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Editorial / Starting the year on a fast track

Contents

MaNEP news	2
Scientific Highlight	3
Free Column	4
Publications	5
Publications (2)	6
Calendar	7

Highlights

[MaNEP at CERN, for LHC celebrations](#)

[Women internships : what for ? What results ?](#)

[Recent highlights on high \$t_c\$ superconductivity](#)



By Prof.
Oystein
Fischer

2008 started on a fast track with the great news that our eminent MaNEP member, **Prof. Joel Mesot**, was appointed new director of the Paul Scherrer Institute (PSI). My warmest congratulations !

Next week, the annual meeting of the Swiss Physical Society will take place with a strong MaNEP participation and the plenary talk on Thursday, March 27 by 2007 Nobel Prize winner Albert Fert - who already visited us last November - as a highlight. Just after this, MaNEP will be present as a key partner of the

LHC celebrations at CERN, early April.

Subscriptions for the 2008 Summer Internship for female students have recently opened (*see below*) : these internships are our important effort to stimulate the advancement of women in science.

Their initiator and organiser, **Dr. Michel Decroux**, describes the program in this issue. I strongly encourage female students to take this unique opportunity.

Among the recent scientific highlights, let me mention that the *Science* paper by Nicolas Reyren *et al.* - from the group of Jean-Marc Triscone - published last summer was noted as one of the **2007 Top**

10 breakthroughs in the *Science* magazine.

Thumbs up to this young researcher !

Prof. Hugo Keller also comments on recent important highlights on high t_c superconductivity in our scientific highlight section.

So well, with the upcoming decision on the 3rd phase, no doubt this year will represent a turning point for MaNEP.

And with your strong efforts to bring science on novel electronic materials in Switzerland to the highest level, I am confident that it will also be a turning point towards a great scientific future...

Summer Internships for women / Subscriptions launched



Each year since 2004 MaNEP gives a unique opportunity to female students in physics in their

3rd or 4th year to spend one month with a financial support in one of MaNEP's research groups. Take the chance and subscribe until June 30, 2008 !

All details [[here](#)]

Interview

In this issue, **Michel Decroux** (Advancement of Women Programme manager) explains why we need these internships and what are the outcomes [[to the ITV](#)].



MaNEP News

MaNEP doc student's work featured in the *Science Top 10 2007 breakthroughs*



Nicolas Reyren has good reasons to smile !! This doc student working with Jean-Marc Triscone in Geneva has seen his work on 'Superconducting

Interfaces Between Insulating Oxides' mentioned among the "2007 Top 10 breakthroughs" of the Science magazine. Congratulations !

[on Science website - Transition Metal Oxides] - [read Nicolas Reyren's Scientific Highlight in our September 2007 issue]

MaNEP Doctoral Program on

The MaNEP Doctoral Program has recently started up and has related web pages (in English and French) now available. Contents will be added progressively but you can already find a general presentation and info as well as tutorials, seminars, etc.

[www.manep.ch/phd]

KTG : fruitful visits at MaNEP

Several fruitful visits have recently taken place in Geneva including Freescale Semiconductors. Freescale moved their European HQ in Geneva and are interested in academic collaborations in the Lake Geneva region; there is an interest on both sides to collaborate on high sensitivity sensors. Regarding Swatch, Mr. Hayek created a new holding dedicated to clean technologies: the Belenos Clean Power Holding AG. Technologies of interest concern the creation, use and storage of hydrogen generated by solarcells. With Prof.Yvon (UniGE)

joining MaNEP for Phase III, conditions are thus favorable for a collaboration. We also welcomed Montena EMC, a very innovative company based in Fribourg which is active in electromagnetic field testing and certification and looking for new market opportunities. With a deep knowledge in electric device design and assembly, this company would be perfectly geared to integrate novel MaNEP materials. (MK)

A new director for PSI

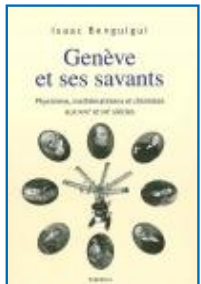


Prof. Joël Mésot has been appointed new director of the PSI by the Swiss Government on December 21, 2007. The leader of the Laboratory of

Neutron Scattering at PSI and an professor at ETHZ, Joël Mésot is also a respected MaNEP Forum member. He will take up his new position at PSI on August 1, 2008. Well done !

