

Reial Academia de Medicina de la Comunitat Valenciana  
18 de Septiembre de 2014

# La Microscopía Electrónica: ¿una Tecnología en decadencia?

Pedro Mestres-Ventura

Univ.-Prof. em. Dr. med. Dr. h. c.

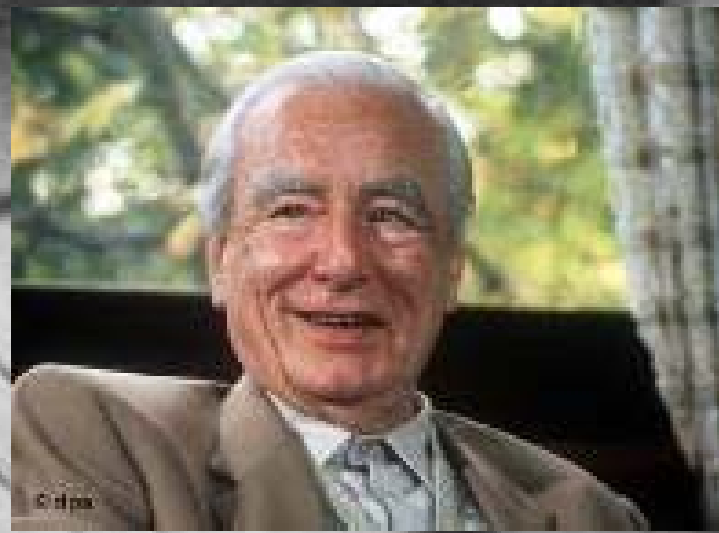
Institut für Anatomie und Zellbiologie

Medizinische Fakultät

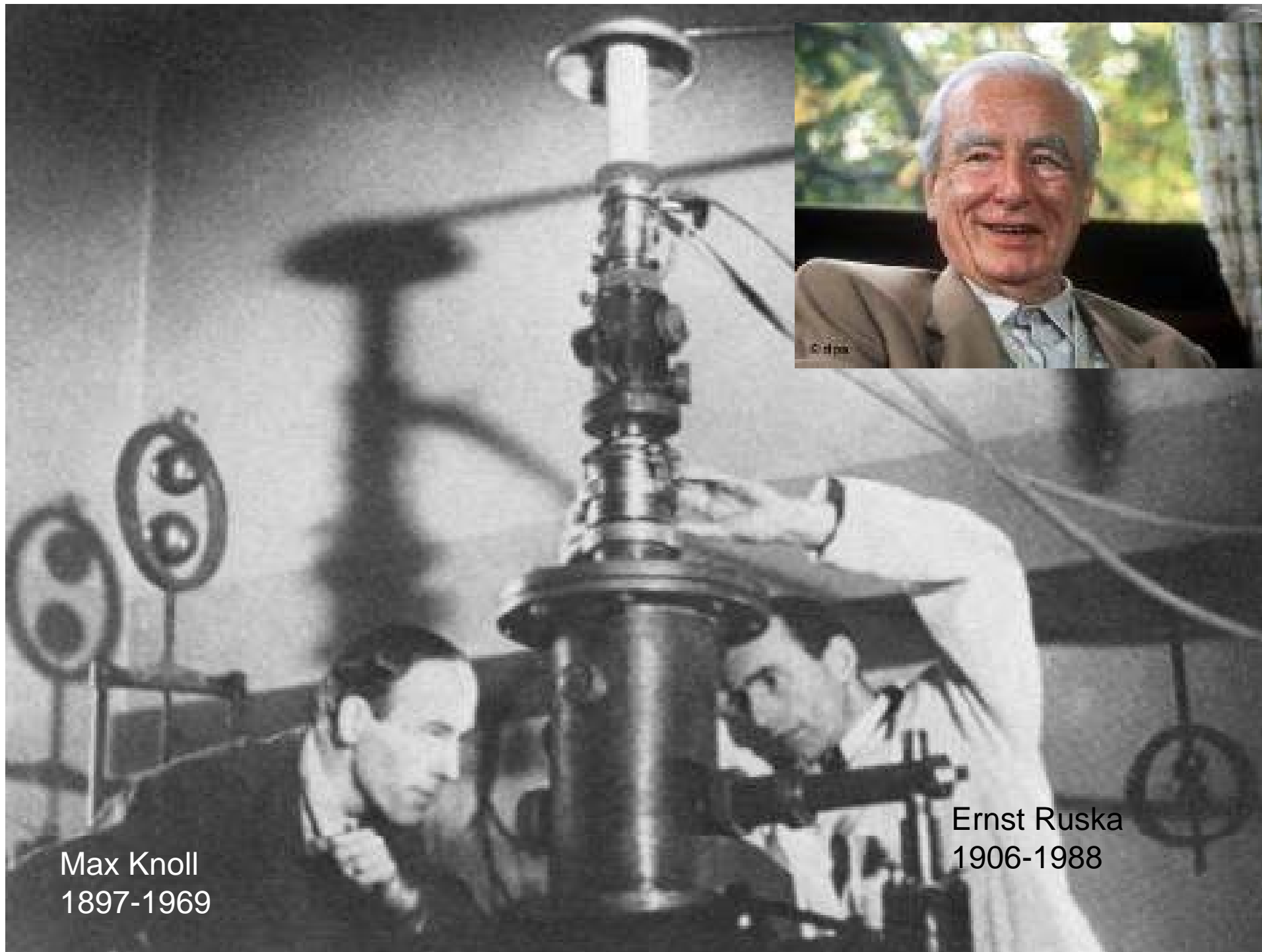
Universität des Saarlandes

Homburg/Saarbrücken

Bundesrepublik Deutschland

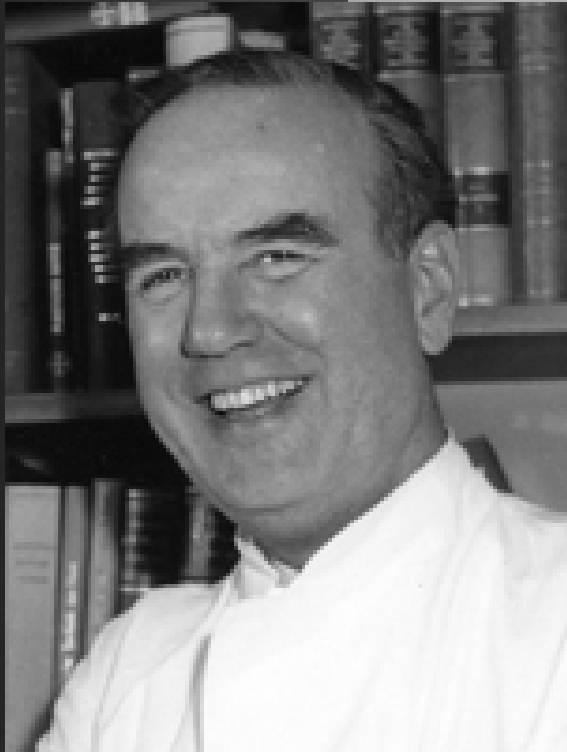


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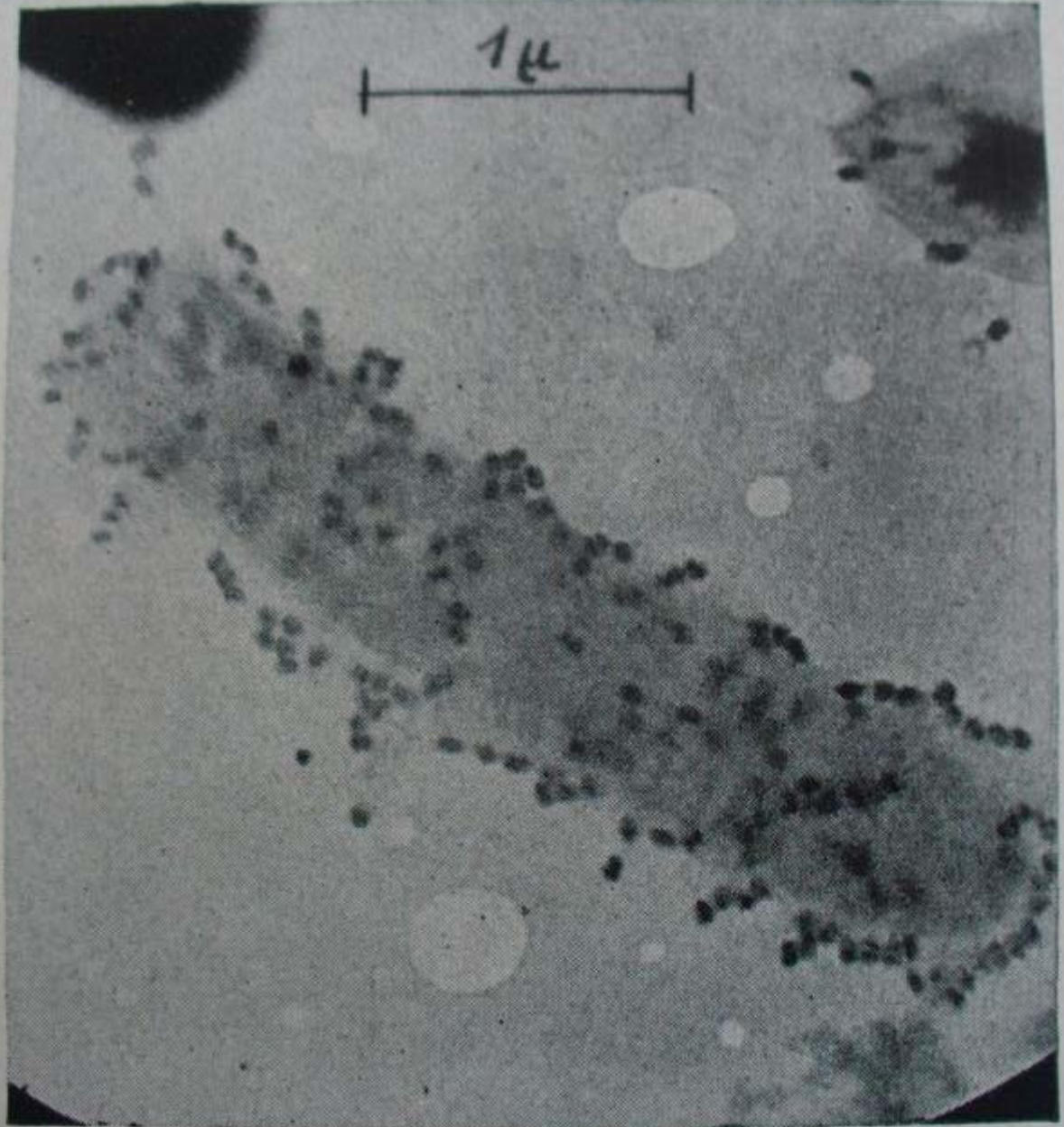


