

Strong Dynamics and Criticality in Quantum and Gravitational Systems

– DFG Research Training Group RTG 2522/1 –

Holger Gies



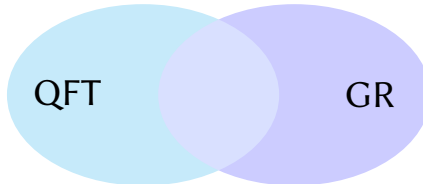
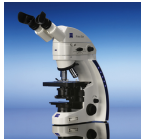
FRIEDRICH-SCHILLER-
UNIVERSITÄT
JENA

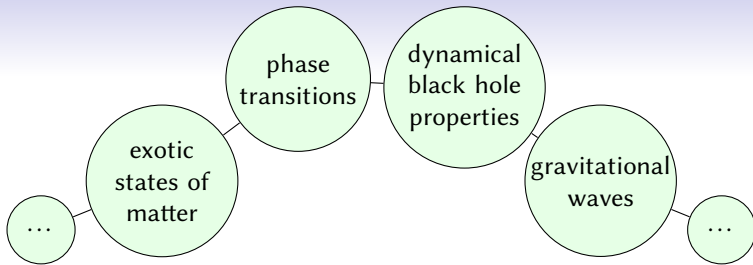


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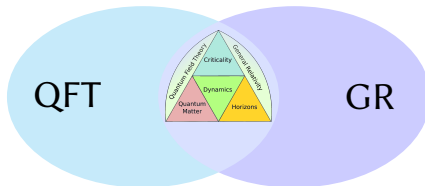
Martin Ammon, Sebastiano Bernuzzi, Bernd Brügmann,
Daniela Cadamuro, Stefan Hollands, Reinhard Meinel, Bernd Rosenow,
Rainer Verch, Andreas Wipf

RTG Kickoff, 25-26 February, 2020

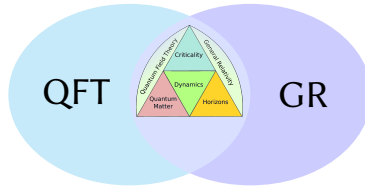




Emerging dynamical
& critical phenomena



Core research idea of the RTG

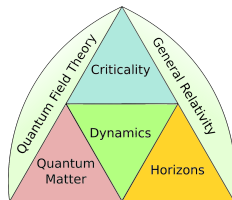


- ▶ investigate, understand and compute
the emergence of complexity in GR & QFT
from foundational building blocks

...focus on relevant & topical example systems
- ▶ pushing the boundaries at the method frontier
of quantitative theoretical
& conceptual mathematical physics

RTG 2522: proposed funding structure

- ▷ 10 projects at the QFT & GR interface



- ▷ DFG-funded

- 12 doctoral researchers

- ▷ associate members, currently:

- ~ 10 PhD fellows
- ~ 2 postdocs

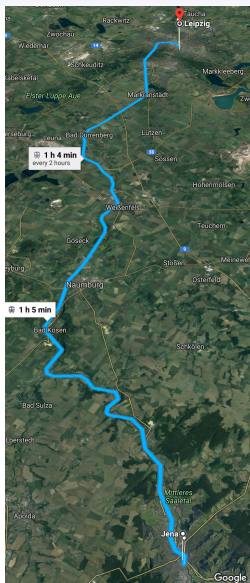
Uniqueness of RTG 2522

▷ Jena-Leipzig



▷ broad theoretical method portfolio:

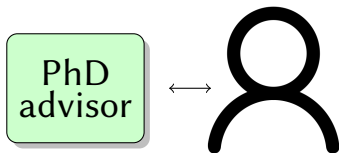
- analytical constructions
- computer algebra
- lattice simulations
- mathematical physics
- high-performance numerics
- functional methods
- gauge-gravity correspondence
- constructive methods



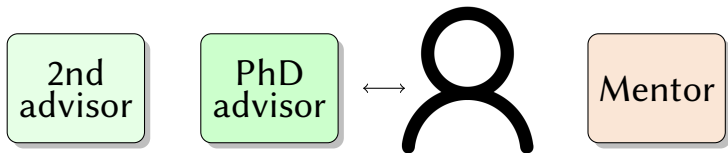
What the RTG can do for you



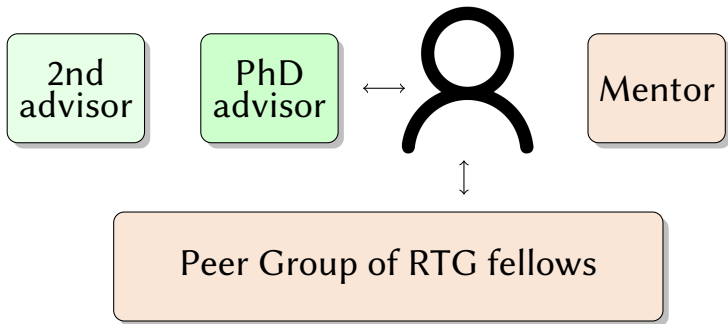
RTG 2522: Supervision



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RTG 2522: Supervision



▷ Formal measures:

- Supervision agreement

RTG as partner

- Status talks

▷ Opportunities

- Mentor-mentee dialogue
- Peer group monitoring

Monitoring Workshops

Qualification

Goal: Ability to carry out own research with an increasing degree of independence

