

RTG Models of Gravity Colloquium

Date:	08.05.2019
Time:	10:00 - 18:00
Location:	ZARM, University of Bremen Room 1730

Program

09:45 - 10:00	Welcome - Coffee
10:00 - 11:00	Students' Seminar: Roberto Tanzi (ZARM, Bremen) <i>"Hamiltonian treatment of asymptotic symmetries"</i>
11:00 - 11:30	Journals' Club: Eugenia Boffo (Jacobs University, Bremen) <i>"Deformed graded Poisson structures, Generalized Geometry and Supergravity"</i>
11:30- 11:45	Discussion and Coffee
11:45 - 12:45	Talk 1: Nezihe Uzun (Lyon) <i>"Symplectic ray bundle transfer in general relativity"</i>
12:45 - 14:30	Lunch + board meeting
14:30 - 15:30	Talk 2: Oldrich Semerak (Prague) <i>"Black holes under external influence"</i>
15:30 - 16:00	Discussion and Coffee
16:00 - 17:00	Talk 3: Hadi Godazgar (Albert Einstein Institute, Potsdam) <i>"Dual and extended asymptotic charges "</i>
17:00 - 17:30	Women's assembly and Coffee
18:00	Dinner Del Bosco Trattoria (Hotel Munte) Parkallee 295, 28213 Bremen

Abstracts

Talk 1:

Nezihe Uzun (Lyon)

“Symplectic ray bundle transfer in general relativity”

Reciprocity relations in physics signal the existence of potentiality of a system. Maxwell-Betti reciprocity for virtual work in elasticity, Onsager's reciprocity in thermodynamics or quantum mechanical reciprocity of the received signal all state that the observables are unchanged when the input and output agents are traversed. Those distinct systems share a similar property: they can be linked to a well-defined symplectic potential. The work we will present here grew out of questioning what kind of potentiality Etherington's distance reciprocity in relativity corresponds to. We will present the outcome of such an investigation which turns out to be a symplectic phase space reformulation of first order geometric optics in relativity. Potential applications of this formalism for astrophysical and cosmological scenarios will also be discussed.

Talk 2:

Oldrich Semerak (Prague)

“Black holes under external influence”

Abstract: Black holes are very strong sources of gravity, yet they may still be influenced by external matter and fields considerably. We first study such an influence within the class of static and axially symmetric solutions of Einstein's equations, when superposition is simple due to the linear behaviour of one of the two relevant metric functions. We consider an another black hole, an encircling thin ring or a thin disc as the additional sources, and illustrate the resulting geometry on basic invariants (focusing on the black-hole interior) and on geodesic dynamics (which becomes chaotic due to the presence of the additional source). The much more difficult rotating (non-static) case is at least treated perturbatively, and the usage of the corresponding Green functions we simplified recently is illustrated on linear perturbation of Schwarzschild due to a rotating finite circular thin disc.

Talk 3:

Hadi Godazgar (Albert Einstein Institute, Potsdam)

“Dual and extended asymptotic charges ”

I will review recent progress in understanding the relation between charges in asymptotically flat spacetimes. This work has lead to the realisation that there is an infinite number of dual BMS charges that complement the ones already in the literature. I will discuss the construction of these charges and their implication.

Students' Seminar:

Roberto Tanzi (ZARM, Bremen)

"Hamiltonian treatment of asymptotic symmetries"

Asymptotic symmetries are an important feature of gravity, electromagnetism, and other field theories. The interest in this topic has increased in the last few years, in particular after it has been conjectured by Hawking, Perry, and Strominger that it could be related to the solution of the long-standing information loss paradox.

I will review the recent progresses in the Hamiltonian treatment of asymptotic symmetries in gravity and electromagnetism, the advantages of the approach and the open issues.

Journals' Club:

Eugenia Boffo (Jacobs University, Bremen)

"Deformed graded Poisson structures, Generalized Geometry and Supergravity"

In recent years, a close connection between supergravity, string effective actions and generalized geometry has been discovered that typically involves a doubling of geometric structures. We investigate this relation from the point of view of deformations of graded canonical Poisson structures and derive the corresponding generalized geometry and gravity actions. We consider in particular natural deformations based on a metric g , a 2-form B and a scalar (dilaton) ϕ of the 2-graded symplectic manifold $T^*[2]T[1]M$. The corresponding deformed graded Poisson structure can be elegantly expressed in terms of generalized vielbeins. It involves a flat Weitzenböck-type connection with torsion. The derived bracket formalism relates this structure to the generalized differential geometry of a Courant algebroid, Christoffel symbols of the first kind and a connection with non-trivial curvature and torsion on the doubled (generalized) tangent bundle $TM \oplus T^*M$. Projecting onto tangent space, we obtain curvature invariants that reproduce the NS-NS sector of supergravity in 10 dimensions. Other results include a fully generalized Dorfman bracket, a generalized Lie bracket and new formulas for torsion and curvature tensors associated to generalized tangent bundles. A byproduct is a unique Koszul-type formula for the torsion-full connection naturally associated to a non-symmetric metric $g+B$. This resolves problems with ambiguities and inconsistencies of more direct approaches to gravity theories with a non-symmetric metric.

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