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Highlights

Martin Peter Colloquium welcomes Phil W. Anderson

Scientific highlight : how to find a pin in a haystack, by Prof. Juerg Huelliger

Record-breaking : over 20 publications announced this month !

Editorial / A full-speed start

By Prof. Oystein Fischer



MaNEP's autumn has started full speed. 70 students attended the MaNEP Summer School in Saas-Fee last week. A series of high- level lectures covering the physics of low dimensional systems were presented. I extend my warmest thanks to the lecturers for their efforts.

Already coming next week we have the MaNEP Topical Meeting where **Professor Philip W. Anderson** from Princeton shall give the Martin Peter colloquium on the theory of high temperature superconductors. Phil is extremely well-known by most MaNEP members for his

numerous striking contributions to solid state physics.

He was **designated by a recent academical research as the most creative physicist** before many other top people ; not really a surprise for those who know his broad and rich input to our and other fields.

See also the comments by Dirk van der Marel to Phil's most recent work ([below](#)).

In this issue you can also find a **very interesting contribution by Jurg Hulliger** on recent developments in his search for new materials. This is also a brilliant example of MaNEP members contributing to our e-Newsletter. A smashing result in this sense is also the large number of new publications being announced

and several contributions to the **reading tips' section**.

The summer was obviously productive in MaNEP! Many thanks goes to all those who contributed to this issue.

You will also find a new announcement for the **mobile post-doc programme** in this issue. I hope many of you take the opportunity to apply.

I also draw your attention to the **new book on Superconductivity by Guy Deutscher**.

Finally, it is a pleasure this month to **congratulate Prof. Davor Pavuna (EPFL)** who has received the Nikola Tesla medal from the hands of the Croatian President.

A comment on PW Anderson's work / Electrons living apart together

A few days away from welcoming Philip W. Anderson, it is the perfect time to read the comment on our prestigious's guest's work written by **Dirk van der Marel** (*head of Project 2 / picture right*).

This comment entitled "*Superconductors : Electrons living apart together*" has just been published in *Nature Physics*.



References :

Nature Physics
September 2006, Volume 2,
issue 9, pp 585-586.
doi:10.1038/nphys405

From Sept. 22nd until end of October, the paper will be **online for free**.

MaNEP News

Martin Peter Colloquium / MaNEP welcomes Phil W. Anderson

Nobel Prize winner



Philipp Warren Anderson from Princeton University will be the special guest of

the 2nd Martin Peter

Colloquium in UniGE. His conference entitled "RVB after all : the theory of High Tc" will take place at 17h, on Wednesday 27th, at the Auditoire A of the Physics Institute.

MaNEP members are also encouraged to come to the related **Topical Meeting on**

"Novel Superconductors".

The 15-minutes talks will start at 10h45 and finish at 16h10.

[The full programme can be seen in the [Calendar section](#)]

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Award / Prof. Davor Pavuna receives the Nikola Tesla decoration



A teacher at the Physics Institute of Complex Matter at the EPFL, Prof. Davor Pavuna

(right on picture) was decorated on July 5 in Zagreb by the President of Republic of Croatia for his innovative research on novel disordered and electronic materials and for his role in international scientific cooperation.

The 'Nikola Tesla' award is a part of the international

celebration of the 150th anniversary of the birth of Nikola Tesla. He is widely recognized as 'the father of alternating current', and as a remarkable US inventor with 700 patents filed.

[more about Nikola Tesla : click [here](#)]

Send your own MaNEP news to [the editor](#), thank you !

Mobile post doc Programme / New call for submissions

You are a MaNEP post doc willing to develop an independent project within and using the MaNEP network ? **We offer 2 mobile post doc positions for one year.** Salary and some additional funding for travel will be provided.

The project has to be carried out in one (or several) group (s) of MaNEP ; a project carried out in the group where you got your PhD will not be

accepted, but collaborations with it are however possible. Projects implying 2 or several MaNEP groups will have the preference.

To apply, send a max. 2 pages-description of your project, your CV and publication list.

Indicate where and in which MaNEP group you will mainly carry out your research and join a letter of the MaNEP

group leader stating that he/she is ready to have you working in his/her laboratories. Indicate also the other groups implied in the collaboration.

