



International Organization for Chemical Sciences in Development

Biennial Report 2010-2011

Summary

The biennium 2010-2011 marked a major transition period for IOCD, with the appointment of a new Executive Director followed by the development and approval of a new organizational strategy for the period to 2020, structural reforms and renewed memberships of the governing body and the Senior Advisory Council.

IOCD's **Strategy 2011-2020** focuses on three strategic priorities: chemistry for better health; chemistry for a better environment; and capacity building in chemical education. With the approval of the Strategy by IOCD's governing body, intensive strategic development work began in 2011 to reshape IOCD's programmes in line with the new mandate and to seek new relationships with key partners across the world to implement its mission.

Through the transition period, IOCD's Working Groups and Projects have continued to advance on a number of fronts. Highlights include:

- IOCD's Biotic Exploration Fund (BEF) has assisted Kenya to establish a bioprospecting programme. A national bioprospecting strategy supported by Sh10 billion funding was launched by the Government of Kenya in Nairobi on 3 November 2011 in a meeting attended by the BEF's Chair, Dr John Kilama.
- In collaboration with the International Atomic Energy Agency and the Tanzania Atomic Energy Commission, IOCD's Environmental Analytical Chemistry Working Group organized a workshop in Arusha on 23-24 May 2011, which focused on the analysis of air particulate matter.
- IOCD's Medicinal Chemistry Working Group has prepared a Distance Learning Course on Medicinal Chemistry, available on the internet and as a CD, to help scientists gain knowledge about the latest methods to advance their research. By 2011, piloting with more than 100 participants had been completed and evaluations showed a high degree of satisfaction with the course.
- On 12-15 January 2011, the Plant Chemistry Working Group organized an international symposium and workshop on African Plants as sources of drugs, agrochemicals, cosmetics and food supplements, held at the University of the Western Cape, South Africa. Planning was also undertaken for the 2012 international symposium, to be held in Nanjing, China on 22-24 September 2012, on the theme of "Functional Molecules in Nature".
- IOCD's work on open and distance learning continued with its programmes in medicinal chemistry, organic chemistry tutorials online (in Spanish) and support microscale science and for library resources. During 2011, IOCD began exploratory work for the establishment of a new kind of internet-accessible knowledge resource base in the chemical sciences: the *Chemistry KnowBase*.

As part of its broader efforts to promote the chemical sciences for development, IOCD contributed in a number of ways to the 2011 International Year of Chemistry, including through participation in key IYC2011 events and the publication of a major review of 'Chemistry for Development'.

A complete overhaul of IOCD's website was undertaken, with new sections and materials added to provide additional information to users and offer links to other valuable sources on the chemical sciences and development.

1. Introduction

The International Organization for Chemical Sciences in Development (IOCD) was launched at UNESCO in Paris in 1981 as the first international non-governmental organization specifically devoted to enhancing the role of the chemical sciences in the development process and involving chemists in low- and middle-income countries (LMICs).

Vision and Mission

IOCD envisions a world in which the chemical sciences play their optimal role in yielding benefits in the health, agricultural and industrial sectors of all countries, thereby improving the quality of life and wellbeing for people everywhere.

IOCD's mission is to promote the pursuit and application of the chemical sciences for sustainable, equitable human development and economic growth, especially in LMICs, through:

1. **Raising the profile of the chemical sciences in development** among researchers, funders and policy-makers;
2. **Increasing the capacity to conduct and use the chemical sciences in LMICs to advance their development** by strengthening capacities at the individual, institutional and national/systems levels to apply the chemical sciences to meet current and future challenges;
3. **Strengthening the participation of LMIC researchers in the chemical sciences** in national and global priority areas, including attaining the Millennium Development Goals and advancing the domains of better health and a better environment.