[[Press Release - German / French](#)]

MaNEP sponsors exhibition on Geneva's scientists



After the Einstein exhibition in 2005, MaNEP sponsors a new exhibition by physicist and science historian Isaac Benguigui. The material is based on his book : "Genève et

ses savants : physiciens, mathématiciens et chimistes des 18e et 19e siècles" (Ed. Stlatkine) **From April 9 to May 8, 2008 at UniMail (Bd Carl-Vogt, Geneva)**

Reminders

LHC : MaNEP partner of CERN celebrations in April



For the last time before years, the public will be allowed to visit the CERN's Large Hadron Collider (LHC), during Open Doors that will take place on April 5 and 6, 2008.

MaNEP will be a key-partner of this celebration by providing most of the activities illustrating the theme of superconductivity : a new version of the 'SupraSurf' (a human-scale levitating device) and other fun experiments, as well as its movie 'Superconductivity : a short story of an enduring enigma' and its humourous exhibition by Swiss cartoonist Mix&Remix will be on display. Come and visit us at the site of Meyrin, building Nr 163.

[[website](#)] - [[CERN Bulletin](#)]

DVD of MaNEP superconductivity movie available in 3 languages

You can order for free the 15-minute MaNEP movie "Superconductivity : a short story of an enduring enigma" for teaching uses or your public events. Available in English, German and French. Contact [Anne Rougemont](#).

Job opportunities

Monaco ITER fellowships 2008

The Monaco ITER Postdoctoral Research Fellowships allows recent PhD graduates to join the ITER Organization. [[how to apply](#)]



Scientific Highlight --- page 4

Recent highlights in the research of high temperature superconductivity

by Hugo Keller (UniZH) and Annette Bussmann-Holder (Max Planck Institut, Stuttgart in Germany)

In collaboration with MaNEP the University of Zürich group has recently performed two decisive experiments on cuprate high temperature superconductors (HTS's) which challenge theoretical models based on purely electronic mechanisms.

From muon spin rotation (μ SR) experiments the temperature dependence of the superfluid density has been determined from which clear conclusions on the pairing symmetry can be extracted. The experimental results for three different cuprate families disclose generic trends for HTS's, namely the coexistence of an s-wave and a d-wave gap in the CuO₂ planes and a predominantly s-wave gap along the c-axis [1 – 3] (Fig. 1 shows representative results). These findings are not compatible with approaches that concentrate on the planes only, but consistent with early predictions where the 3D nature of high temperature superconductivity was suggested to be manifest in coupled gaps [4, 5]. In addition, the existence of the s-wave gap is in strong support of ideas that the lattice plays a crucial role in HTS's.

These latter conclusions are in accord with oxygen isotope effect (OIE) experiments where not only OIE's on the superconducting transition temperature but also on the magnetic penetration depth [6], the superconducting gaps, the Néel temperature, and the spin glass temperature have been observed [7]. Throughout the whole phase diagram of cuprates OIE's exist which are sign reversed for the superconducting properties as compared to the magnetic states. The strong doping dependence of these OIE's has been shown to stem from renormalizations of the kinetic energy caused by polaron formation [8]. This interpretation is consistent with ideas that led to the discovery of high temperature superconductivity, namely

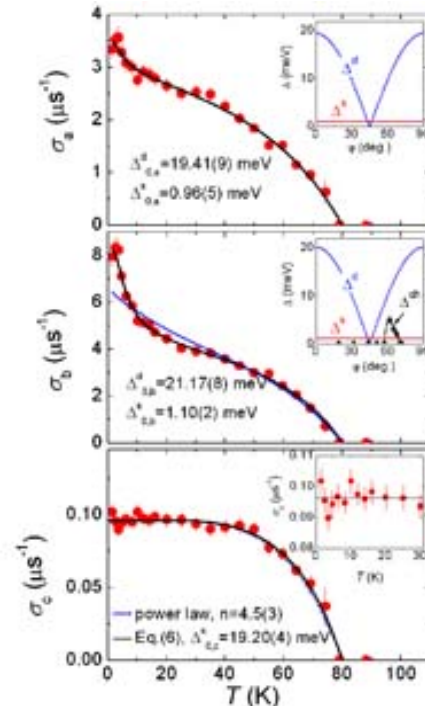


Figure 1 Temperature dependence of the μ SR relaxation rates

$\sigma_a \propto \rho_a$, $\sigma_b \propto \rho_b$, and $\sigma_c \propto \rho_c$ of single crystals of YBa₂Cu₄O₈ measured along the crystallographic directions a, b, c (ρ_a , ρ_b , and ρ_c are the corresponding superfluid densities) [3]. The insets to the figures show the individual contributions from the s- and d-wave gap. The full lines are results from a power law dependence.

the concept of Jahn-Teller polarons [9] which might provide a much better glue to the electron pairing than conventional electron-phonon coupling.

