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Preface

The European Conference PHYSICS OF MAGNETISM 2014 (PM’14) was the fourteenth of the series that have been organized jointly by the Institute of Molecular Physics of the Polish Academy of Sciences and the Faculty of Physics of the Adam Mickiewicz University every three years since 1975 in Poznań. From the early beginning, the conferences were meant as an international forum for the presentation and discussion of novel scientific ideas in the field of broadly understood magnetic phenomena including experimental results and new materials. The present Conference was focused on novel metallic oxides and anomalous magnetoresistive materials, low dimensional quantum magnets, heavy fermions, fluctuating valence and Kondo systems, magnetic multilayers, surfaces, nanostructures, and magnonic crystals, high temperature superconductors and electronic structure.

As for the earlier conferences of this series, the venue of the fourteenth PM’14 conference held on June 23–27, 2014 was again Poznań, in the modern buildings of A. Mickiewicz University, offering excellent conference facilities.

The PM’14 Conference was divided into several sessions chaired by scientists from the conference Programme and Advisory Committees. The program of the Conference consisted of 32 invited talks. They were presented by distinguished physicists from Europe, USA, Canada, and Japan.

The invited speakers (in alphabetical order):

R. Alleschmacher (Switzerland) — Static and dynamic properties of magnetic domain walls
J.F. Annett (UK) — Spin-flipping with conical magnets: Superconducting proximity effects in bi- and multilayers
J.-P. Ansermet (Switzerland) — Magnetization dynamics under heat currents
A. Bansil (USA) — Recent progress in modeling electronic structure and spectroscopy of topological insulators and novel superconductors
K.S. Bedell (USA) — The Higgs amplitude mode in ferromagnetic metals
A. Bonatti (Australia) — Physics of magnetism in GaN doped with transition metals
E. Coronado (Spain) — From molecular magnetism to molecular spintronics
M.G. Cottam (Canada) — Spin-wave instability theory for ferromagnetic nanostructures
G. Cumberi (Germany) — Spin selective transport through helical molecular systems
B. Dluhak (France) — Graphene: new venues for spintronics
J. Dubowsk (Poland) — Micromagnetic approach to exchange bias
M. Fähnle (Germany) — Theory of ultrafast demagnetization after femtosecond laser pulses
V. Franco (Spain) — The magnetoelastic effect: a useful tool for the characterization of phase transitions
A. Garg (USA) — Collective relaxation dynamics in molecular magnetism
H. Hahn (Germany) — Tailoring and tuning of magnetism in nanostructures
D. Kaczorowski (Poland) — Quantum critical superconductivity in f-electron systems
B. Keimer (Germany) — Spin and charge correlations in two-dimensional correlated-electron metals
P. Kopčanský (Slovakia) — How to induce high sensitivity of liquid crystal to external magnetic field?
S. Maekawa (Japan) — Power spintronics
D. van der Marek (Switzerland) — Optical properties of lattice tuned RNO3
P. Mendels (France) — Quantum kagome spin liquids
K. Miyake (Japan) — Kondo effects without magnetic degrees of freedom
A.M. Oleś (Poland) — Frustration and entanglement in spin-orbital models
J. Ranninger (France) — High Tc superconductivity and metastability
A. Ślębarski (Poland) — Properties near magnetic instability of heavy-electron compounds Ce3M4Sn13 and La3M2Sn13, with M = Co, Rh, and Ru
J. Spaček (Poland) — Real space pairing in high temperature superconductors and heavy fermions: beyond renormalized mean-field theory and comparison to experiment
T. Stobiecki (Poland) — Magnetic tunnel junctions for spintronics applications
T. Story (Poland) — Electron and spin properties of topological crystalline insulator Pb1−xSnxSe
P. Tomczak (Poland) — How do we measure bipartite entanglement for Heisenberg antiferromagnets?
M. Vojta (Germany) — Dirty magnets: from fractional moments to cluster spin glasses
M.R. Wegewijs (Germany) — Magnetic anisotropy goes spintronic
T. Wojtowicz (Poland) — Spintronics research with (Gd,Mn)Te-based diluted magnetic semiconductor quantum structures

Besides these lectures, 337 contributions were presented in either oral (61 short talks) or poster form.

The papers which were submitted and accepted for publication after the referee procedure are published in the Conference Proceedings.

The success of PM’14 was due to the contribution of 412 participants from different countries. The collaboration with the Editorial Staff of Acta Physica Polonica A was efficient and fruitful for both sides. The Guest Editors wish to thank the staff members for their effort and enthusiasm.