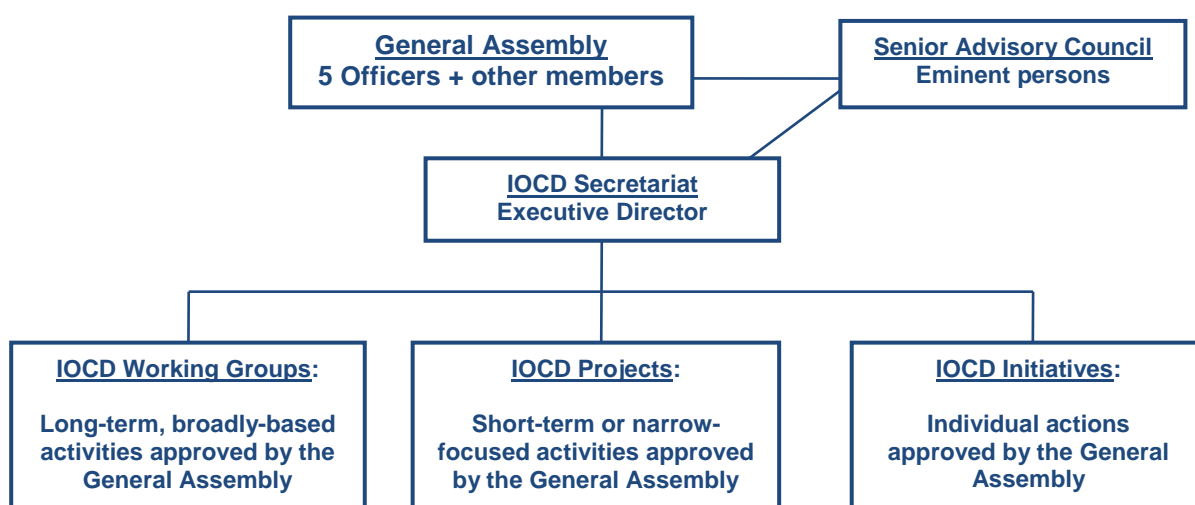
Constitution and Organization

IOCD was registered as a non-governmental organization in Belgium in 1983. An affiliate organization, the Organization for Chemical Sciences in Development, Inc. (OCDI), was established in the USA which has tax-exempt 501 (c)(3) status to facilitate funding.

IOCD is governed by a General Assembly, which meets annually and whose membership includes scientists from around the world, elected by the existing members of the governing body.

The General Assembly elects eminent persons to a Senior Advisory Council, who contribute ideas and help to promote IOCD's work. In 2011, membership of the Senior Advisory Council was revised to include five members based in India, Kenya, Russia and Japan.

Figure 1 International Organization for Chemical Sciences in Development



IOCD's activities are managed by a small Secretariat headed by an Executive Director, who reports to IOCD's governing body. In addition to activities conducted by the Secretariat (including communications and information, representation, fundraising and special initiatives), much of the work of IOCD is pursued through Working Groups and Projects, authorised by the General Assembly (Figure 1). These are described below.

2. Working Groups and Projects

IOCD's work on its strategic priorities is taken forward by international teams of scientists who have volunteered to collaborate and are organised into Working Groups and Projects. The following activities of Working Groups and Projects were undertaken in 2010-2011.

2.1 Biotic Exploration Fund

Background

Many LMICs which have been the source of raw materials such as minerals and primary agriculture products now seek to reap the economic and developmental benefits of increasing production and adding value to the materials through processing. At the same time, global concern for the environment requires that all countries conserve their natural resources, engage in sustainable development and not follow pathways that may lead to pollution, exhaustion of resources and loss of biodiversity. Some examples of key contributions of chemistry to these challenges include developing cleaner, more efficient, less energy-intensive and less polluting extraction and refining methods for minerals; methods for the recycling of inorganic and organic materials; developing new substitute materials that can be produced more sustainably; and the discovery and exploitation of biological resources such as plants, animals and bacteria as sources of new nutrients, pest-resistant crops and drugs for combating diseases.

IOCD Activities

IOCD works to encourage and facilitate the sustainable and equitable exploitation of natural resources for local benefit in LMICs and for global benefit.

In collaboration with Thomas Eisner (credited as the "father of chemical ecology."), in 1995 IOCD established a Working Group known as the Biotic Exploration Fund (BEF), to facilitate and catalyse ethical bioprospecting worldwide. Initial funding to set up the BEF came from the US National Academy of Sciences, the American Chemical Society, the John D. and Catherine T. MacArthur Foundation, UNESCO and the Novartis Foundation for Sustainable Development. The BEF has assisted several LMICs in Africa, Asia and Latin America to develop policies for ethical, sustainable bioprospecting, helping establish the foundations for new products and processes that will contribute to better health and economic development. This has often involved sustained engagement over several years to support national initiatives. Examples of ongoing work include:

- **Kenya:** In 1998 IOCD cooperated with the International Centre of Insect Physiology and Ecology (ICIPE) in Nairobi, Kenya, to establish a bioprospecting programme that continues to expand and prosper. Follow-up since then with the Government of Kenya has led to the establishment in 2011 of a national bioprospecting strategy supported by Sh10 billion funding, launched in Nairobi on 3 November 2011 in a meeting attended by the BEF's Chair, Dr John Kilama.
 - The strategy is spearheaded by the Ministry of Forestry and Wildlife and Kenya Wildlife Service and will provide structures and systems to effectively and efficiently manage and regulate bioprospecting activities in Kenya. It will seek to tap the huge market of bioprospecting and generate wealth and knowledge for the country and will be implemented through enhancing institutional capacity and review of the statutory and regulatory framework for bioprospecting and also developing a system of bioinformatics and benefit sharing. Other elements include enhancing information access and developing a communication system as well as a financial and resource mobilisation mechanism for bioprospecting.
 - The launch makes Kenya among the first countries in the world to have a bioprospecting roadmap after establishment of the Nagoya Protocol on Access and Benefit Sharing. The launch included an expert dialogue workshop for effective biodiversity laws that attract investments for economic growth.

- **Uganda:** In 1998, a group of scientists in Uganda contacted IOCD with a request for assistance to establish bioprospecting in their country and IOCD began a long-term programme to facilitate this. In April 2005, with IOCD cooperation, the Uganda National Council for Science and Technology convened the National Conference on Bioprospecting, entitled “Bioprospecting for Economic Development.” Recommendations of this conference called for establishment of the National Centre for Bioprospecting in Uganda. To facilitate passage of essential legislation on biodiversity by the Uganda parliament, in March 2007 at the request of the Uganda Minister of Planning IOCD convened a consultative briefing with members of Parliament, university vice chancellors, entrepreneurs and representatives of indigenous peoples. In further follow-up, IOCD has assisting Ugandan policy makers in the development of draft legislation on bioprospecting for parliamentary approval. Contacts with Ugandan authorities continued in 2011 to support further development of the ongoing process.

Leadership of the BEF Working Group

Chair: Dr. John Kilama (Uganda/USA)
President, Global Bioscience Development
Institute

Dr. Michael Tempesta (USA)
President, NatProd Consulting Services

Vice-Chair: Dr. Gordon Cragg (USA),
Natural Products Branch,
National Cancer Institute

Prof. Barbara Timmermann (Argentina/USA)
Department of Medicinal Chemistry
University of Kansas

2.2 Environmental Analytical Chemistry

Background

Contamination of the environment can result from a wide range of human activities, including agriculture, industrial production, energy production and consumption and household activities. Analytical chemistry is a vital tool to help address concerns about the environment, enabling the detection and monitoring of levels of contamination of air, land and water.

IOCD Activities

IOCD’s Working Group in Environmental Analytical Chemistry, formed in partnership with International Union for Pure and Applied Chemistry (IUPAC), works to enhance capacities for environmental chemical analysis and sustainable use of resources in LMICs, addressing the need to ensure a sustainable environment encapsulated in Millennium Development Goal 7.

The Working Group seeks to collaborate with analytical chemists in LMICs to build their capacities as staff members and managers of analytical laboratories. These chemists are expected to produce test results that are accurate, reliable, and acceptable internationally, since the results are involved either in monitoring a country’s environment (air, water and soils), or ensuring the quality and purity of agricultural or manufactured products intended for export.

IOCD’s principal strategies are to:

1. Organize workshops with analytical chemists and laboratory managers in LMICs to train them in analytical methods, metrology, and good laboratory practice; and
2. Work directly with selected laboratories in LMICs to identify difficulties that prevent them from obtaining test results of sufficient accuracy and reliability when testing commodities for export. IOCD would then work with the laboratories to identify appropriate remedial measures.

Over a number of years, Working Group activities have been undertaken in Africa, Latin America and Central and Eastern Europe. During the 2010-2011 biennium, activities included:

- **Uganda:** In agreement with the Ugandan Ministry of Tourism, Trade and Industry, the IOCD Working Group has partnered with the Uganda National Bureau of Standards (UNBS) to strengthen its capacity to test export commodities to international standards. In October 2005, IOCD scientists provided technical consulting to seven Ugandan Commodity Testing Laboratories engaged in testing commodities for export. Follow-up has continued since then and UNBS has continued to enhance its capabilities for internationally acceptable analytical methodology – for example, in May 2011 receiving certification from the South African National Accreditation System as an accredited calibration laboratory for mass metrology.

