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2014

international year of crystallography

United Nations Educational, Scientific and Cultural Organization

International Union of Crystallography

Partners for the International Year of Crystallography 2014

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International Union of Crystallography

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IUCr facts

53 member countries

42 Adhering Bodies (including 3 regional Associates, ACA, AsCA, ECA)

23 Commissions

8 Journals

IUCrJ launched in january 2014

since 1947

The IUCr is a member of ICSU International Council for Science

Aims of the IUCr

- *Promote international cooperation in crystallography*
- *Contribute to the advancement of crystallography in all its aspects, including related topics concerning the non-crystalline states*
- *Facilitate international standardization of methods, of units, of nomenclature and of symbols used in crystallography*
- *Form a focus for the relationship of crystallography to other sciences*

Structure of the IUCr

- *Adhering Bodies represent countries in the Union*
- *Delegates of Adhering Bodies meet at triennial General Assembly*
- *Executive Committee manages Union's affairs*
- *Commissions further scientific objectives*
- *Regional Associates represent geographic areas*
- *Representatives liaise with other scientific organizations*
- *Secretariat and technical editing office perform administrative and publishing activities*

Adhering Bodies

Argentina
Consejo Nacional de Investigaciones Cientificas y Tecnicas

Australia
Australian Academy of Science

Austria
Österreichische Akademie der Wissenschaften

Belgium
Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique

Brazil
Brazilian Crystallographic Association

Bulgaria
Bulgarian Crystallographic Association

Canada
National Research Council

Chile
Comision Nacional de Investigacion Cientifica y Tecnologia

China, People's Republic of
Chinese Association for Science and Technology

China, Taipei
The Academy of Sciences Located in Taipei

Croatia
Croatian Crystallographic Association (under the auspices of the Croatian Academy of Science and Arts)

Czech and Slovak Republics
Regional Committee of Czech and Slovak Crystallographers

Denmark
Royal Danish Academy of Sciences and Letters

Egypt, Arab Republic of
Academy of Scientific Research and Technology

Finland
Suomen Tiedeakatemiain Valtuuskunta

France
Académie des Sciences (Institut de France)

Germany
Deutsche Gesellschaft für Kristallographie

Greece
Hellenic Crystallographic Association

Hungary
Magyar Tudományos Akadémia

India
Indian National Science Academy

Ireland, Republic of
Irish Crystallographic Association

Israel
Israel Academy of Sciences and Humanities

Italy
Consiglio Nazionale delle Ricerche

Japan
Science Council of Japan

Korea, Republic of
Korean Crystallographic Association

Mexico
Consejo Nacional de Ciencia y Tecnologia

Netherlands
The Dutch Association for Crystallography (NVK)

New Zealand
The Royal Society of New Zealand

Norway
Det Norske Videnskaps-Akademi

Poland
Polska Akademia Nauk

Portugal
Sociedade Portuguesa de Fisica

Regional Committee – AsCA
RC of Crystallographers from Bangladesh, Malaysia, Singapore, Thailand and Vietnam

Regional Committee – ECA
RC of Crystallographers from Algeria, Latvia, Morocco, Tunisia, Turkey and Ukraine

Russia
Russian Academy of Sciences

Serbia
Serbian Ministry for Science and Technology

Slovenia
Slovenian Ministry of Science and Technology

South Africa
National Research Foundation

Spain
Subdireccion General de Organismos y Programas Internacionales, Ministerio de Ciencia y Tecnologia

Sweden
Kungliga Vetenskapsakademien

Switzerland
Schweizerische Gesellschaft für Kristallographie

UK
The British Crystallographic Association

USA
National Academy of Sciences - National Research Council

Milestones

- *1947: IUCr accepted into ICSU*
- *1948: First General Assembly of IUCr*
- *1948: Acta Crystallographica launched*
- *1948-1993: Structure Reports*
- *1952: International Tables for X-ray Crystallography*
- *1957: World Directory of Crystallographers*
- *1983: International Tables for Crystallography*
- *1994: Home Page on World Wide Web*
- *1999: Online access to electronic journals*
- *2006: International Tables Online*
- *2014 IUCrJ open access journal launched for the IYCr*

