TONY DAVIES COLUMN

COAST

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Introduction

Over the years we have been able to feature in this column some good funding initiatives which have led to innovation in which we have all been able to profit. Recently, I have had the privilege to be invited to get involved with a programme of funding, which was initiated back in 2008 to counteract what was seen by industry and academia as a decline in fundamental analytical research in the Netherlands and the associated and inevitable problems around producing high quality researchers and technicians. The clear link between strengths in analytical science and the "economic and social health of the nation" were recognised.

An astonishingly large group of SMEs, major industry partners and academic organisations signed up to work on the business plan for the COmprehensive Analytical Science and Technology (COAST) initiative (www.ti-coast.com). This plan was worked on through 2008, the TI-COAST foundation formed in December of that year and the plan presented to the national co-ordination body for chemistry ("RegieGroep Chemie", RGC), the Ministry of Economic Affairs and the national science foundation NWO who agreed to fund the TA-COAST R&D programme in 2009.

COAST is one of a series of initiatives under the Technology Areas for Sustainable Chemistry innovation programme (TASC). TASC is a public–private partnership programme under The Netherlands Organisation for Scientific Research (NWO) and Advanced Chemical Technologies for Sustainability (ACTS); it comprises four separate technology areas (TA):

- Low Energy Routes to Bulk Chemicals (TA-Low Energy Routes)
- Eco-efficient Use of Biomass for Bulk and Fine Chemicals Production (TA-Biomass)
- Syngas, a Switch to Flexible New Feedstock for the Chemical Industry (TA-Syngas)
- Comprehensive Analytical Science and Technology (TA-COAST)

The COAST mission is clearly defined as follows:

COAST's mission is to strengthen analytical science in the Netherlands by uniting R&D, human capital and infrastructure:

To advance R&D and innovation in analytical technologies and encourage cross-fertilization between analytical technologies and application areas (see also Figure 1)*;*

To improve education in analytical science and to increase the number of graduates;

To provide access to research facilities and knowledge for players within and across application areas.

The analytical science applications which were to be concentrated on ranged from the composition of complex mixtures, molecular structure assessment, solid characterisation, as well as the increasingly important data handling and chemometrics. The range of applications regarded as falling under the scope of COAST went from extremely localised analyses such as personalised medicine applications through industrial process analysis as well as research into the fundamentals of new analytical technologies.

Researchers are expected to look into making significant improvements in the resolution of analyses, whether in morphological studies and chemical imaging or in time domain and molecular dynamics. Naturally process analytical technology features along with the processing of complex multi-dimensional data sets (see, for example, Figures 2 and 3).

The mission has resulted in organising the programme into three strategic pillars: R&D, Human capital and Infrastructure.

Funding R&D

COAST has a more classical bid-oriented side in the funding of R&D projects with the overlying target of exploiting the funding levels and industrial support to achieve significant breakthroughs in the innovation areas funded. The first call closed at the end of August 2011 and was very successful with nine proposals being accepted for more than 9 million Euros of funding involving some 24 industrial partners, including 10 SMEs and 17 academic groups working across the range of priorities already identified above. This initial TA-COAST portfolio of projects is financed by private partners in the chemistry, water, agro-food, life science sectors, as well as the ministry of Ministry of Economic Affairs, the NWO and the participating universities.

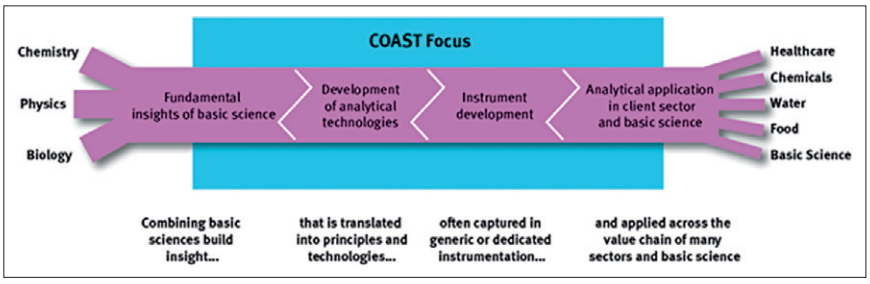

Figure 1. The focus of the COAST initiative.

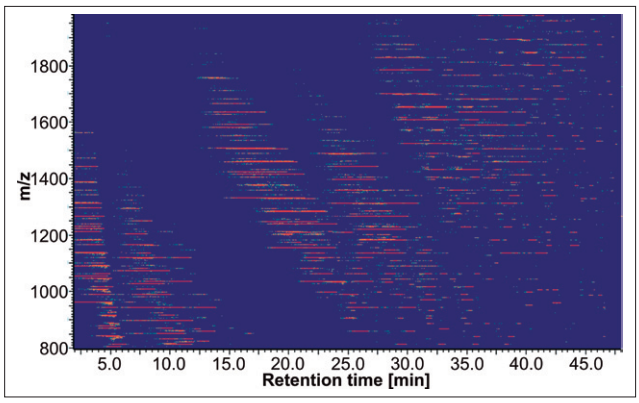

Figure 2. Contour plot of the LC-ESI-TOF-MS analysis of a castor oil ethoxylate with post-column addition of triethylamine. A. Nasioudis, AkzoNobel Research, Development & Innovation, Deventer, The Netherlands, unpublished work (2011).