- **IAEA-IOCD-TEAC Joint Workshop on Air Particulate Matter:** With increasing urbanization, rise in vehicle emissions and trend towards greater industrialization, urban air quality in many countries is worsening. Many African countries have begun to adopt air quality management legislation, regulations, or policies as a consequence of the high concentration of air pollution, particularly in the large cities, and its adverse effect on human health. In collaboration with the International Atomic Energy Agency (IAEA) and the Tanzania Atomic Energy Commission (TAEC), IOCD's Environmental Analytical Chemistry Working Group organized a workshop in Arusha on 23-24 May 2011, which focused on the analysis of air particulate matter. The report of this workshop and the outcomes are available at: www.iocd.org/v2_PDF/ReportArushaWorkshop2011p.pdf

Leadership of the Environmental Chemistry Working Group

Chair: Dr Jack Plimmer (UK/USA)
Tampa, Florida

Vice-Chair: Prof. René Van Grieken (Belgium)
Chemistry Department, Antwerp University

2.3 Medicinal Chemistry

Background

Medicinal chemistry has helped transform human health, providing drugs for prevention and treatment of many life-threatening infections and metabolic disorders and helping alleviate pain and suffering. New drugs are constantly needed to provide better treatment of known illnesses, combat the constantly evolving resistance mechanisms of pathogenic organisms and provide an armoury of defences against newly emerging infections. The creation of affordable drugs for diseases mainly affecting poor populations (e.g. many tropical infections) remains a global challenge.

IOCD Activities

Since its inception, IOCD has utilized a number of Working Groups to promote attention to neglected areas of medicinal chemistry of particular relevance to LMICs; to strengthen the participation of chemists from LMICs in programmes of national and global relevance; and to build capacities for medicinal chemistry in LMICs.

- The Tropical Diseases Working Group benefitted from an association with the European Cooperation in Science and Technology programme on Drug Discovery and Development for Parasitic Diseases (COST B32) and IOCD provided a number of travel grants for LMIC scientists to participate in COST meetings. With the conclusion of the COST B22 programme, IOCD decided to sunset the Tropical Diseases Working Group as a separate activity in 2010 and to subsume this area within the broader approach of the Medicinal Chemistry Working Group.
- IOCD's Medicinal Chemistry Working Group has previously organized international symposia and workshops on medicinal chemistry to facilitate professional updating, training and networking. The current focus of the Working Group is now on capacity building and its principal strategies include:
 - Providing travel grants to LMIC scientists to let them participate in special workshops and training courses around the world.
 - Organizing a Distance Learning Course on Medicinal Chemistry to help scientists in LMICs gain knowledge about the latest methods to advance their research. This course, available online at no charge (<http://ntpd.pharm.ku.edu/IOCD>), consists of PowerPoint slides illustrating fundamental concepts in medicinal chemistry and how they may be applied to the solution of problems involved in designing potential therapeutic agents and solving problems that arise in their progression to clinically useful materials. It is divided into four segments: Introduction, Pharmacodynamics, Pharmacokinetics, and Operational Stratagems. Progress through the course is aided by quizzes at short intervals in each of these sections. The course was designed by Dr. Lester Mitscher and is based on presentations he has made in the U.S. and abroad over a number of years. The course content is updated annually based on feedback from users and the IOCD Executive Board. The Division of Continuing Education of the College of Pharmacy, University of Kansas, adapted the material to a distance learning model using funding from IOCD. By 2011, piloting with more than 100 students had been completed and evaluations showed a high degree of satisfaction with the course.

Leadership of the Medicinal Chemistry Working Group

Chair: Prof. Lester Mitscher, (USA)
Medicinal Chemistry Department
School of Pharmacy, University of Kansas, USA

2.4 Plant Chemistry

Background

Plants are vital to human wellbeing, providing a wide array of materials for nutrition, health, clothing, structural uses, energy and much else. Plants form an extremely important element of the economy for many LMICs and their value can be further enhanced by the identification and commercial development of specific compounds they contain.

IOCD Activities

Since 1988, the Plant Chemistry Working Group (which superseded IOCD's earlier Agrochemistry Programme) has provided opportunities for LMIC natural products chemists to network, update their knowledge about isolation and structure elucidation and learn techniques for preliminary biological screening which they could apply in their own laboratories. It has organized workshops for training in analytical or bioassay techniques (three in Africa and Latin America 1990-1994) and international symposia on the chemical, biological and pharmacological properties of medicinal plants (ten in Africa, Asia and Latin America 1996 – 2011). With each symposium, the Working Group also convenes a workshop on chemical screening and bioactivity-guided fractionation. Some IOCD funds are provided to assist with travel grants for younger scientists from LMICs to attend each symposium and associated workshop. The Working Group has also awarded small research grants to a number of younger scientists from LMICs, selected from among those who have been awarded travel grants.

