An IUPAP-IUCr project within the 2016-2019 ICSU Grants Programme

LAAAMP

Lightsources for Africa, SE Asia, the Americas and Middle East Project

Sekazi Mtingwa
TriSEED Consultants, USA
Chair, LAAAMP Exec. Comm.
Chair, IUPAP C13 Commission

Sandro Scandolo
ICTP Trieste, Italy

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Dir. of Outreach, IUCr

http://laaamp.iucr.org/

INTERNATIONAL COUNCIL FOR SCIENCE

The 2016-2019 ICSU Grants Programme

*The **ICSU Grants Programme** is a competitive, peer-reviewed programme that supports innovative collaborative scientific initiatives of relevance to science and society.*

*The programme seeks to facilitate **active collaboration between Scientific Unions** and other members of the ICSU community (for example ICSU Regional Offices, Interdisciplinary Bodies, Joint Initiatives, Networks etc.) by addressing long-standing priorities for ICSU members in **developing science education, outreach and public engagement activities**, and to mobilise resources for international scientific collaboration.*

Three Projects have been awarded a Grant for 2016-2019.

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LAAAMP

Lightsources for Africa, SE Asia, the Americas and Middle East Project

Lightsources for **A**frica, the **A**mericas, Asia and **M**iddle East **P**roject (*LAAAMP*)

Full project title:

Utilisation of Light Source and Crystallographic Sciences to Facilitate the Enhancement of Knowledge and Improve the Economic and Social Conditions in Targeted Regions of the World

Lead Applicants:

International Union of Pure and Applied Physics, IUPAP
International Union of Crystallography, IUCr

Grant awarded: € 300,000
Grant period: 3 years (2017-2019)

Why *LAAAMP?*

2016: ~ 50 synchrotrons in the world, mostly in "developed" countries

Adapted from "AfLS Roadmap", C. Biscari, 2016

Light Sources contribute to Sustainable Development

United Nations Educational, Scientific and Cultural Organization

Sustainable Development Goals

1. Contribute to the development of a critical mass of researchers able to innovate for the future
2. Develop regional and international cooperation and trigger partnerships
3. Improve education and create opportunities
4. Reinforce knowledge-based policymaking at country level
5. Reduce scientific divide between North and South

"Investing in basic sciences and promoting innovations stemming from science is a prerequisite to any success in sustainable development"

--Maciej Nalecz at the World Science Forum 2017

SESAME

Synchrotron-light for **E**xperimental **S**cience and **A**pplications in the **M**iddle **E**ast