Commissions of the IUCr

- *Aperiodic Crystals*
- *Biological Macromolecules*
- *Charge, Spin and Momentum Densities*
- *Crystal Growth and Characterization of Materials*
- *Crystallographic Computing*
- *Crystallographic Nomenclature*
- *Crystallographic Teaching*
- *Crystallography in Art and Cultural Heritage*
- *Electron Crystallography*
- *High Pressure*
- *Inorganic and Mineral Structures*
- *International Tables for Crystallography*
- *Journals*
- *Magnetic Structures*
- *Mathematical and Theoretical Crystallography*
- *Neutron Scattering*
- *Powder Diffraction*
- *Small-Angle Scattering*
- *Structural Chemistry*
- *Synchrotron Radiation*
- *XAFS*

IUCr financial support

- *Sponsorship and support for schools and meetings*
- *Support for young scientists*
- *Visiting Professorship programme*
- *President's Fund*
- *Grants for specific projects sponsored by Commissions*
- *Ewald Prize*
- *African Initiative*

IUCr African Initiative

- Crystallography schools and lectures: South Africa , Algeria , Cameroon , Congo ,Gabon , Ivory Coast , Morocco, Zimbabwe

IUCr African Initiative

- Collaboration with manufacturers to install diffractometers in selected Universities which will be centers for materials and molecules characterization

Dschang University : diffraction center (March 2013)

Regional and Scientific Associates

- *American Crystallographic Association*
- *European Crystallographic Association*
- *Asian Crystallographic Association*
- *Latin American Crystallography Association*

- *International Organization of Crystal Growth (IOCG)*
- *International Centre for Diffraction Data (ICDD)*

Journals of the IUCr

Milestones in journals publishing

- *1948: Acta Crystallographica launched*
- *1968: Acta subdivided into Sections A and B*
- *1968: Journal of Applied Crystallography*
- *1983: Acta B subdivided into Sections B and C*
- *1993: Acta D (Biological Crystallography)*
- *1991: Introduction of CIF manuscripts*
- *1994: Journal of Synchrotron Radiation*
- *1997: SGML typesetting of papers*
- *1997: Electronic-only ("CIF-access") papers*
- *1998: Electronic delivery to printers*
- *1998: Electronic archive and 50-Year Index*
- *1999: Electronic proofs*
- *1999: Crystallography Journals Online*
- *2001: Electronic only journal (Acta E launched)*
- *2002: All back issues (to 1948) available online*
- *2005: Acta F (Structural Biology and Crystallization Communications) launched*
- *2008: Acta E made open access*
- ***2014 Open Access IUCrJ***

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UN General Assembly, GA/11262 3 July 2012 Resolution 66/284 submitted by Morocco, approved unanimously

2014 is proclaimed International Year of Crystallography

United Nations

- *Recognizing that humankind's understanding of the material nature of our world is grounded, in particular, in our knowledge of crystallography;*
- *Stressing that education about and the application of crystallography are critical in addressing challenges such as diseases and environmental problems, as well as solutions for plant and soil contamination;*
- *Considering that* ***the impact of crystallography is present everywhere in our daily lives;***
- *Considering also the significance of the scientific achievements of crystallography, as illustrated by twenty-three Nobel Prizes awarded in the area, and that crystallography is still fertile ground for new and promising fundamental research;*
- *Considering further that 2014 marks the centenary of the beginning of modern crystallography and its identification as the most powerful tool for structure determination of matter,*
- *Being aware that* ***2014 provides an opportunity to promote international collaboration as part of the sixty-fifth anniversary of the founding of the International Union of Crystallography****;*
- *Noting the broader welcome by the crystallographic community worldwide of the idea of 2014 being designated as the International Year of Crystallography*

crystallography

Michele Zema
Project Manager for IYCr2014

EMC5, Oujda, Oct 2013

2014

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Ò IYCr2014

objectives

- ✓ to **increase public awareness** of the science of crystallography and how it underpins most technological developments in our modern society
- ✓ to **inspire young people** through public exhibitions, conferences and hands-on demonstrations in schools
- ✓ to illustrate the **universality of science**
- ✓ to intensify the programme **Crystallography in Africa** and create similar programmes in **Asia and Latin America**
- ✓ to foster **international collaboration** between scientists worldwide, especially North–South contributions
- ✓ to **promote education** and research in crystallography and its links to other sciences
- ✓ to involve the large **synchrotron and neutron radiation facilities** worldwide in the celebrations of IYCr2014, including the SESAME project set up under UNESCO auspices

crystallography

IYCr2014 virtual press conference

What crystallography can do for you

Thursday 12 December 2013, 13:00–13:30 GMT

- first public screening of the video to launch IYCr2014
- messages from IUCr President, Prof. Gautam R. Desiraju, and UNESCO DG, Ms Irina Bokova
- Q&A session – ask the experts

