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## Analytical chemistry in Europe – education, research, publications and conferences

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COMMENT

### Introduction

Modern analytical methods are indispensable in many disciplines, including medicine, biology and environmental protection, as well as being fundamental to chemistry and chemical technology. Nearly 50% of EU laws and regulations require strict analytical measurements to monitor compliance. Prof M. Grasserbauer expressed this eloquently at EUROANALYSIS XIII in 2004 in Salamanca in his statement that “Analytical Chemistry is indispensable to democratic governance”. This is supported by the number of batch analyses per year carried out in Europe (*ca.* 10<sup>10</sup>) and the astronomical amount of data resulting from continuous analytical monitoring. Nearly 70% of European chemists consider chemical analysis as either the main or an extremely important part of their job description. In the field of Analytical Chemistry more than 100,000 papers are generated in Europe alone every year. Therefore it is not surprising that Analytical Science was proclaimed as a breakthrough science by EuCheMS. It is clearly stated in its documents that the need for analytical measurements arises in all research

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disciplines, industrial sectors and human activities that entail the need to know not only the identities and amounts of chemical components in a mixture, but also how they are distributed in space and time. Recent developments in this area have underpinned major advances in the biosciences, such as genome mapping and diagnostics. Further developments will improve our capability for real time and remote analysis and miniaturisation will enhance our ability to undertake *in situ* and *in vivo* analysis. Increasing globalisation of analytical chemistry, together with the increasing range of tasks within its remit, put an escalating burden on analytical chemists with regard to education, research and development of new analytical methods and approaches, their publication and, above all, their practical application in everyday life. The activities of EuCheMS-DAC [1] are focused in this direction and can provide helpful support in addressing these demanding challenges as demonstrated in the following paragraphs. In our opinion the main task of DAC is to promote analytical chemistry, *e.g.* by attracting more young people to study this exciting field of chemistry and increasing general awareness of the importance of the subject.

#### *Teaching of analytical chemistry*

In spite of its growing importance, chairs of Analytical Chemistry are not very common in the older EU countries and the outlook in the newer EU countries is also not too optimistic. Therefore, most people working in the field of analytical chemistry are not graduates from departments specialising in analytical chemistry education. Learning by doing is a well-known slogan in our rapidly changing world but it would probably be useful, and indeed beneficial, for society to educate graduates who are fit for their job at an early stage. DAC has traditionally paid great attention to appropriate education in the subject, which resulted in the Eurocurriculum of Analytical Chemistry. This Eurocurriculum was supported and approved by all EuCheMS member societies and a well-known and well accepted textbook has been written on the basis of this Eurocurriculum [2]. Further developments in this field resulted in Eurocurriculum II [3]. This document incorporates the requirements of the Bologna Process [4] and is a very good starting point for all further effort in this field. For many years the comprehensive biennial analytical congress EUROANALYSIS (the flagship DAC event) has fostered a special session devoted to education, and such a session will be incorporated in EUROANALYSIS XVII, which will be held on August 23-25, 2013 in Warsaw, Poland [5]. From this point of view the activities of the DAC Study Group Education are very important and can greatly contribute to further improvements in analytical chemistry education. However, a crucial role in this process must inevitably be played by individual teachers of the subject, *i.e.* individual analytical chemists who love, and can enthuse about, their science. Such people are encouraged to submit contributions to the special ses-

sion describing their experiences, in particular in areas such as “Pitfalls in Education in Analytical Chemistry” and “Models for Education in Analytical Chemistry”.

The constant evolution and fine tuning of the education of analytical chemists in Europe is important from the perspective of *e.g.* student exchanges, joint PhD projects and ERASMUS exchange programmes. In this regard it is necessary to mention the extensive activities of the European Chemistry Thematic Network Association (ECTNA) [6] which have resulted in the Chemistry Euro-bachelor and Chemistry Euromaster labels and - since this year – the Chemistry Doctorate Eurolabel [7]. DAC is ready to support any effort in this field because without appropriate education there will not be a bright future for analytical chemistry in Europe.

#### *Research in analytical chemistry*

Many recent developments in analytical chemistry have been connected more with technical and/or technological progress than with new discoveries. The centre of gravity has moved from chemistry to physics (the construction and development of expensive instrumentation based more on physical than chemical principles) and to biology (the application of biological principles for analyte recognition and the construction of smart sensors). The increasing cost of sophisticated instrumentation simultaneously generates a pressure to develop simple and inexpensive methods suitable for large scale monitoring. Fundamentally new principles useful for analytical chemistry can be expected to originate at the interface between various disciplines and the communication between scientists from different disciplines is of paramount importance in this regard. These changes in research directions also require changes in our educational practice [8]. DAC assists in this process by organising the biennial EUROANALYSIS conference and inviting people to attend from different fields that are important for the further development of Analytical Chemistry.

