Feed: NEUTRON SCIENCES NEWS

The ORNL Neutron Sciences Directorate operates the world's highest flux reactor-based neutron source (the High Flux Isotope Reactor) and the world's most intense pulsed accelerator-based neutron source (the Spallation Neutron Source).

New research instrument at SNS

A new research instrument, the Hybrid Spectrometer (HYPSPEC), is online at the Spallation Neutron Source (at Beam Line 14-B) and being commissioned for experimental use. According to information released by Oak Ridge National Laboratory, the new instrument "combines the time-of-flight technique used at pulsed sources such as SNS with the advantages of crystal spectrometers that use continuous neutrons,:"ORNL spokesman Bill Cabage said HYSPEC was developed by a team that included participation from top U.S. universities, as well as national labs and an international user group. "HYSPEC is a new concept in high-flux inelastic neutron spectrometry," he said. Cabage said HYSPEC is the first polarized beam spectrometer among the SNS research instruments. A dozen instruments have already been commissioned at the SNS, which sits atop Chestnut Ridge about a mile from the main ORNL campus, and HYSPEC and another newcomer, TOPAZ, a single crystal diffractometer, are being commissioned for experimental use. 'Where atoms are, and what they do' PhysOrg 5/24 New research from the University of Southampton has devised a new method to more accurately measure gas bubbles in pipelines. A 100-million-year old fossil from Antarctica's tropical age, revealed by neutron imaging, fascinated participants at the "Neutron Scattering for Novices" workshop at Oak Ridge National Laboratory's Spallation Neutron Source (SNS), held May 16. Robert McGreevy, ORNL's deputy associate lab director for Neutron Sciences showed the geological sample as an example of what advanced neutron techniques can do -- in this case, nondestructively see what's inside an ancient fossil. The workshop, organized by the University of Tennessee-ORNL Joint Institute for Neutron Sciences (JINS), introduced neutron scattering techniques to scientists who have little or no experience with neutrons in research. Kelly Beierschmitt, associate laboratory director for Neutron Sciences at Oak Ridge National Laboratory, invited faculty members, research scientists, and postdocs, as well as senior Ph.D. students, to become neutron users at facilities such as the SNS and the High Flux Isotope Reactor (HFIR) at ORNL.Back to Top

---

'Where atoms are, and what they do'

New research from the University of Southampton has devised a new method to more accurately measure gas bubbles in pipelines. A 100-million-year old fossil from Antarctica's tropical age, revealed by neutron imaging, fascinated participants at the "Neutron Scattering for Novices" workshop at Oak Ridge National Laboratory's Spallation Neutron Source (SNS), held May 16. Robert McGreevy, ORNL's deputy associate lab director for Neutron Sciences showed the geological sample as an example of what advanced neutron techniques can do -- in this case, nondestructively see what's inside an ancient fossil. The workshop, organized by the University of Tennessee-ORNL Joint Institute for Neutron Sciences (JINS), introduced neutron scattering techniques to scientists who have little or no experience with neutrons in research. Kelly Beierschmitt, associate laboratory director for Neutron Sciences at Oak Ridge National Laboratory, invited faculty members, research scientists, and postdocs, as well as senior Ph.D. students, to become neutron users at facilities such as the SNS and the High Flux Isotope Reactor (HFIR) at ORNL.Back to Top

---

The use of acoustic inversion to estimate the bubble size distribution in pipelines