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available soon after the end of the press conference

Brian Kobilka
Jenny Glusker
David Blake & David Bish
Philippe Walter
Christopher Llewellyn-Smith
Emil Makovicky

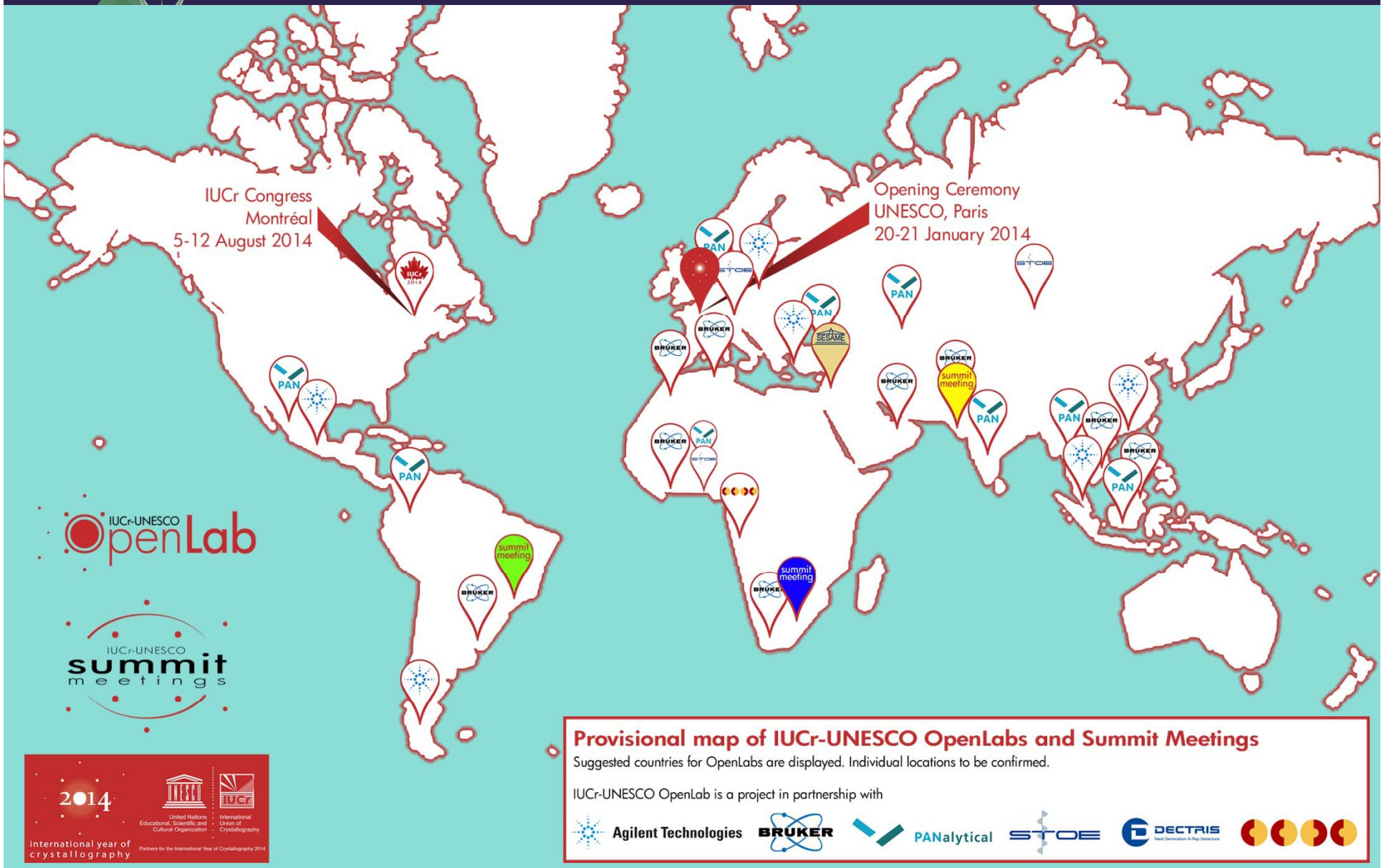
Abdelmalek Thalal
Peter J. Lu
Martijn Fransen, PANalytical
Juliette Pradon, CCDC
Christian Broennimann, Dectris
BRICS Session, “Young” Session

Type I Exhibitions +

new installations of second-hand diffractometers; these will be operational on a long-term basis. The hubs also host exhibitions, workshops and other activities.