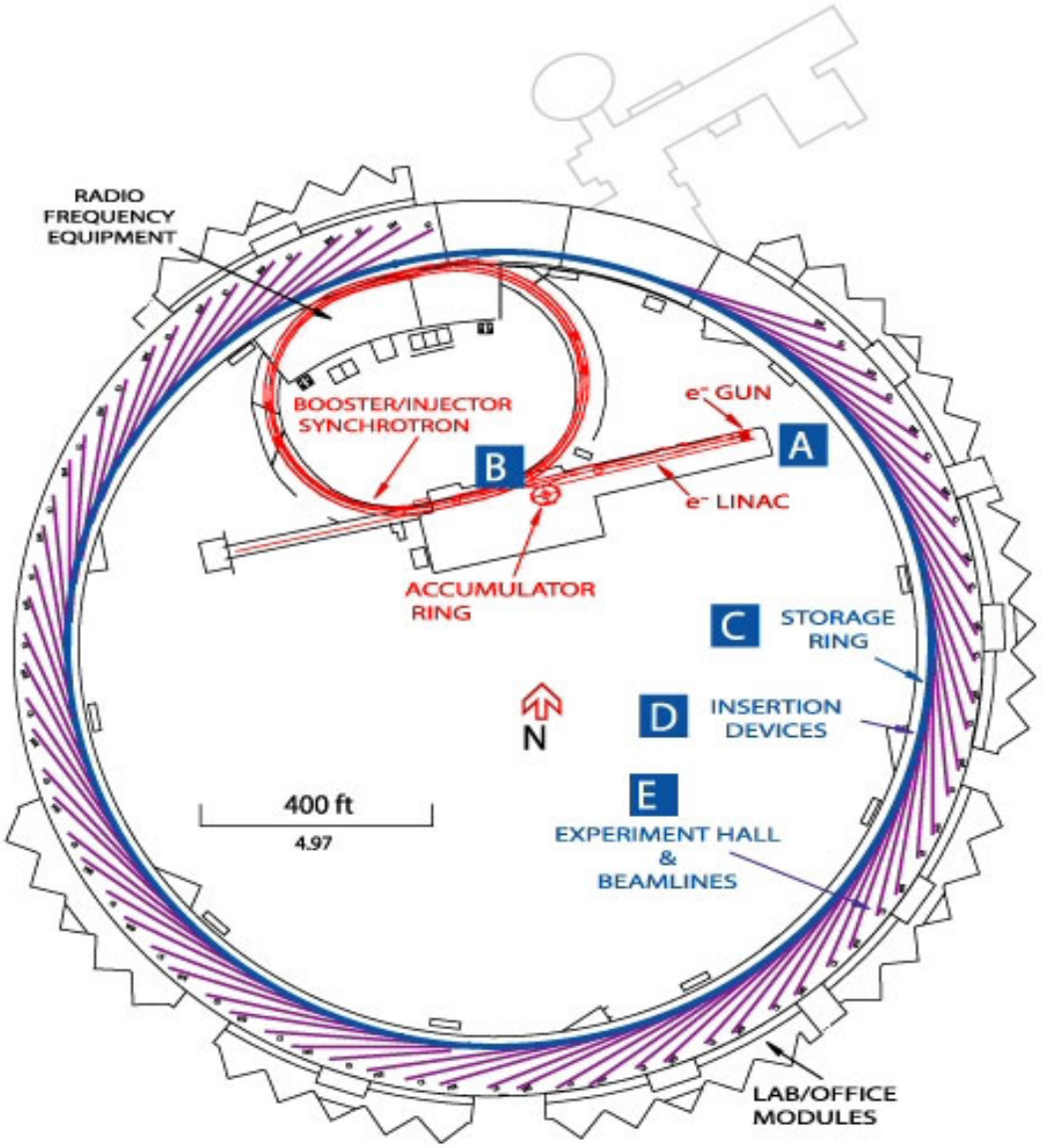
A synchrotron light source in the Middle East that should build scientific and cultural bridges between diverse societies, and contribute to a culture of peace through international cooperation in science.

