International Organization for Chemical Sciences in Development
www.iocd.org

Current Activities of IOCD Working Groups and Projects, 2014-15

A. Introduction

After 30 years of successful service in **promoting the chemical sciences for development**, IOCD refreshed its strategy for 2011-2020, focusing on ***three strategic priorities:***

- **Chemistry for better health**
- **Chemistry for a better environment**
- **Capacity building in chemistry education**

IOCD operates through Working Groups, each evolving a multi-year programme focusing on a key area of the chemical sciences with an international team of scientists, including many from **low- and middle-income countries (LMICs)**. In addition, more specific and restricted or time-bound activities are undertaken as Projects.

B. Activities under the strategic priorities

B1: Chemistry for Better Health

IOCD's strategy is to support:

- capacity building for medicinal chemistry, including drug analysis, discovery and development, including in and for the health needs of LMICs.
- isolation, structure elucidation, bio-assay and ethical exploitation of natural products.

Medicinal Chemistry Working Group: The current focus of the Working Group is on capacity building, through organizing a Distance Learning Course (online and CDs) on **Contemporary Medicinal Chemistry**, developed by **Profs. Lester Mitscher and Thomas Prisinzano**, Medicinal Chemistry Department, Kansas University, USA to help scientists in LMICs gain knowledge about the latest methods to advance their research. This course, run free for >5 years, covers fundamental concepts and their application to designing potential therapeutic agents and solving problems arising in progression to the clinic. During 2014 the course was updated, converted to a self-answered quiz format and distributed free upon request to applicants world-wide.

The COBRE Program (US National Institutes of Health) held a two day session on 9-10 January 2014 using the distance learning slide materials presented by Profs. Mitscher and Prisinzano, who led lively discussion sessions. The meeting was attended by a capacity group of 50 applicants from various university and industrial groups in the Central Region of the USA. Because of the popularity of the session, it was agreed to present it again in January 2015.

Plant Chemistry Working Group: The **2015 IOCD International Symposium on Plant Chemistry** will take place in Marrakesh, Morocco on 7-10 April 2015 on the theme **The Plant Kingdom: Source of drugs, neutraceuticals and cosmetics**. The Working Group, chaired by **Prof. Kurt Hostettmann**, is collaborating closely with the local organizing committee in Morocco led by **Prof. Zoubida Charrouf** to organize the Symposium. The opening lecture will be given by **Her Royal Highness Princess Chulabhorn of Thailand**. Details of the programme, abstract submission schedule and registration process, as well as information on hotel booking, workshops, side events and social events, can be accessed at: www.iocd.ma

In September 2014, **Prof Hostettmann received the Egon Stahl Gold Medal**, the highest distinction of the Society for Medicinal Plant and Natural Product Research, for his outstanding lifetime work on the chemistry of natural products.

Prof. Sabrina Krief of the National Museum of Natural History, Paris, has accepted to lead a new IOCD Project on the **identification of medicinal plants through studies of self-medication by the great apes**. She is preparing a review for IOCD of zoopharmacognosy and animal self-medication as a potential souce of new medicinal agents.

IOCD's ***Biotic Exploration Fund Working Group*** has helped countries in Africa, Asia and Latin America to develop policies for ethical, sustainable bioprospecting, to establish the foundations for new products and processes that will contribute to economic development, better health and a sustainable environment. Its work is discussed in more detail below (see section B2).

B2: Chemistry for a Better Environment

IOCD's strategy is to:

- enhance capacities for **chemical analysis** applied to the environment;
- support capacity building for the **exploration and sustainable, ethical exploitation of natural resources** in and for the benefit of LMICs.
- promote development of **new materials at the forefront of renewable energy technologies**, including in LMICs.

In 2013, IOCD decided to reformulate its former Environmental Chemical Analysis Working Group and began developing a new ***Working Group in Analytical Chemistry***, with a remit to strengthen capacities and encourage application of analytical chemistry to solving a range of environmental and other challenges. It is hoped to launch the new Group in 2015.