Type II Exhibitions +

existing labs already equipped with at least one diffractometer. Each lab will host one or two two-week tutorials in different periods during IYCr2014.


IUCr Congress
Montréal
5-12 August 2014
Opening Ceremony
UNESCO, Paris
20-21 January 2014
IUCr-UNESCO OpenLab
IUCr-UNESCO summit meetings
2014
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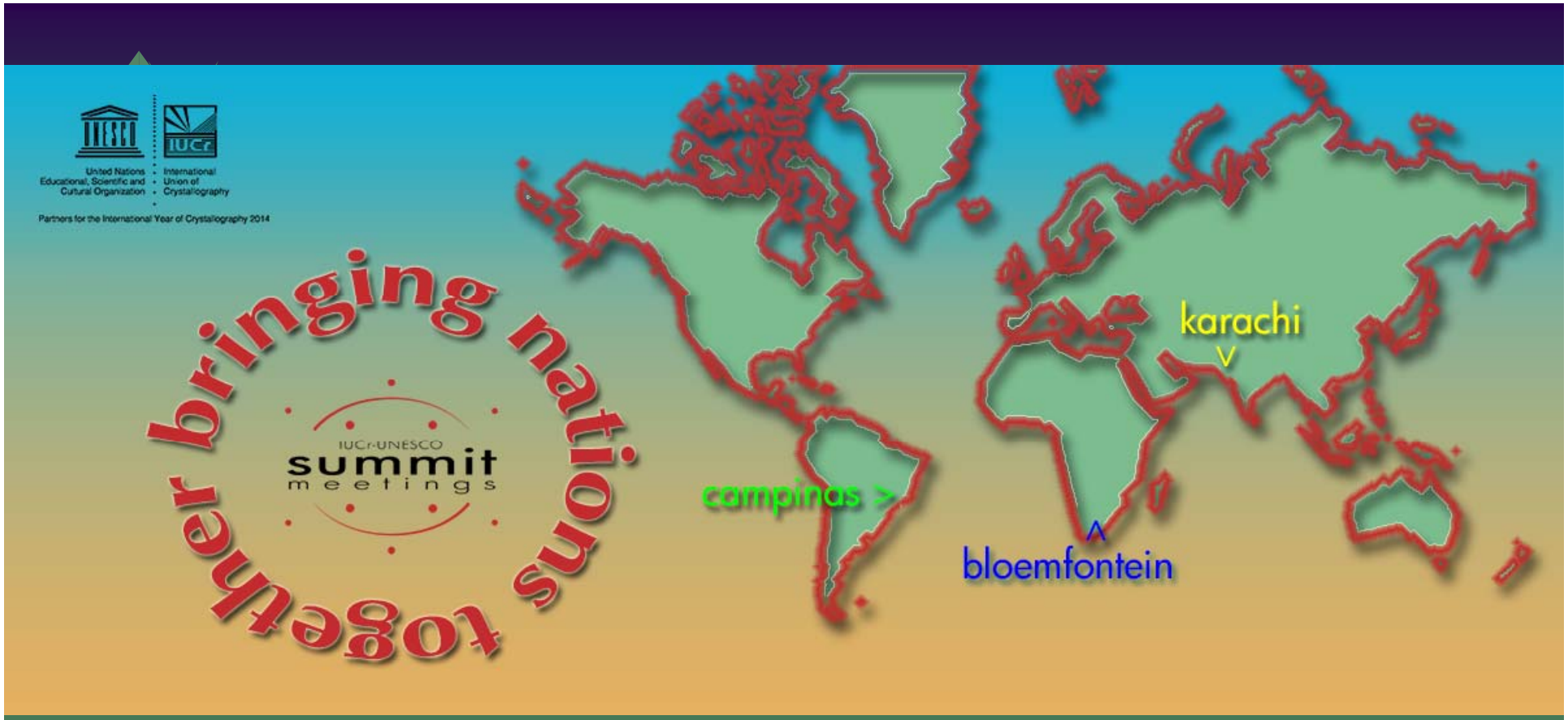
Provisional map of IUCr-UNESCO OpenLabs and Summit Meetings
Suggested countries for OpenLabs are displayed. Individual locations to be confirmed.
IUCr-UNESCO OpenLab is a project in partnership with
Agilent Technologies
BRUKER
PANalytical
STOE
DECTRIS



Karachi (Pakistan), 28-30 April 2014, Vistas in **Chemical crystallography**

Campinas (Brazil), 21-24 September 2014, **Biological Crystallography** and complementary techniques

