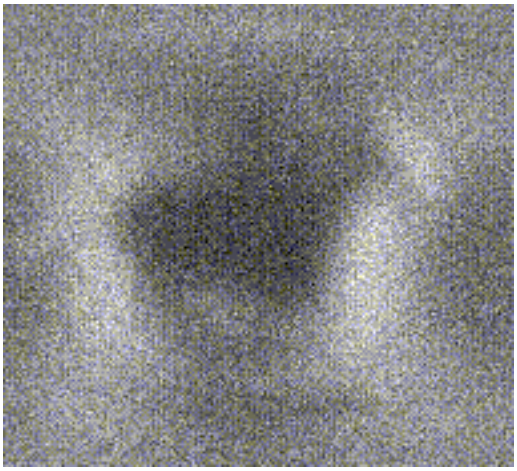
**Quantum horse/Quantum imaging**

**Quantum horses run in the Barkhausen Building**

Albert Einstein proposed teleportation in 1935, but was skeptical. However, this didn't stop science fiction writers from beaming, as the line "Beam me up, Scotty" from "Enterprise," Star Trek: The Original Series (1966–1969) demonstrates. Today, however, teleportation, beaming and entanglement are reality. A team from BIOLAS@TU Dresden (TUD) and TU Darmstadt has now „beamed horses“ as videos using laser beams. The images of the horses can be transported from one space to another without any time delay using entangled photons (light particles). For biomedicine, this opens up exciting applications in cancer diagnostics, which will be researched in the "Physics of Life" cluster at TU Dresden.

Background: Quantum computing, quantum communication, and now quantum imaging enable fundamentally new applications. In 2022, Anton Zeilinger, among others, received the Nobel Prize in Physics for quantum teleportation (spooky action at a distance). In addition to secure communication via teleportation, Anton Zeilinger also pioneered quantum imaging, which is now expected to find applications in biomedicine. The project "3D Quantum Imaging with Undetected Light and Wavefront Control" is funded by the German Research Foundation (DFG). The team includes Dr. Stefan Krause, Dr. Lars Buettner, and Prof. Juergen Czarske from TU Dresden, BIOLAS (Biomedical Computational Laser Systems), as well as Prof. Markus Graefe and Jonas Vasikonis from TU Darmstadt. Albert Einstein described quantum entanglement as "spooky action at a distance," in which light particles (photons) are connected in such a way that they share the same fate even over great distances. If the property of one entangled particle is measured, the corresponding property of the other particle is immediately known. Because these photons are correlated, their interaction with the object can provide information about its properties, thus enabling a new form of imaging for biomedicine. The underlying technology is also important for the further development of quantum computing. The BMBF's 6G-life cluster is also pursuing applications of quantum communication in the direction of quantum internet and quantum robotics.

It is also conceivable that cheat sheets could be teleported from home to the classroom in real time and without a direct connection using AR glasses (AR, augmented reality, see the film Minority Report). However, the project is pursuing applications using quantum holography of entangled photons, which are urgently needed for biomedicine.



Quantum Horse (photo by Dr Stefan Krause)