- In 2011, the Plant Chemistry Working Group organized an international symposium and workshop on African Plants as sources of drugs, agrochemicals, cosmetics and food supplements. This was held at the University of the Western Cape, South Africa, 12-15 January 2011.
- Planning was initiated and progressed for the 2012 symposium. This will be held in Nanjing, China on 22-24 September 2012, co-organized with Nanjing University and China Pharmaceutical University and co-sponsored by the National Natural Science Foundation of China. The conference, on "Functional Molecules in Nature", will discuss trends, present latest results and exchange ideas relevant to the chemistry and biology (particularly pharmacy) of natural products including phytochemicals and microbial secondary metabolites. Further details can be found on the Conference website (<http://conference.nju.edu.cn/iocd2012/>).

Leadership of the Plant Chemistry Working Group

Chair: Dr. Kurt Hostettmann (Switzerland)
Laboratoire de Pharmacognosie et Phytochimie
Université de Genève

Vice-Chair: Dr Mahabir Gupta (Panama)
CIFLORPLAN, Facultad de Farmacia
Universidad de Panamá
Vice-Chair: Dr Jacob O. Midiwo (Kenya)
Chemistry Department, Nairobi University

2.5 Capacity Building in Chemical Education

Background

As well as acquiring specific technologies, LMICs need to put in place a broad array of capacities and enabling factors so they can use the chemical sciences in responding to changing conditions and new challenges over time and to become self-reliant in their abilities to determine their own futures.

IOCD Activities

IOCD's strategy is to assist in enhancing capacities for chemical education, including:

- **Distance Education:** Open and distance learning (ODL) in chemistry provides a very flexible, cost-effective approach to delivering technical training, continuing education and high quality source materials that can be quickly, efficiently and cheaply up-dated to keep pace with advances in fast-developing field.
 - **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 online and as a CD, has been developed and piloted by a working group which is led by an IOCD member at the University of Kansas who is one of the world's leading authorities in medicinal chemistry: see section 2.3 above for details, and the website: <http://ntpd.pharm.ku.edu/IOCD>.
Leader: Prof. Lester Mitscher, (USA) - Dept of Medicinal Chemistry, School of Pharmacy, University of Kansas.

- **Organic chemistry tutorials – Spanish:** An IOCD group 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: for details, see section the website: www.iocd.unam.mx/nomencla/nomencla.htm
Leader: Prof Carlos Rius (Mexico) – the Faculty of Chemistry, Universidad Nacional Autónoma de México.
- **Chemistry KnowBase:** During 2011, IOCD began exploratory work for the establishment of a new kind of internet-accessible knowledge resource base in the chemical sciences.
Leader: Prof Alain Krief (Belgium) – Chemistry department, University of Namur.
- **Global Microscience Project:** Practical laboratory work is often extremely limited in low- and middle-income country (LMIC) science courses due to the poor availability of equipment, chemicals and lab facilities. To overcome these difficulties, chemistry professor John Bradley (University of Witwatersrand, S Africa), developed portable micro-scale kits involving miniature pieces of apparatus that teachers could use in the classroom enabling with very small quantities of chemicals, enabling chemical reactions to be conducted and experiments observed at first hand even in very poorly resourced schools. The RADMASTE Centre at the University of Witwatersrand 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 and materials are designed to be easily adaptable to different national curricula. At the present time, English versions of the available microscience materials provide coverage of all educational levels: from primary to all of the secondary level (and university/tertiary level in some cases). These materials include chemistry, physics (micro-electricity resources) and biology teaching. There are also many language versions available of specific microscience materials, indicating world community interest to develop the project further. UNESCO provides global access to the guide for teachers and the student manual on its website.
 - Under the auspices of UNESCO, IUPAC, IFSE and IOCD, more than 80 countries have benefited from introductory microchemistry workshops and training courses, all of which have had positive review by local experts and teachers alike.
 - In 2011, IOCD initiated discussions with partners in Africa to explore the potential for a programme to integrate microscale science kits into school chemistry curricula.
Leader: Prof M James Cosentino (USA) – Biology Department, Millersville University, PA.
- **Books for International Development:** Lack of access to good quality, contemporary textbooks is critical for education and professional development in all areas, including the chemical sciences, but university libraries in LMICs often lack a stock of suitable materials due to the high costs of purchasing and shipping. Aided by student volunteers, IOCD established a programme at the University of Millersville, USA, to collect good quality textbooks (across all disciplines) donated by libraries and private sector companies. The project 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, at least 17 shipments of c. 7,000 kg each have been sorted, packaged, shipped and delivered to libraries in LMICs, including 10 countries in Africa and Asia (Angola, Bangladesh, Comoros, Democratic Republic of the Congo, Eritrea, Guinea-Bissau, Mauritius, Pakistan, Swaziland and Vietnam). The Millersville group has also successfully arranged deliveries of functioning, used computers (24 per shipment) to 13 LMICs and of essential medical supplies to Haiti following the 2009 earthquake.
Leader: Prof M James Cosentino (USA) – Biology Department, Millersville University, PA.

