對外合作組織與機構動態報導

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ARGONNE WELCOMES SCIENTISTS TO ADVANCED PHOTON SOURCE AND CENTER FOR NANOSCALE MATERIALS

阿岡實驗室先進光子源與奈米材料中心開放運用，持續為科學做出貢獻

By Karen Mellen

More than 400 researchers from numerous disciplines will convene at the U.S. Department of Energy's (DOE) Argonne National Laboratory today for the annual users' meeting for the Advanced

報告摘要(KEY INFORMATION)

1. 5 月 8 日，來自各種不同領域、超過 400 名研究人員聚集於阿岡國家實驗室，參與年度先進光子源與奈米材料中心使用者會議。阿岡實驗室的這兩項設施，每年分別吸引5000及500名來自各地的科學工作者使用，對於研究發展的貢獻不可勝道。
2. 二阿岡實驗室之團隊分別因「即時反應伊波拉病毒的爆發」，以及「研究腫瘤與病人對癌症藥物之反應模式」，貢獻顯著，榮獲美國能源部特殊獎。
3. 5 月 11 日，比利時核能研究中心與歐洲同位素運輸協會、國際同位素公司共同舉辦第六屆醫學放射性同位素研討會。不僅阿斯特里德公主蒞臨，更有約 100 名來自歐洲各地專家學者參與這場盛會，一同討論該領域之最新進展與挑戰。
4. 歐洲委員會一直以來都對「多功能混合型研究用反應爐在高科技之應用計畫」抱支持態度。自 2010 年起，該計畫被納入高度優先之大型能源研究建設；依規畫，該反應爐將坐落於多功能性的比利時，尖端發展能源安全與對抗氣候變遷之研究。
5. 澳洲政府於 4 月宣布將啟動新機制，於國內天然氣短缺時干預其出口，以解決國內天然氣供應危機、電價居高不下等問題。原先預期至少在 2020 年時澳洲將成為全球液化天然氣最大出口國，此舉震驚全球液化天然氣產業。

Photon Source (APS) and Center for Nanoscale Materials (CNM).

The APS and CNM, both DOE Office of Science User Facilities, annually attract more than 5,000 and 500 scientific users, respectively, from nearly all U.S. states and dozens of other countries.

The theme of this year's meeting is "Driving Discovery," with an emphasis on the momentum in the scientific community made possible by the breadth and scale of experiments done at the APS and the CNM.

"Each experiment and paper, no matter the end result, adds to our collective understanding of matter and advances our mission, articulated by the Department of Energy, to drive first-class science that can make a difference in people's lives."

APS reaches milestone for 20,000 peer-reviewed publications

This year saw the publication of the 20,000th peer-reviewed journal article based at least in part on experiments done at the APS since it opened in 1996.

The APS provides ultra-bright, high-energy X-ray beams to allow scientists to collect data in unprecedented detail – the beams are one billion times more powerful than the X-rays at a doctor's office. These beams are generated by electrons moving at nearly the speed of light around the synchrotron, a ring the size of a professional baseball stadium.

"Included in those 20,000 journal articles were studies that led to two Nobel Prizes for Science, as well as thousands of discoveries to advance our understanding of enhanced materials, diseases and even the cosmos," said Stephen Streiffer, director of the APS and Associate Laboratory Director for Argonne's Photon Sciences Directorate.

Research done at the APS to characterize the behavior of proteins that cause diseases and potential therapies has resulted in numerous drugs in public use, including Abbott Labs' Kaletra, one of the first HIV drugs.

In another study done in part at the APS, researchers found that Mars may have had more water than previously thought.

"Each experiment and paper, no matter the end result, adds to our collective understanding of matter and advances our mission, articulated by the Department of Energy, to drive first-class science that can make a difference in people's lives," Streiffer said.

CNM researchers take interdisciplinary approach to discovery nanoscience

At the CNM, dedicated Argonne researchers and users from outside facilities focus on nanoscience and nanotechnology that addresses important challenges, particularly in energy, information, materials and the environment.

Researchers at the CNM employ an array of one-of-a-kind capabilities to study matter at the nanoscale, whose dimensions range from a few atoms to a few hundred atoms across.

Unique capabilities at CNM include a premier clean room with advanced lithography and deposition capabilities, expansive synthesis and nanofabrication resources, a hard X-ray nanoprobe at the APS, and myriad scanning probes, including low-temperature and ultra-high vacuum scanning tunneling microscopes.

