

GR 7: Didactical aspects of relativity

Zeit: Mittwoch 16:30–17:50

Raum: NW-Bau - HS3

Hauptvortrag GR 7.1 Mi 16:30 NW-Bau - HS3
Teaching about gravitational waves — ●MARKUS PÖSSEL — Haus der Astronomie / Max-Planck-Institut für Astronomie, Heidelberg

Over the past few years, gravitational waves have captured the imagination of the general public and, specifically, of pupils and of university-level students world-wide. This makes gravitational waves an attractive subject for teaching. But their grounding in general relativity also makes gravitational waves a challenging subject to teach. In this talk, I explore different ways of teaching about gravitational waves at the undergraduate and at the high school level, using concepts from Newtonian physics as well as models, analogies, and visualizations.

Hauptvortrag GR 7.2 Mi 17:10 NW-Bau - HS3
Visualizing relativistic effects in a non-relativistic model — ●THOMAS FILK — Institute of Physics, University of Freiburg, Hermann-Herder-Str. 3, 79104 Freiburg

A chain of harmonically coupled pendula in a gravitational field is a classical Newtonian system. However, in a continuum limit, where the discreteness of the chain can be neglected, the equations of motion of this system become Lorentz invariant. Therefore, all non-trivial solutions of this system (solitons, breathers) behave like relativistic objects: there is a maximal speed of propagation and the solutions show Lorentz contraction and time-dilation when in motion (with the proper Lorentz factor and the speed of light replaced by the speed of wave propagation along the chain). Intrinsically, i.e. when the “clocks” and “rulers” of the system are used, this becomes a Lorentz invariant relativistic system. Extrinsically, i.e. for an external observer, it remains to be Newtonian.

This model cannot only be used to demonstrate relativistic effects in the classroom, but it also shows nicely how Einstein’s interpretation of relativity comes about when the measuring devices are considered as part of the system. And it emphasizes the usefulness of changing perspectives.