Send your proposal to: [Stéphanie Grandjean](#) by mail.

The deadline for the proposal submissions is October 31st, 2006

Free Column

How to find a pin in a haystack

by Prof. Jürg Hülliger (chemist/UniBE - head of Project 4)

Separating superconductive matter from normal state diamagnetic grains : new method

Doing chemistry in the solid state, say, by reacting granular starting materials exposed to high temperature offers opportunities and causes difficulties quite different from those we are used to when performing reactions in liquids and gases. Performing chemistry in liquids and gases can take a fortune of highly advanced separation techniques to purify and finally identify compounds.

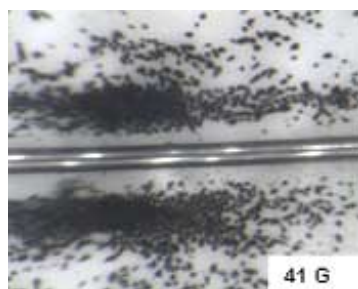
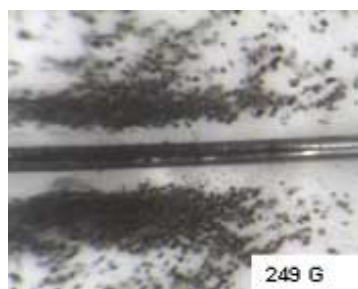
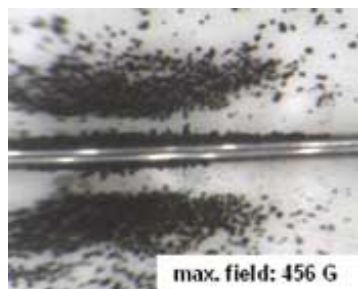
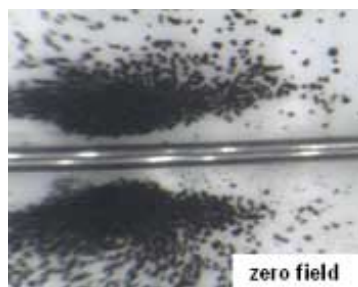
Contrary, solid state production of materials often has to enface samples that are not phase-pure, which can not be processed to separate them into individual phases, including minority contributions.

Here, I think we have made a real step forward by developing a new method for separating superconductive matter from normal state diamagnetic grains : if a ceramic grain or single crystal in the Meissner or vortex state gets located into the near field distribution of a magnetized wire (perpendicular to its length), the particle may be pushed into the region of the lowest total field, depending on the ratio of magnetic and gravitational forces.

Phenomenologically, the particle can get attracted side wise to a wire, i.e. in the direction perpendicular to the external field. Magnetic forces at considerably low external fields of less than 50 G can be sufficient to hold

superconducting particles on a thin wire, allowing to separate such particles from an assembly of grains.

Basics of the theoretical aspects and a first experimental demonstration can be found in **Supercond. Sci. Technol. 19, 748-755, 2006.** [see [publications](#)]



Up to now we have been able to demonstrate a sensitivity of 1 ppm and we are quite confident to rise sensitivity up to about 10 ppb.

Given now a rather simple method to find “a pin in a haystack” **we are well equipped for a quest to search for new phases by combinatorial syntheses, performed within project 4 of MaNEP II.**

First trials have already retrieved superconducting particles at 77 K from highly multiphase reaction products. Important to notice, that by changing the external field, a superconductor, magnetically described by its hysteresis loop, will behave totally different than normal state matter.

This means, a particle large enough to be observed visually would be sufficient to demonstrate the existence of superconductivity at any temperature at which such an experiment is performed.

Having such a tool in hand, we might once more speculate about the existence of superconductivity above 135 K. Thus, we will revisit published work (Phys. Rev. B and many others!) reporting on higher T_c 's, which finally failed in reproducing bulk samples.

However, it might well be that such samples nevertheless contained traces of interesting superconductors, difficult to synthesize in bulk quality.

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Figures description

The capturing of superconducting particles by a magnetized wire

From top to bottom: YBCO at zero field; grains captured sidewise at maximum field; paramagnetic behaviour when decreasing the field; loss of particles at low field. Note that particles moved sidewise when lowering the field below capturing.