Max Knoll  
1897-1969

Ernst Ruska  
1906-1988

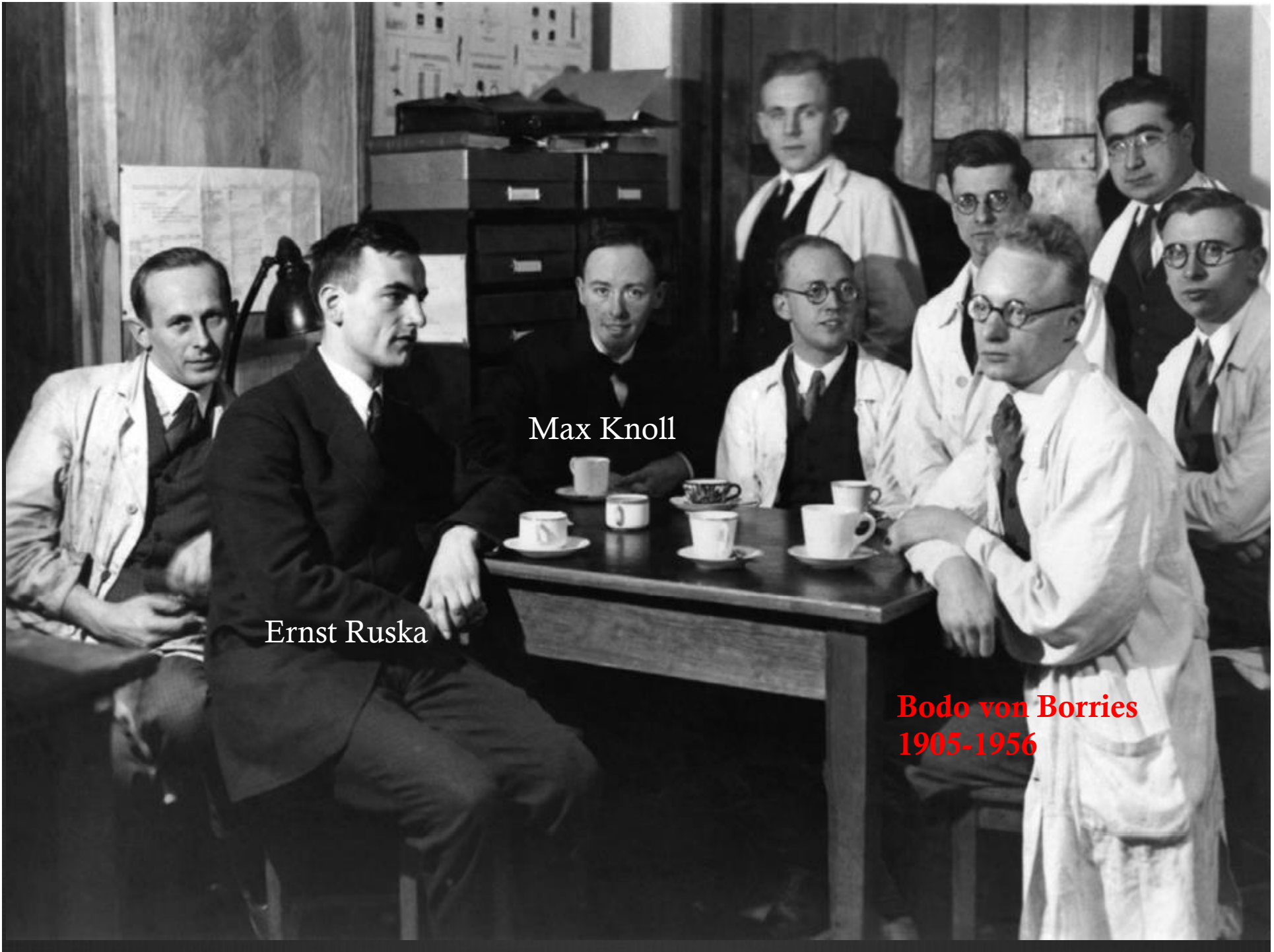


Helmut Ruska  
1908-1973



a)