"Nanoscale technology has so much promise to provide new products and materials that will revolutionize how we live, from better personal electronics to more effective applications for national defense," said Supratik Guha, director of the CNM and Argonne's Nanoscience and Technology Division.

"As nanotechnology becomes better understood by a wide variety of scientific disciplines, we are seeing requests for proposals from not just materials scientists, but also bio-engineering and medical researchers," said Guha, who is also a professor at the Institute for Molecular Engineering at the University of Chicago.

The four-day users' meeting at Argonne will include workshops and poster sessions to discuss results of scientific discovery; a "speed science slam" in which researchers have just four minutes to describe their projects; short courses; and a symposium on drug discovery.

DEPARTMENT OF ENERGY SECRETARY RECOGNIZES ARGONNE SCIENTISTS' WORK TO FIGHT EBOLA, CANCER

美國能源部認可阿岡科學家打擊伊波拉病毒與癌症之貢獻

By Dave Bukey

Two groups of researchers at the U.S. Department of Energy's (DOE) Argonne National Laboratory earned special awards from the office of the U.S. Secretary of Energy for addressing the global health challenges of Ebola and cancer.

For answering urgent questions about potential Ebola outbreaks in the U.S., Argonne scientists Chick Macal, Jonathan Ozik and Nick Collier earned the DOE Secretary's Appreciation Award. Also recognized, for helping predict precise therapies for specific cancer patients, was

the team of Rick Stevens, Tom Brettin and Ravi Madduri.

“I am thrilled that, once again, our scientists and engineers have received the Department of Energy’s most prestigious awards,” said Paul Kearns, Argonne’s interim director. “These six researchers deserve exceptional recognition for taking meaningful steps toward protecting our nation from disease.”

Both teams are harnessing Argonne’s Mira supercomputer, located at Argonne Leadership Computing Facility, to approach public health dilemmas in new and promising ways.

As the Ebola virus swept through West Africa in 2014, data scientist Macal and his team in Argonne’s Global Security Sciences division joined DOE’s Ebola Task Force to halt the international health crisis.

“The DOE asked us to model what might happen if Ebola came to the U.S.,” said Macal. “We dropped everything and got to work.”

Macal, Ozik and Collier have spent years refining sophisticated models that can simulate human responses to crises; they could come quickly to realistic answers.

The group uses an approach that predicts the behavior of individual “agents” – representing people, households, organizations, etc. – and how they interact. With agent-based modeling, Macal can see how entire populations may evolve and identify tipping points that affect their fate in countless scenarios, including an Ebola outbreak.

Macal’s team had extensive computer models of how populations of large U.S. cities may handle a bacterial infection such as Methicillin-resistant Staphylococcus aureus, or MRSA. To adapt the models for Ebola, they visited Chicago-area hospitals and incorporated Ebola-related procedures into their models.

“This allowed us to estimate the healthcare resources required – space, staff and how to dispose of medical waste,” Macal said.

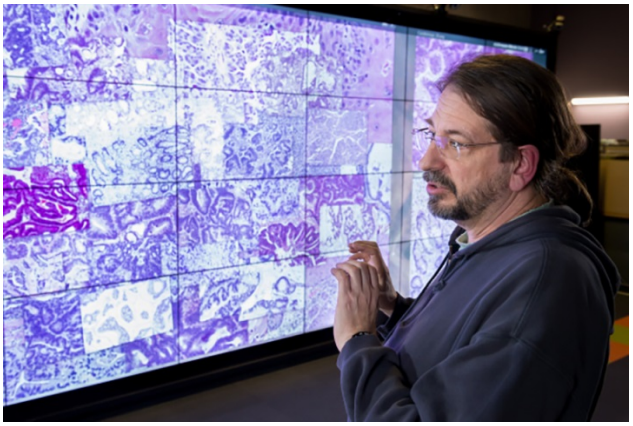
By January 2015, as the Ebola epidemic peaked, Macal, Ozik and Collier had a playbook detailing how a city like Chicago might respond to – and suppress – the spread of such a disease.

Collaborating with other national laboratories, Argonne improved “the robustness and quality of analytic products used to inform critical decisions throughout the outbreak,” wrote Richard

Hatchett, former acting director of the Biomedical Advanced Research and Development Authority at the Department of Health and Human Services, in support of the awards.

The team has since generalized their models to apply to a wide range of infectious diseases and created the Chicago Social Interaction Model (chiSIM), an agent-based model of more general social interactions.

