

# Full Professor (W3) for „Fundamentals of Optics and Photonics“

## Concept

Optics is a key technology of the 21st Century. Six Nobel prizes (Physics and Chemistry) were awarded within the last 5 years to acknowledge achievements obtained in optics and with optical methods or materials, respectively. Interestingly, they cover both very fundamental research as well as applied aspects. This highlights the fact that Optical Science is a particularly efficient forerunner for novel technology. It is fair to say that quantum optics is at the forefront of the novel quantum technology in general.

Optics/Photonics has also been identified as one of key sectors of technology on the Science Campus of Humboldt-Universität at Adlershof. It is one of the four research topics at the Department of Physics. There, the experimental and theoretical research groups concentrate on novel emerging fields within the optical sciences beyond traditional optics. These concern light of highest and lowest intensity down to single photons, light at highest stability, light in confined geometry and in complex nanostructures, as well as light emitted or absorbed from smallest entities of matter such as molecules or atoms. In these research efforts light is both a tool and an object of study itself. The Optics groups at the Department of Physics have tight links with the non-university research centres on the Adlershof campus. There are joint affiliations, e.g. S-Professorships, with the Max-Born-Institute, the DLR-Institute of Optical Sensor Systems and the Ferdinand-Braun-Institute.

In the winter semester 2015/16 a new Masters Program on Optical Sciences will start aiming at specialized education in Advanced Optics and Photonics. In the beginning it is expected that about 30 students per year will enrol in this program.

The professorship in Optical Sciences is a key position within the Department of Physics. It is expected not only to participate, but also to successfully develop the field of optics and to further enhance the international visibility. It should help to maintain the ability of Adlershof as one of the largest science & research campuses in Europe to compete with other world-leading centres in Optical Sciences.

Possible candidates should have - or should be expected to establish - an outstanding internationally visible record of innovative research in experimental optics. The overall research could concern quantum hybrid systems, coherent or non-linear phenomena in condensed matter, (integrated) quantum technology, quantum information, or similar topics.

Possible specific research areas can be:

- **(Non-linear) quantum optics and optomechanics**

Study the non-linear interaction of photons and phonons and/or explore quantum optomechanical transducers to establish quantum hybrid systems or to perform quantum-limited precision measurements; explore (structured) materials for quantum non-linear optics and quantum optomechanics.

- **Photonics with cold atoms**

Obtain unprecedented enhancement of coherent and non-linear light-matter interaction by coupling ensembles of cold atoms and integrated photonic or plasmonic structures. Utilize quantum-enhanced sensitivity of cold quantum objects to detect optical, electronic or structural phenomena in low-dimensional or bulk solid-state systems. Explore implications on future atom-photon chips.

- **Artificial atoms**

Establish coherent control and manipulation of optical or magnetic excitations in rare earth ions, optically active point defects or molecular systems. Pursue studies of ensembles or

few interacting entities with the goal to reveal complex mesoscopic and macroscopic quantum phenomena. Explore applications in integrated optical quantum technologies.

The new professor will actively collaborate within the research focus Optics/Photonics at the Department of Physics and with the research institutes on campus as well as in the Berlin/Brandenburg area. It is expected that he or she will initiate novel concerted research activities in Optical Sciences or Modern Optics. Also the professor should actively engage in established research activities, e.g., within the collaborative research centre CRC951 on hybrid inorganic/organic opto-electronic systems or within the research focus Modern Optics in the Integrated Research Institute for the Sciences Adlershof.

**Contact:**

Prof. Oliver Benson  
Department of Physics  
Humboldt University Berlin  
Newtonstr. 15  
12489 Berlin, Germany  
Phone: +49 30 2093 4712  
[Oliver.bensonphysik.hu-berlin.de](mailto:Oliver.bensonphysik.hu-berlin.de)