

Symposium of the EuCheMS Working Party 'Ethics in Chemistry' 2017

6 – 7 July 2017,

Roma, Società Chimica Italiana, Viale Liegi 48c

Ethics in Action: Chemistry, Professionalism, and Society –

Participants: Angela Agostiano, CSI-President (Bari, Italy), Gustavo Avitabile (Naples, Italy), Luigi Campanella (Rome, Italy), Romualdo Caputo (Naples, Italy), Franco De Angelis (L'Aquila, Italy), Valentina Domenici (Pisa, Italy), Hartmut Frank (Bayreuth, Germany), Modest Gertsyuk (Kyjiw, Ukraine), Matteo Guidotti (Milan, Italy), Danila Lelo (Rome, Italy), Jan Mehlich (Germany/Taichung, Taiwan), Domenico Misiti (Rome, Italy), Georgina Nagy (Veszprém, Hungary), Hans Steisslinger (Germany/Bressanone, Italy), Anca Silvestru (Cluj-Napoca, Romania), Ferruccio Trifiró (Bologna, Italy), Margherita Venturi (Bologna, Italy).



Front: Anca Silvestru, Margherita Venturi, Georgina Nagy, Valentina Domenici
Back: Modest Gertsyuk, Hans Steisslinger, Hartmut Frank, Luigi Campanella,
Jan Mehlich, Domenico Misiti, Romualdo Caputo, Franco De Angelis

The Working Party (WP) "Ethics in Chemistry" of the European Society for the Chemical and Molecular Sciences (EuCheMS) held its annual symposium in Rome at the headquarters of the Italian Chemical Society (SCI) that generously hosted the event. On the groundwork of the WP's previous efforts to clarify and sort the various directions that reflections on "Ethics in Chemistry" can take^[1], this year's symposium stood in the focus of bringing these insights into action. The scientific committee had compiled a program with talks given by experienced practitioners in chemical sciences and in the education and dissemination of chemistry. It was an explicit goal of the organisers to make steps beyond mere theoretical elaboration towards a pragmatic realisation of ethical considerations in chemical activities, creating valuable impact in regard to the promotion of sound and sustainable progress in all areas of the chemical endeavour.

The President of the Società Chimica Italiana, **Angela Agostiano** (University of Bari), welcomed the participants to the seat of SCI. In her address, she indicated her unconditional support of the goals of the WP, suggesting to draft a memorandum in which the needs for a more profound introduction of principles of ethics in education and practice of chemistry are emphasised. Subsequently, **Hartmut Frank** (University of Bayreuth), co-founder and chair of the WP, set the scene by reminding of the key relevance of chemical-technological inventions and practices as condition for human cultural history; he summarised the previous activities of the WP and emphasised that – besides theoretical definitions of scope - the development of practical strategies is important. **Hans W. Steisslinger** (Terra Institute) pleaded in his talk "System Change and Ethics" to introduce a systemic view on science and economy, away from particularistic and dualistic approaches ("*Here is chemistry, there is society and the environment.*"). Chemists need to understand and define their role in science and business - derived from integrated systemic thinking – in order to foster economic and environmental sustainability. This mindset asks for new measures of success (e.g. the common good rather than material growth). Scientific progress should be enacted to serve environmental integrity and societal and individual well-being. Both academic chemists and actors in chemical industry will only be able to face and solve upcoming global challenges when they allow normative - including ethical - reflections on their connection with the social sphere to guide decision-making and professional conduct towards a sustainable future.

With the goal to sharpen awareness of the ethical and social dimensions of chemistry, the next two presenters introduced their approaches to integrate normative topics into the education of young chemists. **Jan Mehlich** (Tunghai University) shared his experiences with teaching a course "*Science, Ethics, and Society*" to students of science majors. In order to equip young chemists with skills in fulfilling their responsibilities as societal actors, such a course should cover topics of professional ethics (such as research ethics, principles of 'good scientific practice'), issues of sustainability, responsibility, risk and precaution, as well as an interdisciplinary discourse on the definition and assessment of progress. For implementation in the curricula of chemical faculties, he suggested a modular syllabus design as an aid for lecturers with various backgrounds, requirements, and organisational constraints. Compilation of a lecture on the ethical and social dimensions of chemistry will thus be possible with relatively little effort.

Margherita Venturi (University of Bologna) took a similar direction, but in the context of secondary schools (10th to 12th grade). As part of the EU-FP7 project 'Irresistible', she investigated the introduction of the concept of *Responsible Research and Innovation* (RRI) to pupils, reflecting on social aspects of scientific and technological progress. Besides bringing cutting-edge research into schools, the goal of the project is to encourage students to improve their learning and perception of science. Such activities with pupils - including experimentation, critical discussion of RRI dimensions, and the preparation of exhibitions - revealed that education about ethical and social dimensions of science can increase the pupils' awareness of the links between science, society, and environment, at the same time motivating them to pursue a career in scientific and technological fields as responsible member of society.