MEMBERS OF SESAME

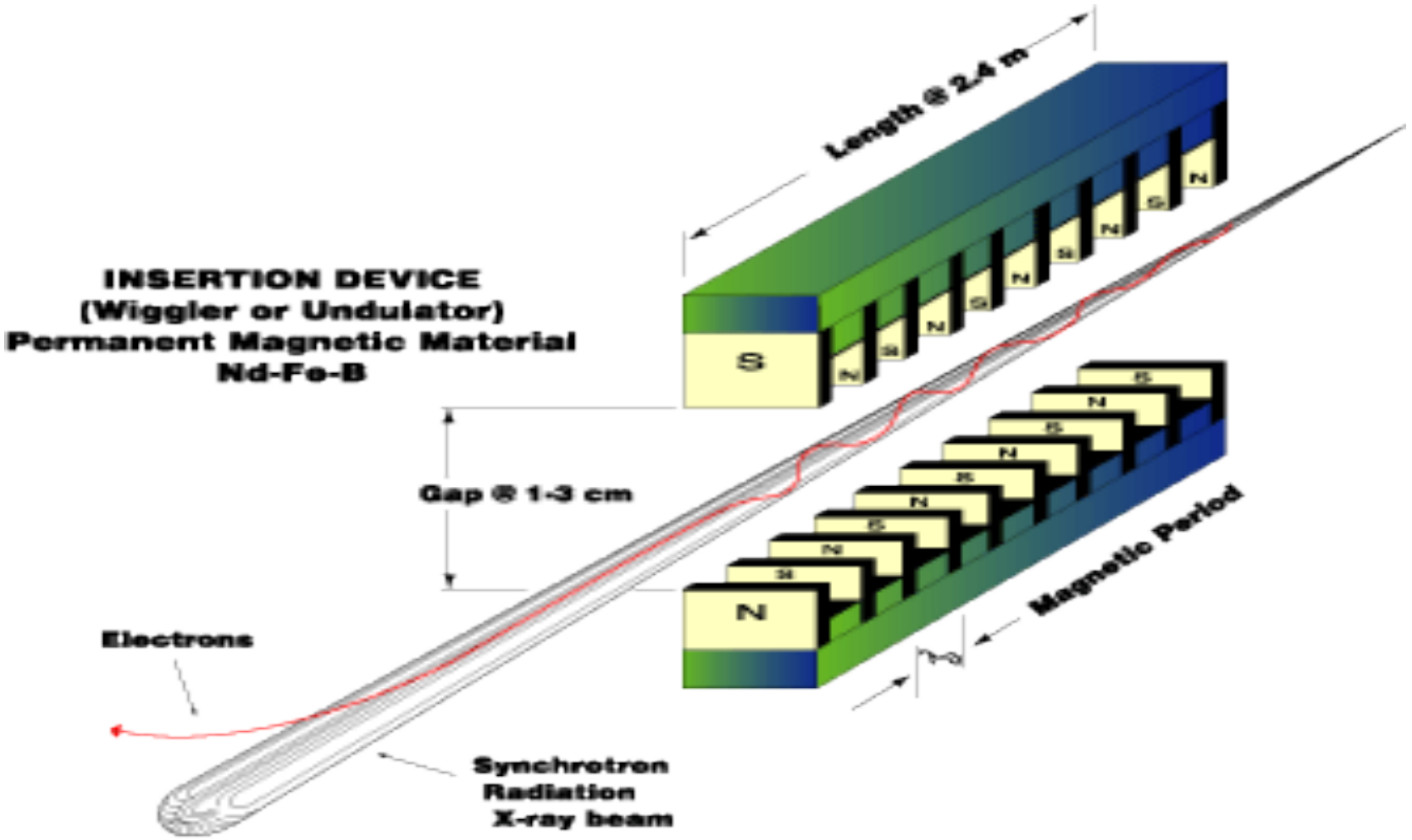
ADVANCED PHOTON SOURCE (APS)

ARGONNE NATIONAL LABORATORY

APS BEAMLINES



SCHEMATIC OF INSERTION DEVICE



Undulator Insertion Device at Advanced Photon Source (ANL)

LAAAMP > Structure > Partnering Advanced Light Sources (AdLSs)

Advanced Light Source, Lawrence Berkeley National Lab (Berkeley, CA,USA)
Advanced Photon Source, Argonne National Lab (~Chicago, USA)
ALBA Light Source (Barcelona, Spain)
Australian Synchrotron, Australian Nuclear Science & Tech Org. (~Melbourne)
Canadian Light Source (Saskatoon, Canada)
DELTA Light Source (Dortmund, Germany)
Elettra Light Source (Trieste, Italy)
European Synchrotron Radiation Facility (ESRF) (Grenoble, France)
MAX IV Laboratory (Lund, Sweden)
National Synchrotron Light Source-II, Brookhaven Nat'l Lab (Long Is, NY, USA)
Photon Factory, Institute of Materials Structure Science, KEK (Tsukuba, Japan)
Pohang Accelerator Laboratory (Gyeongbuk, South Korea)
SESAME Light Source (Allan, Jordan)
Siam Photon Source, Synchrotron Light Res. Inst. (Nakhon Ratchasima, Thailand)
SLAC National Accelerator Laboratory (Stanford University, USA)
Taiwan Photon Source, Nat'l Synchrotron Radiation Res. Ctr. (Hsinchu, Taiwan)

LAAAMP Regional AdLS Usage & Strategic Plan Committees (USPC)

