

Foundations of Quantum Theory

New Lecture at the Institute of Physics, PAS

- **Time & Location:** Wednesdays at 10:00, room D, Institute of Physics PAS (al. Lotników 32/46).
- **Online:** Zoom meetings (passcode: 709157) at <https://zoom.us/j/97634000369?pwd=Y8r7bUeOqdcaoLeNcapeLIKOPdSlvP.1>
- **Duration:** 15 sessions, each 2 hours (30 hours in total)
- **First Lecture:** **October 23th.**
- **Website:** www.theory.ifpan.edu.pl?class=24/1/foundqm/pszan
- **Lecturer:** Dr Piotr Szańkowski (piotr.szankowski@ifpan.edu.pl)
- **Reading Materials:** Available on the course website.
- **Language:** English

Course Overview:

We will begin by exploring the intricate relationship between physical theories, their mathematical formalisms, and their interpretations, with examples drawn from both classical and non-classical physics. The core focus of the course is a critical examination of the standard formalism of quantum mechanics: its mathematical structure, its conceptual underpinnings, and, most importantly, its limitations.

From there, we will evaluate the potential for restructuring quantum theory's formalism to address these limitations. Historical attempts at reformulation will be discussed, along with an analysis of their partial successes and reasons for not fully resolving the challenges.

Finally, we will make our own attempt at constructing from scratch a fully functioning and complete formalism for the theory by *deducing* it from experimental observations—a *phenomenological quantum mechanics*.

Criteria For Admission

Basic knowledge on quantum mechanics is very much welcomed. However, it is possible that not having much experience with quantum theory might also be advantageous.