Since both above mentioned experiments are direct, bulk sensitive, and unambiguous and have been carried through systematically for different cuprate families and as functions of doping, we conclude that the order parameter in cuprates is much more complex than just d-wave symmetry, the third dimension, i.e., physics involving the c-axis are of outermost importance, lattice effects in terms of polaron formation crucially dominate the whole phase diagram.

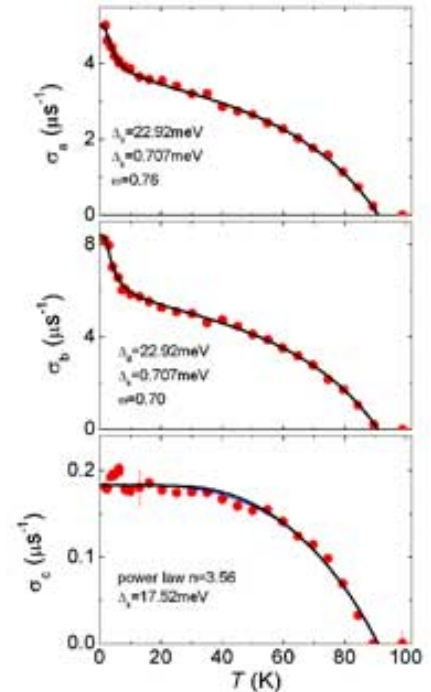


Figure 2 : the same as in Figure 1, but for YBa₂Cu₃O_{7-x} [2].

1. R. Khasanov et al., Phys. Rev. Lett. 98, 057007 (2007).
2. R. Khasanov et al., Phys. Rev. Lett. 99, 237601 (2007).
3. R. Khasanov et al., J. Supercond. Nov. Magn. (online 20.12.2007).
4. K. A. Müller, Nature (London) 377, 133 (1995).
5. K. A. Müller and H. Keller, in High T_c Superconductivity 1996: Ten Years after the Discovery (Kluwer, Dordrecht, 1997) p. 7.
6. See e.g., H. Keller, in Superconductivity in Complex Systems, eds. K. A. Müller and A. Bussmann-Holder (Springer Series Structure and Bonding) 114, 143 (2005), and refs. therein.
7. R. Khasanov et al., arXiv:0711.2257.
8. A. Bussmann-Holder and H. Keller, in Polarons in Advanced Materials, ed. A. S. Alexandrov (Springer Series in Materials Science) 103, 599 (2007).
9. K. A. Müller, J. Phys.: Cond. Mat. 19, 1 (2007); and refs. therein.



Summer Internships for women at MaNEP : what for ?

An interview with Dr Michel Decroux
manager of the Advancement of Women Programme

By Anne Rougemont, editor

Subscriptions for the 2008 Summer Internships for female students in physics have just opened : a good opportunity to take a look back on this operation that was launched in 2004 with its initiator, Dr Michel Decroux.

Why did you chose to set up these summer internships as opposed to any other ' promotion of women' project ?

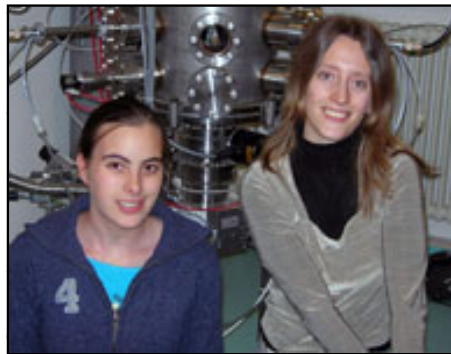
When I was given this mission I first contacted the major actors in the advancement of women field at UniGE, EPFL, etc. I needed inspiration for a project that could be implemented on the national level, as we are a national network. The summer internships were suitable in this sense, and they also had given good results at EPFL where they had already been tested.

