OVERVIEW:

Research activity of the Department of Theoretical Physics concerns theoretical high - energy and elementary particle physics, intermediate energy particle physics, theoretical nuclear physics, theory of nuclear matter, theory of quark - gluon plasma and of relativistic heavy - ion collisions, theoretical astrophysics and general physics. There is some emphasis on the phenomenological applications of the theoretical research, yet the more formal problems are also considered. The detailed summary of the research projects and of the results obtained in various fields is given in the abstracts.

Our Department actively collaborates with other Departments of the Institute as well as with several scientific institutions both in Poland and abroad. In particular members of our Department participate in the EC network which allows mobility of researchers. Several members of our Department have also participated in the research projects funded by the Polish Committee for Scientific Research (KBN). The complete list of grants is listed separately.

Besides pure research, members of our Department are also involved in graduate and undergraduate teaching activity both at our Institute as well as at other academic institutions in Kraków. At present five students are working for their Ph.D. or MSc degrees under supervision of the senior members from the Department. We continue our participation at the EC SOCRATES-ERASMUS educational programme which allows exchange of graduate students between our Department and the Department of Physics of the University of Durham in the UK.

Professor Jan Kwieciński

REPORTS ON RESEARCH:

Self-Consistent Superfluid Nuclear Matter Calculation

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Self-consistent spectral function for nuclear mater is obtained using T matrix approximation including off-shell nucleon propagation [1]. At low temperatures the system undergoes a transition to a superfluid phase. The self-consistent T-matrix approximation is generalized also to this case using anomalous Green's functions and a superfluid condensate. Scattering and off-shell propagation reduce the value of the pairing gap and the critical temperature [2].

References:

1. P. Bożek, Phys. Rev. **C59** (1999) 2619;
2. P. Bożek, Nucl. Phys. **A657** (1999) 187.