Bloemfontein (South Africa), 15-16 October 2014, **Materials Science and Mining**

what’s going on

Slovak Post – Postage stamp
Date of issue: 14 February 2014

The € 1 denomination stamps will have a circulation of 3 million units

From crystal growing competitions world-wide to a world-wide crystal growing competition

- The experience and expertise of established national crystal growing competition will form the basis for the worldwide contest
- Many countries already involved (Belgium, France, Spain, Singapore, Canada, England, Australia)
- Involvement of the UNESCO Associated Schools Project Network
- Awards for the best videos or essays describing the experience
- Educational material for teachers prepared by the IUCr and the working group for the competition

World-wide crystal growing competition for school children

http://www.iycr2014.org/participate/crystal-growing-competition

With the participation of the UNESCO Associated Schools Project Network

An initiative of the IUCr Commission on crystal growth (CCGCM) *and* IOCG, International Organization for Crystal Growth

Capture the spirit of crystallography in the places, objects and experiences of everyday life

what's going on

Events

This page lists events associated with the International Year of Crystallography. If you wish to add to this list, please follow the link to add an event or project.

Forthcoming events | Special publications | Photos of events

December 2013

L'enigma Escher (Reggio Emilia *Italy* 19th Oct 2013 - 23rd Feb 2014)
Platonic Solids and Quasicrystals - Moments in the History of Crystallography (Uppsala *Sweden* 30th May 2013 - 4th May 2014)
CRISTALLI! (Padova *Italy* 6th Oct 2013 - 28th Feb 2014)
Crystals: Beauty, Science, Structure (Oxford Museum of History of Science *United Kingdom* 7th Nov 2013 - 30th Mar 2014)
Two Braggs Public Lecture (Oxford *United Kingdom* 3rd Dec 2013 7:00pm)
AsCA 2013 Meeting (Hong Kong *Hong Kong* 7th Dec 2013 - 11th Dec 2013)
6èmes Journées de Chimie de l'Etat Solide (Hotel Laico - Hammamet *Tunisia* 16th Dec 2013 - 18th Dec 2013)

January 2014

Crystallography for schoolchildren (National Institute of Technology, Calicut *India* 1st Jan 2014)
Concours National de croissance cristalline (*France* 1st Jan 2014 - 31st Dec 2014)
NIS colloquium on "Time and space resolved techniques with Synchrotron Radiation beams" (Turin *Italy* 8th Jan 2014 9:30am-6:30pm)
"Quasicrystals" lecture (New York City *United States of America* 8th Jan 2014 7:00pm-8:30pm)
Festival de la cristallographie (Paris *France* 17th Jan 2014 - 18th Jan 2014)
Structural and biophysical methods for biological macromolecules in solution (São Paulo *Brazil* 19th Jan 2014 - 26th Jan 2014)
IYCr2014 Opening Ceremony (UNESCO Main Building, Paris *France* 20th Jan 2014 10:00am - 21st Jan 2014 2:00pm)
Lectures "la cristallographie, une clef de la connaissance" (UNESCO, Paris *France* 22nd Jan 2014)
School of crystallization and polymorphism (San José 27th Jan 2014 - 31st Jan 2014)
Southern African Powder Diffraction Conference and Workshop (Johannesburg *South Africa* 27th Jan 2014 - 31st Jan 2014)

February 2014

From Penrose tilings to Siberian glaciers: the extraordinary search for natural quasicrystals (Aula Magna of the University of Florence *Italy* 13th Feb 2014 6:00pm)
Postage stamp issue (Bratislava *Slovakia* 14th Feb 2014)
IYCr2014 Symposium at Biophysical Society 58th Annual Meeting (San Francisco *United States of America* 15th Feb 2014 - 19th Feb 2014)
Neutron and X-ray studies of Advanced Materials VII - Challenges of the Future World (*United States of America* 16th Feb 2014 8:30am - 20th Feb 2014 2:55pm)
Belgian Crystal Growing Competition (n.a. *Belgium* 24th Feb 2014 - 4th Apr 2014)

March 2014

A Celebration of Crystallography in Solid State and Materials Chemistry: Complex Problems and New Solutions in Inorganic Small Molecule Crystallography (Dallas *United States of America* 15th Mar

Links

- events by date
- events by country
- events by category
- opening ceremony
- openlabs
- summits
- crystal growing competition
- photos of events
- add an event or project

new IUCr publications for IYCr2014

IUCrJ, a fully open-access journal. The journal will publish its inaugural issues in 2014 to coincide with the International Year of Crystallography.

