

Scottish Crucible
Stefan Hild

SUPA **IGRF** Institute for Gravitational Research **LSC**
University of Glasgow **Science & Technology Facilities Council**
School of Physics and Astronomy
University of Glasgow



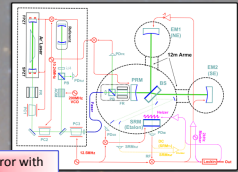
Started to work as 'HiWi' at GEO600 during my 1st year of studies (bolting together vacuum systems, building clean rooms etc)

In the 4th year I had (together with a friend) my own lab and experiment: 'Interferometric Recycling Techniques', SFB 407

Physics Studies at University of Hannover

The Quest for the First Direct Detection of Gravitational Waves:

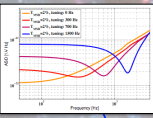
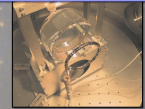
- Predicted by Albert Einstein's General Theory of Relativity.
- GW are tiny ripples in space time caused by acceleration of heavy masses.
- To detect them we need to measure lengths with unprecedented precision.
- Michelson interferometers such as GEO600 are able to detect arm length changes of 10^{-19} m, which is about 1/1000 of a proton diameter.



Developing a mirror with in-situ adjustable reflectivity

Diploma Thesis at Garching 12m prototype Max Planck Institute for Quantum Optics

Side product: First ring-heater used for thermal compensation.



Quantum noise shaping by Signal Recycling

Measurement of a low-absorption sample of OH-reduced fused silica
Order: Eric Frazee, Luke, Walter Willner, Sam Stein, Harriet Green, Joshua Smith, Minakata Hiroaki, Nathan Harrison, Sarah Webb, James Hough, and Robert Schnabel

Ultra-low absorption optics: world record for fused silica

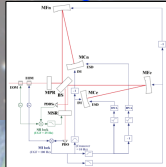
Appointed ILIAS (FP6) GW-WP1 member

**Max Planck Institute for Gravitational Physics
PhD: GEO 600**

The GEO600 Gravitational Wave detector is run by a British-German-Spain collaboration of about 200 Scientists. During my PhD I had to great chance to be part of only a handful of scientist who worked directly at the heart of this highly complex machine. I worked on most aspects relevant for constructing, commissioning and operation of GW detectors.

Data characterisation: Inventing new Veto-methods

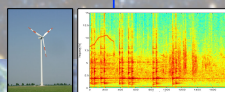
Complex Control Systems: 300 partly coupled servo loops



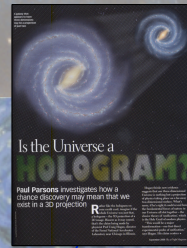
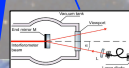
Suspensions and seismic isolation



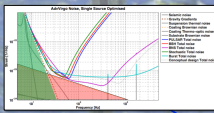
Seismic survey on effects of wind mills



Calibration using photon pressure



Does noise in GEO600 indicate that we live in a hologram?

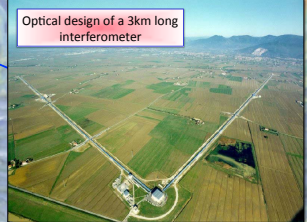


Plenty of simulations

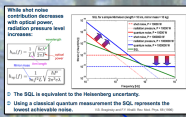
Optimising the Advanced Virgo sensitivity for different astrophysical target sources, e.g. colliding neutron stars, supernovae, pulsars ...

**University of Birmingham
Optical Design of Advanced Virgo**

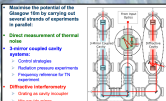
Research Fellowship (funded by CNRS and INFN) for the optical design of the French-Italian Advanced Virgo interferometer. The project funding was obtained by using the core interferometer design I developed during this fellowship.



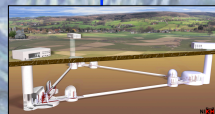
Optical design of a 3km long interferometer



Trying to beat Heisenberg's Uncertainty Principle: AEI-10m Sub-Standard-Quantum-Limit Interferometer.

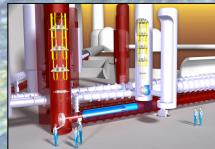


For Rolling Grant: Developed the research program for 4 PDRAs for the next 5 years.



Einstein Telescope

FP7 funded design study for a 3rd Generation GW Detector. The baseline design is based on two articles I wrote.

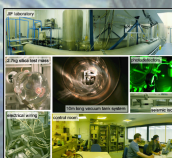


**University of Glasgow
Lecturer**

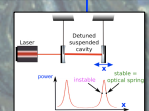
Institute for Gravitational Physics (IGP)

Chair of the Sensing and Control working group of the GEO collaboration.

Glasgow 10m interferometer: A testbed for advanced interferometry techniques



Optical Springs: Making light stiffer than diamond.



Scientific outputs of the last 8 years:

- About 100 peer-reviewed publications
- More than 10 first-author papers
- More than 60 talks on international meetings

My motivation for applying to Scottish Crucible:

- Interdisciplinary aspects
- Interplay of Science, Politics and Society
- Learn about funding policies and the RSE
- Meeting interesting people

Interests OUTSIDE research:

- Hiking Scotland + Traveling around the world
- Photography
- Audio engineering for live concerts
- Architecture, Arts and good Music

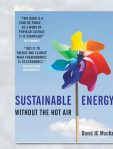
My favorite side topic: ENERGY

- Climate change and climate reconstruction.
- How to produce enough sustainable energy?
- Strength and weaknesses of renewable sources?
- How to cope with fluctuations in demand and production?
- How to store huge amounts of energy?

Lectures

1. Introduction
2. Climate change and greenhouse gases
3. Renewable energy
4. Energy storage
5. Fusion
6. Hydro and geothermal
7. Geothermal, LPTL, Fuel cells
8. Road Learning Public lecture
9. Fuel Cells
10. Nuclear fission
11. Nuclear fusion
12. Wind
13. Solar
14. Hydroelectric + T&E
15. Wave
16. Wind Power of Charge
17. Energy storage for Power
18. Geomagnetic
- 19-21. 22. Nuclear

Introduced new Honours Course on 'Energy and environment' for physics students.



Superb book, everybody should read

Contributed to safety studies of nuclear waste storage for the Austrian Government