



## KONWERSATORIUM INSTYTUTU FIZYKI UMCS

13.10.2022 r., (czwartek) godz. 11<sup>15</sup>, Aula IF im. St. Ziemeckiego

**Prof. dr hab. Piotr Magierski**

*Politechnika Warszawska*

### **Exotic Structures in Superfluids**

Superfluidity and superconductivity are remarkable manifestations of quantum coherence at a macroscopic scale. The existence of superfluidity has been experimentally confirmed in many condensed matter systems, in  $^3\text{He}$  and  $^4\text{He}$  liquids, in nuclear systems including nuclei and neutron stars, in both fermionic and bosonic cold atoms in traps, and it is also predicted to show up in dense quark matter. The interplay between spin-polarization and superfluidity gives rise to fascinating phenomena manifested in Josephson-p junction or in exotic phases like FFLO or Sarma (interior gap) phase, which involve nontrivial behavior of the order parameter.

I will present certain aspects of superfluidity in nonequilibrium conditions, which originate from dynamics of the order parameter both in unpolarized and spin-imbalanced systems. In particular, I will discuss certain properties related to the structure and dynamics of quantum vortices in the context of quantum turbulence. Finally, I will describe the possibility of creation of various exotic structures: spin-polarized droplets (ferrons), disordered structures and supersolids in superfluid cold atomic gases.

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Uprzejmie zapraszam wszystkich pracowników, doktorantów i studentów Instytutu Fizyki.

Dr hab. Ryszard Zdyb, prof. UMCS  
Dyrektor IF UMCS