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Editorial / 2007 : more challenges ahead

By Prof. Oystein Fischer



Another year comes towards an end, a year where we have celebrated 20 years of HTS. This means 20 years during which we have explored these materials to a depth never achieved with other classes of materials.

And nevertheless we have not yet found a microscopic mechanism that everybody agrees on. This just illustrates how difficult the problem of strongly correlated electron systems is.

At the end of 2006, MaNEP, more than ever, is facing a formidable challenge in

research, a challenge that we are prepared to meet and take up again in 2007.

This month we gladly welcome a **new mobile post doc**, Dr Azzedine Bendounan, who will have his working place at PSI while collaborating with EPFL, UNINE, and UNIGE.

We have also decided to continue our programme of summer internships for female students in 2007.

A **MaNEP doctoral school** is under elaboration. In a first approach this will be limited to the University of Geneva. The goal here is to reinforce the training of the students and to attract the very best ones to MaNEP.

In an effort to strengthen interaction between MaNEP scientist, and in particular the younger ones, we have started a mail-based **MaNEP discussion-group using the Google solution**.

I encourage you all to take advantage of this attractive way to promote internal discussions in the coming year. Two new questions are just being submitted to your attention on which we hope to gather many enriching ideas and suggestions (see *below*).

I shall now leave you to a most deserved break and wish you a **Merry Christmas and a HAPPY NEW YEAR !**

MaNEP discussion-group / Fishing for suggestions on two issues !



Google Groups MaNEP's discussion group has been a little sleepy lately ! We'd thus like to ask you to **please provide plenty of astonishing inputs** on the two following 2007 issues :

1) as you will read in the **MaNEP news section**, the creation of **MaNEP's future Doctoral School** is well on its way thank to Dr Christophe Berthod. We'd like to collect all your ideas, suggestions and wishes on the subject.

2) **MaNEP's Topical Meetings** : please share your wishes for subjects YOU would like to have treated in them ! Thank you in advance for your inputs.

[[To the discussion-group](#)]

MaNEP News

Jobs / 2 open positions at PSI and UniGE

We currently have two news open positions available :

1 - PhD Position

on "Nanocrystalline ceramic film coating without sintering (NANCER)" at PSI.

Starting from January 1st, 2007. Duration : 3 years.

[[Download PDF for details](#)]

2 - Technical assistant (assistant technique 2)

at the DMPC-MaNEP at UniGE. Starting : to be discussed.

[[Download PDF for details](#)]

New mobile post-doc / Meet Dr Azzedine Bendounan



Since December 2006 Dr Azzedine Bendounan benefits from the MaNEP

mobile post-doc programme. His role will be to stimulate collaborations between various MaNEP groups in Geneva, EPFL, Neuchâtel, Zurich and the Paul Scherrer Institute. The research focus will be on the electronic structure investigation of

high-temperature superconductors by means of various probes available within MaNEP.

Dr Bendounan was born in 1977, in Algeria. After a physics studies at the University of Oran, he received master and PhD degrees in physics from the University Henri-Poincaré in Nantes (France). During his PhD thesis he studied the behaviour of Shockley-type surface states in ultra-thin films of Ag on Cu(111) by

means of high resolution angle resolved ultraviolet photoelectron spectroscopy (ARUPS).

He investigated as well by ARUPS the interfacial electronic structure of organic films on metallic surfaces, e.g. PTCDA/Ag(111) and NTCDA/Ag(111). In 2004, and for a period of two years, he joined as a Post-doc the photoemission group of Prof. Reinert at the University of Würzburg (Germany).

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Send your own MaNEP news to *the editor*, thank you !

French TV Science show / C'est pas sorcier pays a visit to MaNEP

For twelve years now, the weekly French Science show (by France 3) *C'est pas sorcier* has introduced many scientific topics to children. It was thus a honour to be recently asked by the famous team to visit one of our Geneva STM set-ups. The filming team then went on to see

the LHC at the CERN.

The shootings will be part of a 2007 show dedicated to a "Voyage au coeur de la matière" (*A journey into the heart of matter*). Broadcasting dates are still unspecified but of course we shall let you know as soon as we find out !



[[click here](#) to enlarge]

In the center, Fred, one of the three presenters.