5725/40



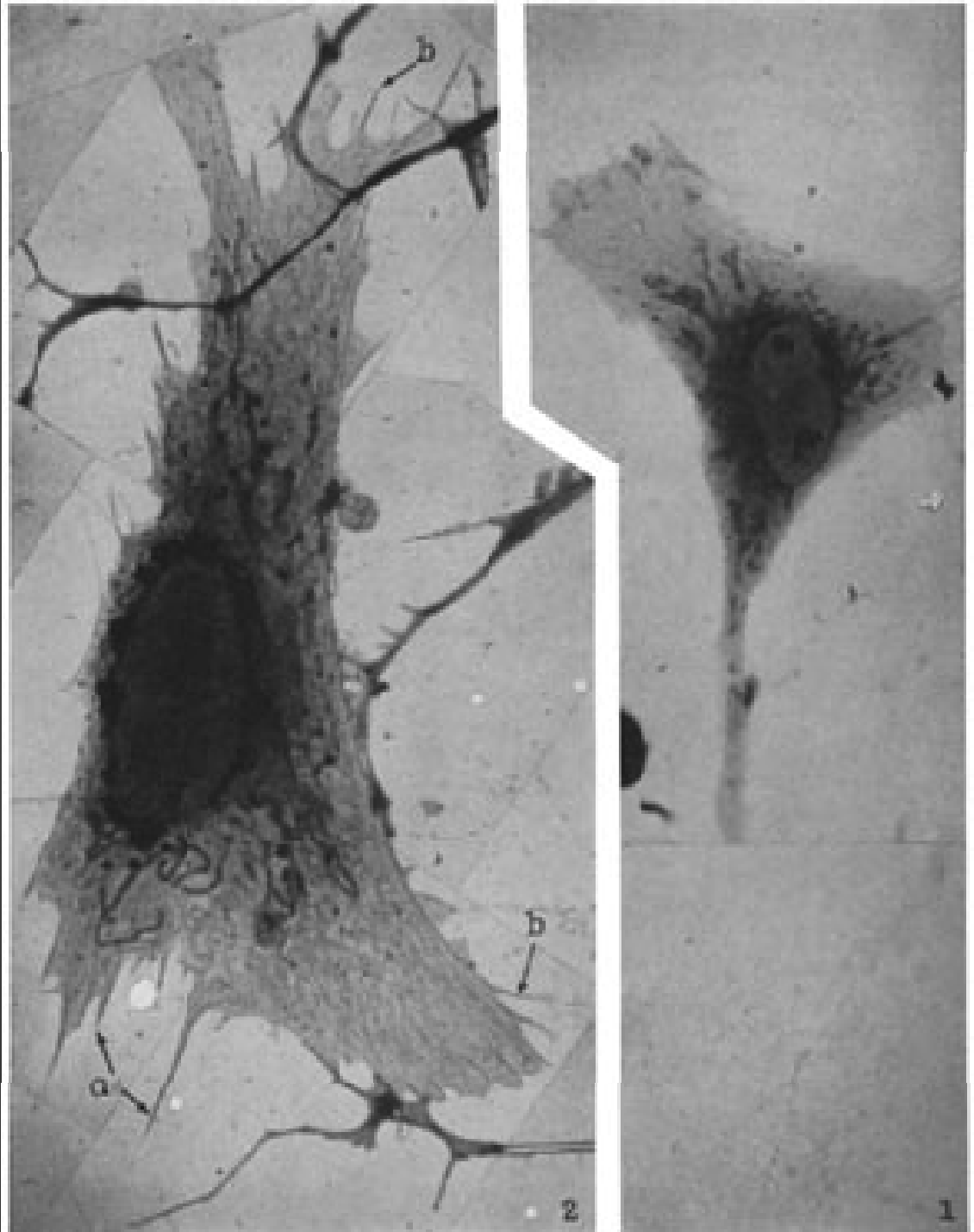
Max Knoll

Ernst Ruska

**Bodo von Borries**  
**1905-1956**



Keith R. Porter  
1912-1997



**DIE  
ÜBERMIKROSKOPIE**

**EINFÜHRUNG,  
UNTERSUCHUNG IHRER GRENZEN  
UND ABRISS IHRER ERGEBNISSE**

**VON  
BODO v. BORRIES**

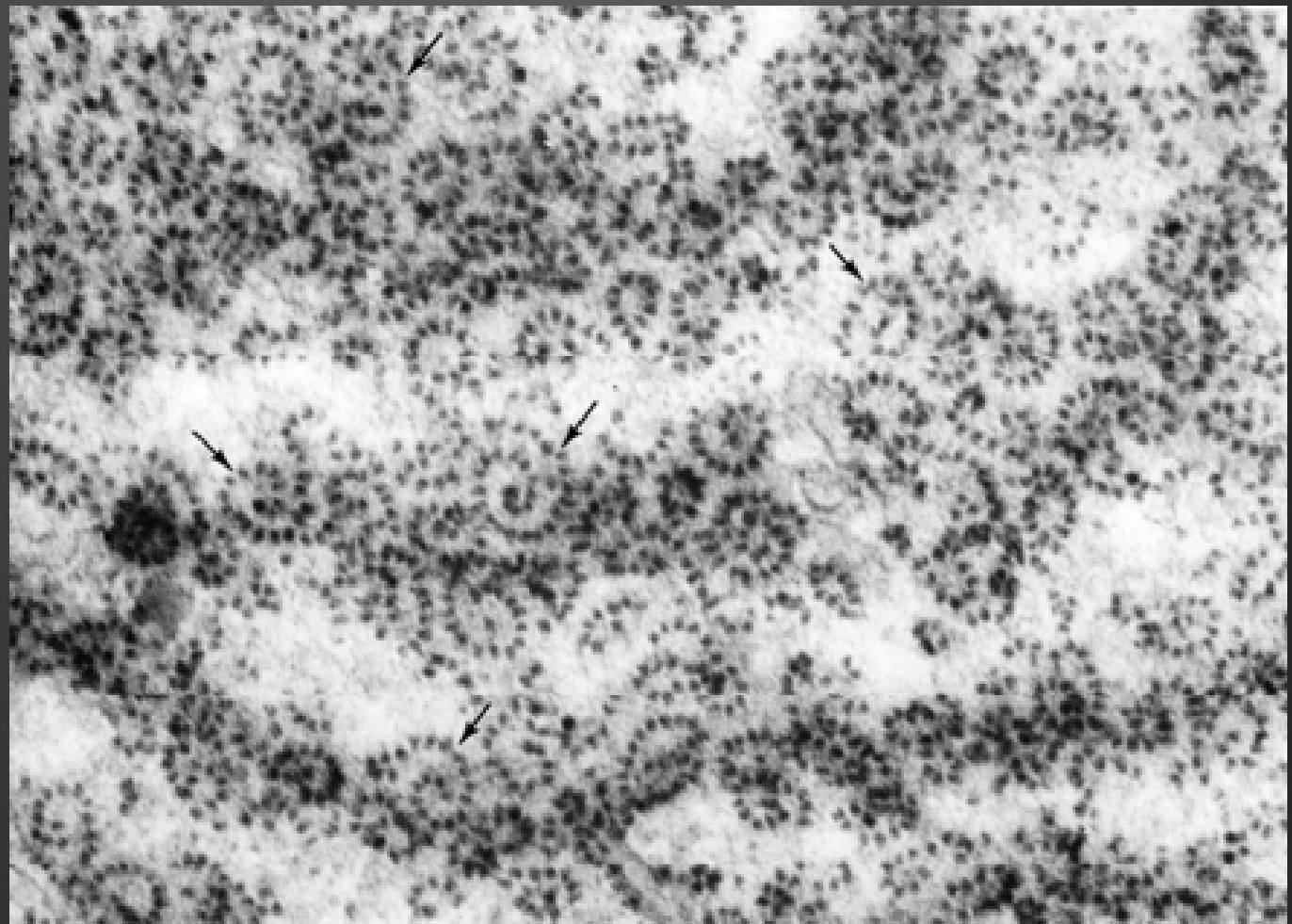


**VERLAG DR. WERNER SAENGER, BERLIN**

1949



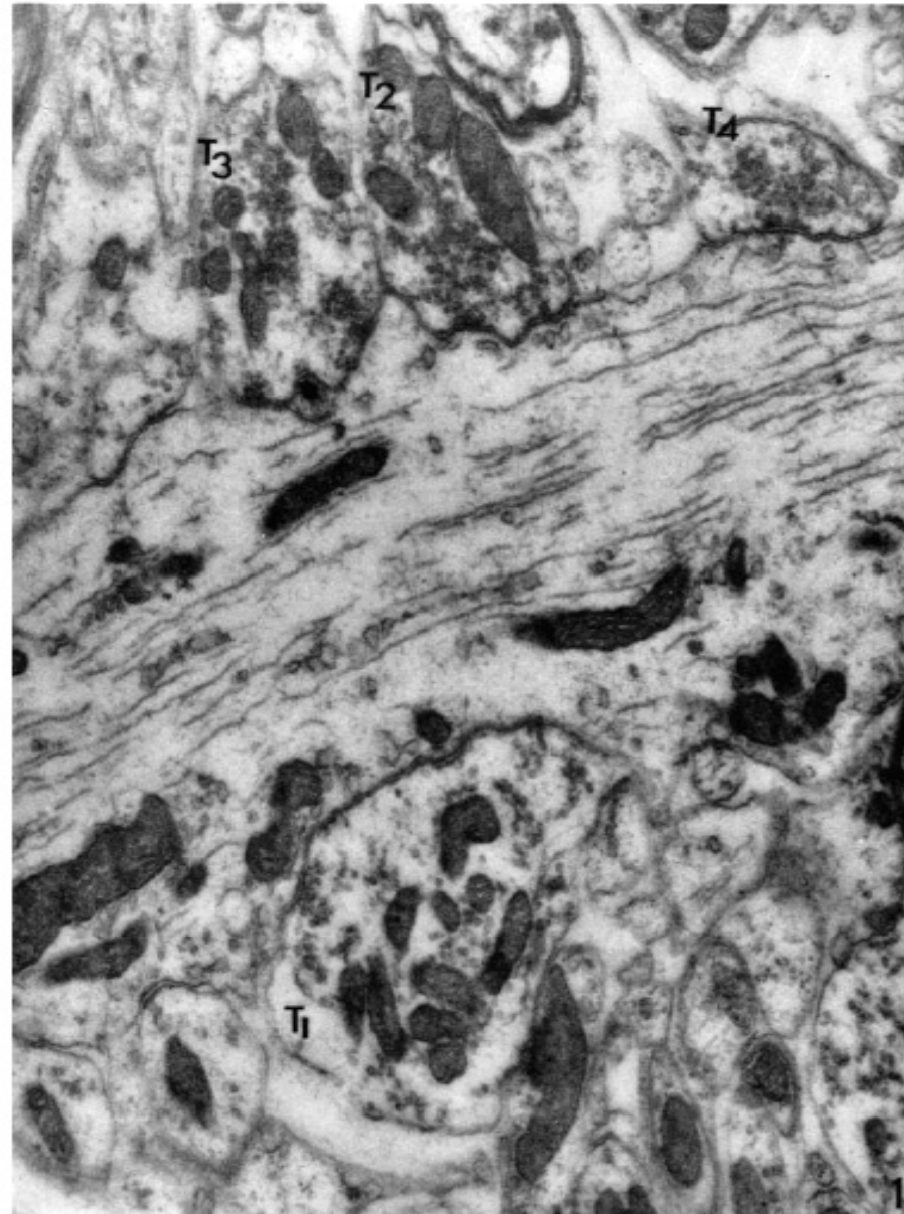
G. E. Palade  
1912-2008



Palade, G.E. 1955. *J. Biophys. Biochem. Cytol.* 1:59-68.

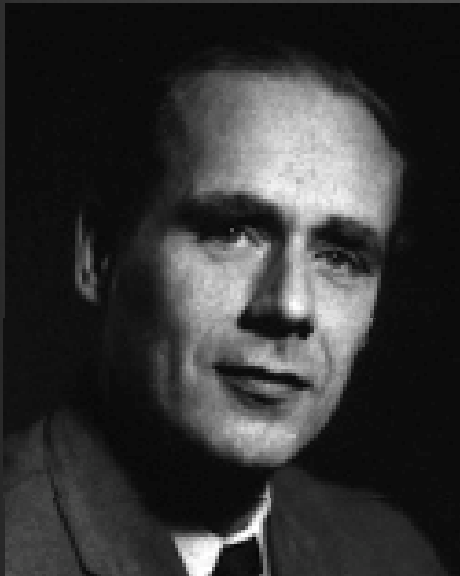


S.L. Palay  
1918-2002

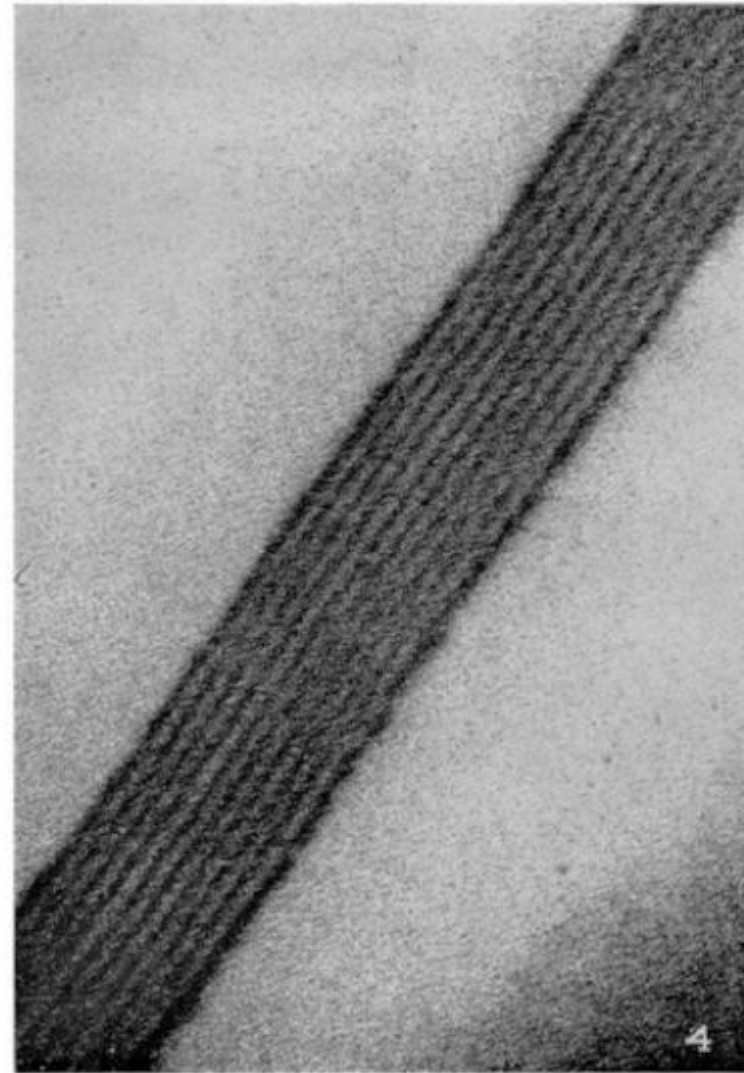


(Palay: Central nervous system synapses)