Africa

Simon Connell (*Chair*) Univ. of Johannesburg, South Africa
Djamel Bradai UST Houari Boumediene, Algeria
Jean-Pierre Ezin Université d'Abomey-Calabi, Benin
Claude Lecomte Chair of IUCr Crystallography in Africa initiative
Ernie Malamud Fermilab, University of Nevada, USA
Brian Masara SA Inst of Physics, Zimbabwe
Prosper Ngabonziza Dept Solid State Quantum Electronics, Rwanda
Ahmadou Wague University of Cheikh Anta Diop, Senegal

Mexico

Matías Moreno (*Chair*) Universidad Nacional Autónoma de México
Abel Moreno Cárcamo Coordinator of the Red de Usuarios de Luz Sincrotrón (RedTULS) and Instituto de Quimica, UNAM
Mayra Cuellar Universidad de Guanajuato
José Reyes Gasga President of the Sociedad Mexicana de Cristalografía and Instituto de Física, UNAM
José Ignacio Jiménez Universidad Nacional Autonoma de México
Tomás Viveros Universidad Autónoma Metropolitana-Iztapalapa

Caribbean

Carlos Cabrera (*Chair*) University of Puerto Rico at Río Piedras
Fidel Antonio Castro Smirnov Advisor to the President of the University of Informatics Sciences, Cuba
Noel Blackburn Brookhaven National Laboratory, USA
Eric Sheppard Hampton University, USA

SE Asia

Rungrueang Phatthanakun (*Chair*) Head of Research Facility, Synchrotron Light Research Institute (SLRI), Thailand
Nuttawan Pramanpol Protein Crystallography Beamline Scientist, SLRI, Thailand
Shangjr (Felix) Gwo Vice President of Asia-Oceania Forum on Synchrotron Radiation Research (AOFSRR) and Director, National Synchrotron Radiation Research Center (NSRRC), Taiwan
Chia-Hung Hsu Secretary General and Staff Scientist, NSRRC, Taiwan
Michael James Head of Science, Australian Synchrotron

Middle East

Özgül Öztürk (*Chair*) Universität Siegen, Germany
Roy Beck-Barkai Tel-Aviv University, Israel
Musa Mutlu Can Istanbul University, Turkey
Ahmed Farghaly National Research Center, Cairo, Egypt
Jamal Ghabboun Bethlehem University, Palestine
Kirsi Lorentz The Cyprus Institute, Nicosia, Cyprus

LAAAMP Tasks

Regional Committees take AdLS and Crystallography Usage Surveys and develop **Strategic Plans** for each Region	TASK 1
Establish an AdLS/Crystallography **Colloquium Programme** in each Region	TASK 2
Publish and Disseminate an AdLS/Crystallography **Information Brochure**	TASK 3
Promote and Facilitate Researcher and Student **Short- & Long-Term Visits/Study** at International AdLS and Crystallography Facilities and Schools (*including IUCr-UNESCO OpenLabs*)	TASK 4
Convene a **Meeting at UNESCO** Headquarters in Paris to Present the *Strategic Plans* for the Regions and Launch the *Business Plans*	TASK 5

TASK 1 - *LAAAMP* Strategic Plans

Strategic Plans are being developed by the Regional AdLS Usage & Strategic Plan Committees (USPC) to grow and enhance AdLS and crystallography user communities.

LAAAMP SURVEY *https://laaamp.iucr.org/tasks/survey*

LAAAMP Survey of Physical Instrumentation Availability at Universities

Through this project, entitled in full ***Utilisation of Light Source and Crystallographic Sciences to Facilitate the Enhancement of Knowledge and Improve the Economic and Social Conditions in Targeted Regions of the World***, ICSU will partner with IUPAP and IUCr to enhance Advanced Light Sources (AdLS) and crystallographic sciences in Africa, Mexico, the Caribbean, SE Asia and Middle East.

This survey is for researchers in anthropology, biology, biomedical sciences, chemistry, engineering, geology, materials science, and physics in the *LAAAMP* regions (Africa, Mexico, the Caribbean, SE Asia and Middle East) to see what facilities are available on the ground at their home institutions, plus which of the ~50 lightsources around the world that they use, and what techniques (wavelengths) they use (from NMR to Mossbauer).

