



Editorial / From 2007 to 2008 : feedbacks and new challenges

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Highlights

PSI's Day of the Neutrons : another big public success

MaNEP movie on superconductivity soon available in 3 languages

Nobel Prize winner visits MaNEP

US Government focuses on physical sciences and engineering



By Prof.
Oystein
Fischer

With the year 2007 coming to an end, MaNEP is facing important and exciting new challenges to ensure its future.

Electronic materials are at the very core of future advanced technologies and MaNEP has thus an exciting mission to study such materials, to find new ways for their fabrication and to prepare for their applications.

This will be the spirit in which we shall elaborate the **pre-proposal for the third phase, due on March 31, 2008.**

And as Matthias Kuhn points out in this edition's **Special Highlight**, it seems the US

government shares the same view and thus is now focusing strongly on physical sciences through the ACI.

Looking back at the year 2007 we had a number of memorable events. Let me underline that I feel that the public is becoming increasingly aware of the importance of science.

It is thus more than ever important to organise events in which science is presented in a way accessible to everybody.

This was illustrated by **the remarkable success of public events like the MaNEP "SupraFête" in Geneva and the "PSI Day of the neutrons" (with MaNEP's contribution)** on which Joël Mésot and Stefan Janssen give us some feedback in the **Free Column**.

On the other hand, MaNEP is well prepared to take up the challenge of the third phase, from what I can judge based on the enthusiasm and the quality of the presentations we had from the 200 participants at our biannual meeting at *Les Diablerets* this autumn.

This gives me a good feeling that we are on the right track.

January will start full speed with **our internal workshops** - so I thank all participants for sending the required infos to **our administrator** (*also read below*) asap.

So to get ready for a crucial year 2008, I wish you all a most deserved break for Christmas... and a **HAPPY NEW YEAR !**

2008 Internal Workshops / Last reminder

MaNEP's internal workshops will take place from January 14 to 18 to discuss the progress on the 6 projects and produce the basis for the 7th MaNEP Progress Report. A **Forum meeting** is planned on Wednesday, January 16.

ASAP - URGENT !

Please send **Isabelle Bretton**

- the title of your contribution (s)
- your hotel reservation needs



All meetings will take place at the Hôtel

Beaulac in Neuchâtel.
[[More details - PDF](#)]





MaNEP movie soon available on a 3-language DVD

The 15-minute movie entitled "Superconductivity : A short story of an enduring enigma" was initially created for the MaNEP **SupraFête** back in June.

The movie is as an all-public introduction to superconductivity covering its history and an overview of current and possible future applications. Nobel Prize winner Georg Bednorz and MaNEP director Oystein Fischer provide their own views in short pieces of interviews. **From January on, the movie will be available on DVD** (in French, English and German) for educational purposes only. If interested, please contact Anne Rougemont, by **mail** or phone : +41 22 379 64 99.

MaNEP will be part of CERN celebrations for the LHC next year



CERN will be setting up several events to celebrate the expected launch of its Large Hadron Collider (LHC) in 2008.

MaNEP has been asked to take part and will lend **experiments** (including the new **SupraSurf**) for Open Days in April.

Later on, the **MaNEP exhibition** - illustrated by Swiss-French cartoonist *Mix&Remix* - will be shown at **theGlobe** (*picture*), CERN's exhibition centre, as well as the **MaNEP movie on superconductivity** (*also read above*). More infos to come during next spring.

Collaboration with Swissneutronics renewed

MaNEP has been collaborating with ETHZ and SwissNeutronics over Phase II to optimize neutron guides. Neutrons are expensive to produce so it is important to minimize losses during their transport to the targets. We are pleased to announce that the contract has just been renewed for Phase III. (MK)

Contact : joel.mesot@psi.ch

Nobel Prize winner Albert Fert visits MaNEP

The 2007 Physics Nobel Prize winner **Albert Fert** was in Geneva on Friday, November 16, for a DPMC-MaNEP colloquium.

The French physicist gave a **talk** entitled "*Présent et futur de la spintronique*" (Present and Future of spintronics). He carried on with more discussions with some of his Geneva colleagues and was introduced to MaNEP's activities.



