

Proceedings
of the XVI National Conference
on Superconductivity and Strongly
Correlated Systems
Zakopane, Poland, October 7-12, 2013

Editors of the Proceedings:
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WARSAW

POLISH ACADEMY OF SCIENCES
INSTITUTE OF PHYSICS

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Jagiellonian University, Kraków



Faculty of Physics and Applied Computer Science,
AGH University of Science and Technology, Kraków



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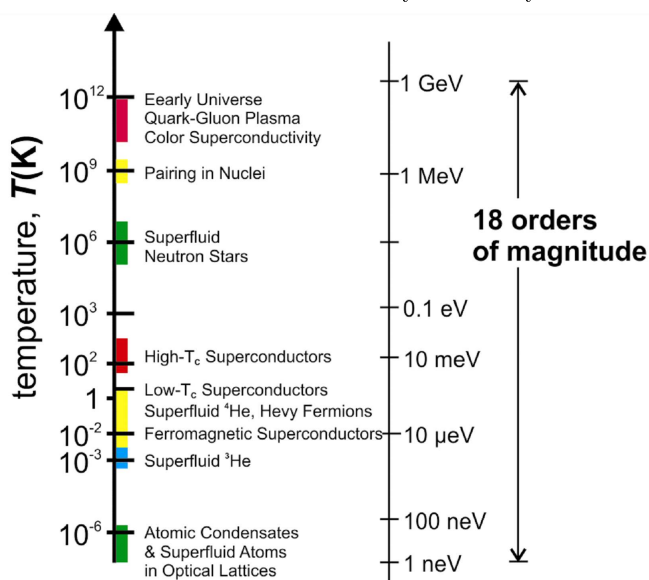
Foreword

The conference is one of the series of the meetings organized to consolidate and review our efforts in the area of unconventional superconductivity and its relation to magnetism and in the broader scope, to the field of correlated fermion systems. For the first time, the Conference had an international character and the Proceedings is published in the two parts: the present issue, as well as the Focus Issue: *From Correlations to Unconventional Superconductivity*, the latter appears in the *Philosophical Magazine B*. About 130 participants from Poland and from abroad took part in the Conference. The Conference was co-organized by the Marian Smoluchowski Institute of Physics of Jagiellonian University and the Faculty of Physics and Applied Computer Science of the AGH University of Science and Technology. Both institutions financially supported us to help in reducing the fee for students and support partly some of the foreign invited guests. The next conference will take place in 2015 and is organized by the Institute of Low Temperatures and Structural Research of the Polish Academy of Sciences in Wrocław (chairman: Prof. Krzysztof Rogacki).

Apart from a regular conference schedule, an inaugural lecture was delivered by Prof. Bogdan Sulikowski from the Institute of Catalysis and Surface Chemistry from the Polish Academy of Sciences in Kraków. The title of this special lecture was: *Five-fold Symmetry in Science and Art*. It is probably also worth mentioning, that the conference was quite intense, as 62 invited and contributed talks were delivered during 4.5 days of its regular schedule. There were two full sessions devoted exclusively to presentations by young scientists. This, in our view, speaks for vitality of the field and a broad interest in the subject within our country. What probably is still lacking is a good coordination of the efforts of different research groups. The series of the Conferences is aimed also to provide a platform for discussions between different groups.

The Institute of Physics of the Jagiellonian University organized the Conference three times: once chaired by Prof. Andrzej Szytuła and twice by myself. In all three cases the Conference were co-chaired by Prof. Andrzej Kołodziejczyk from the Faculty of Physics and Applied Computer Science of the AGH University of Science and Technology. A close cooperation in this respect between our two universities must be emphasized. I take this opportunity to thank our Deans: Prof. Andrzej Warczak (JU) and Prof. Janusz Wolny (AGH) for their help. Additionally, Prof. Andrzej Warczak and Vice-Rector of AGH, Prof. Zbigniew Kąkol, have opened the conference and have given brief presentations of our universities and the respective faculties.

Having organized one of the first conferences (in 1988) and the present one (2013) 25 years later, I would like to make the following general remarks. First of all, the field of superconductivity has grown up enormously during those 25 years and the field of *unconventional superconductivity* has been created that encompasses both high-temperature and heavy-fermion superconductivity from one side, and organic-metal superconductivity, and superconductivity in iron pnictides from the other. In the enclosed figure I illustrate the fact that this phenomenon appears at all energy scales of physical phenomena. In other words, it can be regarded as a universal phenomenon among the condensed-matter systems. In this manner, it is becoming as universal as is magnetism (for details cf. J. Spałek and D. Goc-Jaęło, *Phys. Scr.* **86**, 048301 (2012)) as it is not limited to the lattice systems only.



What is equally interesting, the unconventional magnetism is tightly associated with the onset of the superconductivity in all the systems mentioned explicitly above. Therefore, it is our deep conviction that the ultimate solution of the puzzle concerning the mechanism of pairing in those strongly correlated systems should come from a cooperation between the magnetic coupling of spins forming local moving pairs, if only metallic state becomes stable against the Mott (Mott–Hubbard) insulating state. This is also the reason why a sort of satellite meeting was organized by us this year (2014) under the title: *From Spins to Cooper Pairs*. Everybody is welcome to participate in this conference which will have form of a workshop.