The investigators



left : Prof. Jürg Hülliger
right : Dr. Hans Willems

[click [here](#) to see big picture]

Are you also willing to share your views, feedbacks and / or recent scientific results ? Contact [the editor](#) !

Publications (1)

Superconductor Science and Technology

Theory of high gradient attractive magnetic separation of superconducting materials and its experimental verification by $\text{YBa}_2\text{Cu}_3\text{O}_x$ particles

doi:10.1088/0953-2048/19/8/010

L. Dessauges, **J.B. Willems (UniBE/picture)**, D. Favre, C. Bohrer, F. Helbling and **J. Hülliger (UniBE/picture)**.



Prof. Jürg Hülliger and Dr Hans Willems

Supercond. Sci. Technol. 19 (2006) 748-755 [[PDF](#)]

[read Prof. Hülliger's special contribution in [Free Column](#)]

Physical Review Letters

Doped Spin Liquid : Luttinger Sum Rule and Low Temperature Order

Phys. Rev. Lett. 96, 086407 (2006) [[PDF](#)]



R. M. Konik, **T. M. Rice (ETHZ/picture)**, and A. M. Tsvelik

Quadrupolar Phases of the $S=1$ Bilinear-Biquadratic Heisenberg Model on the Triangular Lattice

Phys. Rev. Lett. 97, 087205 (2006) [[PDF](#)]



Andreas Läuchli, **Frédéric Mila (EPFL/picture)**, and Karlo Penc.

Magnetic Domain Formation in Itinerant Metamagnets

Phys. Rev. Lett. 96, 196406 (2006) [[PDF](#)]



B. Binz, H. B. Braun, T. M. Rice, and **M. Sgrist (ETHZ/picture)**.

d -Wave Resonating Valence Bond States of Fermionic Atoms in Optical Lattices

Phys. Rev. Lett. 96, 250402 (2006) [[PDF](#)]



Simon Trebst, Ulrich Schollwöck, **Matthias Troyer (ETHZ/picture)**, and Peter Zoller.

Continuous-Time Solver for Quantum Impurity Models

Phys. Rev. Lett. 97, 076405 (2006) [[PDF](#)]

Philipp Werner, Armin Comanac, Luca de' Medici, **Matthias Troyer**, and Andrew J. Millis.

Fate of Vacancy-Induced Supersolidity in ^4He

Phys. Rev. Lett. 97, 080401 (2006) [[PDF](#)]

M. Boninsegni, A. B. Kuklov, L. Pollet, N. V. Prokof'ev, B. V. Svistunov, and **M. Troyer**.

Spectroscopy of Ultracold Atoms by Periodic Lattice Modulations

Phys. Rev. Lett. 97, 050402 (2006) [[PDF](#)]



C. Kollath (UniGE/picture), A. Iucci, T. Giamarchi, W. Hofstetter, and U. Schollwöck.

Leggett-Garg Inequality with a Kicked Quantum Pump

Phys. Rev. Lett. 97, 026805 (2006) [[PDF](#)]



Andrew N. Jordan, Alexander N. Korotkov, and **Markus Büttiker (UniGE/picture)**.

Full-Counting Statistics for Voltage and Dephasing Probes

Phys. Rev. Lett. 97, 066801 (2006) [[PDF](#)]



S. Pilgram (ETHZ/picture), P. Samuelsson, H. Förster, and M. Büttiker.

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Important notice : if picture of main MaNEP authors are not provided, pictures will be put according to material available from the web.

Publications (2)

Physical Review B

Thermal fluctuations and vortex melting in the Nb₃Sn superconductor from high resolution specific heat measurements

Phys. Rev. B 74, 104502 (2006) [[PDF](#)]



R. Lortz (UniGE/picture), F. Lin, N. Musolino, Y. Wang, A. Junod, B. Rosenstein, and N. Toyota.

Doping dependence of the redistribution of optical spectral weight in Bi₂Sr₂CaCu₂O_{8+δ}

Phys. Rev. B 74, 064510 (2006) [[PDF](#)]



F. Carbone (UniGE/picture), A. B. Kuzmenko, H. J. A. Molegraaf, E. van Heumen, V. Lukovac, F.

Marsiglio, and D. van der Marel, K. Haule and G. Kotliar, H. Berger and S. Courjault, P. H. Kes and M. Li.