[Left to right : Prof. Dirk van der Marel, Prof. Albert Fert and MaNEP director Prof. Oystein Fischer]

Albert Fert endend this busy day with interviews with some Swiss medias.

Watch and listen (in French) :

- 1st RSR interview : show **Impatience**

- 2nd RSR interview : show **Haute**

Définition

- **an interview on tsr.ch**

TV show with MaNEP features aired on December 1st



In 2006 the Geneva MaNEP group hosted a TV team from the famous French family-friendly science show called **C'est pas Sorcier**. They spent hours filming at one of the STM labs, before moving on to CERN.

These features were used at the beginning of the programme which is entitled **Voyage au coeur de la matière** (*A journey into the heart of matter*). It was aired on Saturday, December 1st on French TV channel France 3.

[[see the corresponding web page](#)]

Job opportunities

MaNEP members publicise the following job positions :

PhD position on nanoelectronics by scanning probe microscopy

At the Institut Néel, CNRS - Joseph Fourier University, Grenoble, France. For students with a master degree obtained outside France

[[download job offer in PDF](#)]

highly motivated chemist, physicist, material scientist as Postdoctoral fellow

at EMPA - Dpt of Solid State Physics and Catalysis

[[download job offer in PDF](#)]



The American Competitiveness Initiative : full speed ahead with physical sciences !

by Matthias Kuhn*

After focusing on biotech and security technologies, the US government now supports a new belief : that the next decade's major breakthroughs will come from physical sciences and engineering. A good sign for MaNEP's activities.

The American Competitiveness Initiative (ACI) was launched in February 2006 by the White House.

This initiative is aimed at boosting American innovation which is considered a key engine to grow the economy.

Some important changes are taking place regarding the type of research supported by the US government.

During the period 2001 – 2007, most of the federal support was dedicated to biomedical research and security technologies.

Due to foreign competition and acknowledging that 50% of the post-World War II economic growth was due to R&D fueled technological progress, a new set of challenges is emerging : among them, the cost of energy and its consequences on all areas of society.

The new belief is that advances in physical sciences and engineering will generate the key scientific and technological breakthroughs of the next decade.

Research in physical sciences and engineering provides tools and technologies for all the other fields. Ultimately, everything is made of atoms and their subcomponents.

Basic techniques such as imaging, manipulation and simulation of matter at the atomic scale are of value for applications in every field.

A few examples from the past :

- 1) 1988 / Giant magneto-resistive effect : data storage and reading
- 2) 1990 / Lithium ion battery : MP3s, mobile phones, laptops
- 3) 1988 / Thin film transistor : LCD TV
- 4) 1960-1970 / Large scale circuit design : DRAM
- 5) 1965 / Fast Fourier Transform : signal processing and compression, etc.



The ACI incarnates the new belief that physical sciences and engineering will provide tools for all other fields.

Doubled budget

Based on the above, the budget for federal R&D provided by the ACI will double from 2006 to 2016, reaching 19.5 billion dollars (versus 6 billion in 1998).

According to the ACI, the areas of research with the highest potential for breakthrough innovation are:

- Nano-fabrication and nano-manufacturing
- Electronic materials as enablers for nanotech, biotech and energy
- High-end computing (petascale)
- Quantum information processing (including quantum cryptography)
- Sensor detection capabilities

Partnerships are considered a key element of success for the ACI.

Despite the frequent comments that MaNEP is very focused on fundamental research and that applications are thus farfetched, the ACI shows that this type of research is now seen as the most promising for breakthrough innovations in the future.

This is both reassuring and highly motivating for the whole MaNEP community.

For more information :

- [[ACI website](#)]
 - [[ACI : full PDF document](#)]
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*Matthias Kuhn is MaNEP's Knowledge and Technology Transfer Manager since 2005



A feedback on the *Day of the Neutrons* at PSI and MaNEP's contribution

By Stefan Janssen and Joël Mésot*

After the great success of the public visitor day in 2005 the Paul Scherrer Institute again invited the general public to a special *Day of the neutrons* on October 28. MaNEP contributed by lending successful set ups, like the new *Suprasurf*.

Then event's subtitle was '*Spies in the microcosmos*' and was meant to attract people's attention on the fascinating property of the neutrons to probe the microscopic world and to provide examples from physics, chemistry, biology and materials science.