START

Powered by opinion stage

Please take a few minutes to fill in the *LAAAMP* survey and help develop a database of AdLS and crystallography users and facilities used in the targeted regions of the project. Thanks!

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Empowers Regional Initiatives
Example: African Light Source (AfLS)

African Laser Centre (ALC): Early Advocate for a Multinational AfLS

Headquartered in Pretoria, South Africa, it is an organization that consists of over 30 laser laboratories from across the African continent.

Launched in 2003 to enhance laser research and training in Africa.

First organization to call for an African multinational synchrotron light source, as specified as a long-term goal in its *2002 Strategy and Business Plan*.

Model for Pan-African cooperation towards an African Light Source (AfLS).

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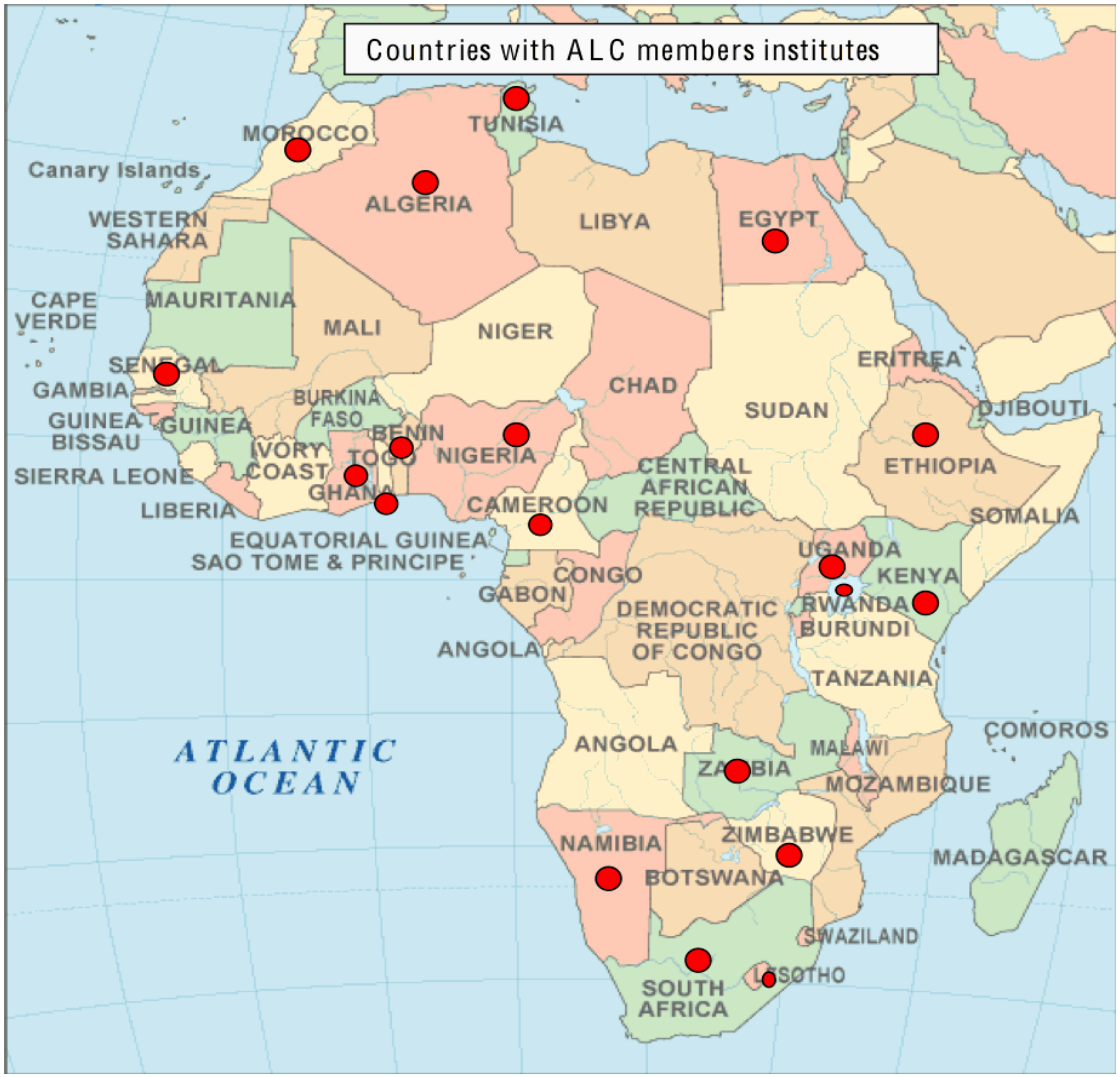
Locations of ALC Institutions