New research from the University of Southampton has devised a new method to more accurately measure gas bubbles in pipelines. The ability to measure gas bubbles in pipelines is vital to the manufacturing, power and petrochemical industries. In the case of harvesting petrochemicals from the seabed, warning of bubbles present in the crude that is being harvested is crucial because otherwise when these bubbles are brought up from the seabed (where pressure is very high) to the surface where the rig is, the reduction in pressure causes these bubbles to expand and causes 'blow out'. A blow out is the sudden release of oil and/or gas from a well and issues with the blow out preventer were key in Deepwater Horizon oil spill (also known as the Macondo blowout) in the Gulf of Mexico in 2010. Now, a team led by Professor Tim Leighton from the Institute of Sound and Vibration Research at the University of Southampton, has devised a new method, which takes into account that bubbles exist in a pipe. Professor Leighton and his team (Post-doctoral research fellows Kyungmin Baik and Jian Jiang) were commissioned to undertake the work as part of an ongoing programme to devise ways of more accurately estimating the BSD for the mercury-filled steel pipelines of the target test facility (TTF) of the $1.4 billion Spallation Neutron Source (SNS) at Oak Ridge National Laboratory, Tennessee, USA one of the most powerful pulsed neutron sources in the world ORNL's Mook Wins Onnes Prize for Superconductivity Research Newswise 5/14 Herbert A. Mook Jr., a UT-Battelle Senior Corporate Fellow at the Department of Energy's Oak Ridge National Laboratory, has won the 2012 H. Kamerlingh Onnes Prize, awarded for outstanding experiments in the study of superconductivity.Mook was cited "for several decades of important neutron spectroscopy and diffraction experiments on superconductors, especially those with magnetic tendencies." The Onnes Prize, named after the winner of the 1913 Nobel Prize in physics for the discovery of superconductivity and related research, is awarded every three years for outstanding experiments in superconductivity, or the absence of electrical resistance in certain materials at extremely cold, typically near absolute zero, temperatures. Mook began his distinguished career in 1965 at ORNL, where he has expanded his neutron scattering research to investigate the interaction of magnetism and superconductivity. Among Mook's diverse range of experiments utilizing neutron analysis, he and collaborators have studied the nature of the magnetic structure and fluctuations in high-temperature superconductors using ORNL's High Flux Isotope Reactor. Mook served as the first scientific director of the Spallation Neutron Source from 1995 to 2000 and the director of the Center for Neutron Science from 2000 to 2004. He has twice received the DOE

Award for Outstanding Scientific Accomplishments in Solid State Physics, in 1982 and 1998. Back to Top

---

ORNL's Mook Wins Onnes Prize for Superconductivity Research

Herbert A. Mook Jr., a UT-Battelle Senior Corporate Fellow at the Department of Energy's Oak Ridge National Laboratory, has won the 2012 H. Kamerlingh Onnes Prize, awarded for outstanding experiments in the study of superconductivity.Mook was cited "for several decades of important neutron spectroscopy and diffraction experiments on superconductors, especially those with magnetic tendencies." The Onnes Prize, named after the winner of the 1913 Nobel Prize in physics for the discovery of superconductivity and related research, is awarded every three years for outstanding experiments in superconductivity, or the absence of electrical resistance in certain materials at extremely cold, typically near absolute zero, temperatures. Mook began his distinguished career in 1965 at ORNL, where he has expanded his neutron scattering research to investigate the interaction of magnetism and superconductivity. Among Mook's diverse range of experiments utilizing neutron analysis, he and collaborators have studied the nature of the magnetic structure and fluctuations in high-temperature superconductors using ORNL's High Flux Isotope Reactor. Mook served as the first scientific director of the Spallation Neutron Source from 1995 to 2000 and the director of the Center for Neutron Science from 2000 to 2004. He has twice received the DOE Award for Outstanding Scientific Accomplishments in Solid State Physics, in 1982 and 1998. Back to Top

---

Neutron scattering charts moves of memory-shape alloys that change structure in response to environmental cues

Shape-memory alloys (SMAs) are an engineer's dream, able to shape-shift spontaneously to accommodate changing operating conditions. A research team from the National Aeronautics and Space Administration and the University of Central Florida is studying the internal mechanisms of these real-life "Transformers" at the Spallation Neutron Source at the Department of Energy's Oak Ridge National Laboratory, with an eye toward increasing their use in everyday scenarios. The shape-memory alloy research is funded by NASA's Fundamental Aeronautics Program. The SNS is a user facility at Oak Ridge National Laboratory sponsored by the Department of Energy Office of Basic Energy Sciences, Scientific User Facilities Division in the Office of Science. ORNL's High Flux Isotope Reactor may be last reactor to convert to low-enriched fuel Knoxville News Sentinel 5/8 One of the nonproliferation goals of the Obama administration is to eliminate the use of highly enriched uranium in research reactors around the globe, providing assistance to convert these reactors to use low-enriched uranium (less than 20 percent U-235) and helping supply the fuel as needed. It's a way of reducing the threat of weapons-making materials falling into the hands of terrorists or others with nuclear weapon ambitions.This initiative, of course, has been on the U.S. agenda well before the current administration, but it's been getting additional emphasis post-Prague, with the removal of HEU from Mexico being one of the latest examples.Although converting these research reactors is a stated priority, the schedule for getting it done is slipping in some cases. One of those cases is at Oak Ridge National Laboratory, where the High Flux Isotope Reactor uses highly enriched uranium (greater than 90 percent U-235) and will, according to the latest info from ORNL, continue to use HEU until February 2020. That's the new date for conversion. The new date is considerably later than the previous conversion date for HFIR, which was September 2016. And the previous date was considerably later than its predecessor conversion date, which was in 2014. So you can see thetrend. ORNL officials have said developing a fuel for high-performance reactors such as HFIR has been a challenge, to say the least. Money apparently has been a factor, too. Back to Top