Sadly, I have to mention at the end, that just before the Conference Prof. Jan Klamut has passed away. He was one of the pioneering figures that advocated the cause of advanced studies of high- T_C superconductivity at its very beginning, as well as organized some of the national conferences to coordinate our efforts. A biographical note concerning Prof. Klamut's career is included in these Proceedings.

I would like thank the people from the Local Organizing Committee. In particular, I should acknowledge the role of our scientific secretary – Dr. Danuta Goc-Jagło, and of our graduate students – Andrzej Kądziaława, Ewa Kądziaława-Major, Marcin Abram, Marcin Wysokiński, Krzysztof Bieniasz, and Grzegorz Rut. Thanks are also due to Dr. hab. Adam Rycerz, Dr. Leszek Spalek, Dr. Paweł Starowicz, Dr. Jan Kaczmarczyk, and Dr. Michał Zegrodnik.

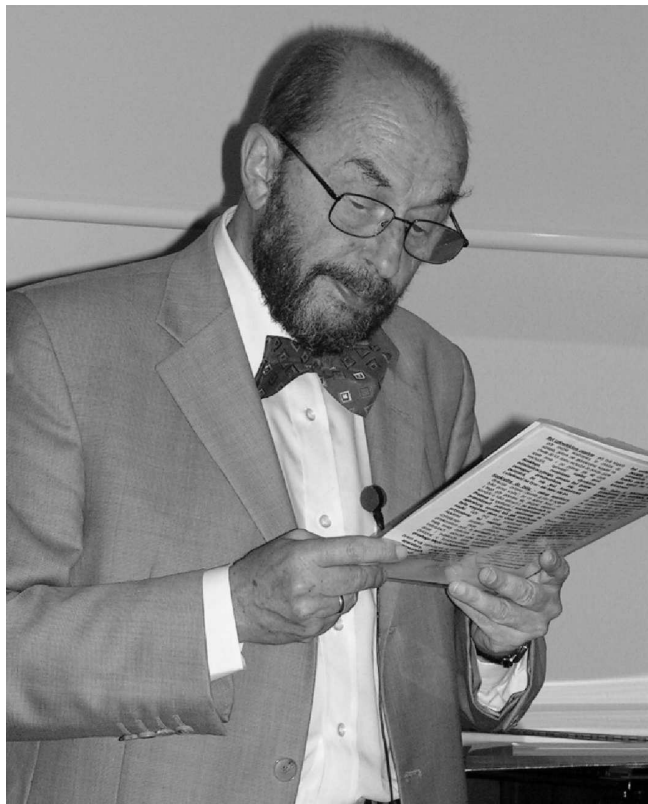
We acknowledge the financial support of the Foundation for Polish Science (FNP) within the project TEAM awarded to our group for the years 2011–15, as well as to the National Science Centre (NCN) within the scheme MAESTRO, grant No. DEC-2012/04/A/ST3/00342. As I said before, the conference was also supported by the AGH University and the Jagiellonian University within the Excellence Programme KNOW.

See you in Wrocław in 2015!

Józef Spalek
*Chairman of the
XVI KKN Conference*

Professor Jan Klamut

(1936–2013)



Jan Klamut was born in 1936 in Lviv (Lwów). During the turmoil of war he was forced to change his residence several times, but ultimately he settled in Wrocław. With this town he was bound for his whole life. He studied physics at the University of Wrocław, where in 1958 he obtained the master's diploma. Then he got a job at the Institute of Low Temperature and Structure Research (ILTSR) of the Polish Academy of Sciences. In this Institute he defended his doctoral thesis, and in 1971 got a habilitation scientific degree. During all his professional life he was attached to the two scientific institutions: ILTSR and the International Laboratory of High Magnetic Fields and Low Temperatures in Wrocław.

In ILTSR he had been working for more than 40 years, being twice the Director of the Institute, in the years 1984–1992 and 1999–2002. In 1993 the authorities of the Polish Academy of Sciences designated him to be the Director of the International Laboratory. In the following years he was repeatedly elected by the Scientific Council for a number of three-year tenures. Due to serious disease he had to resign from the post of Director in June 2012. Professor Klamut made significant contribution to the development of both scientific institutions. In ILTSR he coordinated the construction of the new headquarters located at Niskie Łąki street. In the International Laboratory he succeeded to transform the institution into the international institute of the Polish Academy of Sciences and to greatly reinforce its research potential. He won great recognition among physicists both in the country and abroad, and he got the doctor *honoris causa* title from the Russian Academy of Sciences. In Poland he initiated to organize cyclical scientific conferences devoted to superconductivity; the proceedings of the subsequent XVI National Superconductivity Conference are included in the present issue. He was the author or co-author of more than 100 scientific articles and of two books. His interests were exceptionally wide. Apart from science he was fascinated by philosophy and arts. He died on March 13, 2013. May he rest in peace!

Tomasz Palewski
Professor of the International Laboratory of
High Magnetic Fields and Low Temperatures

