

Letter to Editor

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## Environmental chemistry - does it exist?

....with this question, professor Stuart Bennett from Open University (Manchester, UK) began his lecture at the meeting of the Committee of Education in Environmental Chemistry (*CEChE*) (Division of Chemistry & the Environment FECS) held in Rome (10-12 January 2002). Other questions which were discussed were: should a chemistry graduate be environmentally aware and how might chemistry courses achieve this awareness? The meeting was organized by prof. Uri Zeller (Haifa University) and prof. Sergio Facetti (University of Milano) and among participants were representatives from Ireland, the United Kingdom, Germany, Denmark, Greece, Italy, the USA and from Poland (prof. B. Buszewski - the national representative in FECS, prof. M. Jarosz - vice-chairman of the Polish Chemical Society and chairman of the Commission on Education in Analytical Chemistry of the Committee of Analytical Chemistry PAS, dr T. Buszewska, Nicholas Copernicus University in Torun - member of the Commission of Analytical Chemistry Education of the Committee of Analytical Chemistry PAS and the Laboratory of Chemical Education, and dr. I. Maciejowska from the Department of Chemical Education of Jagiellonian University).

The molecular sciences provide powerful tools that help environmental scientists understand how the environment works; but equally, the natural environment provides many fascinating multidisciplinary problems to tax the chemistry undergraduate's application of chemical principles. In between lies the impact of human activity on the environment is frequently blamed for the negative image of chemistry so widespread in the general population.

Provocative answers to the aforementioned questions were found in the following statements which defined what environmental chemistry is not:

- an easy possibility,
- an excuse for teaching analytical chemistry,
- an equal for *green chemistry*, which is recommended to include in educational programs in the framework of environmental chemistry - environment protection (contact person: dr. Dennis L. Hjeresen, dennish@lanl.gov),
- a science about chemical processes going in different environmental matrices (water, air, soil).

The debate was organized around five key questions:

1. What should be done? - create a vision of education on environmental chemistry in Europe,
2. What might be done, taking into account the present state? - analysis of present state,
3. How to carry this out, what was established? - choose or adapt different methods of chemical education,
4. How to spread the range of knowledge and which skills the should students gain that they might master basis of environmental chemistry? - characteristics of works on educational programs and examples of courses on environmental chemistry, which are compatible with the vision of the Division of Chemistry & the Environment FECS,
5. How should environmental chemistry be promoted in scientific and educational journals? - using professional journals to educational aims - amongst them the *Polish Journal of Environmental Studies* (from the FECS list) was recommended.

As the criteria distinguish this chemical discipline enumerated:

- holistic, multidisciplinary and interdisciplinary approach,
- integration of different domain, integration of theoretical and experimental works,
- education in context, problem solving.

Participants agreed unanimously that introducing elements of knowledge concerning the environment to education in each field of chemistry and at each level is necessary along with chemistry taking clear part in programs of studies (for teachers, environmental protection, etc.). In connection with this there was initiated a complete collection of *case study* problems and assessment questions from different European countries, which could be used in lecture. This field of activity belongs to prof. Bernd Jastorff from Bremen University (jastorff@uft.uni-bremen.de), who kindly invites Polish teachers to cooperate. For further information please contact M. Gagan from the Open University (j.m.gagan@open.ac.uk). We also encourage all interested to send to prof. Peter Childs from Ireland (peter.childs@ul.ie) descriptions of environmental chemistry courses to create common, Internet-based, European resources (data base).

It was also agreed that education on environmental chemistry must be based on concrete examples and special emphasis should be put into training of skills of solving of real not *academic* problems, because a chemist's work is based on it.

It is obvious that students must acquire base knowledge to have a possibility of problem solving. But

a number of facts and definitions which are necessary to master should be limited to advantage of education on skills of information searching in different knowledge sources. Prof. B. Buszewski deals with choices recommended from available textbooks. Any suggestions or critical remarks should be sent to: bbusz@chem.uni.torun.pl.

Especially strong emphasis was put on necessity of permanently improving the educational workshop of academic teachers which unfortunately takes place at not many European universities. In connection with leading such works for Ph.D. students of chemistry at Jagiellonian University in Cracow and preparing workshops for teachers of environmental chemistry under the auspices of CEChE, everyone, who has had experience in this matter, is kindly asked to contact dr. I. Maciejowska (maciejow@chemia.uj.edu.pl). To activate the academic environment the decision has been made to prepare rules of competition on interesting and effective leading of educational activities on environmental chemistry.

**The following suggestion closed our debate:** Every chemistry graduate should possess basic knowledge and skills for understanding processes in the environment, to be able to foresee consequences of his/her activity and manage in breakdown situations, especially if he/she would work in the acquired profession.

The quality of education and satisfaction from our work depend on academic cooperation and a good relationship teacher-student.