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MaNEP News (2)

2006 Women Internships / Results and perspectives



The 2006 Internships for female students in physics gathered seven young women. Among them, only two were from the Swiss-German part ; they were "hosted" at the EMPA

and PSI.

All participants declared they have been delighted by the experience which seems to have led some of them to now consider pursuing a career in research. The call for the 2007 internships will come soon.



Until then, please send any comment, proposal or suggestion to
Dr Michel Decroux, MaNEP's Advancement of Women Programme manager.

SNF-CTI Funding / Call for projects ends January 24, 2007

We remind you that it is your last chance to send a project to obtain a joint SNF-CTI funding. This call is for

PhD theses related to industry in the field of Supramolecular Materials - Nanoscience

The aim of this funding is to enable up to six young

researchers working in departments of the Swiss university system to pursue research closely related to applications in a scientific field that is highly relevant to the future.

Therefore part of the PhD thesis is to be undertaken in a industrial laboratory appropriate to the research topic.

The postmark deadline is January 24, 2007.

Chosen theses will start in April 2007.

Contact : Dr Stefan Husi - shusi@snf.ch

Web page : [[click here](#)]

Application form : [[PDF](#)]

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Send your own MaNEP news to *the editor*, thank you !

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Free Column

MaNEP Doctoral School in gestation at the DPMC-UniGE

by Dr Christophe Berthod

The training of new researchers is one important mission of the NCCR MaNEP.

Accordingly, MaNEP has been continuously supporting in several different and complementary ways the training of young scientists in its specific domains of activity through meetings and special actions : Les Diablerets meeting, Saas Fee summer school, and the Advancement of Women programme.

In the course of 2007, the establishment of a Doctoral School in Geneva is scheduled, with the concern of continuing and developing this action.

Promote horizontal communication

Its main goals will be to improve the training of PHD candidates in the first two years of their thesis, to develop a more stimulating working environment by promoting horizontal communication among PhD students, and to contribute to the international reputation of MaNEP by attracting more foreign students in Switzerland.

To begin with, the MaNEP Doctoral School will be launched at the NCCR host institution, namely in the Condensed Matter Division (DPMC) of the Geneva University.

This stage should allow to set up the basic rules and experiment new ideas, while ensuring a smooth transition for students and thesis supervisors.



In a later step, the possibility of extending the concept to other groups in the network will be scrutinized, by trying to find the common denominator between the Doctoral School directives and the various regulations of the Swiss universities.

Diversify the skills of PhD students

Besides a high-level teaching in basic condensed-matter physics and specialized courses from various sources (3ème Cycle de la Physique en Suisse Romande, summer schools), the Doctoral School also intends to stimulate the transfer of knowledge within the NCCR from the more advanced to the new generation of physicists. To this end, short modules on

highly focussed scientific questions will be organized in response to explicit requests by the students. In a rapidly evolving world, it is also important to diversify the skills of PhD students by dispensing lessons on topics related to, e. g., technology transfer and patents, scientific and public communication, modern computer tools, etc. The MaNEP network will of course be of great value in finding qualified teachers for these various short courses.

At present the MaNEP Doctoral School is still in the state of concept. The implication of everybody in the NCCR is therefore desirable at this point, in order to help building up a tool which will meet the expectations of all MaNEP members. *Any concern, comment, criticism, and idea is therefore warmly welcome.*

Keeping in mind that the excellence of our PhD's is a major component of MaNEP's future, we hope that this project will encounter a favorable echo and stimulate fruitful discussions in the various groups.

We need your inputs !

Please share your ideas, suggestions and wishes about the future MaNEP Doctoral School !

You can do so either **by e-mailing Dr Berthod** or by sharing your views on the **MaNEP Discussion-group**.

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The project manager



Dr Christophe Berthod,
UniGE

*Are you also willing to share your views, feedbacks and / or recent scientific results ? Contact **the editor** !*

Publications (1)

Physical Review B

Pseudogap of the high-temperature superconductor $\text{La}_{1.96-x}\text{Sr}_x\text{Ho}_{0.04}\text{CuO}_4$ as observed by neutron crystal-field spectroscopy

Phys. Rev. B 74, 184520 (2006) [[PDF](#)]



Petra S. Häfliger (PSI / picture), Andrew Podlesnyak, Kazimierz Conder, Ekaterina Pomjakushina and Albert Furrer.