#### *Publication in analytical chemistry*

As in all branches of sciences, analytical chemists are under increasing pressure to generate quantifiable outputs (*i.e.* increasing number of papers in high impact factor journals) which serve as a basis for their evaluation, further grant support, etc. It remains questionable if this pressure really improves science in general and analytical chemistry in particular as it can lead to an increasing number of papers of decreasing quality. Moreover, the increasing volume of published data makes it very difficult to follow recent developments, even in a relatively narrow field of research. New journals (especially web-based) are introduced nearly every week. Analytical chemists, as members of the world-wide scientific community, have to follow these trends in order not to lose research income and scientific status. Nonetheless it is important that a balance is found

and that outputs are targeted at appropriate journals (with particular reference to their scope), demonstrate clear novelty AND added value compared with published work and include robust method validation.

#### *The role of EuCheMS-DAC*

As stated above, DAC is very active, especially in the field of education of Analytical Chemistry and in the organisation and support of analytical chemistry oriented events such as conferences, seminars and meetings. Our Polish colleagues are very active in their preparations for the above mentioned EUROANALYSIS conference in Warsaw. A listing of other interesting conferences sponsored by DAC can be found on its web pages [1]. Among these is the 12<sup>th</sup> Eurasia Conference on Chemical Sciences on April 16–20, 2012 at Corfu, Greece [9]. Analytical Chemistry will also be well represented at the 4<sup>th</sup> EuCheMS Chemistry Congress in Prague, Czech Republic, on August 26–30, 2012 [10]. The analytical programme will include sessions on electroanalytical methods, separation methods, spectroscopic methods and chemometrics, as well as application based contributions, *e.g.*, in environmental analysis and bioanalysis, and will be of interest to a broad spectrum of Analytical Chemists. In addition, the 1<sup>st</sup> International Conference on Analytical Chemistry (ROICAC 2012) will be held in Targoviste, Romania on September 18–21, 2012 [11].

#### INFORMATION FROM THE EUCHEMS DIVISION OF ANALYTICAL CHEMISTRY

The 2011 Annual Meeting (42<sup>nd</sup> Meeting of EuCheMS-DAC) was held in Belgrade, Serbia, the venue for Euroanalysis XVI. Sixteen EuCheMS Societies were represented. Two DAC Steering Committee Meetings were held during the year: London on April 5<sup>th</sup> 2011 and Belgrade on 9<sup>th</sup> September 2011. The Royal Society of Chemistry and the Serbian Chemical Society are thanked for their hospitality. The Steering Committee membership for 2012 is: Paul Worsfold (Chair, Royal Society of Chemistry), Jens Andersen (Secretary, Danish Chemical Society), Wolfgang Buchberger (Austrian Society for Analytical Chemistry), Slavica Ražić (Serbian Chemical Society), Jiri Barek (Czech Chemical Society) and Maciej Jarocz (Polish Chemical Society). The Secretary of DAC will retire by the end of 2012 and Wolfgang Buchberger has kindly agreed to become the new Secretary. The 2012 Annual Meeting will be held in Prague on 26<sup>th</sup> August 2012. Two DAC Steering Committee Meetings will be held during 2012, one in Warsaw and one in Prague (co-incident with ECC4).

Euroanalysis XVI was held in Belgrade, Serbia, September 11–15, 2011. The Chairpersons were Prof Dr Slavica Ražić and Prof Dr Ivanka Popović. This was a highly successful Conference and attracted 600 participants. Further details can be found at [www.euroanalysis2011.rs](http://www.euroanalysis2011.rs). The Robert Kellner Lecture (RKL) jury selected Prof Jonas Bergquist from Uppsala University for the 2011 RKL award and the lecture was delivered as a Plenary Lecture in Belgrade. The 2011

EuCheMS Lecture was also presented as a Plenary Lecture in Belgrade by Prof Alfredo Sanz-Medel from the University of Oviedo, Spain.

Euroanalysis XVII will be held in Warsaw, Poland, August 25–29, 2013 and the Chairperson is Prof Dr Maciej Jarosz. Further details can be found at [www.euroanalysis2013.pl](http://www.euroanalysis2013.pl). Euroanalysis XVIII will be held in Bordeaux, France in 2015 under the auspices of the Société Chimique de France. The Chairpersons are Prof Philippe Garrigues and Dr Christian Rolando.

DAC will have 5 active Study Groups in 2012:

- “Education in Analytical Chemistry”; Head: Prof Reiner Salzer.
- “Quality Assurance and Accreditation”; Head: Dr Jens Andersen. Prof Hendrik Emons will act as DAC liaison person to CITAC. Dr Heiner Korte will chair a sub-committee of this Study Group to provide feedback on the proposed changes to SI units.

- “History”; Head: Prof Duncan Burns.

- “Bioanalytics”; Head: Prof George Horvai.

- “European AC on the web”; Head: Prof Bo Karlberg.

A Task Force on “Chemometrics” will also operate in 2012, headed by Prof Roma Tauler.

The following meetings/networks will be organised in co-operation with EuCheMS-DAC:

- 13<sup>th</sup> Conference on Instrumental Analysis (JAI), EXPOQUIMIA, 14–16 November, 2011, Barcelona, Spain.

- 12<sup>th</sup> Eurasia Conference on Chemical Sciences, April 16–20, 2012, Corfu, Greece.

- Analysdagarna, 11–13 June, 2012, Uppsala, Sweden.

- European Chemistry and Chemical Engineering Education Network (EC2E2N, [www.ec2e2n.net](http://www.ec2e2n.net)).

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