Looking at life through a magnifying glass

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Looking at Life through a Magnifying Glass: Analytical Chemistry in the Life Sciences

Research and development of sensitive and selective analytical techniques are pivotal in a highly developed society, as they allow the description of complex systems in concrete and reliable terms. The development of such techniques combined with novel methods of data analysis is the focus of Analytical Chemistry. Such methods are being applied to a wide range of problems of relevance in medicine, biology and chemistry.

Life Sciences is a recently introduced term that covers biology, chemistry and medicine with special emphasis on interdisciplinary research and teaching. Working in the area of Analytical Chemistry with a focus on Life Sciences means to develop methods that permit measurements that help to describe living organisms all the way from microorganisms to human beings. No doubt life will never be described by simply measuring entities such as the blood sugar concentration or the amount of a given vitamin in serum. One may even say that it is presumptuous to mention Life in connection with our limited possibilities to describe it in analytical terms. It is therefore not the purpose of this oratie to convince you that Analytical Chemistry is here to understand Life in its entirety but to present some of the astounding new possibilities that analytical methods offer in describing living systems in so far unprecedented detail.

The newly founded research group Analysis of Biomacromolecules has put its focus on developing analytical methods to profile proteins and peptides. This work is done both in the perspective of developing novel ways of diagnosing disease early on as well as in trying to understand biological mechanisms in more detail. It is thus evident that all of our projects are collaborations between analytical chemists, biologists and medical scientists. For example, the early diagnosis of cervical cancer, a disease that causes some 4000 deaths per year in The Netherlands alone, is presently based on so-called Pap smears. In order to discover better markers of this disease that would allow earlier intervention with a higher chance of a successful therapy, we have teamed up with the Department of Gynecological Oncology at the University Hospital Groningen (Prof. Dr. Ate van der Zee). Through the meticulous collection of many thousands of serum samples from patients over the last 25 years, this Department has opened possibilities of extensive comparisons between patients. By comparing protein profiles and hopefully discovering significant differences in the profiles we expect to discover markers that correlate with disease progression and therapy. These markers will be further evaluated in prospective studies for their predictive value. Such an enterprise cannot be successful without advanced data analysis and handling capabilities, which we develop in collaboration with Bioinformatics groups both in Groningen and elsewhere.

Other examples of our work, which is still in its beginnings, could be mentioned. In the interest of space, I want to refer the reader to our website for further details [http://www.farm.rug.nl/InterACT/btrs.html]. I would like to conclude by saying that Analytical Chemistry has entered an age where the rapid accumulation of measurable data from living organisms is beginning to provide a framework, where such systems can be described in considerable detail. This will allow studying how such systems react to perturbations and how they maintain homeostasis. In the end, it will also show the many individual differences that make each of us unique. An exciting future lies ahead for both Analytical Chemistry and Life Sciences.