Intraband optical spectral weight in the presence of a van Hove singularity: Application to $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$

Phys. Rev. B 74, 174516 (2006) [[PDF](#)]



F. Marsiglio, F. Carbone (DPMC-UniGE / picture), A. B. Kuzmenko, and D. van der Marel.

Structural properties of $\text{Sr}_{0.61}\text{Ba}_{0.39}\text{Nb}_2\text{O}_6$ in the temperature range 10–500 K investigated by high-resolution neutron powder diffraction and specific heat measurements

Phys. Rev. B 74, 134103 (2006) [[PDF](#)]



J. Schefer (PSI / picture), D. Schaniel, V. Pomjakushin, U. Stuhr, V. Petíek, Th. Woike, M. Wöhlecke, and M. Imlau.

Structural and magnetic dimers in the spin-gapped system CuTe_2O_5

Phys. Rev. B 74, 174421 (2006) [[PDF](#)]



J. Deisenhofer (DPMC-UniGE / picture), R. M. Eremina, A. Pimenov, T. Gavrilova, H. Berger, M. Johnsson, P.

Lemmens, H.-A. Krug von Nidda, A. Loidl, K.-S. Lee and M.-H. Whangbo.

Spin resonance in the ordered magnetic state of $\text{Ni}_5(\text{TeO}_3)_4\text{Cl}_2$

Phys. Rev. B 74, 174403 (2006) [[PDF](#)]



L. Mihály, T. Fehér, B. Dóra, B. Náfrádi, **H. Berger (EPFL / picture)**, and L. Forró.

Unadulterated spectral function of low-energy quasiparticles in $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+x}$

Phys. Rev. B 74, 172509 (2006) - [[PDF](#)]

D. V. Evtushinsky, A. A. Kordyuk, S. V. Borisenko, V. B. Zabolotnyy, M. Knupfer, J. Fink, B. Büchner, A. V. Pan, A. Erb, C. T. Lin, and **H. Berger**.

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Publications (2)

Physical Review Letters

Muons as Local Probes of Three-Body Correlations in the Mixed State of Type-II Superconductors

Phys. Rev. Lett. 97, 177004 (2006) [[PDF](#)]



G. I. Menon, A. Drew, U. K. Divakar, S. L. Lee, R. Gilardi, J. Mesot, (PSI / picture), F. Y. Ogrin, D. Charalambous, E.

M. Forgan, N. Momono, M. Oda, C. Dewhurst, and C. Baines.

Breakup of the Fermi Surface Near the Mott Transition in Low-Dimensional Systems

Phys. Rev. Lett. 97, 136401 (2006) [[PDF](#)]



C. Berthod (DPMC - UniGE / picture) and T. Giamarchi and S. Biermann and A. Georges.

Spin-Lattice Interaction in the Quasi-One-Dimensional Helimagnet LiCu2O2

Phys. Rev. Lett. 97, 067206 (2006) - [[PDF](#)]



Laszlo Mihaly, Balazs Dora, Andras Vanyolos, Helmuth Berger, and Laszlo Forró (EPFL / picture).

Parity of the Pairing Bosons in a High-Temperature Pb-Bi2Sr2CaCu2O8 Bilayer Superconductor by Angle-Resolved Photoemission Spectroscopy

Phys. Rev. Lett. 96, 067001 (2006) - [[PDF](#)]



S.V. Borisenko, A. A. Kordyuk, A. Koitzsch, J. Fink, J. Geck, V. Zabolotnyy, M. Knupfer, B. Büchner, H. Berger (EPFL / picture), M. Falub, M. Shi, J. Krempasky, and L. Patthey.

And also...

Nanotechnology

The surface layer of cleaved bilayer manganites

Nanotechnology 18 (2007) 044020 [[PDF](#)]



F Loviat (PSI / picture), H M Rønnow, Ch. Renner, G Aeppli, TKimura and Y Tokura.

Physical Review A

Modulation spectroscopy with ultracold fermions in an optical lattice

Phys. Rev. A 74, 041604(R) (2006) [[PDF](#)]



C. Kollath (DPMC - UniGE / picture), A. Iucci, I. P. McCulloch and T. Giamarchi.

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Reading tips

Highlight / 10 years of ST spectroscopy in high tc superconductors



A personal comment by Prof. Oystein Fischer about an article to appear in the Review of

Modern Physics, compiling 10 years of ST spectroscopy in high tc superconductors.