Meanwhile, Argonne's Stevens, Brettin and Madduri introduced a similarly radical approach to cancer research. In January 2016, the Cancer Moonshot Task Force was launched to renew governmental focus on cancer research.



With two decades of experience in computational biology, Stevens jumped at the opportunity. "The immediate goal was to accelerate research on cancer and to pioneer the notion of predictive medicine," he said.

Stevens and his team took the award for their role in the partnership between DOE and the National Cancer Institute, which was named the Joint Design of Advanced Computing Solutions for Cancer.

The project, in which Ozik and Collier also were involved, brings the full capacity of advanced computing and machine learning to cancer, examining the disease from three perspectives: molecular, patient and population.

Stevens' group focuses on patient challenges, interpreting pre-clinical models that can predict how specific patients and tumors may respond to different types of drugs. (For more, see "Cancer's big data problem").

"More than 50 percent of patients with tumors don't respond to chemotherapy," said Stevens. "This is a huge challenge. We are trying to streamline the building of models that would give us a recommendation – for this patient, try these set of drugs in this order."

Stevens and his colleagues are starting the second of three years devoted to discovering computational clues to beat cancer.

The Ebola modeling research was supported by the Argonne's Laboratory Directed Research and Development program. The ongoing cancer research is funded by U.S. Department of Energy's Exascale Computing Project, the National Institutes of Health and the National Nuclear Security Administration. The Argonne Leadership Computing Facility is a DOE Office of Science User Facility.

GLANCE INTO THE FUTURE OF NUCLEAR MEDICINE

一窺核能醫學的發展趨勢

On 11 May, the Belgian Nuclear Research Centre (SCK•CEN) organized the 6th Symposium on Medical Radioisotopes in Mechelen in collaboration with the European Isotope Transport Association (EITA) & Isotopes Services International (ISI). In the presence of Her Royal Highness Princess Astrid, around one hundred Belgian and European experts assisted to the Symposium to discuss the latest progress and challenges in the field.

The Symposium on Medical Radioisotopes was devoted to future challenges for nuclear medicine. This was a successful edition with a record-breaking attendance. Lots and lots of researchers, professors and professionals in the field came to discuss the progress made in production, transport and treatment. Her Royal Highness Princess Astrid, who recently visited SCK•CEN to meet its young researchers, also wanted to come to discover the developments made in nuclear medicine.

All aspects of medical radioisotopes supply chain were discussed during this 6th edition. Everything begins with the production. SCK•CEN is one of the world's largest medical radioisotope producers. Those radioisotopes are essential to diagnosis and treatment of certain diseases, namely cancer. SCK•CEN's BR2 research reactor produces up to 65% of the global demand in molybdenum-99 each year. In 2016, the refurbishment of the reactor was finalized so it could fulfill its vital producer role. Thanks to the Belgian radioisotope production, some 7 million people benefit from a diagnostic examination each year.

"SCK•CEN caters to the growing needs of the sector for the production of radioisotopes", explains Bernard Ponsard, Radioisotopes project manager at SCK•CEN. "We recently renewed our research reactor BR2 and we are working on developing the new research infrastructure called MYRRHA. Thanks to innovative research, we want to help nuclear medicine to flourish by developing new types of radioisotopes which will fight diseases even more effectively and with less harmful side effects".

MYRRHA, THE ONLY BELGIAN INFRASTRUCTURE IN THE EUROPEAN LARGE RESEARCH FACILITIES LIST

比利時核能中心「多功能混合型研究用反應爐在高科技之應用計畫」

The European Commission has been supporting the MYRRHA project since the very beginning. In 2010, through its Strategy Forum on Research infrastructures (ESFRI), the Commission put MYRRHA on the high priority list of large research infrastructures for energy. By choosing the multifunctional Belgian installation, Europe makes sure to stay at the cutting edge of research in energy security and in fighting climate change.

The task of these future large scientific equipment facilities, which will be built in Europe in the next few years, will be to contribute to finding safe and sustainable solutions to the major social, economic and environmental challenges. These are the challenges our societies have to face in terms of production and use of energy resources.

"MYRRHA received a double European recognition. Thanks to its position as a large scientific installation on the ESFRI Roadmap 2010 on the one hand and to its technology for fission reactors (an alloy of lead and bismuth) being chosen amongst three technologies for the European Sustainable Nuclear Industrial Initiative (ESNII) on the other hand. Europe wishes to speed up the development and roll-out of low-carbon (CO2) technologies on the continent," explains Hamid Aït Abderrahim, Deputy Director-General at SCK•CEN.