Why do we need such « positive discrimination » projects to encourage young women to embrace a career in hard science ?

Studies in the US and Canada have shown that some fundamental differences of behaviour between men and women have an impact on the choice of a career in science. In broad outline, women function on a more « emotional » level and tend to make choices based on personal criteria and experience. Men on the contrary are more at ease with non-personal matters and base their choices on more external criteria.

As a result, women will tend to avoid hard science, as they perceive it as too technical and dehumanized.

Observations made during courses show that female students in life science are self-confident, as they feel they can relate to the subject. As a result, they do the talking and men



Caroline Mauron (left) and Jill Guyonnet (right) are students in physics at UniGE. They have both undertaken the MaNEP summer internships.

This is why we need to provide special opportunities that will allow young women to build confidence in their abilities, find their place, and from there to make a real choice for their future career.

Have the internships been successful in this regard ?

Yes, I think so, although I couldn't interview all of the participants since 2004. Usually, after the initial anxiety of being immersed in a top-level research group, they come to realise that researchers are very normal people with family lives, hobbies, etc. - and are relieved to see that they are made a real place in the group, with responsibilities, etc. One of them even wrote « I feel home » ! This shows again the special importance of the human factor for young women : they feel well, so the confidence starts building. Besides, several participants discovered what it means to be passionate about their work... and sometimes their boy friend was not so happy about it !

Have the participants reconsidered their future plans after the internship ?

Yes, the majority have decided to go beyond what they had imagined in terms of a career in research. Others have hesitated but have finally stuck to their initial plans, like teaching in college for instance. And finally, some have discovered that this was really not for them and thus have shifted to something completely different ! But at least, we definitely helped all of them suppress their « scientific inhibitions ».

If you wish to subscribe to the 2008 Internships, go to <http://www.manep.ch/aow/index.html>



Science

Superconducting Vortices in CeCoIn₅ : Toward the Pauli-Limiting Field



By Andrea D. Bianchi, **Michel Kenzelmann (ETHZ-PSI/picture)**, Lisa DeBeer-Schmitt, Jon S. White, Edward M. Forgan, Joel Mesot,

Markus Zolliker, Joachim Kohlbrecher, Roman Movshovich, Eric. D. Bauer, John L. Sarrao, Zachary Fisk, Cedimir Petrovi, Morten Ring Eskildsen.

Science, Vol. 319. no. 5860, pp. 177 - 180 [[online version](#)]

Nature Physics

Bose–Einstein condensation in magnetic insulators



By **Thierry Giamarchi (UniGE / picture)**, Christian Rüegg and Oleg Tchernyshyov.

Nature Physics 4, 198 - 204 (2008)

[[abstract](#)]

Physical Review Letters

Intrinsic Mobility Limit for Anisotropic Electron Transport in Alq₃



By **A. J. Drew (UniFr / picture)**, F. L. Pratt, J. Hoppler, L. Schulz, V. Malik-Kumar, N. A. Morley, P. Desai, P. Shakya, T. Kreouzis, W. P. Gillin, K. W. Kim, A.

Dubroka, and R. Scheuermann

Physical Review Letters 100, 116601 (2008) - [[PDF](#)]

Multiple Gap Symmetries for the Order Parameter of Cuprate Superconductors from Penetration Depth Measurements



R. Khasanov, S. Strässle, D. Di Castro, T. Masui, S. Miyasaka, S. Tajima, A. Bussmann-Holder, and **H. Keller (UniZH / picture)**.

Phys. Rev. Lett. 99, 237601 (2007) - [[PDF](#)]

Quantized Dynamics of a Coherent Capacitor



By M. Moskalets, P. Samuelsson, and **M. Büttiker (UniGe / picture)**.

Phys. Rev. Lett. 100, 086601 (2008) - [[PDF](#)]

Spin Dynamics in a One-Dimensional Ferromagnetic Bose Gas

By M. B. Zvonarev, V. V. Cheianov, and **T. Giamarchi**.

Phys. Rev. Lett. 99, 240404 (2007) [[PDF](#)]

Physical Review A

Scanning tunneling microscopy for ultracold atoms



By **Corinna Kollath (UniGE / picture)**, Michael Köhl, and Thierry Giamarchi.