The STM technique is quite young compared to others : only 25 years-old. At the beginning it was not obvious that this instrument would be useful for the investigation of superconductors.

The breakthrough in the field of superconductors came with the first observation of vortices in NeSe₂ by Hess and co-workers in 1989. The use of this technique in high T_c superconductors started in the mid-90s, a little over 10 years ago.

The quest for an understanding of superconductivity in the cuprates has led to remarkable improvements in many measuring techniques and STM/STS is one of these techniques which have seen striking developments since the discovery of high T_c superconductivity.

Our article summarizes these developments during the 10 years and shall hopefully constitute a base for further investigations. Many groups are presently developing low-temperature STMs and I believe that we shall see numerous improvements and new scientific results over the next 5-10 years to come.

We wrote the article at the request of the Review of Modern Physics, an honour that is largely due to the

excellent work my collaborators have carried out over these 10 years. The article was written with four outstanding ones who each in their way have been essential to the development of the group. It has been a pleasure to write this article with them. It took the team 2 years to gather the matter for the RMP paper and numerous reunions to discuss it. Though it's been a huge task, we had a very pleasant time and a very dynamic interaction while writing.

Scanning tunneling spectroscopy of high-temperature superconductors

To appear in the RMP ; 65 pages, 62 figures. [PDF]

By Oystein Fischer, Martin Kugler, Ivan Maggio-Aprile, Christophe Berthod, and Christoph Renner.

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Send your own reading tips to *the editor*, **thank you !**

Thank you for the tips this month :

Prof. O. Fischer
Prof. Jean-Marc Triscone
Dr Louis Antognazza
Dr Alfred Manuel

Good to know / A selection of science news, readings and tips

The latest THIOX news

Here is the latest issue with information on the coming THIOX meetings and activities. [[download PDF](#)]

Post doc opportunities at Minatec

There are currently 2 post doc open positions at the Laboratoire des Matériaux et du Génie Physique, UMR CNRS 5628, INPG-Minatec, in Grenoble (France). The positions are open starting January 2007, for an initial period of one year, which can be extended, in both cases, to one year more. [[full details in PDF](#)]

More money for research in Switzerland

The Swiss Federal Council plans for a budget increase of 4.5% for research and education, for the 2008-2001 period. This was judged insufficient at the National Education and Research Summit last October ; influential public organizations and institutions will make it clear that significant investments must be made in the coming years in order to safeguard Switzerland's position as a leading research location. A resolution was signed and you can still support it by registering on the website. [[support science resolution](#)]

Top 10 of Predicted Superconductivity-Based Breakthroughs for 2007

Low-cost MRI machines, super-fast Internet routers, and high-capacity power lines top the list of likely breakthroughs in superconductivity in 2007, according to a forecast list released by a developer of superconducting microelectronics technology.

[[full feature on yahoo.com](#)]

Science for Christmas

Be a good (grand)parent who works for the future of science : bring your kid(s) (from age 7) to the *Espace des inventions* during the Christmas break !

[[all infos here](#)]



MaNEP is a long term research programme which gathers 250 scientists from Swiss universities and industry to study new electronic materials which are at the forefront of future technologies.

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Calendar

SNF Media Training : 2007 sessions

The media training for researchers organized by the SNSF proved to be a big success. Therefore there will be another series of courses in 2007.

The courses *in German* will take place on **16-17 February, 15-16 June and 14-15 September**.

The dates for the *French courses* should be published soon on the corresponding **SNF web page** [[here](#)], where you can find all details on the trainings too.

Remember the training is meant for younger researchers (generally PostDoc level) who actually have a chance to use their skills because they do get in touch with journalists.

THIOX Meeting Near Barcelona, March 28-30, 2007

The theme of the meeting is "Oxide thin films and devices for applications". The Meeting will consist of 1/2 day Tutorials that will include selected presentations from academia and industry with a focus on functional characterization and use of oxide thin-film-based devices.

A second part of the meeting (3/2 days) will be dedicated to regular scientific sessions.

Find all details and other THIOX meetings **in the latest THIOX Newsletter**.

Next issue : February 2007.
Deadline for contributions : February 2nd, 2007.