In 1995 IOCD established the ***Biotic Exploration Fund Working Group (BEF)***. It has assisted African, Asian and Latin American countries to develop policies for ethical, sustainable bioprospecting that will contribute to better health and economic development. This has often involved engagement over several years to support national initiatives. During 2014-15, the BEF continues supporting efforts to enact bioprospecting legislation in **Kenya** and to facilitate establishment there of a new public-private partnership for bioprospecting. The BEF is also assisting in developing training of Kenya officials in management of intell-ectual property to ensure protection of Kenya's resources; and is continuing to work with scientists and policy-makers in **Uganda** to draft legislation on bioprospecting for parliamentary approval.

In 2013, IOCD formed the ***Working Group on Materials for Energy Conversion, Saving and Storage (MATECSS)***, **co-chaired by Profs. Federico Rosei and Mohamed Chaker** (Centre Énergie Matériaux Télécommunications, INRS, Université du Québec). The goal of MATECSS is to enable local-scale energy conversion, storage and savings in targeted regions in LMICs through new materials at the forefront of renewable energy technologies. Cooperating with LMIC researchers, MATECSS works towards identifying specific energy needs and developing solutions, using inexpensive adaptive technologies that do not require significant investments in capital equipment and infrastructure and that can make use of local/regional resources. It will also emphasize capacity building through training of young scientists and engineers. Initially, MATECSS conducted a **survey of freely-available materials describing sustainable energy technologies**. This provided an overview of documents, academic papers and online courses, available via the internet (mostly open access), that offer introductory-level instruction in sustainable energy technologies. With IOCD support, in 2014-15 MATECSS is developing a **short course providing an introduction to materials for sustainable energy technologies**, to be offered in an online version as a webinar and as lectures in traditional format.

Prof. Federico Rosei has recently received two highly prestigious awards: a **UNESCO Chair** at the INRS; and the World Cultural Council's **2014 Jose Vasconcelos World Award of Education**.

B3: Strengthening Education in the Chemical Sciences

IOCD's strategy is to help enhance capacities for chemistry education, including through **web-based resources, library provisions and microscale science**:

Web-Based Resources

- **Medicinal Chemistry:** Responding to the increasing demand for trained medicinal chemists in LMICs in the last few years, a **medicinal chemistry distance training programme**, available on-line and as a CD, has been developed and delivered by IOCD's Medicinal Chemistry Working Group chaired by **Prof Lester Mitscher** (Kansas University, USA).
- **Organic chemistry tutorials – Spanish:** An IOCD group led by **Prof. Carlos Rius** in the Faculty of Chemistry, Universidad Nacional Autónoma de México (UNAM) has established a series of web-based organic chemistry tutorials online in Spanish, including modules on structure, synthesis, stereochemistry and nomenclature. This is **one of the most visited websites in the world in Spanish related to chemistry**, registering well over 2 million visits/year.
- **Chemistry knowledge resources on the internet:** IOCD has embarked on development of a suite of free on-line resources, **ChemKnowCore**, for teaching and learning in chemistry.
  - The suite will include a chemical dictionary, accounts of chemistry research, experiments and games and, most important of all, **ChemKnowBase (CKB)**, a new chemistry knowledge repository. CKB will cover the entire field of chemistry and include a comprehensive, searchable contents/ index. It will be curriculum, examination and pedagogy independent, providing a unified global standard of verified chemistry knowledge, while supporting context-dependent knowledge delivery and learning. During 2014-15, **a pilot CKB project is under development**, including website construction and modelling the table of contents..