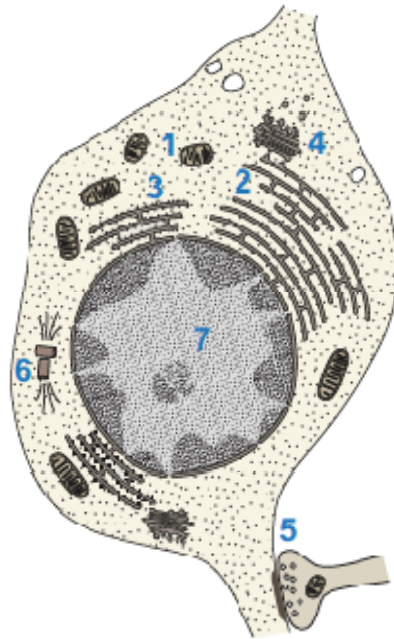




Walther Stoeckenius  
1921-2013



(Stoeckenius: Myelin figures)



- 1 Mitochondria
- 2 Endoplasmic reticulum
- 3 Ribosomes
- 4 Golgi complex
- 5 Chemical synapse
- 6 Centriole
- 7 Chromosomes

Ernst Ruska and Max Knoll build the first **transmission electron microscope**

Helmut Ruska publishes first TEM pictures of **bacteria and viruses**

**M. von Ardenne** the first **scanning electron microscope**

**2** Palade and Porter describe the structure of the **endoplasmic reticulum**

**1** Palade shows the inner membrane configuration of **mitochondria**

Porter et al. publish first TEM images of **whole cultured cells**

**3** George Palade first describes cytoplasmic particles, later named as **ribosomes**

**5** Palade and Palay observe the first **chemical synapses**

Huxley uses TEM to verify the **sliding filament theory** of muscle contraction

**4** Dalton and Felix make first description of **Golgi complex**

**6** Ramhard and De Harven make first description of the mammalian **centriole**

Singer and Schick show the first **immuno labeling** studies using ferritin as an electron dense marker

**7** Ris shows the first images of the animal **chromosome**

White et al. publish reconstruction of the *C. elegans* nervous system – the first **'connectome'**

Adrian et al. show vitrified layers of suspensions containing live viruses can be prepared for **cryo TEM**

Ballerini et al. report the first use of **focussed ion-beam scanning electron microscopy** on biological samples

Frank et al. publish the first **3D structure of the ribosome**

Denk and Horstmann demonstrate the first **automated block-face scanning EM** with sufficient resolution to image all thin cellular processes in nervous tissue

Briggman et al. show correlated light and 3D EM of **entire retinal neurons** in **intact retina** with 2-photon functional  $Ca^{2+}$  imaging and block-face scanning EM.

Zhang et al. use cryo electron tomography to show the 3D structure of the **adenovirus at 3.3 Å resolution**