Over 3500 visitors learned about our research with neutrons and the experimental facilities.

At six large stations they were introduced to the technique and the scientific applications of neutron scattering and imaging. For instance :

Station 1 was dedicated to medical applications. Two researchers from Uni Fribourg reported on their research on the grey cataract in a highly interesting and easily understandable way. The lecture hall was full for each of the three presentations given that day. After each presentation an ophthalmologist was there to answer questions from the audience.

Station 2 offered experimental facilities dealing with low temperatures, high pressure or magnetic fields.

People experienced how strong magnetic fields can be and what happens to 'everyday' objects when

cooled to liquid nitrogen temperatures. In a competition they could test their ability to estimate and compare pressures in our daily life.

Another attraction was set up with the help from the Universities of Geneva and Neuchatel in connection with MaNEP.



The *Suprasurf* from MaNEP was an immense success during the "day of the neutrons at PSI (click picture to enlarge).

Their experiments were exhibited to show the possible future applications of high temperature superconductors. One of the highlights was the *Suprasurf***², a chair equipped with superconductors which levitates over a magnetic railway. Visitors could take a tour and were impressed by the experience of being suspended and glide over the rails without any contact.

Experts from PSI also gave popular talks on materials science and superconductivity. For instance it was explained how neutrons can contribute to solve the mystery of

high-temperature superconductivity.

Those presentations were given in the SINQ halls, which were darkened and illuminated in a spectacular way.

The 'Forum, PSI's visitors centre (www.psiforum.ch)' was open and showed its exhibitions. People were spoiled with ice cream produced by liquid-N₂ at the restaurant.

Many thanks to all the staff involved who made this event a huge success. The generous support by MaNEP, through the universities of Geneva and Neuchatel, is gratefully acknowledged.

***The Suprasurf was created by engineer Gaby Bosch and his team to be first shown in Geneva in June during the *SupraFête*, a big MaNEP public event. It will also be shown during next year's CERN celebrations for the launch of the LHC [note from the editor].*

[[Download the Day of the Neutrons small poster](#)]



***Stefan Janssen** works at the PSI's Solid State Research with Neutrons and Muons. He is responsible for the PSI User Office.



***Joël Mésot** is a MaNEP (Forum) member working at PSI at the Laboratory for Neutron Scattering.



Physical Review Letters

Sine-Gordon Description of Beresinskii-Kosterlitz-Thouless Vortices in Superconductors Immersed in an External Magnetic Field



By L. Benfatto, C. Castellani, and **T. Giamarchi (UniGE, picture)**.

Phys. Rev. Lett. 99, 207002 (2007) - [[PDF](#)]

Calorimetric Evidence for a Fulde-Ferrell-Larkin-Ovchinnikov Superconducting State in the Layered Organic Superconductor κ -(BEDT-TTF)₂Cu(NCS)₂



By **R. Lortz (UniGE, picture)**, Y. Wang, A. Demuer, P. H. M. Böttger, B. Bergk, G. Zwicknagl, Y. Nakazawa, and J. Wosnitza.

Phys. Rev. Lett. 99, 187002 (2007) - [[PDF](#)]

Evidence for an Excitonic Insulator Phase in 1T-TiSe₂



By **H. Cercellier (UniNE, picture)**, C. Monney, F. Clerc, C. Battaglia, L. Despont, M. G. Garnier, H. Beck, and P. Aebi, L. Patthey, H. Berger

and L. Forró.

Phys. Rev. Lett. 99, 146403 (2007) - [[PDF](#)]

Physical Review B

Superconductivity and antiferromagnetism in the two-dimensional Hubbard model: A variational study



By **D. Eichenberger (UniFR, picture)** and D. Baeriswyl.

Phys. Rev. B 76, 180504(R) (2007) - [[PDF](#)]

Magnetic excitations in the spin-trimer compounds $\text{Ca}_3\text{Cu}_3-x\text{Ni}_x(\text{PO}_4)_4$ ($x=0,1,2$)



By A. Podlesnyak, V. Pomjakushin, **E. Pomjakushina (PSI/ETHZ, picture)**, K. Conder, and A. Furrer.