The second session was dedicated to the role of chemists in risk prevention and mitigation of chemical weapons. **Matteo Guidotti** (Institute of Molecular Sciences and Technologies) reported on activities of his institute on the promotion of knowledge about risks arising from chemical, biological, radiological, and nuclear (CBRN) weapons and warfare agents. Besides awareness-raising and dissemination activities, carried out with open round-tables for the broad public and training courses

for professionals (for example, in South-East Asian countries, under the aegis of EU-funded cooperation initiatives), the main objectives are high level education and information-sharing with non-specialists. Thanks to an enhanced inter-agency cooperation among academia, industry, emergency first responders, and military-police forces, raised knowledge may reduce fear, leading to better resilience against non-intentional (technogenic) incidents and criminal acts (terrorist attacks, warfare) involving non-conventional highly toxic chemicals. An example what chemists can do is the recent research on nanostructured materials for improved protection, decontamination, and defence against chemical warfare agents.

Ferruccio Trifirò (University of Bologna), member of the Scientific Advisory Board of the Organisation for the Prohibition of Chemical Weapons, gave an in-depth overview of the history of chemical weapons and the latest attempts to ban them. He outlined the role of chemists in the development and distribution of chemicals used as warfare agents; his contribution evoked a passionate discussion about the responsibility of chemists and the applicability of precautionary principles to the conduct of science. Also discussed was that chemistry in the form of an applied science requires ethical reflections on the duality of potential applications - the exploitation of chemical knowledge and chemicals for both desirable ("good") and despicable ("bad", intended and unintended) purposes. The complex of chemical weapons and the chemists' role in developing this "technology" is a most illustrative case of the duality of applying science and of the need that its practitioners are reminded of their responsibility.

The third session addressed an example at the intersection of chemistry, society, and environment. **Luigi Campanella** (University of Rome - La Sapienza) talked about latest trends in animal experimentation and how the "3R"-principle (replacement, reduction, refinement) has been implemented in REACH, the new EU chemical registry, in order to meet the concerns of societal activists and environmental entities (above all animals). Bioethical considerations and research ethics issues find their way into policy-making and the regulation of researchers' practices. As part of animal protection laws, researchers are requested to reflect upon the usefulness, significance, necessity, and replaceability of animal experiments. The topic exemplifies that chemists (like other scientists in this field) must have the capacity to respond to normative questions that arise from their daily practice.

Valentina Domenici (University of Pisa) shared her insights into another topic that requires chemists to look beyond their margins of academic expertise: the communication of science to scientific lay people. The quality of science journalism is often poor and even misrepresenting scientists' findings; this cannot be explained solely by the incompetence of journalists, but also by the chemists' insufficient capability of communicating their research. Moreover, public concerns about scientific advances are often expressed in a normative and worldview/value-related context, while scientists are used to communicate factual knowledge by statements that are justifiable within the measures of their field of expertise (for example empiric data). Overcoming such barriers would increase public understanding and support for the chemical sciences, which pays off as increased credibility of chemists and greater acceptance in the public discourse on science and technology.

In the final plenum, the speakers and other members of the WP reflected upon the insights gained during the two days and planned further activities of the group. The presentations and discussions made it clear that chemical sciences and industry play an enormously important role for sustainable progress, global environmental integrity, societal wellbeing, and economic wealth. Chemistry must not just be regarded as a science but as a major factor in the development of culture. Therefore, the



Gustavo Avitabile & Modest Gertsyuk
in conversation

ethical issues that arise in the context of the practice of chemistry need to be addressed and reflected in chemical research, in education, and in the implementation of industry and chemistry-based technologies. In particular, the awareness of chemists for their professional responsibility must be raised so that the duality of intended and unintended implications and risks can actively be shifted towards the positive side. Chemists are empowered to elaborate and enhance knowledge that can help to reduce risks and fears. Training towards a heightened sensibility for

the ethical dimensions of their profession and the formulation of guidelines of good science conduct - in analogy to the Hippocratic Oath for medical professions - are, therefore, recommended for all chemical practitioners.

[1] J. Mehlich, F. Moser, B. Van Tiggelen, L. Campanella, H. Hopf, "*On the Ethical and Social Dimensions of Chemistry: Reflections, Considerations, and Clarifications*", *Chem. Eur. J.* **2017**, 23(6), 1210-1218