



# ITE / ΕΙΧΗΜΥΘ

## ΤΕΧΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΕΧΝΙΚΟ ΣΕΜΙΝΑΡΙΟ

**ΟΜΙΛΗΤΗΣ:** Dr. Γεράσιμος Δανηλάτος  
ESEM Research, Sydney - Australia

**ΘΕΜΑ:** Σύντομο ιστορικό και αρχές του ESEM\*

**ΤΟΠΟΣ:** Αίθουσα Σεμιναρίων ITE/ΕΙΧΗΜΥΘ

**ΗΜΕΡΟΜΗΝΙΑ:** Τετάρτη, 21 Οκτωβρίου 2009

**ΩΡΑ:** 12:00

### ΠΕΡΙΛΗΨΗ:

Καθώς τα ηλεκτρονικά μικροσκόπια βασικά λειτουργούν σε συνθήκες κενού, από ενωρίς έγιναν προσπάθειες να επιτευχθεί η εξέταση αντικειμένων ακόμη και μέσα σε περιβάλλον αερίου. Αυτό έγινε με «περιβαλλοντικά κύτταρα» ή κάποιες αλλαγές στο μικροσκόπιο, αλλά αυτές οι προσπάθειες έμειναν περιορισμένες σε μεμονωμένα εργαστήρια ηλεκτρονικής μικροσκοπίας. Το πρώτο εμπορικό ηλεκτρονικό μικροσκόπιο σαρώσεως (SEM), το οποίο επέτρεπε την εξέταση αντικειμένων με την παρουσία αερίων σε υψηλή πίεση (ESEM), βασίστηκε σε εργασίες που έγιναν στο Σύδνεϋ Αυστραλίας τις δεκαετίες του 1970 και 1980. Η αμερικάνικη εταιρία ElectroScan διέθεσε στην αγορά τα πρώτα ESEM προς το τέλος του 1980. Την εταιρία αυτή αγόρασε η Philips το 1996, η οποία ενσωμάτωσε στα μικροσκόπια της την τεχνολογία του ESEM. Μετά την εκπνοή των πατέντων του ESEM, η Γερμανοαγγλική εταιρία LEO (τώρα ZEISS-SMT) μπήκε στην αγορά με ένα αντίστοιχο ESEM.

Η τεχνολογία του ESEM βασίζεται σε μέθοδο διαχωρισμού του κενού από την αέριο κατάσταση του θαλάμου αντικειμένου καθώς επίσης στην προσαρμογή και ανακάλυψη καινούργιων ανιχνευτών μικροσκοπίου μέσα σε συνθήκες αερίου. Έτσι το ηλεκτρονικό μικροσκόπιο απελευθερώθηκε από τους περιορισμούς του κενού, στο οποίο το αντικείμενο πρέπει να έχει επιφάνεια καλού αγωγού και να βρίσκεται σε κατάσταση ξηρασίας. Παρακάμπτοντας πολύπλοκους και χρονοβόρους μεθόδους προπαρασκευής, οι φυσικές επιφάνειες αντικειμένων μπορούν πλέον να εξετάζονται σε σύντομο χρονικό διάστημα κάτω από την επίδραση της ηλεκτρονικής δέσμης, κάτι που ανοίγει εντελώς καινούργιες δυνατότητες μελέτης επιφανειών των αντικειμένων.

\* Environmental SEM



# ITE/EIXHMYO

## SHORT BIOGRAPHY

GERASIMOS (Gerry) D. DANILATOS was born on the Greek island of Cephalonia but in 1953 he and his family moved to the city of Patras after the island was devastated by a strong earthquake. There, he finished his primary and secondary schooling. After two years of national service in the army, he studied at the National University of Athens where he received his Physics Degree with honours, in 1972. Gerry migrated to Australia at the end of 1972 and obtained his Ph.D. from the University of New South Wales (UNSW) in 1977. His thesis entitled "Dynamic Mechanical Properties of Keratin Fibres" involved research into the viscoelastic/molecular properties of wool fibres. He married in 1979 and has two children.

Dr. Danilatos is best known for his pioneering work on the environmental scanning electron microscope (ESEM). The establishment of ESEM did not occur overnight and without trouble. It was the tenacity and absolute conviction by Dr. Danilatos in his technology that kept him going for a long time despite meagre support and numerous obstacles he had to face during the critical early years of development. He indeed achieved an extraordinary result in an unconventional way. Following an initial investigation at the University of New South Wales (UNSW) at the beginning of 1978 into the prior attempts to introduce gas in electron microscopes, he was supported by an external Australian Wool Corporation (AWC) grant to apply his work to wool fibre research that allowed him at the same time to develop his microscopical techniques. Not quite understood and supported by his peers in that early phase, in 1983 he had to transfer his entire laboratory to the Commonwealth Scientific and Industrial Research Organization (CSIRO) as a senior research scientist. There, he could further work on his ESEM undisturbed while applying it to wool research under the continued support by AWC until 1986. By that time the ESEM had reached a high level of development that appeared to fall outside the programs of work in his Organization. Luckily, by that critical time, ElectroScan Corporation in USA was just formed for the purpose of manufacturing a gaseous microscope and Dr. Danilatos's publications professed exactly what the manufacturer needed. CSIRO promptly agreed to surrender the old ESEM prototype and his entire laboratory was transferred to private premises funded by ElectroScan with Dr. Danilatos as its Chief Scientific Advisor until 1993.



# ITE / EIXHMYO

Danilatos was thus able to completely independently continue his work in his ESEM Research Laboratory in Sydney, while ElectroScan undertook to manufacture the first commercial ESEM under license and assignment of various patents. It has been from this laboratory that some of the most voluminous and best works on ESEM have originated. He has continued to work and produce results until the present day while he endeavours to help manufacturers to produce new generations of commercial ESEMs with new capabilities and attuned to optimum operation. He has developed brand new techniques and methods awaiting their implementation.

Danilatos further worked for a period of time to help LEO (now Zeiss) enter the ESEM market with a new commercial ESEM that allows the use of secondary electron detection and extended specimen chamber pressure.

He received the Ernst Abbe Memorial Award by the New York Microscopical Society in 2003. Selected by Marquis in Who's Who in the World and Who's Who in Science and Engineering.

He now plans to bring his work to its logical conclusion by further research and new publications on ESEM to be used by the scientific and manufacturing communities. His works constitute an introduction and the basis in the understanding and use of ESEM. It is certainly no exaggeration that Dr. Danilatos alone and single-handedly, despite numerous difficulties and obstacles, pioneered, invented and developed this unique ESEM instrument to a point where the rest of the scientific and manufacturing world can further develop, expand, apply, use, benefit and enjoy.