1930

1940

1950

1960

1970

1980

1990

2000

2010

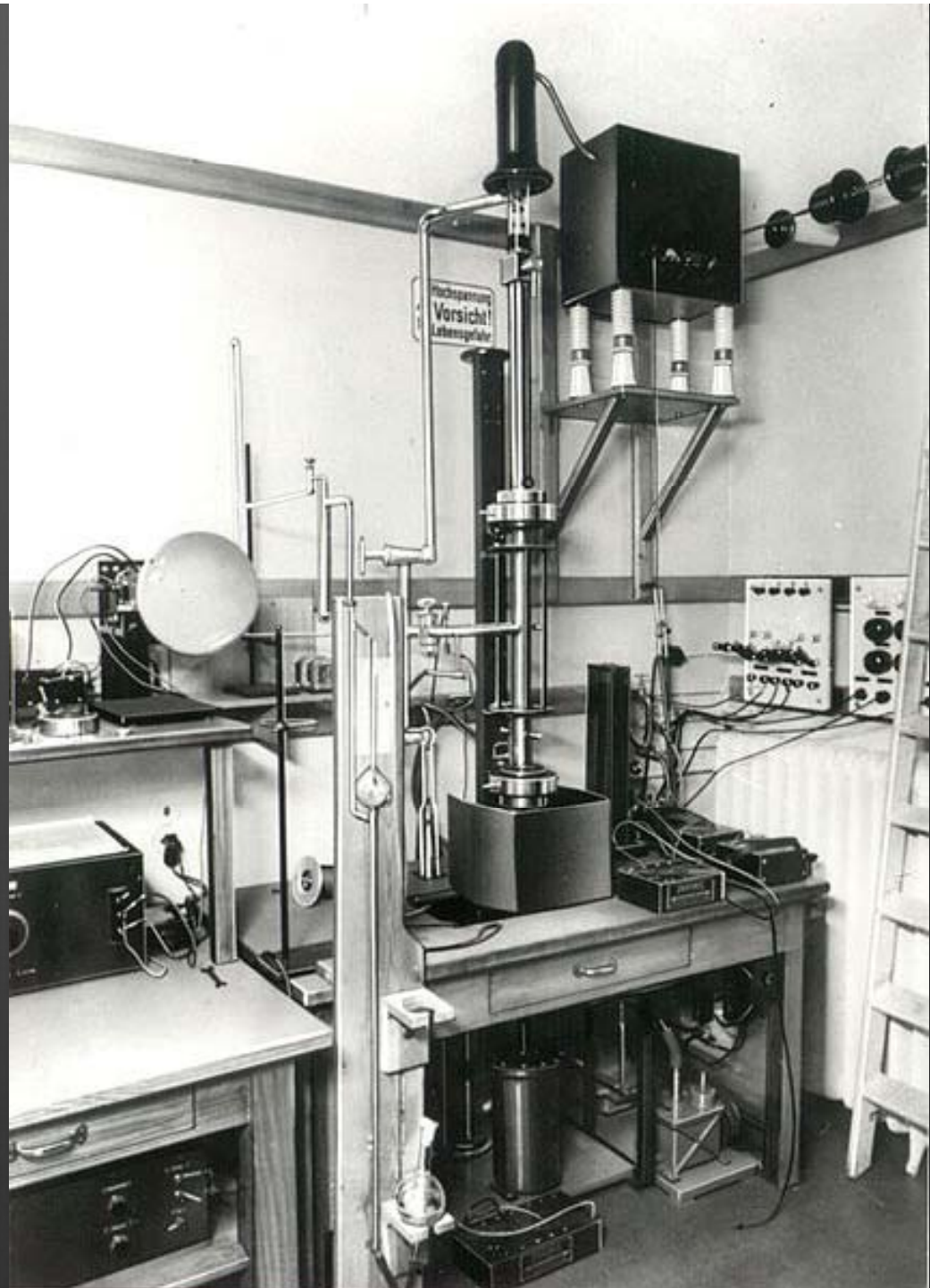
# Das Rasterelektronenmikroskop

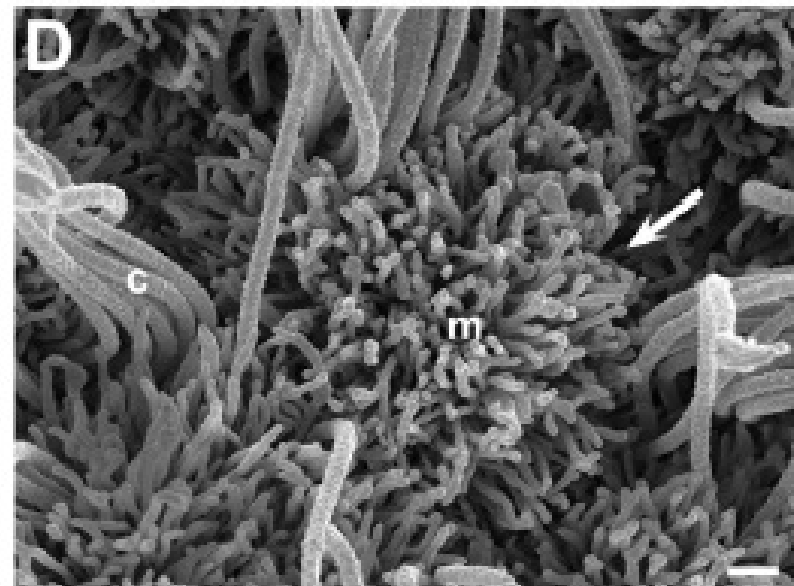
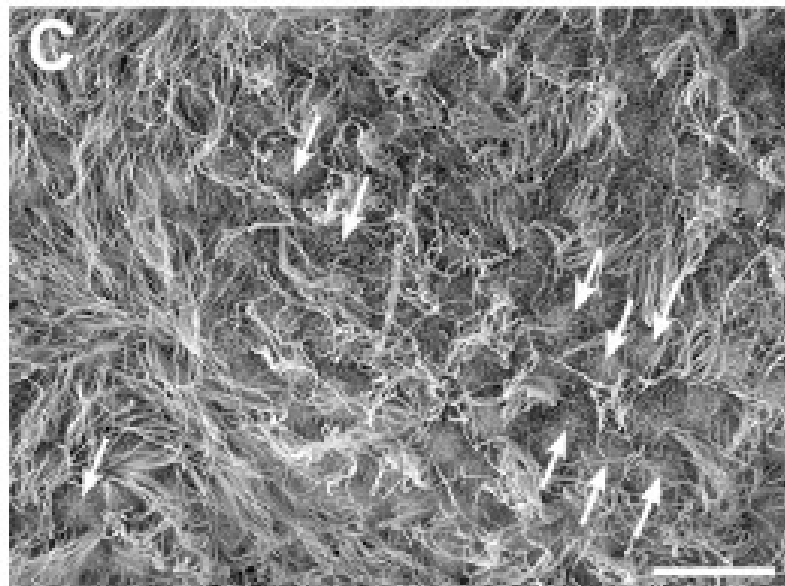
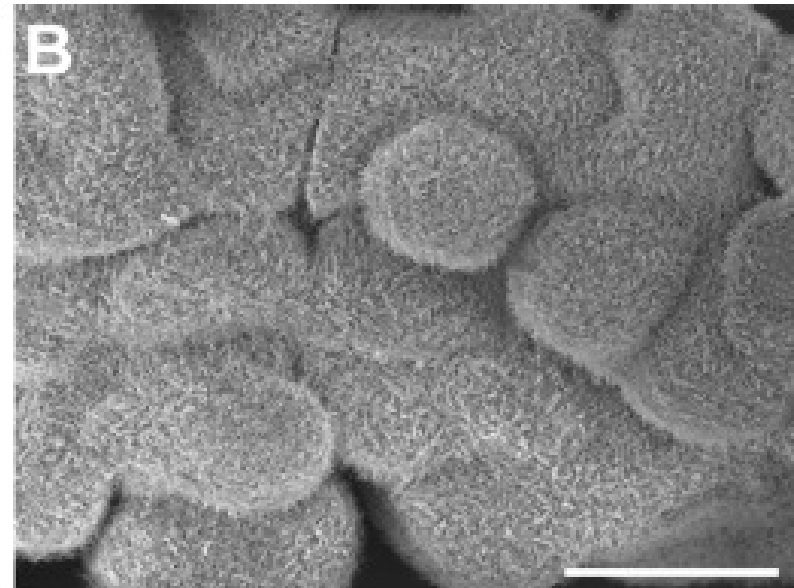
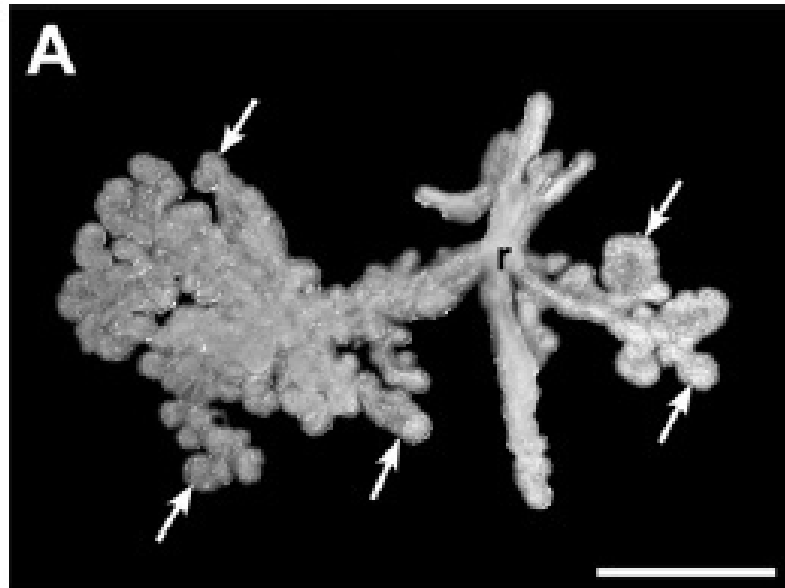
*(the Scanning Electron Microscope)*



Prof. Dr. h. c. Dr. h. c. Manfred von Ardenne

Manfred von Ardenne  
1907-1997





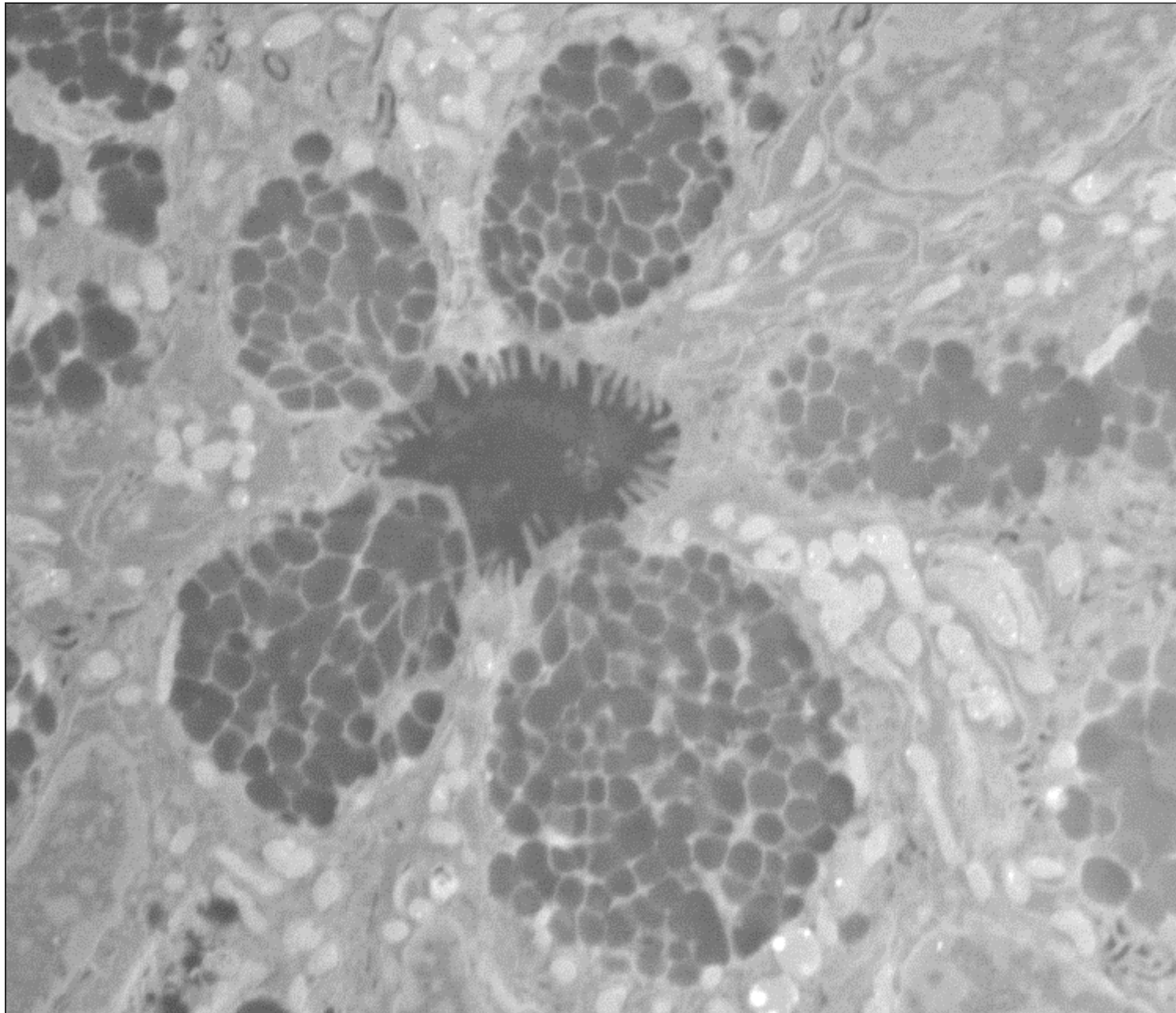


Imagen con  
electrones  
retro-dispersados  
(BSE)

	HV	det	mag	HFW	WD	5 $\mu$ m
	5.00 kV	vCD	16 000 x	18.6 $\mu$ m	5.7 mm	UM. Centro de Apoyo Tecnológico. URJC