This week starts a review of all priority projects, as it is the case every two years. At the end of 2017, the decision for MYRRHA will be taken and the project will either stay on the priority list until 2020 or get the Landmark status considering phase 1 will have been started and

the implementation of the project will be in progress.

"Belgium is more determined than ever to stay at the vanguard of nuclear technological innovation. As proven by the MYRRHA project, we continuously invest in nuclear research to maintain and strengthen our expertise and our infrastructures. The technological solutions offered by MYRRHA are paramount to the next generations. They will help reduce nuclear waste ecological footprint and guarantee the safe production of medical radioisotopes for everyone." claims Marie Christine Marghem, Minister of Energy, Environment and Sustainable Development.

LNG REVIEW APRIL 2017- RECENT ISSUES AND EVENTS

2017-04 天然氣近期回顧

Hiroshi Hashimoto

Introduction

Even the document is very carefully written, the Australian Government shocked the global LNG industry by proposing a mechanism which would give the government the power to impose LNG export controls when there is a shortfall of gas supply in the domestic market. If an East Coast LNG exporter is not a net contributor to the domestic market, it will be required to outline how it will fill the shortfall of domestic gas. An LNG exporter who is drawing from the domestic market will be ordered to limit exports.

April 2017 saw some interesting numbers in the industry.

The four importers in Northeast Asia - Japan, Korea, China and Chinese Taipei - imported 47 million tonnes of LNG in total in the first quarter of 2017, 13% or 5.4 million tonnes more than the same period of 2016.

The first quarter performances by the biggest LNG producing major companies - Shell, BP, ExxonMobil, Chevron and Total - all beat analyst forecasts, reflecting higher oil prices and revenue from new projects.

Natural gas consumption in the EU-28 increased by 4% in 2015, compared with 2014, and by another 7% in 2016, compared with 2015, the recent Eurogas statistical exercise showed. So far in 2017, Russia's Gazprom increased gas production by 12.5% from 1 January to 15 April year on year reflecting the increasing sales to Europe.

Japan's ten incumbent electric power companies as a whole decreased revenues and incomes in the fiscal year 2016 (April 2016 - March 2017), as a result of smaller electric power sales and lower unit sale prices.

On the other hand volumes sold by nation's 203 city gas companies in the fiscal year 2016 grew by 3.4%. Volumes sold to industrial customers increased by 4.2%. Lower average temperatures

in the winter also helped increase residential sale volumes.

Japan's Ministry of Economy, Trade and Industry (METI) announced that the LNG Producer-Consumer Conference 2017 will be held on Wednesday

18 October, jointly hosted by the Asia Pacific Energy Research Centre (APERC).

Some of other important events in the LNG industry in April 2017 are described in this report.

Global issues

- Cedigaz pointed that the 16 million tonne or 6.8% growth of LNG production in 2016 was the highest since 2011 but only represented the very beginning of the LNG wave that is about to hit the market. In spite of a 5% growth of gas demand in Europe, net LNG imports only grew by a timid 1.7%, as flexible LNG was displaced by increased Russian imports. If the start-up of the LNG plans currently under construction goes as scheduled, more than 30 million tonnes per year of new LNG capacity could come on line in 2017 (including additional volumes from the ramping-up of trains launched in 2016), followed by a similar amount in 2018. In 2019, supply capacity additions could still top 25 million tonnes per year, with another 20 million tonnes expected in 2020.
- According to a Bloomberg report, the global LNG market will become over-contracted in 2019 - 20, with contracted volumes exceeding demand by 10 - 24 million tonnes per year. Despite being over-contracted globally, an average of 52 million tonnes per year of un-contracted demand exists across 21 countries in 2017 - 20. 'Portfolio purchase' contracts will grow from 38 million tonnes per year in 2017 to 64 million tonnes per year in 2020 and are likely to be resold to meet the un-contracted demand.
- Global oil discoveries fell to a record low in 2016 as companies continued to cut spending and conventional oil projects sanctioned were at the lowest level in more than 70 years, according to the International Energy Agency (IEA). Oil discoveries declined to 2.4 billion barrels in 2016, compared with an average of 9 billion barrels per year over the past 15 years. Meanwhile, the volume of conventional resources sanctioned for development in 2016 fell to 4.7 billion barrels, 30% lower than the previous year