Research Article

SURFACE and INTERFACE ANALYSIS

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The early days of ECASIA[†]

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The reasons for the foundation of ECASIA lay far back in the late 50s and 60s of the last century, when material analysis was identical with bulk analysis. With the appearance of surface analytical techniques such as SIMS and AES, the importance of surface *analysis* became evident. Unfortunately, analysis at that time was considered as inferior to fundamental studies. The infrastructure of analytical laboratories, worldwide, was poor, compared with today's abundant facilities. To cope with all these difficulties, cooperation of all those involved in the application of surface techniques to practical problems was considered inevitable. This resulted in the establishment of the concept of ECASIA in 1982 followed by the first ECASIA conference in 1985.

Keywords: bulk analysis; surface analysis; surface science; applied surface science; history of ECASIA

Introduction

The past is history; the future is a mystery; the present is a gift. I shall talk about the past, the early days of ECASIA. In order to understand what led us to establish the ECASIA conferences, we must go back to the late 50s and early 60s of the previous century.

Bulk Analysis *Versus* Surface Analysis

There was nothing in solid state analysis ('Analytica land') regarding *surface* analysis in the late 50s and early 60s of the previous century. Technological and practical problems were solved by the application of typical bulk techniques such as wet chemical analysis, optical emission spectrometry (OES), XRF and Spark source mass spectrometry (a semi-bulk analysis method). At that time, people were not aware of the potentialities of surface analysis. For example: High-voltage tubes (*tubes: a term used in the past to designate an electronic device, the predecessor of transistors, consisting of an evacuated glass tube, several centimetres in diameter, containing the necessary electrodes*) from one batch (B) gave bad performance, tubes from another batch (G) gave good performance. An OES analysis gave the same Fe content ($\approx$95% concentration in the bulk) in both cases. A SIMS analysis (later confirmed by XRF) showed that Fe was (i) present with a (surface) concentration of about 50% in the bad samples (B) and (ii) 'not present', i.e. below the limit of detection in the good (G) samples. (The Ni content found with SIMS and OES was the same for the good and bad samples.)

Since OES was an established method and SIMS was relatively new, the OES experts (*An expert is a person who has fallen into all the traps of his field; A beginner is a person who has made no mistake . . .yet.*) did not call in question that their result was the right one. Today every beginner will immediately say that both results are correct, but OES gives the bulk concentration, whereas SIMS gives the surface (near) concentration.

I was told by the high-voltage tube experts that the high Fe surface concentration was probably responsible for the bad performance of the B-type high-voltage tubes. Our conclusion then was that OES analysis is not a panacea; surface analysis is an equally important technique, if the surface concentration of an element determines the device behaviour.

Regarding beginner in the field: when I had started my work at the Philips Research Lab in 1958, I was asked to evaluate the use of Spark Source Mass Spectrometry for trace analysis in solids. A colleague of mine, A. W. Witmer, an old fox in the field of OES, and myself went to Manchester to test the Spark Source Mass Spectrometer MS7, made by MetroVickers (later AEI). There, we were given a test sample to check the performance of this instrument. As I was an enthusiastic beginner, I soon had found that the sample contained nearly all the rare earth elements in small concentrations. When I showed this result to my friend Witmer, he only laughed and said: 'they would never put so many rare earth elements in just a test sample; that is much too expensive!!'

Application Oriented Research *Versus* Fundamental Research

Analysis performed in the industrial laboratories was mainly focussed onto the application of surface (sensitive) techniques to solve practical/technological problems; today this is termed material science or applied surface science. Work at the universities/government labs was focussed on fundamental studies, necessary for a better understanding of the processes taking place during instrumental analysis; this kind of work was termed surface science. Unfortunately, some of these scientists considered application oriented analyses as inferior to their fundamental studies.

Instrumentation

Some of the techniques, e.g. SIMS, were in development (1958); others like Auger spectrometry had just come into appearance (1968); ion scattering was not in use yet.

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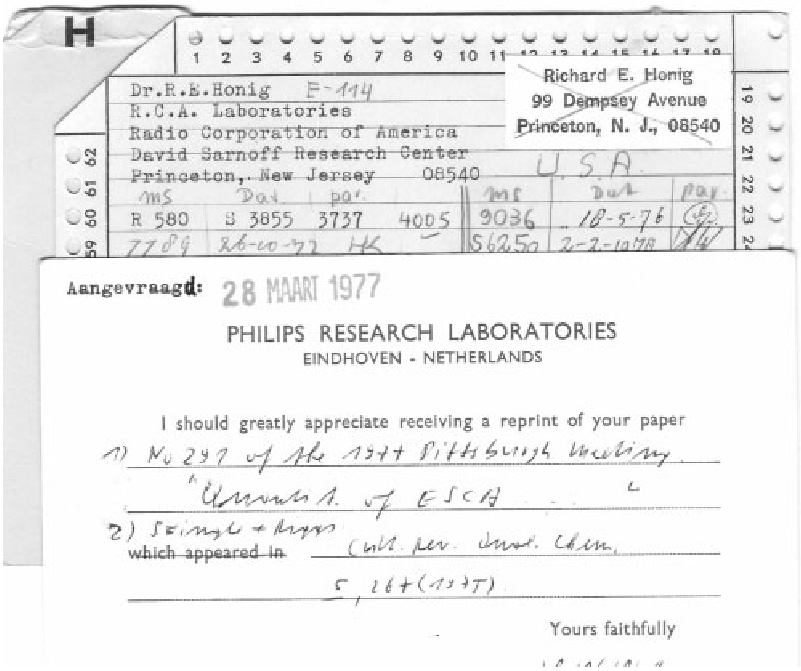