International Tables for Crystallography
Volume H - Powder Diffraction

IYCr2014 Supporters

Agilent Technologies

BRUKER

OxfordCryosystems

PANalytical

STOE

DECTRIS®

Xenocs
Brighter solutions

Rigaku

npg

Anton Paar

INCOATEC
innovative coating technologies gmbh

IYCr2014 Supporters: large-scale facilities

Siam Photon

EUROPEAN SPALLATION SOURCE

Argonne NATIONAL LABORATORY

MAX IV LABORATORY

ansto

DESY

Australian Synchrotron

diamond

LNLS sirius

PAUL SCHERRER INSTITUT PSI

Canadian Light Source Centre canadien de rayonnement synchrotron

KIT Karlsruhe Institute of Technology

ESRF

HZB Helmholtz Zentrum Berlin

SACLA

SPring-8

TU Delft Delft University of Technology

REACTOR INSTITUTE DELFT

NSRRC

PF

Crystallography Journals Online

http://journals.iucr.org

Other publications of the IUCr

Scientific Publications

- *International Tables for Crystallography*
- *IUCr Newsletter*
- *Teaching pamphlets*
- *OUP-IUCr Book Series*
- *World Directory of Crystallographers*

International Tables Online

(International Tables) Volume A home page - Mozilla Firefox

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RELATED SITES: IUCr | IUCr Journals

INTERNATIONAL TABLES Space-group symmetry

Springer

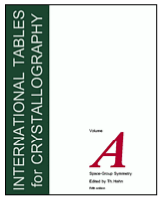
| A | A1 | B | C | D | E | F | G | search

Home > Volume A | previous | next |

International Tables for Crystallography
Volume A: Space-group symmetry

First online edition (2006) ISBN: 0-7923-6590-9 eISBN: 1-4020-5406-8 doi: 10.1107/97809553602060000100

Edited by Th. Hahn



| contents | indexes |

| contributors | editors |

| sample pages | purchase |

| explanation of the space-group data |

Go to space group No. 1 (P1) Go

Volume A treats crystallographic symmetry in direct or physical space. It contains extensive tabulations and illustrations of the 17 plane groups, the 230 space groups and the 32 crystallographic point groups.

The first five parts of the volume contain introductory material: lists of symbols and terms; a guide to the use of the space-group tables; the determination of space groups; synoptic tables of space-group symbols; and unit-cell (coordinate) transformations. These are followed by the plane-group and space-group tables (Parts 6 and 7). For each group type, the following information is presented:

- headline with the relevant group symbols;
- diagrams of the symmetry elements and of the general position;
- specification of the origin and the asymmetric unit;
- list of symmetry operations;
- generators;
- general and special positions with multiplicities, site symmetries, coordinates and reflection conditions;
- symmetries of special projections;
- extensive subgroup and supergroup data.

(International Tables) Space group 143 - Mozilla Firefox

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RELATED SITES: IUCr | IUCr Journals

INTERNATIONAL TABLES Space-group symmetry

Springer

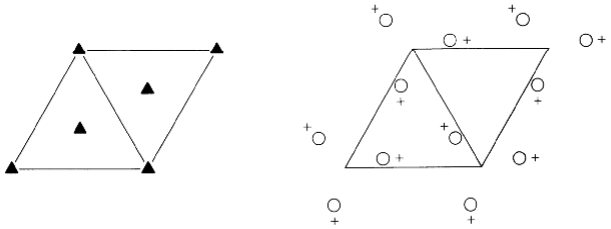
| A | A1 | B | C | D | E | F | G | Go to space group No. 1 (P1) Go

Home > Volume A > Contents > Space group 143 | previous | pdf | index | next |

| maximal subgroups | Wyckoff relations | scanning table |

$P3$ C_3^1 3 Trigonal

No. 143 $P3$ Patterson symmetry $P\text{-}3$



Origin on 3

Asymmetric unit: $0 \le x \le 2/3;\ 0 \le y \le 2/3;\ 0 \le z \le 1;\ x \le (1+y)/2;\ y \le \min(1-x, (1+x)/2)$

Vertices 0, 0, 0 1/2, 0, 0 2/3, 1/3, 0 1/3, 2/3, 0 0, 1/2, 0

0, 0, 1 1/2, 0, 1 2/3, 1/3, 1 1/3, 2/3, 1 0, 1/2, 1

Symmetry operations