In-plane optical spectral weight transfer in optimally doped Bi₂Sr₂Ca₂Cu₃O₁₀

Phys. Rev. B 74, 024502 (2006) [[PDF](#)]

F. Carbone, A. B. Kuzmenko, H. J. A. Molegraaf, E. van Heumen, E. Giannini, and D. van der Marel.

Phenomenological theory of the pseudogap state

Phys. Rev. B 73, 174501 (2006) [[PDF](#)]



Kai-Yu Yang, **T. M. Rice (ETHZ/picture)**, and Fu-Chun Zhang.

Correlation between oxygen isotope effects on transition temperature and magnetic penetration depth in high-temperature superconductors close to optimal doping

Phys. Rev. B 74, 064504 (2006) [[PDF](#)]



R. Khasanov, A. Shengelaya, K. Conder, **E. Morenzoni (PSI/picture)**, I. M. Savi, J. Karpinski, and H. Keller.

Orbital selective overlayer-substrate hybridization in a Pb monolayer on Ag(111)

Phys. Rev. B 73, 245428 (2006) [[PDF](#)]



Christian R. Ast, Daniela Pacilé, Marco Papagno, Thomas Gloor, Frédéric Mila, Stephan Fedrigo, Gero Wittich, Klaus Kern,

Harald Brune, and **Marco Gioni (EPFL/picture)**.

Electronic structure of an ordered Pb/Ag(111) surface alloy: Theory and experiment

Phys. Rev. B 73, 245429 (2006) [[PDF](#)]

D. Pacilé, C. R. Ast, M. Papagno, C. Da Silva, L. Moreschini, M. Falub, Ari P. Seitsonen, and **M. Gioni**.

Understanding mixed valent materials: Effects of dynamical core-hole screening in high-pressure x-ray spectroscopy

Phys. Rev. B 74, 081101(R) (2006) [[PDF](#)]

C. Dallera, O. Wessely,² M. Colarieti-Tosti, O. Eriksson, R. Ahuja, B. Johansson, M. I. Katsnelson, E. Annese, J.-P. Rueff, G. Vankó, L. Braicovich, and **M. Gioni**.

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* **Important notice** : if picture of main MaNEP authors are not provided, pictures will be put according to material available from the web.

And also...

European Physics Journal B

Multiple scattering investigation of the 1T-TaS₂ surface termination

Eur. Phys. J. B 52, 421-426 (2006) [[PDF](#)]



L. Despont (UniNE/picture), F. Clerc, M.G. Garnier, H. Berger, L. Forró and P. Aebi.

Physica C

Fluctuation effects in superconducting nanostrips

Physica C, Vol. 444, Issues 1-2, 2006, 12-18 [[PDF](#)]



A. Engel (UniZH/picture), A.D. Semenov, H.-W. Hübers, K. Il'in and M. Siegel.

Acta Crystallographica

A new synthetic cobalt tellurate : Co₃TeO₆

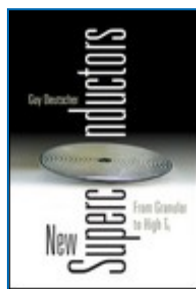
Acta Cryst. (2006). C62, i67-i69 [[PDF](#)]



R. Becker, M. Johansson and **H. Berger (EPFL/picture)**

Reading tips

Book / New Superconductors : From Granular to High T_c



A recent publication by Guy Deutscher, Tel Aviv University (Israel)

How new are the high T_c

superconductors, as compared to the conventional low T_c

ones? In what sense are

these oxides different from regular metals in their normal state? How different is the mechanism for high T_c

superconductivity from the well-known electron-phonon interaction that explains so well superconductivity in metals and alloys? What are the implications of the new features of the high T_c

oxides for their practical

applications ? This interesting book aims to provide some answers to those questions, drawing particularly on similarities between the high T_c oxides and granular

superconductors, which also present a short coherence length and a small superfluid density.

[[click here](#) for more details]

Good to know / A selection of science news and readings

Phil W. Anderson, the most creative physicist of the world ?

So says a new analysis of scientific research papers. The study has been carried out by José Soler, a statistical physicist at the University of Madrid, who says that his "creativity index" could help universities to recruit and promote the best staff.

We will welcome Phil W.

