Report on the IISS2012 Summer School on Crystallography for Health and Biosciences

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In the third week of June, the Insubria International Summer School (IISS) entitled "Crystallography for Health and Biosciences" took place in the ancient Cloister of Sant'Abbondio in Como (Northern Italy). Organized by the Research Group of Crystallography and Structural Chemistry of the University of Insubria, this event was attended by nearly 70 young researchers, doctoral students and post-doctoral scientists from Europe, Asia, Africa and the Americas (see the group photograph below). During the five intense days of this school, several among the most renowned scientists in their fields offered an advanced overview of the role of crystallography in frontier research topics, such as the pharmaceutical and biological fields, as well as for nanomaterials with biomedical applications.

After an introductory session in which the basics of matter–radiation interactions (Paolo Fornasini, Trento) and of structural crystallography (Hans-Beat Bürgi, Bern) were suitably reviewed, the scientific program included several lessons subdivided into three main different, but complementary topics:

a. Small molecules crystallography, with particular emphasis on the polymorphism of active pharmaceutical ingredients (Joel Bernstein, Abu Dhabi), on advanced structural methods from powder diffraction data (Norberto Masciocchi, Como) and on forensic and patent litigation aspects related to drug formulation and process certification (Walter Cabri, Rome).
b. Nanomaterials for regenerative medicine and drug delivery (Attilio Cesaro, Trieste), and their advanced experimental and computational characterization by total scattering techniques (from powder diffraction experiments), such as the pair distribution function (Pavol Juhas, New York) and the Debye Function Approach (Antonio Cervellino, Villigen, and Antonietta Guagliardi, Bari).
c. Structural crystallography of proteins and other biological macromolecules, from an experimental point of view (John Helliwell, Manchester) to several computational aspects (Hugo Monaco, Verona, and Ivano Eberini, Milano), including data mining and validation of the results by other experimental methods (Rita Berisio, Napoli, and Annalisa Pastore, London).

A few other lessons on small-angle X-ray scattering (Peter Laggner, Graz) and crystal growth methods, including tutorials and simple experiments (Juan Manuel García Ruiz,

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Granada) were proposed to the students, completing the dense scientific program of this School.

All teachers were very active during the scientific sessions, and presented many different crystallographic aspects to the attendees, also during informal contacts throughout the whole week. They also enthusiastically volunteered in writing several chapters for a nearly 300 page book (in English), entitled "Crystallography for Health and Biosciences", jointly edited by Norberto Masciocchi (University of Insubria) and Antonietta Guagliardi (Institute for Crystallography, Italian CNR), and published by Insubria University Press.

The organization of the School would not have been possible without the generous funding by the Insubria University (through the IISS branch), the National and International Scientific Bodies (International Union for Crystallography, European Crystallography Association, Associazione Italiana di Cristallografia and International Center for Diffraction Data) and by a few commercial sponsors. Several students from different (distant) countries benefitted from these funds, and received partial grants for their visit to Como, eventually catalyzing fruitful scientific and educational cooperation. Not to be forgotten, several informal occasions for sharing opinions and experiences provided a significant aggregation among all participants, indicative of prolific interactions toward newly emerging science.

Finally, special thanks to all students who impressively participated in questions and discussions after each speech, making us very confident that a new generation of young crystallographers, operating worldwide in many different countries and interested in a large variety of topics, is ready to rejuvenate our Scientific Community.