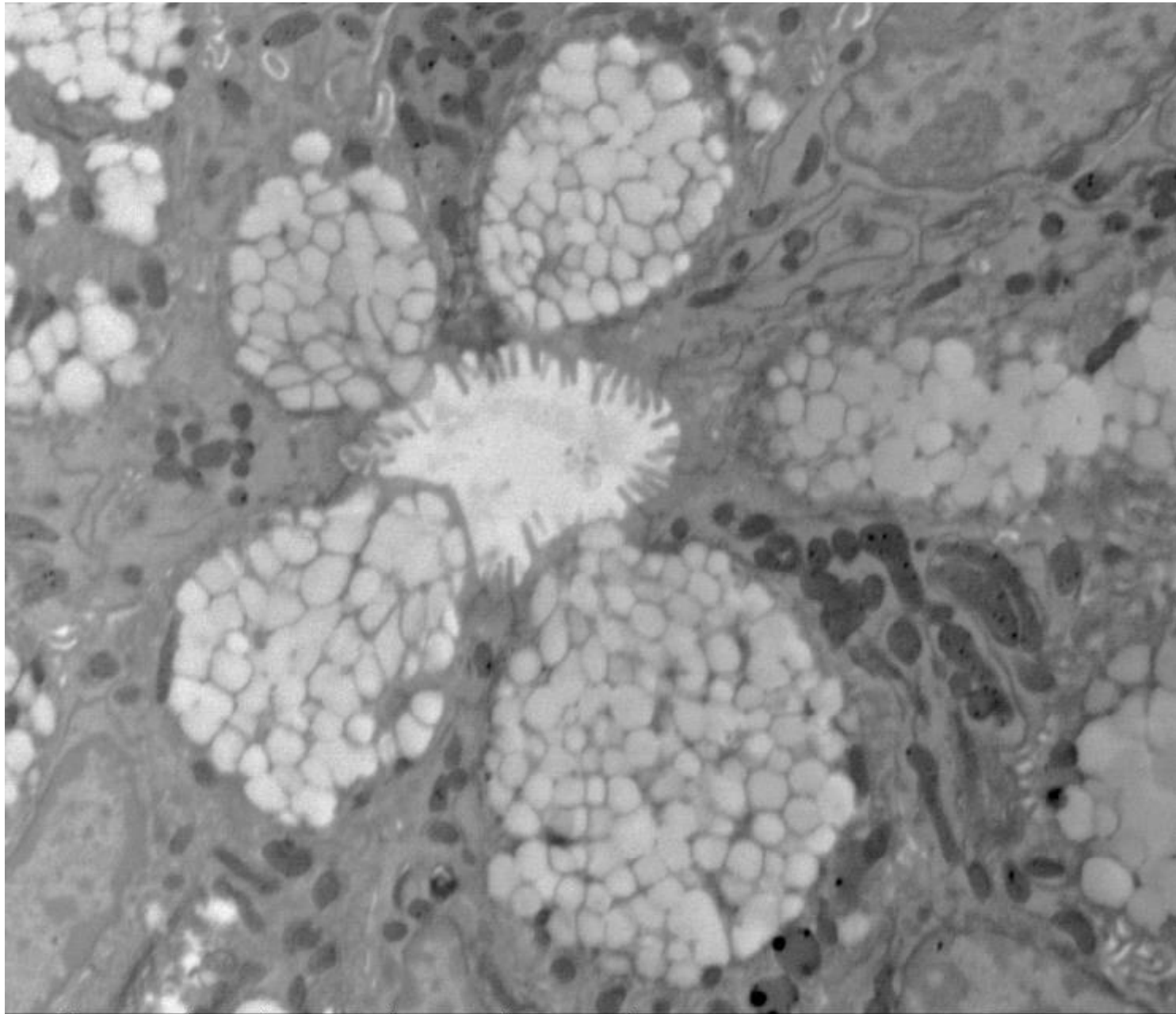
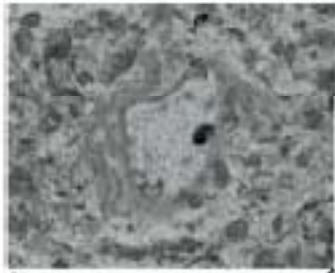
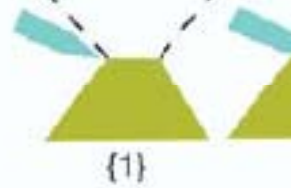
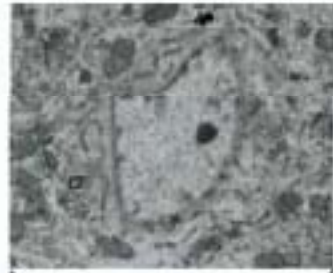


Imagen BSE  
invertida

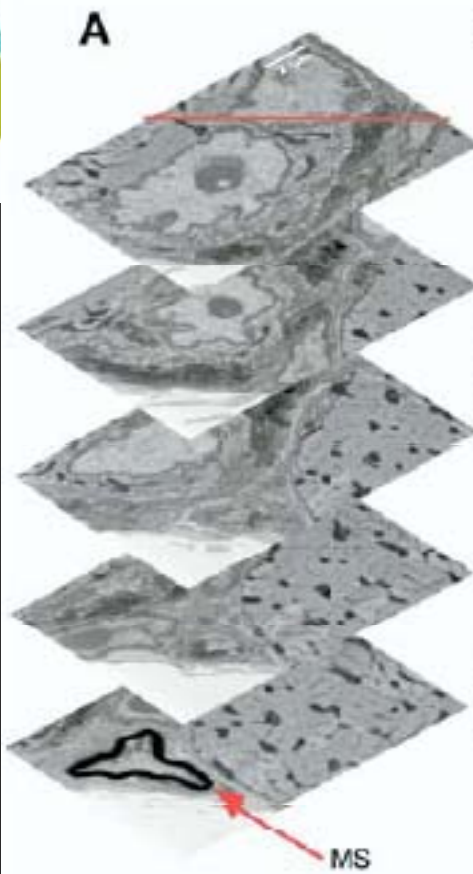
	HV	det	mag	HFW	WD	5 μm	UM. Centro de Apoyo Tecnológico. URJC
	5.00 kV	vCD	16 000 x	18.6 μm	5.7 mm		



**A**

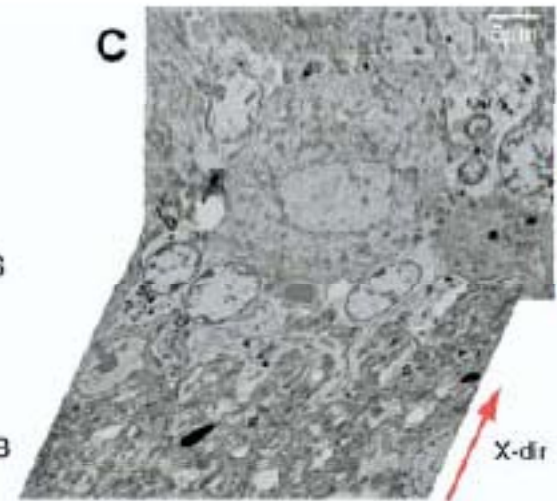
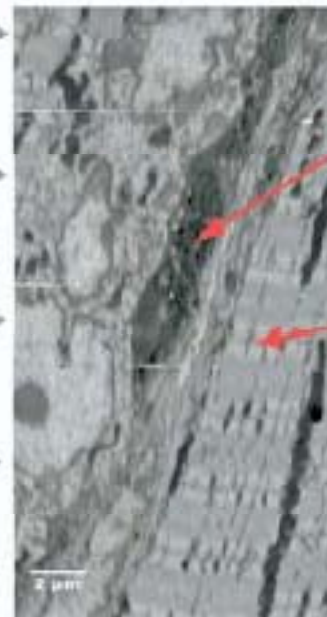


(1)



**A**

**B**



**C**

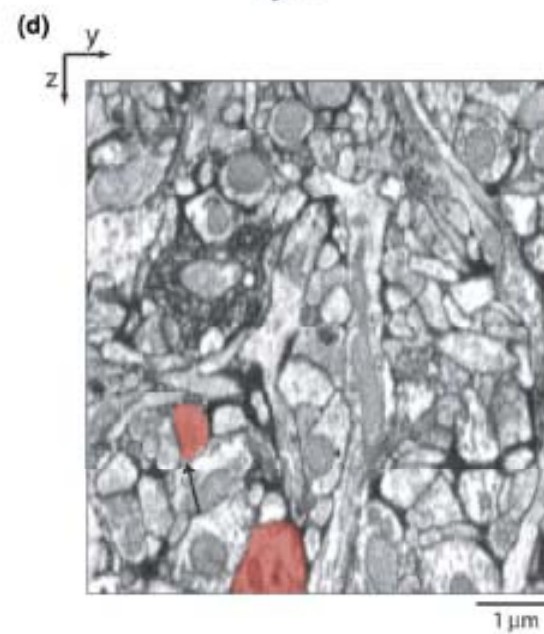
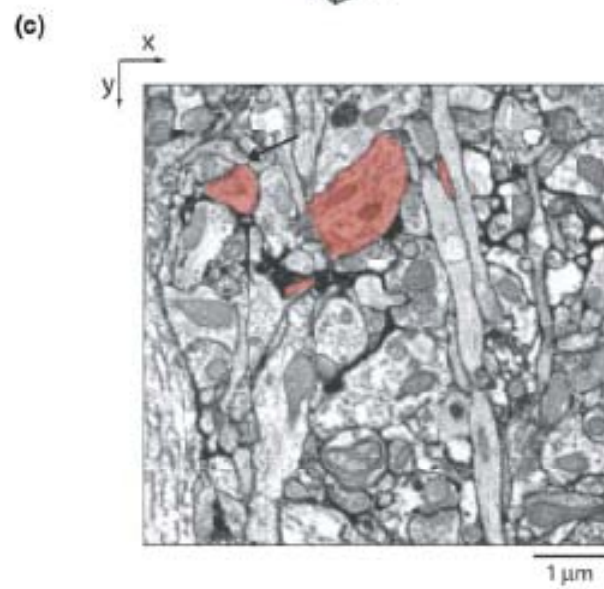
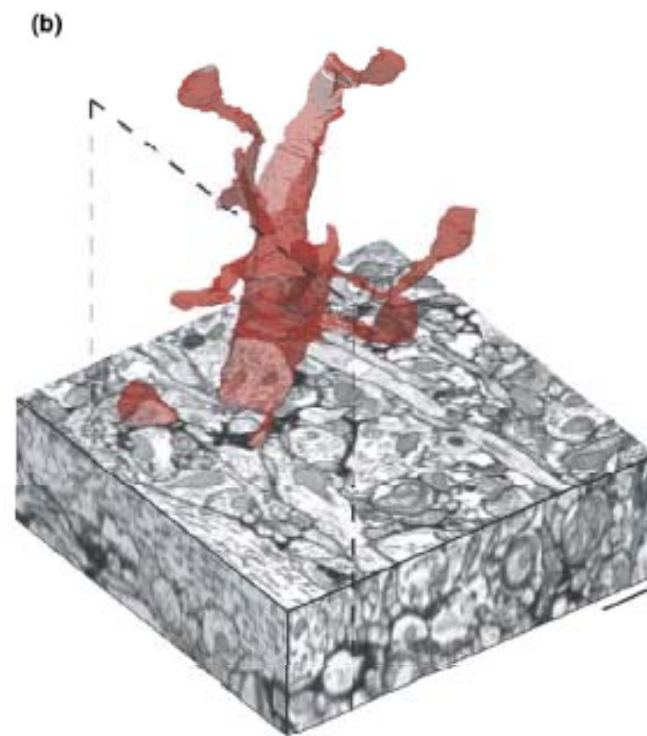
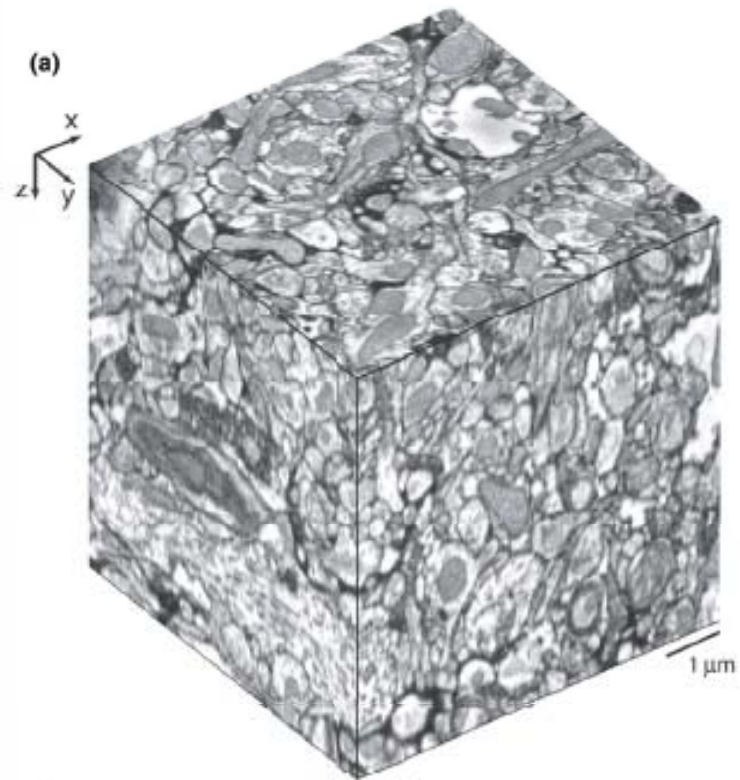
Z-dir