ALC Founders (Pretoria, 2003)

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ALC Outputs during 2006-2013

Output	Quantity	Comments
Publications in refereed journals	151	Annual Report for period 2006 – 2013
Popular journal articles	13	Annual Report for period 2006 - 2013
Publications in conference proceedings	210	Annual Report for period 2006 - 2013
Chapters in books	12	Annual Report for period 2006 - 2013
Theses completed	59	Annual Report for period 2006 - 2013
Masters scholarships awarded	38	This represents total the number of scholarship grants that were awarded within the period 2007-2013.
PhD scholarships awarded	78	This represents the total number of scholarship grants that were awarded within the period 2007-2013.
Training events (workshops/conferences/symposia, short courses) supported	33	2005-2013
Number of students trained at workshops, symposia and short courses	1249	Number of beneficiaries to ALC training since inception to 2013
Masters Students supported	141	This represents the total number of MSc students working within the supported collaboration projects.
PhD Students supported	165	This represents the total number of PhD students working within the supported collaboration projects.

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2nd US-Africa Advanced Studies Institute, iThemba LABS (Cape Town, Nov 2007)

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Brief History of Synchrotron Science in Africa

The largest light source user community on the continent is in South Africa, and Simon Connell (University of Johannesburg) has documented that history.

The first were Trevor Derry and Jacques Pierre Friederich "Friedel" Sellschop, both from the University of the Witwatersrand (Wits).

In 1994, Derry performed studies of diamond surfaces at both the Synchrotron Radiation Source-Daresbury Laboratory and ESRF.

During the same year, Sellschop participated in other diamond studies at ESRF.

In 1996, Giovanni Hearne, currently at the University of Johannesburg, used the facility at the ESRF to study materials under extreme pressures.

Bryan Doyle, now at the University of Johannesburg, served as a postdoctoral researcher at ESRF around 1999.

From those early efforts, the synchrotron light source user community in South Africa started to grow.

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Synchrotron Science Workshop, Pretoria, 1-2 December 2011

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Lightsources for Africa, SE Asia, the Americas and Middle East Project

Major Outcome Was Strategic Plan Adopted by South African Government

As recommended by Strategic Plan, on 21 May, 2013, South Africa signed a medium-term arrangement with the ESRF at a level of 0.3% and became the 20th country to join the ESRF.

Signing ceremony for South Africa joining the ESRF (2013)

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Lightsources for Africa, SE Asia, the Americas and Middle East Project

1st AfLS Conference & Workshop

(http://www.saip.org.za/AfLS2015/)

Venue: ESRF (Grenoble, France)

Dates: 16-20 November 2015

First in a series of conferences

Venue was selected to be on the site of a premier international advanced light source facility.

Future conferences preferably will be held in Africa.

Purpose was to develop a Roadmap and replace the Interim AfLS-SC with a fully mandated Steering Committee.

1st AfLS Conference & Workshop Participants

African researchers and students

Representatives from international light sources

European Commission, IUPAP-C13 Commission, International Union of Crystallography

Government Policymakers

Industrial representatives

Friends of Africa who support the vision for an African Light Source.