2.6 Promoting the Chemical Sciences for Development

Background

During the last two centuries, the chemical sciences have contributed enormously both to broad improvements in human wellbeing (including enhancements in life expectancy, health and quality of life) and to wealth creation for individuals and nations. Landmark examples include the roles of chemistry and related sciences in: innovations in the generation, storage and use of energy; creation of new materials; advances in agriculture, food and nutrition; better health; and economic growth. But the benefits from advances in chemistry and other sciences have not been evenly distributed globally. The least industrially and technologically advanced countries have remained the poorest and people in

LMICs often have much lower life expectancies than those in high-income countries. A large part of the inequalities can be traced to major differences in rates of technical progress (i.e. a combination of technological advances and their diffusion and uptake in different countries and the capacities of the countries themselves to conduct and apply research).

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** – enabling them to contribute to key areas of science and technology for development. Today, IOCD remains the only international NGO with this focus and continues its mission through a variety of channels.

IOCD Activities

IOCD works through a range of channels, including meetings, events, publications 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. Activities in 2010-2011 included:

- **Celebrating the international Year of Chemistry in 2011:** The United Nations designated 2011 as the International Year of Chemistry (IYC2011), providing opportunities for a worldwide celebration of the achievements of chemistry and its contributions to the well-being of humankind. An initiative of IUPAC and UNESCO, the goals of IYC2011 were to increase the public appreciation of chemistry in meeting world needs, to encourage interest in chemistry among young people, and to generate enthusiasm for the creative future of chemistry. IOCD contributions to IYC2011 included:
 - **Contributions by IOCD's President Jean-Marie Lehn :** As a prominent chemist (Jean-Marie Lehn shared the 1987 Nobel Prize in Chemistry), IOCD's President was very active in promoting the field of chemistry and celebrating its achievements in connection with IYC2011.
 - **Meetings:**
Participating in the official launch ceremony of IYC2011 on 27-28 January in Paris at the headquarters of UNESCO, Professor Lehn gave the Introductory Lecture and framed the importance of the year in his talk, entitled "*From Matter to Life: Chemistry!*". Professor Lehn also participated in a number of other meetings associated with IYC2011, including in Europe and Japan.
 - **Interviews and comments:**
In an interview with Nature, Professor Lehn spoke about the role of science in society and culture. Professor Lehn's comment "*Chemistry will undoubtedly remain the central science in the 21st century*" was featured at the front of the IYC2011 Media Kit of the International Union of Pure and Applied Chemistry.
 - **Writings:**
Writing on "*Chemistry: The science and art of matter*" in a special edition of the UNESCO Courier marking the start of IYC2011, IOCD's President Jean-Marie Lehn highlighted the pivotal role that chemistry has to play in relation to many aspects of human progress, including food and medicines, clothes and housing, energy and raw materials, transport and communications and much else.
A paper by Professor Lehn on "*Configurational and Constitutional Information Storage: Multiple Dynamics in Systems Based on Pyridyl and Acyl Hydrazones*" was featured by Chemistry: A European Journal as part of its marking of the beginning of IYC2011.
The book *Concepts of Nanochemistry*, co-authored by Ludovico Cademartiri, Geoffrey Ozin and Jean-Marie Lehn, was featured by the publishers Wiley as one of their official IYC2011 publications.
 - **Contributions by IOCD's Executive Director Alain Krief and other IOCD scientists:**
IOCD was enrolled by its Executive Director, the distinguished Belgian chemist Professor Alain Krief of Namur University, in the IYC2011 Network.
Professor Krief participated in the Closing Ceremony of IYC2011: 1 December 2011, Brussels, Belgium
IOCD Senior Advisory Council member Berhanu Abegaz and board member Stephen Matlin contributed a major review of "*Chemistry for Development*" in the book "*The Chemical Element: Chemistry's Contribution to Our Global Future*", published by Wiley-VCH to mark IYC2011.
- **Participation in International Meetings:**
 - IOCD was a co-sponsor of the *23rd International Symposium on Pharmaceutical and Biomedical Analysis (23PBA)*, held in João Pessoa, Brazil, on 9-12 October 2011. IOCD Board member