Anderson in UniGE on Wednesday September 27.

[[more details](#)]

World's first in-grid outdoor HTS cable now On-line

The transmission of electricity over the in-grid superconducting power cable system started in Albany, NY State, on the local date of July 20th 2006. This system uses high-temperature superconducting cable manufactured by Sumitomo Electric Industries, Ltd. First in the world to be used in the used underground power grid, the super-conducting cable system undergoes a test for the next six months.

[[more infos](#)]

G8 in Moscow : superconductivity clearly mentioned in priorities

Prof. René Flükiger informs us that superconductivity was an important issue during the last G8 summit in Moscow this summer. It is at least clearly mentioned in the related report, paragraph 39. The news have been forwarded to UE contacts in Bruxelles in the hope of boosting this important field of ours.

[[the full report](#)]

Violation of Kirchhoff's Laws for a Coherent RC Circuit

J. Gabelli, G. Fève, J.-M. Berroir, B. Plaçais, A. Cavanna, B. Etienne, Y. Jin, and D. C. Glattli.

Science 28 July 2006 313: 499-502.

DOI: 10.1126/science.1126940

[[link to the pdf](#)]

High T_c , a dead field within four years ?

This is the (depressing !) new analysis of German researchers ; they found that the number of papers in the field peaked in about 1990 and has been steady falling since then. By extrapolating the data, the researchers conclude that the numbers will drop to zero at some point between 2010 and 2015, provided that no groundbreaking discoveries are made in the meantime...

[[full article on PhysicsWeb](#)]

Europhysics news : don't miss the 2006 3rd volume

In the latest Europhysics News you can find one article by Dr Laurent Despont in the *Highlights* section. It is called : "Local polarisation in an ultra-thin ferroelectric".

[[download the PDF](#)]

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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. René Flükiger
Prof. Markus Buttiker
Dr Louis Antognazza
Dr Alfred Manuel
Dr Laurent Despont*



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 / Special highlight

MaNEP Topical Meeting & Colloque Peter

Wednesday 27, 2006
UniGE, Physics Institute
Auditoire A

10.00 - 10.45 Welcome coffee

Topical meeting 1st session

Chair: D. van der Marel
(UniGE)

10.45 J. Chang (ETHZ & PSI), "Interplay between high- and low energy excitations in optimally doped LSCO: an ARPES study".

11.05 G. Levy (UniGE), "Scanning tunneling spectra on HTS: the interplay of the gap, the bosonic mode and the van Hove singularity".

11.25 J. L. M. van Mechelen (UniGE), "Electron-phonon coupling in SrTi_{1-x}Nb_xO₃".

11.45 C. Berthod (UniGE), "Breakup of the Fermi surface near the Mott transition in low-dimensional systems"

12.05 P. S. Häfliger (UniZH), "Muon-spin rotation measurements of the penetration depth in the noncentrosymmetric superconductors Li₂(Pd/Pt)₃B".

12.25 - 14.30 Lunch sandwich poster session*

Topical meeting 2nd session

Chair: G. Blatter (ETHZ)

14.30 Z. Bukowski (ETHZ), "Single crystal growth and properties of superconducting-pyrochlore osmates KOsO₆ and Rb Os O₆. Novel pyrochlore compounds synthesized under high pressure".

14.50 A. Rüfenacht (UniNE), "Probing the superfluid properties of ultrathin copper-oxide superconducting films with the electric-field effect".

15.10 N. Reyren (UniGE), "Electric field effect modulation of transition temperature, mobile carrier density and in-plane penetration depth in NdBa₂Cu₃O_{7-δ} thin films".

15.30 C. Weber (EPFL), "Magnetism and superconductivity of strongly correlated electrons on the triangular lattice".

15.50 D. Eichenberger (UniFR), "Superconductivity in the two-dimensional repulsive U Hubbard model".

16.10 - 17.00 Coffee break

17.00 - 18.00 M. Peter Colloquium with Prof. P.W. Anderson, Princeton University "RVB after all: the theory of High T_c"
Chair: T.M. Rice (ETHZ)

18.15 Aperitif
19.00 END MaNEP Topical Meeting

[*Poster list : see in the PDF doc - full programme]

Next issue : mid-October 2006.
Deadline for contributions : October 6, 2006.