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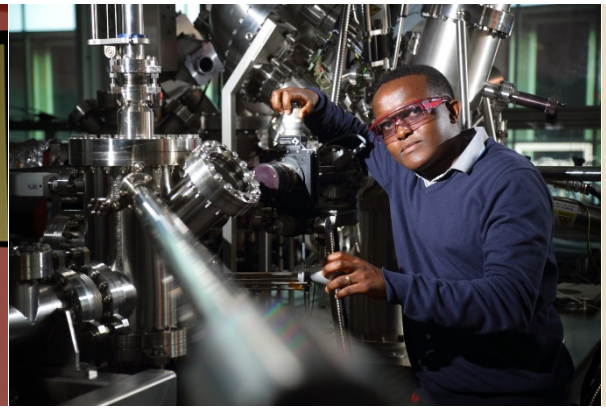
Lightsources for Africa, SE Asia, the Americas and Middle East Project

Several Researcher & Student Participants, 1st AfLS Conference & Workshop ESRF, Grenoble, France, November 2015

TASK 2 - *LAAAMP* Colloquium Programme

The Colloquium Programme dispatches experienced AdLS users and crystallographers to universities and other institutions to give presentations on the capabilities of AdLSs and crystallography and engage in discussions on how they can enhance researchers' investigations and offer career opportunities for university students. While in a given location, the lecturers will visit government officials to inform about the importance of investing into science and AdLS/crystallographic disciplines in particular.



COSTA RICA
4 Dec 2017

Diego G. Lamas

National University of San Martínand and CONICET, National Scientific and Technical Research Council, Argentina; President of the Latin American Crystallographic Association

RWANDA
15-20 Dec 2017

Prosper Ngabonziza

Max-Planck-Institute for Solid State Research, Department of Solid State Quantum Electronics, Stuttgart, Germany

BENIN
4-5 May 2018

Thierry d'Almeida

Senior Research Scientist at CEA, Commissariat à l'Energie Atomique

X-TechLAB AT SÈMÈ CITY, BENIN

X-Ray Techniques for Sustainable Development

Thierry d'Almeida presenting LAAAMP and the X-TechLab project to the Cabinet of the Government of Benin.

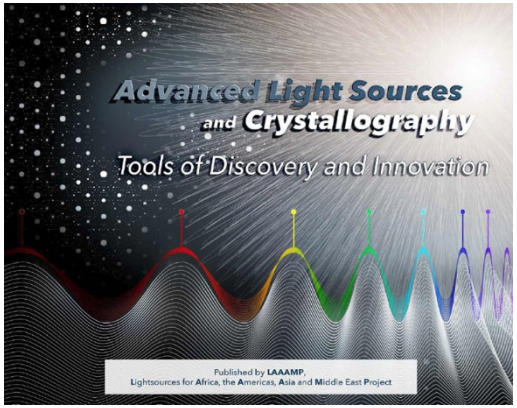
Xtech-SD is aimed at **training** over a hundred Master and Ph.D. students from Benin and neighbouring countries every year, and at **establishing a permanent user research facility** with experienced, permanent staff to act as a hub for the region.

Crystallographic instrumentation is presently under commissioning.

TASK 3 - *LAAAMP* Brochure

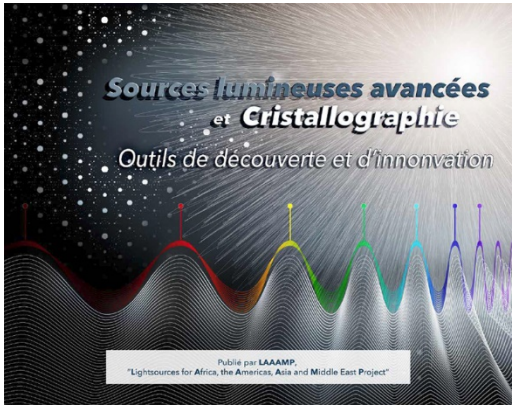
ADVANCED LIGHT SOURCES AND CRYSTALLOGRAPHY: TOOLS OF DISCOVERY AND INNOVATION

Editor: Ernie Malamud *(Scientist Emeritus, Fermilab)*



English

Spanish



French

DOWNLOAD FOR FREE at *https://laaamp.iucr.org/tasks/brochure*

The 24-page *LAAAMP* brochure is aimed at explaining light sources and crystallography to a large general audience: the general public, ministers and legislators responsible for funding science and technology facilities, university professors and high school science teachers and their students.