It is with great regret that we inform the readers that Professor Bernard Coqblin passed away on May 29, 2012. He will remain in the fond memories of his friends and collaborators. A biographical note, concerning Professor Bernard Coqblin, is included in these Proceedings.

Finally, we would like to take this opportunity to thank our colleagues from the Programme, Advisory and Organizing Committees, as well as the referees, who have ensured the scientific quality of the conference and of the proceedings. Our special thanks are also due to all the Sponsors of the Conference (see the relevant list).

Editors
R.J. Wojciechowski, L. Smardz, I. Weymann,
B. Idzikowski, R. Mienas, A. Szajek
In Memoriam
Professor Bernard Coqblin (1940-2012)

Born on Sept. 6, 1940, in Montfort l'Amaury near Paris, graduated in 1961 from the École Polytechnique. After graduating, Bernard Coqblin joined professor Jacques Friedel's group at Laboratoire de Physique des Solides (LPS), Université de Paris as a researcher in Centre National de la Recherche Scientifique (CNRS). He obtained the degree of Docteur d'Etat (Ph.D) in 1967 at the Université Paris. The main subject of his thesis was the stability of localized magnetic moments in metals. In years 1967-68, he worked with Professor J.R. Schrieffer at the University of Pennsylvania as a postdoctoral fellow. They together derived the so-called “Coqblin-Schrieffer (CS) Hamiltonian” which allowed a realistic description of the Kondo effect in rare-earth ions like Ce or Yb [Phys. Rev. 185, 847 (1969)]. This kind of interaction leads to the occurrence of various anomalous properties of the numerous rare-earth and actinide compounds, but especially to the so-called heavy fermion behaviour at low temperatures. This derivation brought Bernard Coqblin wide international recognition just at the beginning of his scientific career.

In 1972 Bernard Coqblin became Maître de Recherche of CNRS at the Université Paris-Sud, working there up to his death in 29 May 2012, being Directeur de Recherche emeritus at this University.

His primary scientific activity was concerned first of all on the theoretical study of the electronic structure and magnetism of systems with rare-earths and actinides. His theoretical contribution cover many aspect of such 4f- and 5f-electron materials. Hence, as a consequence of his scientific interest and activity, he wrote the book entitled: “The electronic structure of rare-earth metals and alloys: the magnetic heavy rare-earths”, published by Academic Press (1977). He was the author or co-author of several chapters and more than 200 papers, he presented about 50 invited talks at international conferences. He co-organized several international conferences. In particular, he was a chairman of a large international conference on the Strongly Correlated Electron Systems (SCES98), with more than 800 participants, organized in Paris in 1998. He was one of the initiators of the international conference series entitled: “Journées des Actinides” started in 1971 in Grenoble (France) and such meetings are still organized annually in various countries. It should be added that Bernard Coqblin was a member of International Scientific Committees of many conferences on rare-earths, actinides or magnetism and, of course, on SCESs.

Bernard Coqblin was the supervisor of many students, and in particular students from South America (Brazil, Argentina, Venezuela) where he often travelled and where he had a number of collaborators, especially in the last years of his world scientific activity.

His theoretical research studies had been firstly performed on “anomalous” rare-earth systems, which show many outstanding properties, going from magnetism to a heavy fermion behaviour or superconductivity. For example he presented the first theoretical model based on the intermediate valence varying with pressure to account for the exceptional temperature-pressure phase diagram of cerium metal. Together with co-workers he explained theoretically the effect of pressure on the properties of the cerium ion, in various alloys and compounds. This was thanks to the introduction of a model describing both the Kondo effect and the crystalline field effect, just by the use of the CS Hamiltonian [see Phys. Rev. B 5, 4541 (1972)]. The same group has subsequently applied this model to compute different kinds of transport properties, which allowed them to give a successful explanation of the electrical resistivity, thermal conductivity and the thermoelectric power of many anomalous rare-earth compounds.

Bernard Coqblin was particularly interested in various features of the strongly correlated electron systems, including the intermediate valence behaviour observed in SmS or TmSe or the anisotropy of Kondo transport properties. He paid much attention to a detailed study of different aspects of the Kondo lattice problem, with a special emphasis on the competition between magnetism coming from inter-site interactions and the intra-site Kondo effect. This competition was extensively studied by him and the theoretical results were successfully applied to cerium, its alloys...
or other anomalous rare-earth compounds. Furthermore, he and his co-workers brought important contributions to solving the problem of the Kondo-spin glass (SG) vs. magnetic order competition. In particular, they used different models, e.g. the Sherrington–Kirkpatrick or Mattis-type models, to describe the SG phase and to account for the experimental phase diagrams of some solid solutions containing cerium or uranium.