X-dir

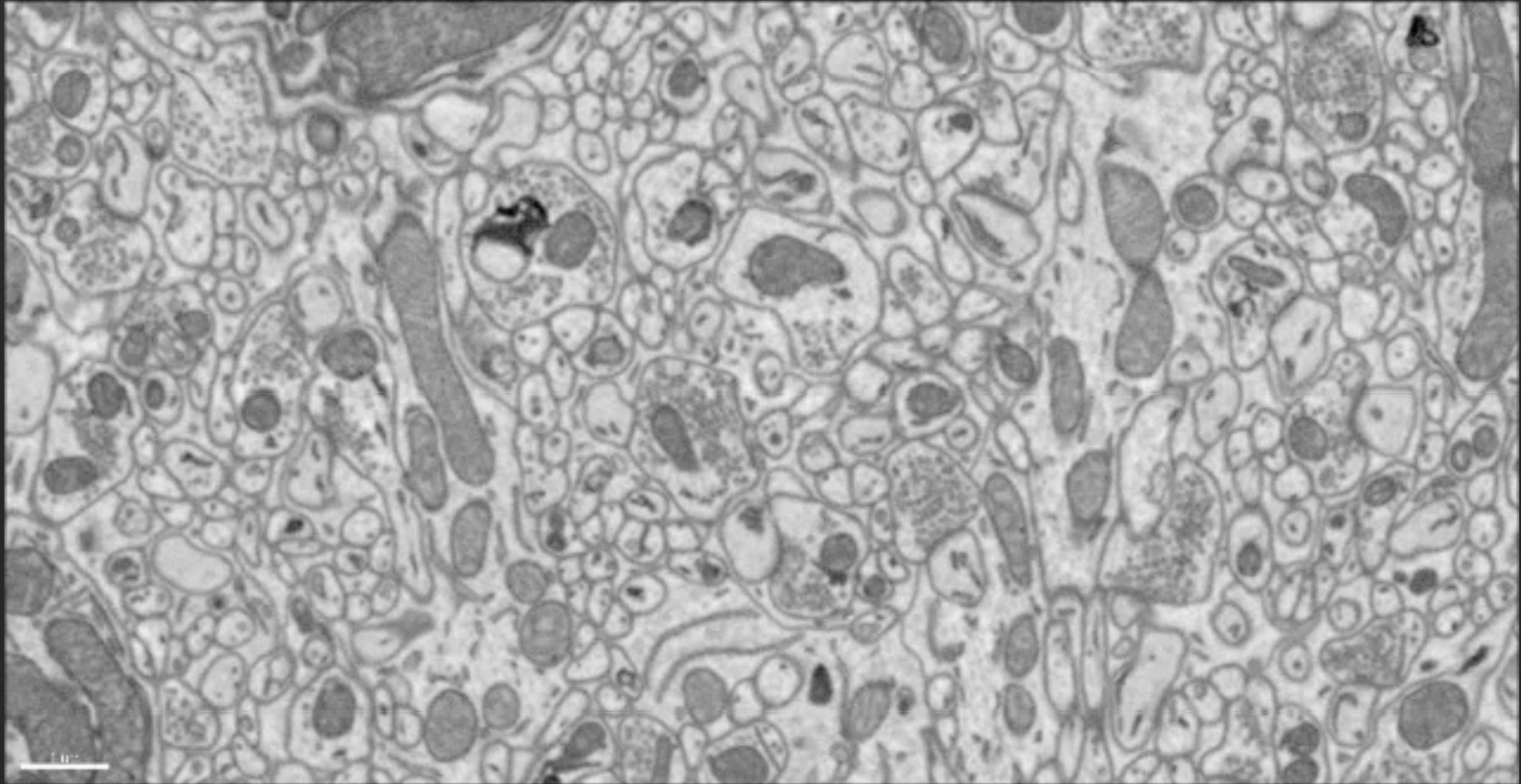
Y-dir

**D**

NM

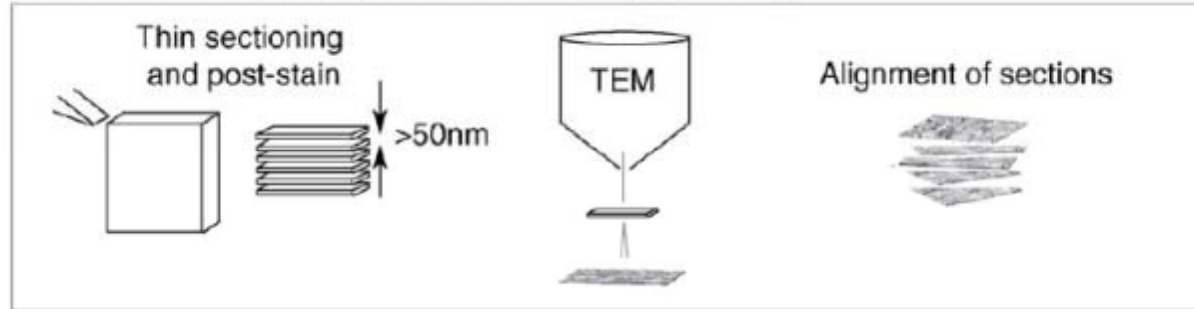






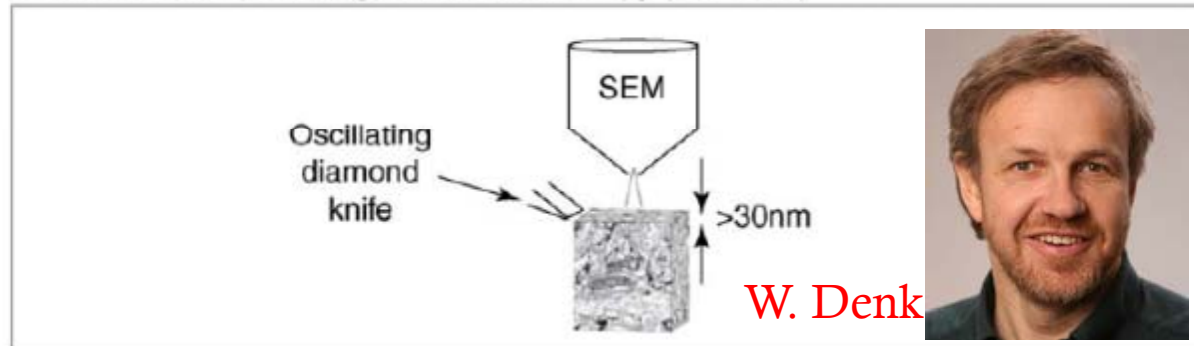
# “Volume Electron Microscopy”