LAAAMP > Tasks > 4. FAculty-STudent (FAST) Teams to AdLSs and Crystallography Facilities

Eligibility

Faculty members at universities in Africa, the Caribbean, Mexico, Southeast Asia or the Middle East. Interested in using AdLSs to further their research and training endeavors. Previous experience with using AdLSs is limited to a year or less. Ability to spend 2 months as a full-time visitor in residence at an AdLS that is a *LAAAMP* collaborative partner.

Student: Registered as full-time Ph.D. student and supervised by the Faculty member

Financial Support

LAAAMP provides 2,000 Euros per person to cover transportation and (partially) accommodation costs. The remainder of accommodation and subsistence should be negotiated with the host AdLS and other sources of support.

First call: Deadline 21 April 2017, Awards announced June 2017,
7 FAST Teams (14 individuals), Period of visits: June-December 2017

Second call: Deadline 15 Nov 2017, period of visits: January-December 2018
16 FAST Teams (31 individuals), visits anytime in 2018.

Third call: Deadline 15 Nov 2018, Extended to 15 Feb for Africa and Caribbean
15 FAST Teams (30 individuals), visits anytime in 2019.

LAAAMP > Tasks > 4. Faculty/student visits at AdLSs and crystallography facilities/schools

Jan-Dec 2018 Program
(16 FAST Teams)

Africa	1 New FAST Team	2 Continuing Team
Caribbean	1 New FAST Team	1 Continuing Team
Mexico	3 New FAST Teams	1 Continuing Team
Middle East	3 New FAST Teams	2 Continuing Teams
SE Asia	2 New FAST Teams	

Jan-Dec 2019 Program
(15 FAST Teams)

TASK 5 – Meeting at UNESCO

A meeting at UNESCO is planned in **December 2019** to present the regions' Strategic Plans and define the charge for more detailed Business Plans that include feasibility studies of constructing AdLSs in regions where they do not yet exist. Representatives from each region's research community, including policymakers, and other international stakeholders and interested parties will be invited.

LAAMP

LAAAMP in the news

Science

SESAME and beyond

Sekazi K. Mtingwa and Herman Winick

Science **356** (6340), 785.
DOI: 10.1126/science.aan6880

EDITORIAL

SESAME and beyond

Last week, Cyprus, Egypt, Iran, Israel, Jordan, Pakistan, the Palestinian Authority, and Turkey, as well as other nations and international organizations, gathered in Jordan to inaugurate the Synchrotron-light for Experimental Science and Applications in the Middle East (SESAME) project. Having persevered through two decades of political and financial challenges, this complex machine is poised to run its first experiments this year. Indeed, SESAME represents the power of science in bringing together countries—even those with frayed relations—under a common goal of advancing knowledge for the benefit of all humankind. The triumph of SESAME, and the outpouring of research results from other light sources around the world, have spurred interest in

tions Educational, Scientific and Cultural Organization (UNESCO) and modeled after the European Organization for Nuclear Research (CERN), the SESAME Council was eventually formed and assumed governance over the project. As the large potential user community in the Middle East became clearer, SESAME evolved into a third-generation, 2.5-GeV light source.

Despite political and funding obstacles, and a roof collapse by unprecedented snowfall, nations and organizations rallied to see SESAME succeed through leadership by former CERN directors-general and support from Jordan, CERN, the European Union, the International Atomic Energy Agency, Italy, and the Japan Society for the Promotion of Science. Other synchrotron light sources allowed Middle East scientists to gain experience

Sekazi K. Mtingwa is a principal consultant at Triangle Science, Education & Economic Development, LLC, Hillsborough, NC, USA. sekazi.mtingwa@gmail.com

Herman Winick is professor emeritus at the SLAC National Accelerator Laboratory, Menlo Park, CA, USA, and at the Applied Physics Department, Stanford University, Stanford, CA, USA. winick@slac.stanford.edu

These new endeavors will face challenges. But they share with SESAME the goals of building regional capacity and promoting understanding, friendship, and peace by bringing together scientists from different countries and ethnicities to perform world-class science.

–Sekazi K. Mtingwa and Herman Winick

serve in a new facility. Originally under the United Na- –Sekazi K. Mtingwa and Herman Winick

THANK YOU!

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