the use of crossing-symmetric dispersion relations sampled at finite momentum transfer. I will review the constraints on EFTs coupled to gravity and ways of reconstructing a unitary UV completion. Moving beyond flat space, I will discuss constraints on the Einstein–Maxwell EFT and near-extremal black holes, where the Weak Gravity Conjecture emerges and turns out to coincide with a causality condition on black-hole quasinormal modes. I will close with open problems: a complete four-dimensional treatment of gravitational constraints, spinning EFTs (SMEFT, ChPT), proofs of swampland-type conjectures, and consistency constraints beyond flat space, including de Sitter.

Thursday 17 September

Ana-Maria Raclariu
09:00–09:40

Flat space holography from AdS/CFT

ABSTRACT

I will review recent developments in flat space holography and its relation to AdS/CFT. I will start by introducing Carrollian and celestial field theories as putative duals to 4-dimensional asymptotically flat spacetimes. I will discuss their properties, including their symmetries and dynamics, and will review some of the issues distinguishing these theories from conventional quantum field theories. I will then discuss how some of these aspects emerge in a limit of AdS/CFT.

Laurent Freidel
09:40–10:20

Quantum Null Ray: localized gauge invariant observables and covariant quantization

ABSTRACT

In this talk, I'll review the construction of gravitational constraints and of the corresponding phase space along generalized Horizons. I will show how the focus on constraints on null rays allow the resolution of the constraints, the construction of gauge invariant observables using a generalization of quantum reference and the resolution of quantum anomalies. I will focus, for pedagogy, my expose on the study of the Raychaudhuri Constraint and its quantization, which describes the dynamics of quantum null rays. If time permits, I'll comment on some new phenomenological possibilities associated with the quantization of field theoretical reference frames.

Piotr Tourkine
10:50–11:30

From QCD to Quantum Gravity and Back: non-perturbative scattering and the S-matrix bootstrap

ABSTRACT

Quantum mechanics and relativity are barely compatible, and the marriage is tight enough to have dynamical content. The S-matrix bootstrap is the tool that reads that content off: one takes analyticity, crossing and unitarity as the definition of the theory and maps out the space of consistent scattering amplitudes, with no Lagrangian and no perturbative expansion. The same question — how do these principles constrain the space of interactions? — governs two problems with no perturbative handle: (soft) hadronic interactions and gravity S-matrix at the Planck scale. After recalling how causality and unitarity bound the low-energy couplings of any theory of quantum gravity, I will focus on the non-perturbative bootstrap, where the constraints are imposed at finite coupling by numerical methods. Here dynamics genuinely emerges from consistency: extremal amplitudes carry Regge trajectories and resonance spectra that were never put in, and in $d = 9, 10, 11$ string and M-theory sit essentially at the boundary of the allowed region.
If time permits, I'll then turn to open problems: the absence of a sharp massless S-matrix in $d = 4$, the question of string universality in higher dimensions, the transplanckian regime where black holes are the UV completion, and above all particle production — the inelasticity that current bootstraps cannot control, and which our approach based on the Mandelstam equation aims to turn into a constructive principle.

Emil Bjerrum-Bohr
11:30–12:10

General Relativity from Amplitudes and Fundamental Gravitational Interactions

ABSTRACT

Our understanding of gravity's interactions remains limited because it is such a weak force. However, recent computational advancements-originally aimed at other Standard Model forces-

and new observations of gravitational waves from black hole collisions provide a rare chance to test fundamental gravity accurately by comparing theoretical predictions with observational data. This presentation will examine the latest progress in calculating gravitational amplitudes and discuss how these developments allow us to test Einstein's theory of gravity and investigate possible deviations.

Friday 18 September

Alberto Salvio 09:00–09:40

Effective Quantum Gravity for the Beginning

ABSTRACT

Motivated by trans-Planckian issues in inflation, I will discuss how to determine the Hilbert space and the amplitudes of quantum perturbations in the general low-energy effective theory of (multi-)field inflation without relying on the sub-horizon limit. The scalar sector is the most intricate, featuring field mixings and second-class constraints, which I will handle using Dirac brackets. These results will enable us to estimate the magnitude of higher-derivative corrections. I will also discuss, in the specific case of slow-roll inflation, how such estimate can be expressed in terms of the first slow-roll parameter ϵ for a given cutoff Λ. I will apply these results to several inflationary models with finite Λ: Higgs inflation, the Starobinsky model, natural inflation and hilltop inflation. Finally, I will discuss the open problem of determining the inflationary quantum state and its relation to UV-complete theories of quantum gravity.

Roberto Emparan 09:40–10:20

Observing quantum gravity at macroscopic horizon scales

ABSTRACT

It has often been assumed that quantum gravity effects near a macroscopic black hole horizon should be strongly suppressed due to the enormous hierarchy between the horizon scale and the Planck scale, and that any observable deviations would require highly speculative or poorly controlled non-local physics. However, it has recently become clear that this expectation can fail in a controlled and physically interesting way. In particular, near-extremal black holes can exhibit enhanced quantum fluctuations, which may become accessible through a variety of physical effects.

Markus Aspelmeyer 10:50–11:30

Quantum Sources of Gravity in the Lab: Status Quo, Challenges and Prospects

ABSTRACT

I provide a brief overview on the current approaches to table-top searches for quantum gravity phenomena. I will then focus on experiments that involve the quantum superposition of massive objects, large enough to produce measurable gravitational fields. The classical and quantum field theoretical predictions for the behaviour of such quantum sources of gravity differ and hence can be experimentally distinguished. An experimental realisation, essentially a quantum Cavendish experiment, requires the ability to prepare largely delocalised massive quantum systems and precision gravity experiments on the micrometer scale. I will review the current status and challenges in the Vienna experiments.

Roberto Percacci 12:00–12:40

closing talk