Books for International Development (BID)

University libraries in LMICs often lack a stock of suitable materials for education and professional development, due to the high costs of purchasing and shipping. IOCD established the BID programme led by **Prof. James Cosentino** (Millersville University, USA) and aided by student volunteers, to collect good quality textbooks (across all disciplines) donated by libraries and private sector companies. BID has received support from UNESCO and the State of Pennsylvania, with cooperation and donations in kind from the World Bank, the American Association for the Advancement of Science and Millersville University. Since 2003, **more than 20 shipments of about 7,000 kg** each have been sorted, packaged, shipped and delivered to libraries in LMICs, including **over a dozen countries in Africa and Asia**. BID has also delivered **functioning, used computers** (24 per shipment) to **13 LMICs** and **essential medical supplies to Haiti** following the 2009 earthquake; and has supplied the **African Academy of Sciences in Nairobi, Kenya** with computers and conference/classroom furnishings, enabling the Academy to conduct conferences, classes, seminars etc. to benefit the scientific community throughout Africa. During 2014, BID made a mixed shipment of books, journals and classroom/office furniture to the **Philippines** and has assembled materials for two further shipments that are in preparation for 2015.

Microscale Science

Practical laboratory work is often extremely limited in LMIC science courses due to the poor availability of equipment, chemicals and lab facilities. **Prof. John Bradley** (RADMASTE Centre, Witwatersrand University, South Africa) developed portable micro-scale kits involving miniature pieces of apparatus that teachers could use in the classroom, enabling chemical reactions to be conducted with very small quantities of chemicals and experiments observed at first hand even in very poorly resourced schools. RADMASTE continues to promote micro-scale science and hosts one of a global network of UNESCO-Associated Centres for Microscience Experiments that form the **Global Microscience Project**, involving **partnerships with IOCD, UNESCO, IUPAC and the International Foundation for Science Education** (IFSE). The kits are easily adaptable to different national curricula, including in chemistry, physics and biology, and are supported in multiple languages. Under the auspices of UNESCO, IUPAC, IFSE and IOCD, **more than 80 countries** have benefited from introductory microchemistry workshops and training courses. As part of the work by IOCD's **Dr Alexandre Pokrovsky** (Russian Federation) and **Prof James Cosentino** (USA) to promote development and use of microscience chemistry kits, IOCD and partners in Africa are exploring the potential for a programme to integrate microscale science into school chemistry curricula.

Shaping the Future of Education in Chemistry

Challenges for the **future role of education in the chemical sciences** was the subject of a consultation co-convened(Namur, 14-15 Jan. 2014) by IUPAC's CHEMRAWN and IOCD. Invited experts from around the world reviewed current developments in chemistry education and considered some critical future needs. An article entitled *Scoping the Future of Education in Chemistry*, based on the meeting, has been published by **Prof. Stephen Matlin** (UK) in Chemistry International.[1] One of the recommendations made by the consultation was that IOCD should establish a ***Working Group on Education in Chemistry***. IOCD is currently seeking suitable leadership for the Working Group.

[1] www.degruyter.com/view/j/ci.2014.36.issue-4/issue-files/ci.2014.36.issue-4.xml

C. Promoting the chemical sciences for development

IOCD was established in 1981 under the auspices of UNESCO, as ***the first international NGO devoted to enhancing the role of the chemical sciences in development work and involving chemists in LMICs.*** Today, IOCD remains the only international NGO with this focus.

IOCD promotes recognition of the importance of the chemical sciences for development, through its website, publications, presentations at symposia, organization of meetings on scientific advances and engagement with policy-makers to promote understanding of the potential for the chemical sciences to contribute to economic advancement and enhanced human health and wellbeing. A perspective on IOCD's past achievements, current activities and strategies for the decade, written by **Prof. Stephen Matlin** (Head of IOCD's Strategic Development Programme and Head of Communications) has been published.[2]

[2] *IOCD: Chemical sciences in development*. **Chemistry International** 2013, 8-11. www.iupac.org/publications/ci/2013/3501/2_matlin.htm

For more information about IOCD and its programmes

Prof Alain Krief, Executive Director, IOCD
61 Rue de Bruxelles, Namur 5000, Belgium
Tel: +32 81 724 548
alain.krief@unamur.be
www.iocd.org

S.A Matlin. November 2014