Phys. Rev. A 76, 063602 (2007) - [[PDF](#)]

Physical Review B

Polaronic signature in the metallic phase of La_{0.7}Ca_{0.3}MnO₃ films detected by scanning tunneling spectroscopy



By **S. Seiro (UniGE / picture)**, Y. Fasano, I. Maggio-Aprile, E. Koller, O. Kuffer, and Ø. Fischer

Phys. Rev. B 77, 020407(R) (2008) - [[PDF](#)]

Quantum to classical transition of the charge relaxation resistance of a mesoscopic capacitor



By **Simon E. Nigg (UniGe / picture)** and Markus Büttiker.

Phys. Rev. B 77, 085312 (2008) - [[PDF](#)]

Photoemission and optical studies of ZrSe₃, HfSe₃, and ZrS₃



By D. Pacilé, M. Papagno, **M. Lavagnini (ETHZ / picture)**, H. Berger, L. Degiorgi, and M. Grioni.

Phys. Rev. B 76, 155406 (2007) - [[PDF](#)]

[[publications, page 2](#)]



Physical Review B (cont.)

Effect of rare-gas adsorption on the spin-orbit split bands of a surface alloy: Xe on Ag (111)-($\sqrt{3} \times \sqrt{3}$)R30°-Bi



By L. Moreschini, A. Bendounan, C. R. Ast, F. Reinert, M. Falub, and **Marco Grioni (EPFL, picture)**.

Phys. Rev. B 77,

115407 (2008) - [[PDF](#)]

Spin-orbit split two-dimensional electron gas with tunable Rashba and Fermi energy

By Christian R. Ast, Daniela Pacilé, Luca Moreschini, Mihaela C. Falub, Marco Papagno, Klaus Kern, and **Marco Grioni (EPFL)**.

Physical Review B, 081407(R) (2008) - [[PDF](#)]

Journal of Superconductivity and Novel Magnetism

s -Wave Symmetry Along the c -Axis and s + d In-plane Superconductivity in Bulk YBa₂Cu₄O₈



By R. Khasanov, A. Shengelaya, J. Karpinski, A. Bussmann-Holder, **H. Keller (UniZH - picture)** and K. A. Müller.

Volume 21, Number 2 / février 2008 - [[PDF](#)]

Review of Scientific Instruments

Adaptation of the Bridgman anvil cell to liquid pressure mediums



By **A.-S. Rüetschi (UniGE / picture)** and D. Jaccard

Rev. Sci. Instrum. 78, 123901 (2007) - [[permalink](#)]

Superconductor Science & Technology

Magnetic-decoration imaging of structural transitions induced in vortex matter



By **Yanina Fasano (UniGE / picture)** and Mariela Menghini.

Volume 21, Number 2, February 2008 - [[PDF](#)]

Reading tip



January **THIOX News**

[[PDF](#)]

[[back to publications, page 1](#)]



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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.

MaNEP is hosted by the



MaNEP is a research instrument of the



SWISS NATIONAL SCIENCE FOUNDATION

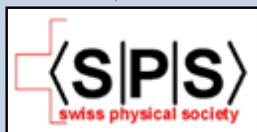
[[back to cover](#)]

Calendar

SPS Meeting

March 26-27, 2008

Uni-Mail, Geneva



MaNEP will set up a parallel session **Programme :**
sps.ch/en/events/spg_jahrestagung_2008/

MaNEP at CERN's LHC celebrations

April 5-6, 2008

Site of Meyrin, Geneva

<http://lhc2008.web.cern.ch/LHC2008/OpenDaysE/super.html>

CCMX Annual Meeting

April 9, 2008

Kursaal, Bern

<http://www.ccmx.ch/sub/events/2008-annual-meeting/index.html>

6th THIOX meeting

April 9-11, 2008

Sestri Levante, Italy

This meeting will be focused on "Advances and new Challenges in Oxide Electronics".

<http://www.thiox.infm.it/>

E-MRS 2008 Spring Meeting

May 26-30, 2008

Strasbourg, France



Programme and details :
[[click here](#)]

7th PSI Summer School on Condensed Matter Research

August 16-22, 2008

Lyceum Alpinum , Zuoz , Switzerland

Topic : "Probing the Nanometer Scale with Neutrons, Photons and Muons"

<http://num.web.psi.ch/zuoz2008/>