▷ Curriculum: Jena + Leipzig

Introductory courses 4+2h		
Gravitational Theory J & L	Quantum Field Theory J & L	
Advanced courses 2+2h		
GR	Interface GR/QFT	QFT
Relativistic astrophysics (J)	QFT in curved spacetime (L)	Euclidean QFT (L)
Gravitational waves (J)	Mathematical cosmology (L)	Gauge theories and particle physics (J)
Dynamics of Einstein equations (L)	Solitons (J)	Nonequilibrium physics, topological phases and anyons (L)
Numerical Relativity (J)	String theory (J)	Lattice field theory (J)
Mathematical Relativity (J)	AdS/CFT correspondence (J)	Topological phenomena in condensed-matter physics (L)
Magnetohydrodynamics (J)		Renormalization theory (J)

- **funded** cross-participation
- coordinated scheduling
`indico.tpi.uni-jena.de`
- VTC participation via



▷ Mitteldeutsche Physik-Combo

~ 2/3-day compact courses 2×/year

- scheduled for Sep 2020, Leipzig
- open to external PhD students

▷ Specialized training events

e.g. new programming techniques

- 6/7 April 2020:
“Intel Software Development tools for HPC”

International orientation and integration

- ▷ Research Seminars
 - int. visiting researchers
- ▷ RTG-funded travel
 - int. summer/winter schools (1st/2nd year)
 - int. workshops/conferences (2nd/3rd year)
- ▷ Mercator fellows



Astrid Eichhorn
Odense



Roni Ilan
Tel Aviv U

- ▷ Int. RTG-Workshops
 - e.g., SIFT 2019
 - FNR 2020, Jena
 - 10-14 Aug
 - ...



- ▷ Competitive support instruments:
 - short-term research visit

~3 month abroad

int. project collaboration

- seminar tour

networking

prep. postdoc phase

Promoting early independence

RTG Preamble: early scientific independence is a natural goal of advisory activities within the RTG

▷ start-up **funding**:
awarded on competitive basis; flexible funding scheme
...starting 2021

- **funding** needed for implementing an own novel research idea.
- after PhD: **funding** for transition to next career phase.
- support for writing a grant proposal
- support for finalizing a scientific project/publication

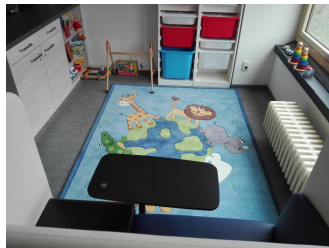
Gender equality and work-life balance

▷ Gender equality measures

- mentoring
Rowena-Morse @J/t.e.a.m. @L
- career advancement and networking
Physikerinnentagung
Women in STEM
- dissemination tours
PhD→postdoc
- role models
female high-profile guests
- targeted outreach
“Physik für Schülerinnen”
“Girls’ Day”

▷ Work-life balance

- family-friendly offices/ kid’s corner
- home-office equipment
- family-friendly event scheduling
- substitute personnel
- child care at RTG events
& outside standard office hours



Environment



Graduate Academies

Profile line
LIGHT

Profile area
Intelligent
Methods&Materials
Math.&Comp.
Sciences

RTG 2522

HRS-APS

IMPRS MiS

Jena M.Sc. Focus:
Quantum- & Gravitational Fields

ARA-Cluster
ABACUS-Cluster

MPG-Strategic coop. grant:
M.Sc. Mathematical Physics

HI JENA
HELMHOLTZ

TLS
IOF
IPHT

MPI-MiS



DFG-FOR 2783
Probing the Quantum Vacuum

RTG 2522/1



Holger Gies



-13-

LQP2
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What you can do for the RTG

excellent research

communicate

Qualification

Goal: Ability to carry out own research with an increasing degree of independence

▷ Research or RTG seminars, “Kollegiatenseminar”

- discuss and decide about program, invite speakers, ask for suitable level

own budget assignment

▷ Mitteldeutsche Physik-Combo

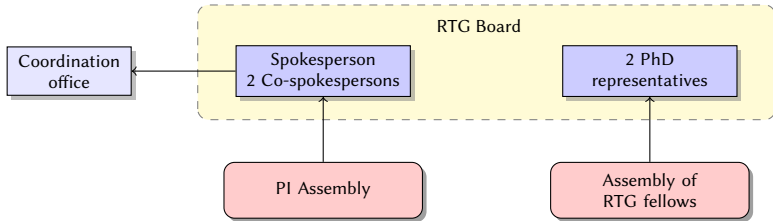
~ 2/3-day compact courses 2×/year

- topic & speaker selection primarily by RTG fellows
- “students-only” session
- combined with
Monitoring Workshop 1×/year

Peer Group

- serve as chairperson!

Organization & Quality Management



▷ election of PhD representatives:

tonight

▷ quality management:

- ...
- statistics, data and countable quality criteria collected by coordination office
- round table discussions @ Combos
- **final report** by each fellow

RTG web page



▷ <http://www.rtg2522.uni-jena.de>

▷ Content & Design

TODO: more about you, more about your projects, publications, ...

jekyll, html, markdown, ...

& Outreach

- ▷ Outreach activities at TPI Jena and ITP Leipzig

Girls' Day; "Physik für Schülerinnen"
"Tag der Physik"
"MINT festival"

- ▷ Science Blog

"My live as a scientist"

- ▷ Public Outreach Talks

"Rent a scientist"

- ▷ RTG 2522 topics on Wikipedia?

check & improve

- ▷ RTG 2522 LOGO

Design suggestions welcome !!!

Put the RTG 2522 into your acknowledgments:



...

This work has been funded by the Deutsche Forschungsgemeinschaft (DFG) under Grant No. 406116891 within the Research Training Group RTG 2522/1.

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Mission of RTG 2522



- ▷ offering comprehensive research training
across conventional field boundaries

overcoming the traditional separations into isolated subfields

- ▷ enabling RTG fellows to comprehend the
interrelations of seemingly disparate fields

for creative solutions of future challenges