Stephen Matlin gave a Keynote Lecture during 23PBA, on “*Globalization and development: The critical role of pharmaceutical and biomedical analysis*”.

- Alain Krief was a speaker at the **11th Eurasia Conference on Chemical Sciences** at The Dead Sea, Jordan, 6-10 October 2010.
- **Website:** As well as presenting its own work, IOCD used its website to highlight the International Year of Chemistry and the 100th anniversary of the Chemistry Nobel Prize awarded to Marie Curie.

3 Celebrating IOCD’s 30th Anniversary

In 1981 a group of distinguished scientists from 15 countries meet with the Belgian chemist Pierre Crabbé at UNESCO, Paris, to consider giving sustained support to the research of chemists in LMICs. The result was the birth of IOCD, which was chartered two years later in Belgium, as the first international NGO specifically devoted to enhancing the role of the chemical sciences in the development process and involving chemists in LMICs.

In its first 30 years of operation, the overall impact of IOCD has been to:

- help highlight the importance of chemical sciences as contributors to development;
- raise the profile of the field and its practitioners;
- initiate, promote or sustain a number of technical, managerial, policy and collaborative projects or networks advancing chemical sciences in LMICs; and
- contribute to vital resources for teaching, learning and research.

Commemorating the 30th anniversary of its foundation, IOCD’s Annual Meeting in Strasbourg in April 2011 included a special session reflecting on its history and attended by Marie-Noelle Crabbé, daughter of IOCD’s late founder Pierre Crabbé. As part of its 30th anniversary celebrations during 2011, IOCD re-published on the web the *Pierre Crabbé Memorial Oration*, delivered by Stephen Matlin during the opening of an international congress in China in 1992,; and a new section on the history of IOCD was mounted on its website.

4 Strategic Development

Background

Many changes have taken place in the landscape of science and development since IOCD was founded in 1981. There are many new actors and new sources of funding targeted at specific areas such as tropical diseases; many LMICs are advancing economically (e.g. Brazil, China and India are now among the largest economies in the world and are become leaders in areas of advanced technology); and the paradigm of development has shifted from ‘aid-as-charity’ provided by high-income countries (HICs) and focused on individual training and institutional capacity building: it is now centred on enabling LMICs to establish and manage their own systems, including in science, technology and innovation – where appropriate, facilitated by ‘south-south’ partnerships or ‘triangular’ partnerships involving collaborations between a HIC, an LMIC with an emerging economy and a lower income country. There is also now much greater emphasis on inter-disciplinarity and recognition of the value of working at the interfaces between traditional sciences – as highlighted in IYC2011.

Looking to the future, IOCD’s 30th anniversary year therefore also marked the initiation of a new strategy.

IOCD Activities

IOCD’s work builds on its strengths and now focuses on three strategic priorities, discussed below, which aim to achieve IOCD’s mission and contribute to the achievement of the Millennium Development Goals (MDGs). The work undertaken under each priority is accomplished through IOCD’s Working Groups and Projects, as well as through actions taken directly by members of the governing body, secretariat and advisory council.

1: Chemistry for better health

The nature of health challenges faced in every part of the world is changing, as a result of shifting patterns of disease, the globalization of health threats, changes in the environment and in human behaviour.

IOCD's strategy is to support:

- capacity building for medicinal chemistry, including drug analysis, discovery and development, in and for the health needs of LMICs. IOCD has worked extensively in this field and its ongoing programme in this priority area will especially help to meet MDG 6 (combating HIV/AIDS, malaria and other diseases).
- chemists working on the isolation, structure elucidation and bioassay of natural products. About a third of all currently used medicines are derived from compounds first extracted from natural sources such as plants, bacteria and fungi. IOCD has a long track record of working in this field, including supporting structure elucidation and regular symposia on plant chemistry. Furthermore, the Biotic Exploration Working Group has helped several countries in Africa, Asia and Latin America to develop policies for ethical, sustainable bioprospecting, helping establish the foundations for new products and processes that will contribute to better health (MDG 6) and economic development (MDG 1).