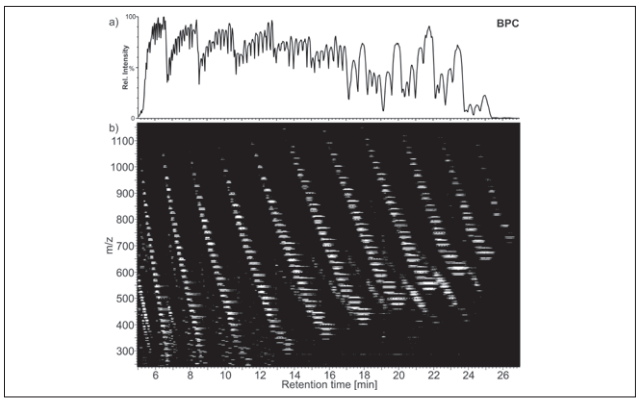

Figure 3. LC-ESI-TOF-MS analysis of a fatty alcohol block-copolymer: a) the base peak chromatogram; b) the contour plot. A. Nasioudis, *Energy and Charge Control in Mass Spectrometry of Synthetic Polymers*. PhD Thesis, University of Utrecht (June 2011).

As you would expect from the author of this column, my interests very much lie in the realms of the analysis of complex spectroscopic data sets and I am very pleased that we have a project starting up to look at just such multi-dimensional analyses with a consortium of industrial partners and the renowned teams of Professor Dr Lutgarde Buydens at Radboud University of Nijmegen, Institute for Molecules and Materials, and Professor Dr Edwin van den Heuvel in the Department of Epidemiology of the University Medical Centre, Groningen. Amusingly the project runs under the acronym ALBERT—Analysis of Large data sets By Enhanced Robust Techniques (after St Albert the Great—Albertus Magnus—Patron Saint of Science).

Human capital

From the outset it was a clear goal of the COAST programme to increase the available human resources with desirable skill sets in analytical science. Not only is this being carried out through the usual PhD placements tied up with the R&D project funding opportunities, but also through an Analytical Science Talent Programme for undergraduates at HLO level (Higher Laboratory Education) during the last three years of their studies at eight different universities of applied sciences. There are currently 35 candidates on this programme, and an additional 25–30 will be recruited in 2013. The programme includes taught sessions by popular university professors with experienced industrial practitioners, as well as paid placements in industry. In total the candidates will be expected to undertake five weeks of summer courses, 27 days of Saturday education and some 3000 hours of placement work with industrial partner companies over the three years of the programme.

Additionally, the MSc+ programme has been put in place at three universities to provide added value for MSc level students. It started in 2012 with the first five students, and in 2013 an additional 10 will be selected to join the programme. Students will be expected to attend additional courses and Saturday lectures targeting more detailed education in areas such as spectroscopy, solids and surface analysis techniques, advanced separation science, microscopy and imaging, as well as their applications.

Finally, COAST has also brought together the materials generated as part of the other Human Capital programmes and offers them as Life Long Learning (L3) paid education opportunities for employees in COAST partner companies or others who wish to broaden their horizons, sharpen their skills or just keep up-to-date with the latest developments in their particular areas of interest.

Infrastructure programme

The third leg of the COAST initiative looks to make advanced, high-quality instrumentation available where it would otherwise be problematic to gain access. This sharing will not only ensure that the investment made by COAST participants in advanced analytical instrumentation can see better utilisation rates than are currently possibly the case, but that, as a useful by-product of this collaboration, the pool of highly skilled experienced potential employment candidates is also increased.

As we have discussed in the past the more advanced hyphenated analytical techniques also present additional problems when it comes to the exponential growth in the amount of data they can produce and the associated difficulties found in efficiently and accurately processing such data. The COAST project has recognised that there would be little point in making the advanced instrumentation available to a wider user base if there was no equivalent support for analysing and processing the data. So under the Infrastructure programme, not only is access to advanced instrumentation available but also support for multivariate statistical analyses and the associated data storage and computational power.

Conclusions

All in all I was very pleased to find such an innovative and strategically important initiative being kicked off and followed through at such difficult financial times for funding bodies and industrial companies alike. I hope to be able to follow the outputs of the portfolio of projects and initiatives during the coming years and will report interesting developments as they occur in the coming years.