## Serial section transmission electron microscopy (SSTEM)

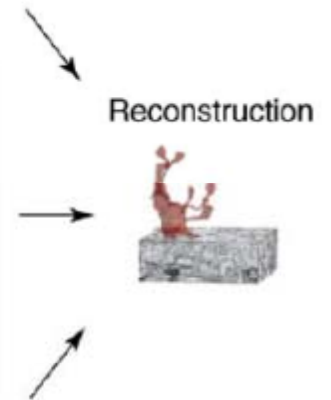


K. Harris

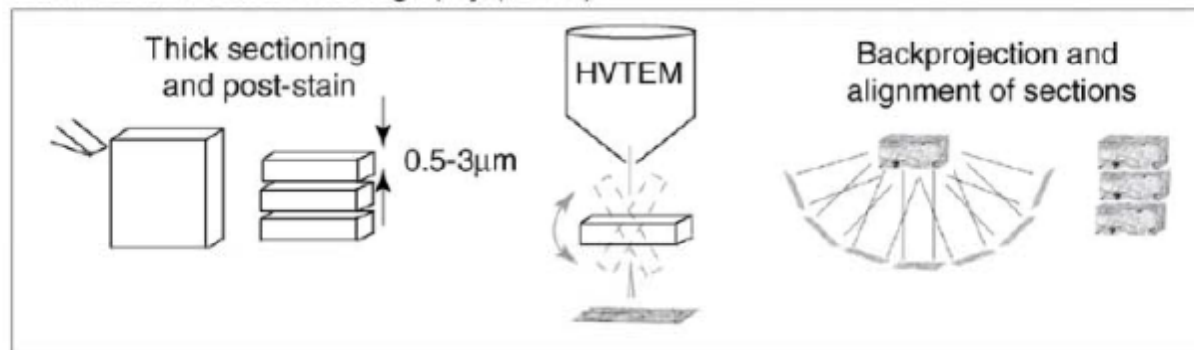
## Serial block-face scanning electron microscopy (SBFSEM)



W. Denk

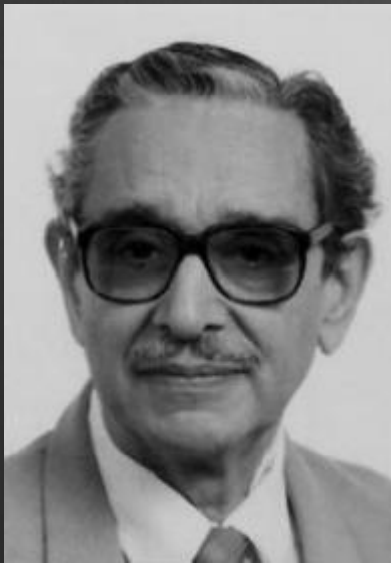


## Serial section electron tomography (SSET)



W. Baumeister

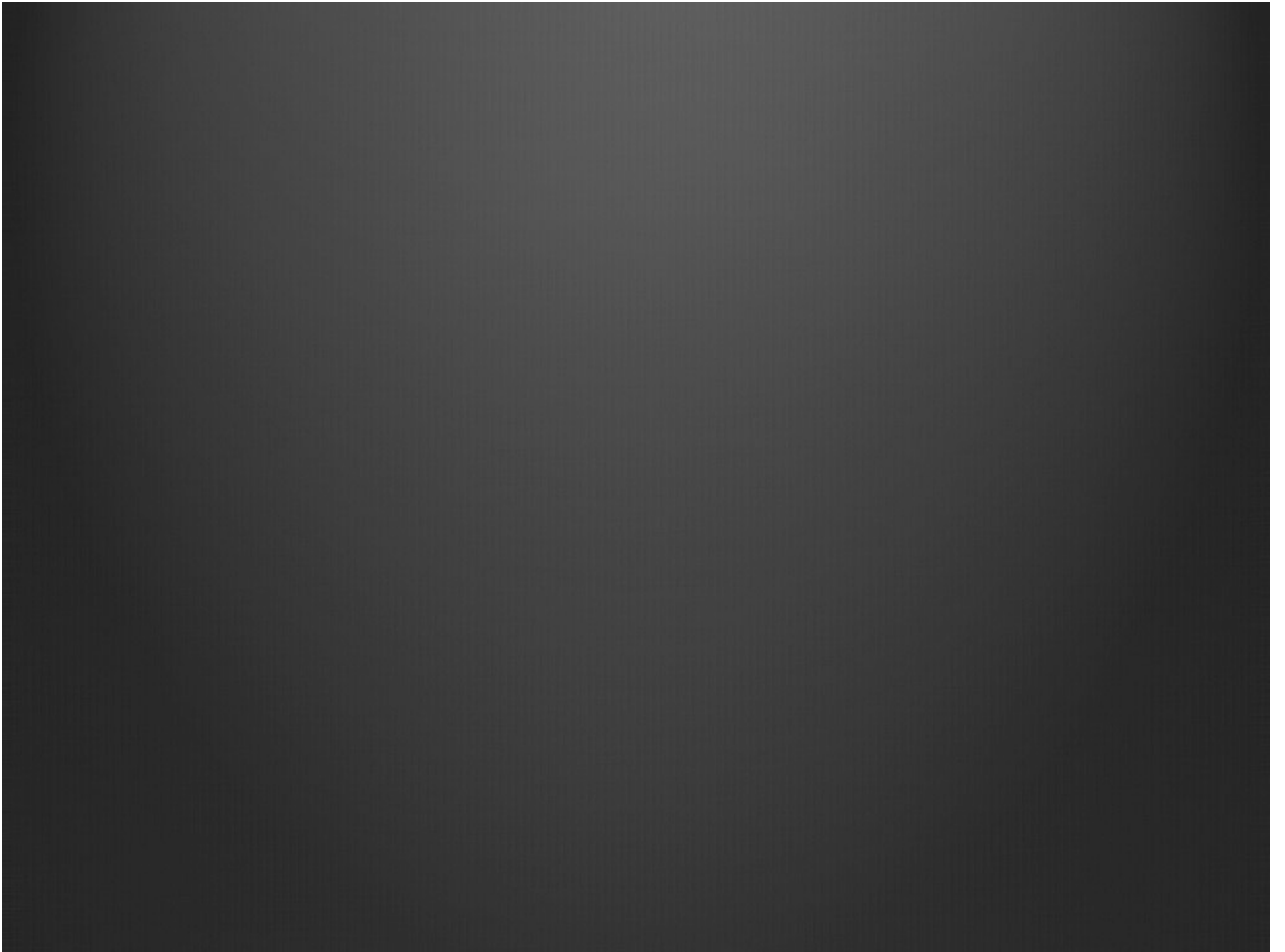
# EM en Patologia (surgical pathology)



Sergio A. Bencosme  
(1920-)



Michael J. Mihatsch  
(1943-)



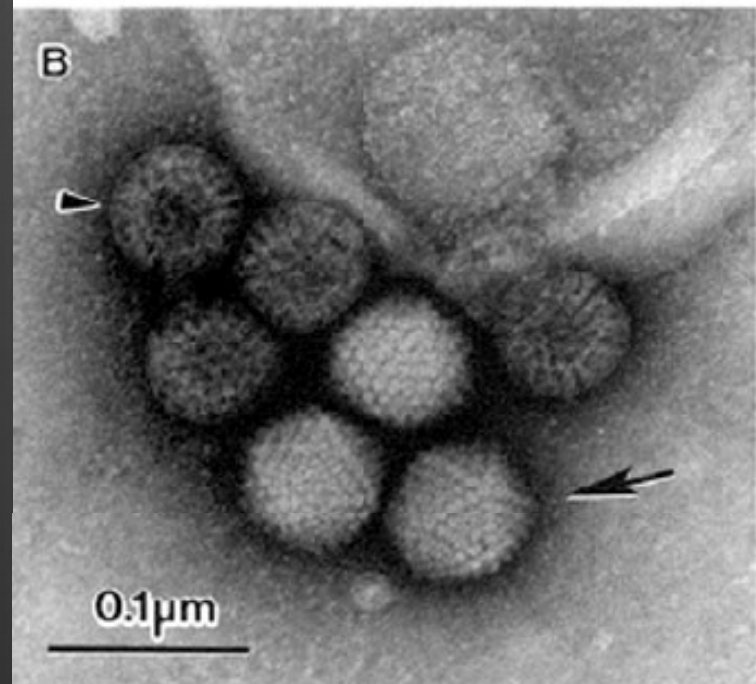
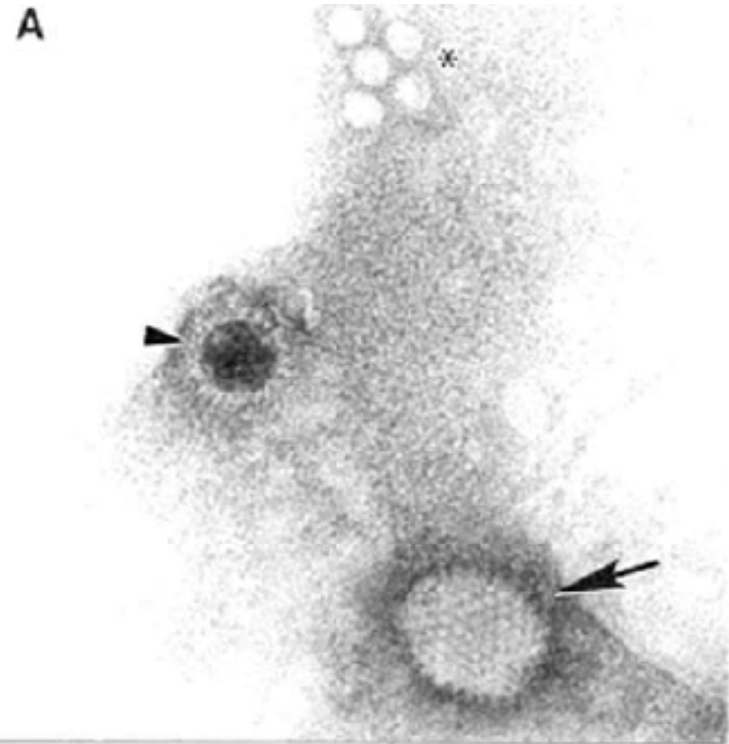
# Infectious Disease Emergencies



Hans Gelderblom



Michael Laue



Muchas Gracias

Vielen Dank