2: Chemistry for a better environment

Concern for the environment, including contamination of air, land and water, has become increasingly a matter for global attention since the first Earth Summit in 1992. Countries are now learning how to engage in sustainable development and avoid the historic pathways which have led to pollution, exhaustion of resources and loss of biodiversity.

IOCD's strategy is:

- to enhance capacities for environmental chemical analysis and sustainable use of biological resources, addressing the need to ensure a sustainable environment encapsulated in MDG 7. IOCD's Environmental Chemical Analysis Working Group, formed in partnership with IUPAC, has supported workshops and training in laboratory management and in practical analytical techniques, including for the analysis of pesticide residues and water quality.
- to support capacity building for the exploration and sustainable, ethical exploitation of natural resources in and for the benefit of LMICs. IOCD's interventions will help LMICs to advance towards several of the MDGs through contributions by the chemical sciences to economic development (MDG 1), a sustainable environment (MDG 7) and developing effective partnerships (MDG 8).

3: Capacity building in chemical education

A broad array of capacities and enabling factors are needed by countries so they can use the chemical sciences in responding to changing conditions and new challenges over time and to be self-reliant in their abilities to determine their own futures.

IOCD's strategy is to assist in enhancing capacities for chemical education, including:

- **Web-based resources:** IOCD groups have developed:
 - on-line tutorials in organic chemistry, available in Spanish.
 - training in practical medicinal chemistry, available on-line and as a CD, to help up-grade the skills of chemists in the field of drug design and development.
- **Books and equipment for international development:** An IOCD group collects university textbooks across all disciplines, including the chemical sciences, as well as laboratory equipment and computers, and in collaboration with UNESCO makes a number of shipments each year to universities in Africa, Asia and Latin America.
- **Microscale science kits:** In many LMICs, there is little or no opportunity for chemistry students to gain practical experience, especially at the advanced school level. Together with UNESCO, IUPAC and the International Foundation for Science Education, IOCD supports the Global Microscience Project – portable micro-scale kits enabling chemical reactions to be conducted with very small quantities of chemicals. The kits and materials are designed to be easily adaptable to different national curricula, and different language versions are in preparation.

4 Governance, Administration and Finance

IOCD is registered as an international NGO in Belgium and complies with Belgian law regarding its constitution, formal functions and annual reporting on its activities and financing.

General Assembly

As part of its strategic development work, the governing body of IOCD, known as the General Assembly, was reformed during 2011 and its membership was revised by elections to include the officers of the organization (President, Vice President, Treasurer, Secretary, Executive Director) as well as three additional members.

Secretariat

2010 saw the retirement of IOCD's second Executive Director, Dr Robert Maybury, who had taken over from IOCD's founder, Pierre Crabbé, following the latter's tragic death in 1987. The General Assembly warmly thanked Dr Maybury for his many years of outstanding service to the organization and honoured him with the title Emeritus Executive Director.

Prof Alain Krief, a distinguished Belgian chemist at the University of Namur, was selected and approved by the General Assembly as IOCD's third Executive Director. Prof Stephen Matlin (London), a long-standing member of IOCD, was invited to serve as a special advisor to the Executive Director.

Senior Advisory Council

IOCD has followed a long-standing tradition of appointing eminent persons to serve on its Senior Advisory Council, contributing ideas and assisting the governing body and secretariat to promote IOCD's work. Over the years, prominent men and women from all regions of the world, including Nobel Laureates, have contributed to IOCD's mission in this way.

In 2011, membership of the Senior Advisory Council was revised to include five members based in India, Kenya, Russia and Japan.

Funding

IOCD partly funds its operating expenses and some of its initiatives from an endowment built up over the years by the dedicated and astute management of IOCD's finances by the distinguished US scientist Elkan Blout, who served as Vice President and Treasurer of the organization from its founding until 2006.

IOCD solicits funding from a range of national and international organizations, governments and the private sector to resource most of its initiatives. In particular, each Working Group and Project is tasked with supplementing grants from IOCD by securing the necessary resources externally to finance its activities. Support from the various sources is acknowledged on IOCD's website and in the publications of its diverse activities.

*Stephen A Matlin
IOCD Special Adviser, 2012*