

MS48. Teaching and outreach of crystallography

Chairs: Krešimir Molčanov, Bart Kahr

MS48-P1 Olex2 and IYCr OpenLabs

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Olex2[1,2] is a powerful crystallographic package that combines ease-of-use with the powerful tools required for mastering even the most demanding tasks in small-molecule crystallography.

Interested students and novices can achieve remarkable results with a minimum amount of prior knowledge, while more experienced crystallographer will find many tools that make working with structures intuitive and efficient.

This combination leads to the ideal teaching package, where the focus of crystallographic teaching is naturally shifting away from a particular (and often peculiar!) syntax towards a deeper understanding of the underlying principles of crystallographic model building and refinement.

While novices can focus on the actual crystallography at hand, instructors and those with prior crystallographic experience can equally embark on a learning journey: time has not stood still and exciting and developments in the area of small-molecule software is actively happening.

Olex2 has been used extensively in three teaching events during the Open Labs that were organised during the IYCr: Remotely in Buenos Aires (Argentina) and in person in Izmir (Turkey) and Hong Kong. This contribution will draw on the experiences at these Open Labs and reach the conclusion that has been reached by almost all of the participants: Small-Molecule Crystallography is an exciting area for everyone to get involved in – and one that is no longer firmly in the hand of dedicated structural analysts.

[1] **OLEX2**: a complete structure solution, refinement and analysis program, *J. Appl. Cryst.* (2009). 42, 339-341.

[2] The anatomy of a comprehensive constrained, restrained refinement program for the modern computing environment - Olex2 dissected, *Acta Cryst.* (2015). A71

Keywords: small-molecule, refinement, model, teaching, solution, analysis

MS48-P2 The Nosy Monster and the Carbon Stars. Teaching crystallography through children's literature

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The University of Oviedo has been actively involved in several crystallography outreach activities during the last few years, particularly last year in connection with the IYCr2014, and some successful projects are being developed to make crystallography close to the public [1]. In this contribution we will introduce one of these activities: *The Nosy Monster and the Carbon Stars* [2]; A story about particles, matter and crystals, created for children (age from 4 to 8 approximately). The main objective of this project is to show the beauty of crystals and to integrate some crystallography concepts in the absorbent mind of the youngest children.

Recent trends in education have focused on an integrated curriculum. Children learn best when subject matter is meaningful and useful, and when it is integrated with other areas of the curriculum such as reading, hands-on experimentation or maths. This includes reading or listening to any kind of story. Regarding science, this is specially true. Moreover, knowledge acquisition is even more reinforced when an inquiry-based, discovery-focused approach is used. In this sense, literature is a great tool to transmit knowledge to children.

The Nosy Monster and the Carbon Stars is an illustrated book (hardcover, 23x23 cm, 34 pages). A digital edition of the book, both in English and Spanish, is being distributed free of charge [2]. The book can be used in a classroom or at home to introduce the following basic concepts to children: i) Matter is made of particles; ii) Crystals are built up of perfectly ordered particles; iii) Different arrangement of these particles lead to different kind of crystals with distinct properties. The story with not only introduce a topic, but it will hook listeners and serve to demonstrate abstract ideas. It is ideal to use it to lead off a hands on activity about matter and crystals.

“Mati is a monster but, above all, he is a child, and as a child he’s got an inner world which is full of curiosity and color. When he asks his mum what monsters are made of, his mum goes back to the Big Bang to explain him that everything we know comes from the same place, including carbon, of which diamonds, coal, pencils and even us are made!”

Acknowledgements: Financial support from Ministerio de Economía y Competitividad de España (FCT-14-8647 and MAT2013-40950-R)

[1] *Acta Cryst.* (2011) A67, C803-C804; *Acta Cryst.* (2013). A69, s253-s254; *Acta Cryst.* (2014). A70, C1300.

[2] <http://elmonstruocurioso.org>

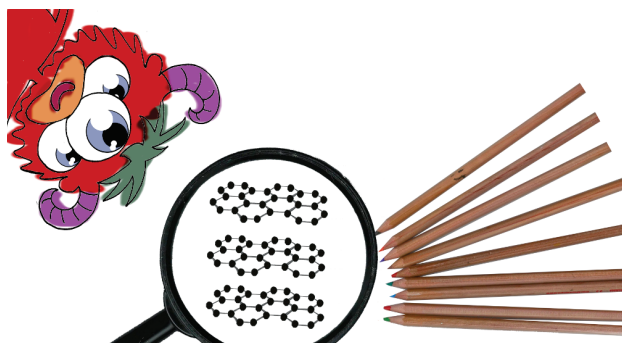


Figure 1. The Nosy Monster and the Carbon Stars - Graphite

Keywords: Crystallography for children, outreach, carbon crystals

MS48-P3 Growing crystals - lighting up dreams - crystal growing competition in Vietnam

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In the framework of the project “**A joint structural research on platinum(II) complexes for antitumor activity and elaboration of the framework for training in crystallography**”, funded by VLIR-UOS in Belgium, single crystal crystallography has been introduced at the Chemistry Department of HNUE in Vietnam. On the other hand, the first edition of a Crystal Growing Competition was organized in Vietnam in 2014. When announced many participants, varying from undergraduate students to high school students were very motivated to grow their own crystals.

Initially, students from a few high schools in Hanoi and the Chemistry Department (HNUE) were selected to participate at this first edition. However, members of some Scientific Clubs also asked to attend the competition, and finally more than 100 student groups were registered. Packages with starting material and description of the procedure how to grow a single crystal were delivered to each group. Alum and copper sulfate were used as materials for crystallization.

The final results were evaluated by the organizers as very positive (Figure 1). An official prize awarding ceremony took place in December 2014. Also a video showing the process of the crystal growth was submitted by one of the participating groups illustrating their motivation and enthusiasm.

A small poll among participants illustrated that the students appreciated the new skills they acquired during the competition and showed the need for a next edition. One of the participants has written a news item at the website of her high school and referred to the competition as “*Growing Crystals – Lighting up Dreams*”. This turns out to be the slogan of the 2015 edition of the Crystal Growing Competition in Vietnam, which is now integrated in the IUCr Crystal Growing Competition 2015.

Acknowledgement: We would like to thank VLIR-UOS (project ZEIN2014Z182), IUCr, KU Leuven and HNUE for supporting the Crystal Growing Competition in Vietnam.