

Uruguay's National Crystal Growing Competition

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During the International Year of Crystallography, in 2014, Uruguay held the first National Crystal Growing Competition (CNCC, for Concurso Nacional de Crecimiento de Cristales, in Spanish). It was organized by an interdisciplinary group of scientists from different areas such as physics, organic, inorganic, bio- and radio- chemistry, among others. The main goal, aligned with the ones set by the IUCr, was to reach the community introducing them to the exciting world of crystallography by involving young people in growing a single crystal. Throughout the first three editions more than 800 people, ages 7 to 30, participated on the CNCC.

The competition involved tutor's workshops, provided by the organizers, to gain specific knowledge in growing crystals, growing the actual single crystal, keeping detailed records of the experiment and presenting the work as a video at the end to be judged. Participants were judged by the weight and quality of the crystal grown as well as their records of the experiment in terms of creativity and scientific rigor.

Introduction

Crystallography is an interdisciplinary science that helps shape modern science through structural determination of numerous substances, from simple salts to complex macromolecules. The importance of this discipline can be seen by the 29 Nobel prizes awarded for various contributions in physics, chemistry and biology. Due to its influence in modern science the United Nations' General Assembly declared 2014 as the International Year of Crystallography (IYCr) celebrating 100 years since the Nobel Prize was awarded to Max von Laue for the discovery of the diffraction of X-rays by crystals. The International Union of Crystallography launched a worldwide initiative aiming mostly to increase public awareness of the science of crystallography and how it underpins most technological development in our modern society. To this end an International Crystal Growing Competition was held, among a series of activities that included specialized workshops, exhibitions, films, and other forms of outreach.

In Uruguay, various activities took place to commemorate IYCr including an Openlab, theme talks, mineral exhibition, crystals' treasure hunt, and the first CNCC.

Aims of the CNCC

- bring participants closer to the world of crystallography and its importance by developing an experimental task: growing a large single crystal.
- encourage interest in science and research through a physicochemical experiment that does not require specific materials or laboratory conditions
- train participants in the application of the scientific method by carrying out a rigorous task that requires commitment
- emphasize the importance of process recording, as well as the communication of results
- stimulate team work, knowledge and experience exchange in a non-structured environment
- encourage participation in the International Crystal Growing Competition

Participants and categories

All kids, teenagers and young adults motivated by scientific knowledge and participating on a planned physicochemical experiment were encouraged to participate with the help of a tutor who would have previously undertaken a crystal growth workshop.

The first edition, aimed at growing a large single crystal, had three categories as follows: 1) elementary school children, 2) highschool students and 3) general public. As of the second edition

the third category was withdrawn and the goal for the first category was to obtain a crystal garden instead of a single crystal.

Development of the CNCC

Stage 1: Preparation, broadcasting, tutor training and distribution of materials

The organization of the event was done by the International Year of Crystallography Work Group of the Facultad de Química, Udelar. In this stage aims, categories and timelines were set, financial aid and sponsorship was requested and graphical identity and broadcasting material designed. During the first months of the school year posters with the information on how to participate were distributed in paper and via web in social media and the webpage of the CNCC. Also, members of the organizing committee who normally participate in outreach activities on the National's Science and Technology Week took the opportunity to spread the contest. Afterwards, interested tutors must undergo a questionnaire to demonstrate their crystal growth knowledge to be able to present participating groups using audio-visual aids developed by the organizers and made available on the webpage, in order to substitute the hands on workshops given in the first two editions. Once they pass the questionnaire they are allowed to enrol student groups and apply for some support consisting of the substance to grow a single crystal. When obtained, depending on donations and financial aid acquired each year, materials are distributed to public schools throughout the country.



Figure 1. CNCC webpage and 4th edition poster.

Stage 2: Crystal growth

The most important stage of the contest is the actual crystal growth experiment. Participants have a period of two months to grow a crystal garden (category 1) or a large single crystal (category 2) of any substance keeping detailed records of the experiment with the guidance of their tutor.

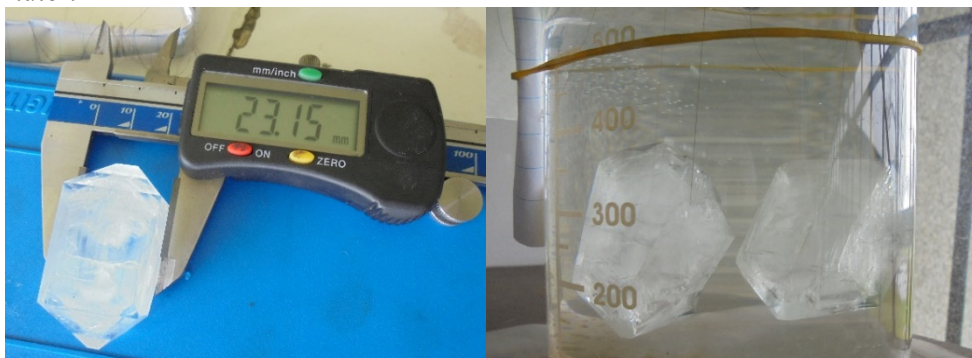


Figure 2. Record photographs from category 2 winners 2014.

Stage 3: Evaluation, communication of results and closure activity

Crystals and a brief video detailing the experiment process are sent to the Facultad de Química to be evaluated. The total score is divided 40% for the crystal garden or single crystal grown, and 60% for the video detailing the experimental process. Points are given for size and quality of the obtained single crystal and creativity and quality of the crystals for the crystal gardens. In the case of the video, creativity and completeness are evaluated. There are first, second and third places determined for each category, as well as, special mentions for size, transparency, creativity, best video, among others.

Every edition of the competition is finalized with a full-day activity where participants can share among themselves and their families their experience by exhibiting the obtained crystals together with posters detailing their work and a screenshot of the 3-minute videos of all participants.

Prizes are given for first, second and third place in both categories, including laboratory kits, tablets, CNCC merchandising (t-shirt, cup and pins) and a coupon for participating in “Chemist for a day”.



Figure 3. Closing activity 2015.

“Chemist for a day”: the major prize in CNCC

Given that participants in CNCC are specially drawn to science the major prize for the second category in the competition is a full-day hands-on activity named “Chemist for a day”. Winners are invited to the Facultad de Química to do simple inorganic and organic synthesis and characterize their products by means of infrared spectroscopy, powder and single-crystal X-ray diffraction. During this day teenagers get to work in research labs, operate equipment and discuss their results.



Figure 4. “Chemist for a day” activity 2015.

Conclusions

In the first three editions of the contest the contest reached over 800 young interested people who actively participated in the contest. The competition provides an opportunity to apply inquiry based teaching methods that can be used during the school year to introduce different physicochemical concepts. Public awareness of crystallography and its implications in everyday life increased. Participants proudly shared their experiences among themselves and their families in the closing activity enjoying a full-day at the University. “Chemist for a day” has proven to be successful initiative as CNCC’s major prize.

Finally, the CNCC has become a happily expected activity for teachers and students alike, presenting new challenges every year.

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