---

ORNL's High Flux Isotope Reactor may be last reactor to convert to low-enriched fuel

One of the nonproliferation goals of the Obama administration is to eliminate the use of highly enriched uranium in research reactors around the globe, providing assistance to convert these reactors to use low-enriched uranium (less than 20 percent U-235) and helping supply the fuel as needed. It's a way of reducing the threat of weapons-making materials falling into the hands of terrorists or others with nuclear weapon ambitions.This initiative, of course, has been on the U.S. agenda well before the current administration, but it's been getting additional emphasis post-Prague, with the removal of HEU from Mexico being one of the latest examples.Although converting these research reactors is a stated priority, the schedule for getting it done is slipping in some cases. One of those cases is at Oak Ridge National Laboratory, where the High Flux Isotope Reactor uses highly enriched uranium (greater than 90 percent U-235) and will, according to the latest info from ORNL, continue to use HEU until February 2020. That's the new date for conversion. The new date is considerably later than the previous conversion date for HFIR, which was September 2016. And the previous date was considerably later than its predecessor conversion date, which was in 2014. So you can see thetrend. ORNL officials have said developing a fuel for high-performance reactors such as HFIR has been a challenge, to say the least. Money apparently has been a factor, too. Back to Top

---

Neutron scattering unlocks milk protein

Martha, a cow placidly grazing in a field in The Netherlands, became an important collaborator with researchers who successfully analyzed and characterized the internal protein structure and the composite particles of her milk using small-angle neutron scattering at Oak Ridge National Laboratory's High Flux Isotope Reactor (HFIR). Researchers have long struggled with the challenge of unraveling the internal structure of this protein. An international collaboration was formed among University of Utrecht researchers C. G. (Kees) de Kruif and Andrei Petukhov; Volker Urban, an instrument scientist at HFIR; and Thom Huppertz from NIZO, a Dutch independent contract research company that helps food and ingredient companies improve the quality and profitability of their products. The researchers used the HFIR's general purpose small-angle neutron scattering instrument (GP-SANS) to study samples of milk from Martha, a cow on the de Kruif family's farm. They compared the neutron scattering data with various theoretical models of casein structure that have been proposed in the literature. The results showed that one model prevails: The casein micelle proteins are composed of a protein matrix in which calcium phosphate nanoclusters (about 300 per casein micelle) are dispersed. March $20M plutonium project at ORNL to support space program Knoxville News Sentinel 3/30 Over the next two years, Oak Ridge National Laboratory will carry out a $20 million pilot project to demonstrate the lab's ability to produce and process plutonium-238 for use in the space program. Tim Powers, director of ORNL's Non-Reactor Nuclear Facilities plutonium-238 for use in the space program. Tim Powers, director of ORNL's Non-Reactor Nuclear Facilities Division, said the technology demonstration will include development of neptunium-237 targets that will then be introduced into the High Flux Isotope Reactor to produce small amounts of Pu-238. Later, workers will remove the targets from the reactor core and process the radioactive materials in hot cells at the lab's Radiochemical Engineering Development Center, separating the Pu-238 from the neptunium and purifying the plutonium. Powers said the ORNL program will support the U.S. Department of Energy's plan to eventually produce 1? to 2 kilograms of Pu-238 per year, using existing infrastructure within the DOE complex. For years, the U.S. has relied on purchases from Russia to supplement the inventory of the radioisotope for the space power program. There have been multiple proposals to re-establish a U.S.-based production program, none of which took hold. According to Powers, very small amounts of neptunium will be introduced into the High Flux Isotope Reactor in the early stages of the demonstration project. Over time, some of the targets will be withdrawn for evaluation, while others will be left in the reactor core for longer irradiation periods, he said. Back to Top

---

[$20M plutonium project at ORNL to support space program]

Over the next two years, Oak Ridge National Laboratory will carry out a $20 million pilot project to demonstrate the lab's ability to produce and process plutonium-238 for use in the space program. Tim Powers, director of ORNL's Non-Reactor Nuclear Facilities Division, said the technology demonstration will include development of neptunium-237 targets that will then be introduced into the High Flux Isotope Reactor to produce small amounts of Pu-238. Later, workers will remove the targets from the reactor core and process the radioactive materials in hot cells at the lab's Radiochemical Engineering Development Center, separating the Pu-238 from the neptunium and purifying the plutonium. Powers said the ORNL program will support the U.S. Department of Energy's plan to eventually produce 1? to 2 kilograms of Pu-238 per year, using existing infrastructure within the DOE complex. For years, the U.S. has relied on purchases from Russia to supplement the inventory of the radioisotope for the space power program. There have been multiple proposals to re-establish a U.S.-based production program, none of which took hold. According to Powers, very small amounts of neptunium will be introduced into the High Flux Isotope Reactor in the early stages of the demonstration project. Over time, some of the targets will be withdrawn for evaluation, while others will be left in the reactor core for longer irradiation periods, he said. Back to Top

