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# First Mexican Synchrotron Radiation Users Meeting

The first Mexican Synchrotron Radiation Users Meeting took place in Cuernavaca on May 4–6, 2011, with 74 researchers and students in attendance. This event was organized by the Universidad Nacional Autónoma de México (UNAM), the Universidad de Guanajuato (UG), and the Centro de Investigación y de Estudios Avanzados (Cinvestav), and supported by the Mexican Science and Technology Council (CONACyT). The meeting originated from an initiative of the Mexican High Energy Physics Network in coordination with CONACyT as an initial step in evaluating the feasibility and pertinence of building a synchrotron light source in Mexico, envisioned as a facility that would also be open to users from other countries. This initiative included other actions such as visits to recently opened synchrotrons in order to broaden perspective and gain knowledge of the potential technological and economic impact of constructing and operating a synchrotron light source in Mexico.

This meeting had two main objectives. First, to share a broad view of current research at some of the most important synchrotron sources in the world with Mexican academic and scientific community and government officials. In order to accomplish this, selected invited speakers with a long experience in synchrotron radiation sources presented talks where they gave an overview of current research in materials science, protein structural studies, catalysis and surface science, medical imaging, and environmental science. Second, it was important to perform a census of the Mexican scientific community currently using synchrotron facilities, and to get a first-hand presentation of their current work with synchrotrons.

In total, there were 25 presentations by Mexican synchrotron users covering a broad

range of interests, including condensed matter physics in areas such as dynamical lattice instabilities in correlated materials, Mott-Hubbard transitions in di-fluoride insulators, the appearance of ferro-electricity from the para-electric state in multiferroics and in studies of matter under extreme pressure. In environmental science, there was specific interest in studying the effect of Se and Cd on the growth of crops such as broccoli and cauliflower, the effect of ZnO and rare earth oxides on soy plants, and the Cd tolerance of Mexican desert plants. In structural biology and medical imaging, there was interest in using X-rays as a driving force to study chemical reduction on protein crystals, in using the phase effect in images applied to mammography, in studying the structure-function relationship of enzymes that bind nucleic acids, and in the use of X-ray dichroism for the study of spider webs. Additional local interest was in the non-destructive characterization of cultural heritage samples such as XVII-XIX century paintings and manuscripts, and pre-Colombian pottery and sculpture.

The meeting opened with a welcome session with Enrique Rudiño (UNAM) presiding. It was followed by invited talks from Hiroyuki Oyanagi (AIST, Japan), who presented X-ray absorption experiments on photoinduced transitions and high-temperature superconductors. These experiments were performed on the Photon Factory and SPring-8 using the latest design in fluorescence detectors developed by Hiroyuki Oyanagi's group. This was followed by a presentation on Inelastic X-ray Scattering by Yong Cai (NSLS, Brookhaven, USA). Cai gave an introduction to different experimental techniques related to inelastic X-ray scattering currently used at NSLS and new beamlines that will be ready

shortly. He then discussed applications of this technique to several materials science problems as well as new developments in ultrahigh resolution (less than 1 meV) X-ray sources.

After these invited sessions, there was a formal meeting inauguration attended by university officials with Jorge Flores, head of the Presidential Advisory Council on Science and Technology of Mexico, presiding. After the inauguration, a presentation of the status of the synchrotron project was made by Matias Moreno (UNAM) from the High Energy Physics Network, followed by a general session of questions and comments by all attendees. The rest of the first day was devoted to science presentations by local Mexican researchers in the topic areas summarized earlier, which were of high quality, describing work most of which has been or will be

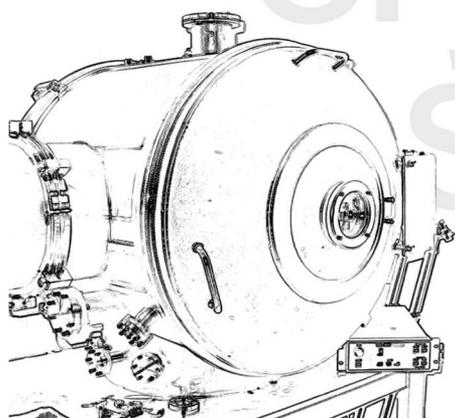
published in international journals of their respective fields.

The second day of the meeting started with an invited presentation by Miquel Salmeron (Lawrence Berkeley Laboratory, USA), who described the use of in situ X-ray spectroscopic techniques such as X-ray absorption and X-ray photoemission performed at the Advanced Light Source (ALS, USA) to the study of surfaces and nanoparticles. This was followed by a presentation by Andrzej Joachimick (Argonne National Laboratory, USA), who emphasized the impact that macromolecular structural determination had in the field of genomics and proteomics, through accurate protein structural determination, leading to a precise understanding of protein functionality. His talk surveyed the current facilities at third and fourth generation synchrotrons.

These presentations were again followed by Mexican users' presentations in the same area and, in addition, on materials science and molecular physics performed at synchrotrons with lines with capabilities in the infrared and ultraviolet range of the electromagnetic spectrum.

The final day of the meeting started in the infrared, with Michael Martin (Lawrence Berkeley Laboratory, USA) as the invited speaker. Martin described the use of synchrotron sources for FTIR spectroscopy and infrared (IR) microscopy. He presented a series of examples spanning disciplines from biology to physics to chemistry to environmental science, with emphasis on the new technical directions of future IR beam lines. His talk was followed by an X-ray presentation by Dean Chapman (University of Saskatchewan, Canada) dealing with the

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unique capabilities for biomedical imaging and therapy at the Canadian Light Source, with an emphasis on the development of novel detection techniques for imaging, and the current challenges that should be faced to provide large animal and human imaging capabilities. The talks were followed by contributions from Mexican speakers in subjects such as biomedical imaging, X-ray photoemission spectroscopy, and X-ray absorption and X-ray fluorescence spectroscopies applied to archeological and historical objects.

The meeting closed with a session in which a Users Committee was established, with Guadalupe de la Rosa (Universidad de Guanajuato), Marcos Delgado Ríos (Universidad Autónoma de Ciudad Juárez), Daniel Hernández Cruz (Universidad Autónoma de Chiapas), Enrique Rudiño (UNAM), Erick Adrián Juárez-Arellano (Universidad del Papaloapan, Oaxaca), and Jose Mustre (Cinvestav). Also, an advisory body, which will help the User Committee to interface with the High Energy Physics Network, was formed. Its members include Matias Moreno

(UNAM), José Jiménez (UNAM), Mauro Napsuciale (Universidad de Guanajuato), Antonio Juárez (UNAM), and Armando Antillón (UNAM).

The outcome of the meeting was overall very positive. It was clear that the number of synchrotron users had substantially expanded over the last decade, increasing from five at the end of the 1990s to more than seventy today, performing research in synchrotrons located in North and South America, Europe, and Japan. A large fraction of these users reside in state universities and not only in the traditional national universities or government research laboratories, as reflected in the geographical diversity of the members of the coordination committee. Hence the use of synchrotron radiation sources has effectively contributed to a major scientific and educational development, something which has been a challenge in the past. Based on these conclusions and on feedback from the invited speakers on the priorities to consider for the presentation of a synchrotron construction project to Mexican authorities, the Users Committee is of the



Attendees at the First Mexican Synchrotron Users Meeting in Cuernavaca.

strong view that the construction of a synchrotron source in Mexico will impact the scientific and technological capabilities of the country in a very significant manner. The next step will be the preparation of a white paper to CONACyT by the end of July 2011, which will likely propose an approximately two-year-long preparation phase that would include funding for the development of a formal proposal and for training accelerator and beamline scientists. ■

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