Phys. Rev. B 76, 064420 (2007) - [[PDF](#)]

Rectification and nonlinear transport in chaotic dots and rings



By M. L. Polianski and **M. Büttiker (UniGE, picture)**.

Phys. Rev. B 76, 205308 (2007) - [[PDF](#)]

Photoemission and optical studies of ZrSe_3 , HfSe_3 , and ZrS_3



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

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

Phase diagram of hole doped two-leg Cu-O ladders

By P. Chudzinski, M. Gabay, and **T. Giamarchi (UniGE)**.

Phys. Rev. B 76, 161101(R) (2007) - [[PDF](#)]

Advanced Materials

Molecular Thin Films: A New Type of Magnetic Switch



By S. Heutz, C. Mitra, W. Wu, A. J. Fisher, A. Kerridge, M. Stoneham, A. H. Harker, J. Gardener, H.-H. Tseng, T. S. Jones, **C. Renner (UniGE, picture)**, G.

Aeppli.

Volume 19, Issue 21, Pages 3618 - 3622 - [[PDF](#)]

Also see [[Nature news and views](#)]



Applied Physics A

One-step preparation of N-doped strontium titanate films by pulsed laser deposition



By Marozau, M. Döbeli, T. Lippert, D. Logvinovich, M. Mallepell, A. Shkabko, **A. Weidenkaff (EMPA, picture)** and A. Wokaun.

Appl. Phys. A 89, 933–940 (2007) - [[PDF](#)]

Journal of solid state chemistry

Synthesis, Mo-valence state, thermal stability and thermoelectric properties of $\text{SrMoO}_{3-x}\text{Nx}$ ($x > 1$) oxynitride perovskites

By D. Logvinovich, R. Aguiar, R. Robert, M. Trottman, S.G. Ebbinghaus, A. Reller and **A. Weidenkaff (EMPA)**.

Volume 180, Issue 10, October 2007, Pages 2649-2654 - [[PDF](#)]

European Physical Journal B

Anisotropic dynamic response of pentacene single crystals



By R. Schuster, M. Knupfer, D.R.T. Zahn and **H. Berger (EPFL, picture)**.

Eur. Phys. J. B 59, 25-28 (2007)

Annalen der Physik

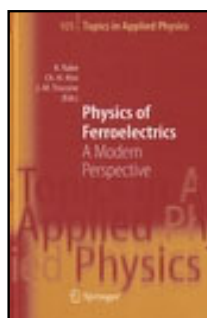
Interference of independently emitted electrons in quantum shot noise

By **Markus Büttiker (UniGe)** and Peter Samuelsson.

Ann. Phys. (Leipzig) 16, No. 10–11, 751 – 766 (2007) - [[PDF](#)]

Book

Physics of Ferroelectrics : A Modern Perspective



Former MaNEP deputy-director **Jean-Marc Triscone** is one of the three editors of this recently published book.

It addresses the paradigmatic shifts in understanding

ferroelectric materials brought about by revolutionary breakthroughs that occurred in the last two decades.

Céline Lichtensteiger and Matt Dawber who are working in his research group, and Patrycja Paruch (former PhD student of Prof. Triscone and newly appointed professor at UniGE) have also contributed.

Springer, Topics in Applied Physics (Vol. 105), 390 pages
[[Find out more and buy the book](#)]

Reading tip

Experts share their views on the upgrade (of ESRF)



An interview with MaNEP member **Marco Grioni (EPFL, picture)** for the European Synchrotron Radiation Facility Newsletter

ERSF Newsletter Nr 46, p.23 - [[PDF](#)]

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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



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Calendar

MaNEP Internal Workshops

January 14-18, 2008

Hôtel Beaulac, Neuchâtel



Discussions on progress of the 6 projects and the 7th Progress Report.

Contact : [Isabelle Bretton](#).

Programme in [[PDF](#)]

2008 SPS meeting

March 26-27, 2008

UniMail, Geneva



MaNEP will set up a parallel session at the 2008 Swiss Physical Society meeting.

More details and online

registration : [[www.manep.ch/en/
events/sps08](http://www.manep.ch/en/events/sps08)]

E-MRS 2008 Spring Meeting

May 26-30, 2008

Strasbourg, France



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