Besides the rare-earth compounds, Bernard Coqblin with his nearest co-worker J. Julien and others had also extensively studied the electronic structure and the properties of the metals, alloys and compounds containing actinides, which show an evolution from the metals presenting a very strong d-f hybridization (U, Np, Pu) to the metals having a well localized character of 5f-electrons (Am, Cm, Bk, . . .) similar to that of rare-earths 4f-ones. This was the first and particularly interesting work considering the problems of the appearance of magnetism in the actinide heavy element series or in their alloys. Later, he and co-workers extended this problem to the spin fluctuation model applied to Np and Pu metals and some actinide compounds. Near the end of his life he was strongly engaged in working on the competition between magnetism and the “underscreened” Kondo lattice (UKL) interactions. One of his last works concerned the application of the $S = 1$ underscreened Anderson lattice (UAL) model to Kondo uranium and neptunium compounds. The resulting Kondo lattice model could describe both the Kondo regime and a weak delocalization of the 5f electrons due to taking into account the effect of 5f-conduction electrons hybridization.

Bernard Coqblin always interested in the thermal transport properties of anomalous rare-earth and actinide compounds. In cooperation with Polish scientists (Z. Klekowski, H. Misiorek, J. Mucha and R. Troć) he took part in works on these subjects. The cooperation with Z. Klekowski was particularly fruitful as it led to finding a correlation between the thermal conductivity and Kondo lattice interaction in several rare-earth compounds.

All the above, though far incomplete, gives a clear picture of the outstanding role of Bernard Coqblin in physics. In recognition of his contribution to science development, his nearest co-workers and co-authors of numerous common scientific papers, namely: A. Bhattacherjee (Orsay), J. Roberto Iglesias (Porto Alegre — Brasil) and C. Lacroix (Grenoble) organized in Orsay in September 2013, a two-day Memory Meeting devoted to Bernard, attended by about two hundred world-famous scientists from all over the world. It is interesting to mention that the most honourable person of this Meeting was, already advanced in age, Prof. Jacques Friedel with whom Bernard had started his scientific carrier. Polish scientists were represented at this Meeting by Prof. Roman Micas, Prof. Andrzej Oleś, Dr. Małgorzata Samsel-Czekala and myself.

In my memory, the first visit of Bernard in our country was to Karpacz in 1974. He took part in the 11th School, entitled “Magnetism in Metals and Metallic Compounds” organized by Prof. Jerzy Przystawa. B. Coqblin presented there a lecture concerning the hybridization problem in actinide metals. Only two years later Bernard came again to Poland, but this time to attend our 2nd International Conference on “The Electronic Structure of the Actinides”, organized in Wrocław, 1976. Later on B. Coqblin was invited to various schools organized by colleagues from different universities of Poland, which took place e.g. in Białowieża, Silesian Ustroń/Jaszowiec etc. He attended our Schools organized twice in Olejnica (near Leszno) in 1984 and 1986, where we were able to gather well-known lectures from all over the world. B. Coqblin was an invited speaker at “The XII School of Modern Physics on Phase Transitions and Critical Phenomena”, Łądek Zdrój, 2001. One year later he took part in organized in Wrocław the International Meeting devoted to “The 50-th Anniversary of discovery in our Institute of ferromagnetism in the trihydride and trideuteride of uranium”. Next, our Institute organized the Workshop on the “Anomalous phenomena in strongly correlated electron materials” in Wrocław, 2005, at which B. Coqblin presented an invited lecture on “Competition between the Kondo effect and magnetism in Kondo lattices”.

Of course, except for these various schools, meetings, workshops and symposiums, B. Coqblin was also present and gave a number of invited talks on large international conferences organized in Poland, like those on magnetism (ICM) in Warsaw, 1993, “Strongly Correlated Electron Systems” in Cracow, 2002 or on “The European Conference on Physics of Magnetism” in Poznań, twice in 2008 and 2011.

It is interesting to emphasize that Bernard Coqblin very willingly expressed his desire to cooperate with people from our Institute, which has resulted in publication of several common papers. Therefore, it is not surprising that Bernard Coqblin was appointed an Honorary Professor of W. Trzebiatowski Institute of Low Temperature and Structure Research of the Polish Academy of Sciences in 2009. It is important to add that he received also the title of Doctor Honoris Causa from the Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil in 2011.

Bernard will be remembered not only as well-known world-class scientist but also as a very nice person, especially for his warm and gentle way of persuading and cooperating with people. We will always remember this valuable friendship with him and the joy he has brought and shared.

Robert Troć

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