---

[Spallation Neutron Source puts the squeeze on methane hydrate cages]

Our robot would find this energy source in shale [deposits], notably here on the east coast of the United States. However, the most abundant deposits of natural gas are under water on the continental shelves and in the permafrost in the Arctic region. At both poles, methane mixes with water and freezes, remaining trapped as an ice-like compound, for millions of years. Much further afield, methane, along with water and ammonia, are major constituents of Saturn's icy moon Titan. Some scientists speculate that on Titan there is a methanological cycle similar to the hydrological cycle here on earth. Surface methane evaporates into the atmosphere, where it condenses, and rains down to the surface again. NASA's Cassini-Huygens Titan probe has been there and sampled it. Methane holds promise as an abundant energy source for tomorrow, but it is Janus-faced: While often referred to as the cleanest fossil fuel producing far less greenhouse gas than either coal or oil, historically it has been seen as a major source of environmental pollution. That's because burning it produces carbon dioxide, a very potent greenhouse gas. Scientists are looking at how to sequester that CO2 byproduct, in an ice-like state. Such a strategy would create a carbon 'energy cycle' in which the methane resource is recovered, used, and then the greenhouse gas sequestered in a form very closely related to the naturally occuring initial materials. "What we do know right now is that when methane is taken up and released into the environment, water plays a critical role", said Chris Tulk, lead instrument scientist on the Spallation Neutrons and Pressure Diffractometer (SNAP) at ORNL. "Whether it is in the oceans where hydrates form on continental shelves, in the icy permafrost conditions, or even as these materials decompose and release the methane into the atmosphere to contribute to the greenhouse effect, water is certainly involved in the process. This research should lead to better models of how hydrocarbons are taken up and released in the environment." February New research instrument at SNS; called 'vibrational spectrometer' Knoxville News Sentinel 2/22 Another new research instrument is being commissioned at the Spallation Neutron Source at Oak Ridge National Lab. According to information released by ORNL, the instrument is called a "vibrational spectrometer" or VISION. It's located on beam line 16b and reportedly received its first stream of neutrons last week.The material research instrument is "optimized to characterize molecular vibrations in a wide range of crystalline and diordered materials over a broad energy range, while simultaneously recording structural changes . . . " It apparently has multiple advantages over similar spectrometers that are currently available. ORNL said there are currently 13 instruments available for experiments at the SNS, with another three -- including VISION -- coming online in the near term. VISION is one of the research instruments sponsored by the Dept. of Energy's Office of Science. It will be used for studiies in nanotechnology, catalysis, biochemistry, geochemistry, and "soft-matter science," the lab said. Christoph Wildgruber is the instrument scientist, Malcolm Cochran is scientific associate and John Larese is principal investigator, ORNL said. In photo, inserted above, that's Cochran on the left and Wildgruber on the right. They're flipping the switch for the beam line (16b). Back to Top

---

[New research instrument at SNS; called 'vibrational spectrometer']

Another new research instrument is being commissioned at the Spallation Neutron Source at Oak Ridge National Lab. According to information released by ORNL, the instrument is called a "vibrational spectrometer" or VISION. It's located on beam line 16b and reportedly received its first stream of neutrons last week.The material research instrument is "optimized to characterize molecular vibrations in a wide range of crystalline and diordered materials over a broad energy range, while simultaneously recording structural changes . . . " It apparently has multiple advantages over similar spectrometers that are currently available. ORNL said there are currently 13 instruments available for experiments at the SNS, with another three -- including VISION -- coming online in the near term. VISION is one of the research instruments sponsored by the Dept. of Energy's Office of Science. It will be used for studiies in nanotechnology, catalysis, biochemistry, geochemistry, and "soft-matter science," the lab said. Christoph Wildgruber is the instrument scientist, Malcolm Cochran is scientific associate and John Larese is principal investigator, ORNL said. In photo, inserted above, that's Cochran on the left and Wildgruber on the right. They're flipping the switch for the beam line (16b). Back to Top