

## SCHOOL REPORT

<b>School:</b>	<b>Berlin School on Neutron Scattering</b>
<b>Specific Title:</b>	<b>33<sup>rd</sup> Berlin School on Neutron Scattering</b>
<b>Date:</b>	<b>28th February - 8<sup>th</sup> March 2013</b>
<b>Venue:</b>	<b>Helmholtz Zentrum Berlin für Materialien und Energie, Lise Meitner Campus, Hahn-Meitner-Platz 1, 14109 Berlin, Germany</b>
<b>Organizer Name:</b>	<b>Bella Lake, Alan Tennant</b>
<b>Affiliation Organizer:</b>	<b>Helmholtz Zentrum Berlin für Materialien und Energie</b>
<b>Total budget:</b>	<b>13.265,82 EUR</b>
<b>Maximum NMI3-II support:</b>	<b>9.500 EUR</b>

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### ***Scope***

The aim of the school is to provide an introduction to neutron scattering with an emphasis on hands-on, practical experience. The school combines a lecture course on specific neutron scattering techniques with a series of hands-on practicals on seven different instruments which the students perform in small groups. There are also lectures on how neutrons are used to tackle problems in specific subject areas e.g. biology, physics etc. Furthermore we introduce them to how a large scale facility runs with tours of the beam halls, an introduction to neutron user service. The aim of the school is to give a broad overview of what can be achieved by neutron scattering rather than specializing on a particular technique. We hope that the students are able to identify how neutron scattering can help them in their current research and also develop an appreciation of the scope of neutron scattering and how it may be useful to them in the future.

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### ***Students***

27 students were chosen to attend the school from a total of 121 applicants. They came from 15 different countries; 10 were from German institutions and 15 from other European institutes. Furthermore there were two additional overseas students funded by the IAEA, one from India and another from Brazil. The vast majority of the students (25 people) were studying for their PhD, we also had 1 diploma/master's students and 1 postdoc. The students came from a wide range of scientific backgrounds including biology, chemistry, engineering, materials science, crystallography and physics. Finally the gender ratio of the school was very good with approximately equal numbers of women (14) and men (13) even though of course gender had not been a consideration in the selection process.

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### ***Organisation***

The first 2 days of the school (Thursday and Friday) consisted of lectures on the principles and techniques of neutron scattering. There were also tours of the neutron beam halls and the sample environment to help the students familiarise themselves with the layout of the instruments. Saturday morning was devoted to specialist guest lectures, Dr Dimitri Argyriou (scientific director of ESS) gave an inspiring talk about the ESS project, Prof Hartmut Zabel (Ruhr-University Bochum) spoke about how the combined use of x-ray and neutron scattering can be used to explore magnetic materials and Dr Andrea Denker (HZB) described how neutron auto-radiography provides information about works of art. The rest of the weekend

was free. The remaining technique lectures were given on the next monday morning. After this the practical part started. The students were divided into 7 groups of ~4 people according to subject area and performed a total of 7 experiments (triple-axis spectroscopy, powder diffraction, small angle scattering, reflectometry, time-of-flight diffraction, tomography and residual stress diffraction). The experiments lasted 3 hours each and took place during the next 3.5 days. They consisted of an introduction to the instrument including a hands-on tour of it and its various components. They then performed an experiment including attaching the sample, controlling the instrument and collecting data, after this they analysed the data and were encouraged to interpret the results. The last morning of the school consisted of lectures on how to use neutron scattering as a tool for research in the subject areas of biology, geosciences and physics. There was also a lecture on how to design a neutron instrument and finally the students were shown how to apply for beamtime. At the end of the school a certificate was issued and the students were asked to complete a questionnaire.

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### **Results**

The school was very successful as reflected in the positive feedback we received from the students in their questionnaire. For example, 76% of the students said that the lectures were at the right level. Concerning the practical part, the majority of students were satisfied, with 83% saying that the introductions to the instruments were very helpful or sufficient and 89% saying that their own involvement in the practical exercise was sufficient. Some of the students asked for a problem sheet to make the lectures more interactive, they also requested diagrams of the instrumental hall so that they could familiarize themselves with the layout of the instruments beforehand, we intend to address both these issues in the next school. Furthermore we also plan to have a poster session, where the students have an opportunity to present their research and discuss with the scientists how they can use neutrons to investigate their research problems.

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