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I should greatly appreciate receiving a reprint of your paper
1) No 297 of the 1977 Pittsburgh Meeting
"Quantit. A. of ESCA"
2) Swingle + Huggins
~~which appeared in~~ Crit. Rev. Anal. Chem.
5, 267 (1975)

Yours faithfully

Figure 1. Database, from 1960, for communicating with other scientists.

This meant that lots of instrument development had yet to be done.

Besides this lack of adequate instruments, the infrastructure in the 60s and further on was not yet at a stage which we take for granted today: there was no internet, no database for literature search, no Xerox copying machine, etc. For an interesting article you had to make an excerpt by hand or write to the author, and ask for a reprint of the article, which in general you would receive after 2–3 weeks by surface or *air* mail (not *e*-mail) (Fig. 1).

There was no PC or MAC; intercontinental travelling was restricted; outgoing phone calls had to be booked through the operator (there were no mobile phones yet). So communication with other applied surface scientists was bound to hard-copy, PTT (Post, Telephone and Telegraph Company providing Surface Mail service) correspondence and so on.

Establishment of ECASIA

These difficulties were encountered by all those who applied surface techniques to solve technological problems. It was thought that cooperation, i.e. exchange of experience and ideas on a regular basis, might be helpful to accelerate the necessary developments (Fig. 2).

National working groups were already active: the UK-ESCA Users group and the working Group SCADEG [Structure and Chemical Analysis van Dunne lagen (Thin Films) en (and) Grensvlakken (Interfaces] in the Netherlands. In 1982, the structure for such a cooperation was established by the SCADEG members: W. van Ooij, A. P. von Rosenstiel and H. W. Werner and the UK-ESCAUG members: D. Briggs, J. E. Castle, J. C. Riviere and M. P. Seah.

This structure (ECASIA) was meant as a European-based series of Conferences for Applications of Surface and Interface Analysis to stimulate exchange of experience and ideas between applied surface scientists. It should emphasise the importance of applications of surface techniques to technological problems and at the same time it should

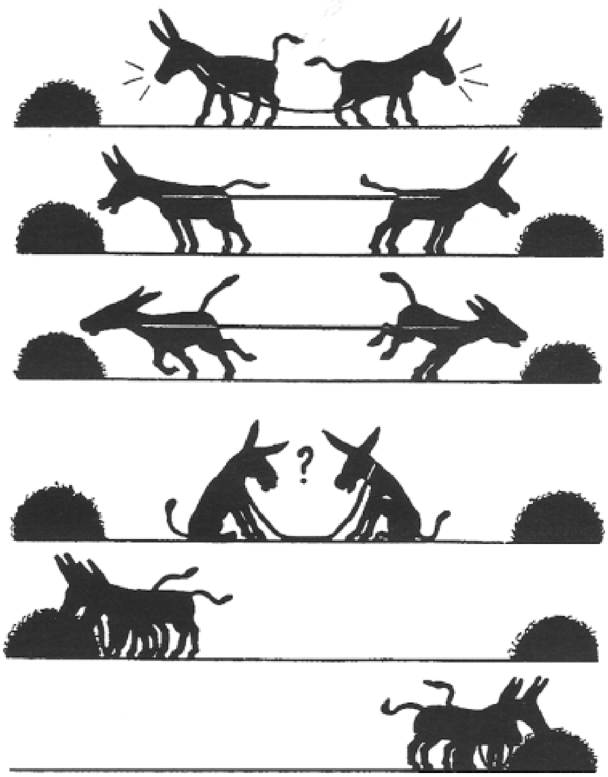

Figure 2. Cooperation pays, not only among mules.

(a) bring together people from universities/government labs, industrial labs and from instrument suppliers;

(b) promote cooperation between application oriented scientists and scientists who study fundamental phenomena;
(c) stimulate closer contact between users and instrument suppliers.

The conferences should be on a broad, European base, with extension later on to worldwide contacts and contributions. This concept has proven to be most valuable and has made ECASIA (www.ecasia.org) conferences an internationally respected forum for Surface and Interface analysis.

Conclusion

I have described so far the early days of ECASIA; the present state of ECASIA and its future developments will be covered by the other authors of this session.

Acknowledgement

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