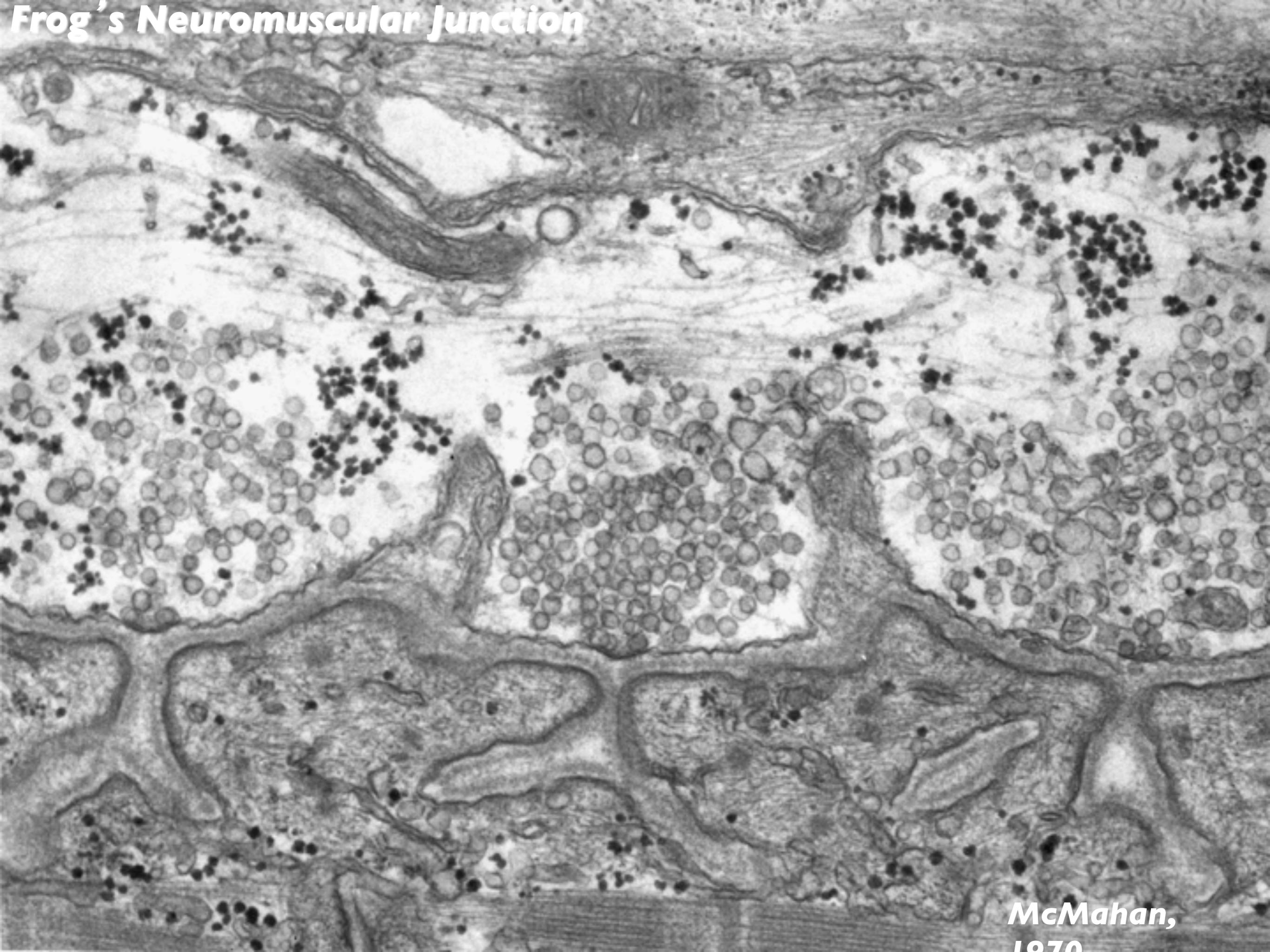


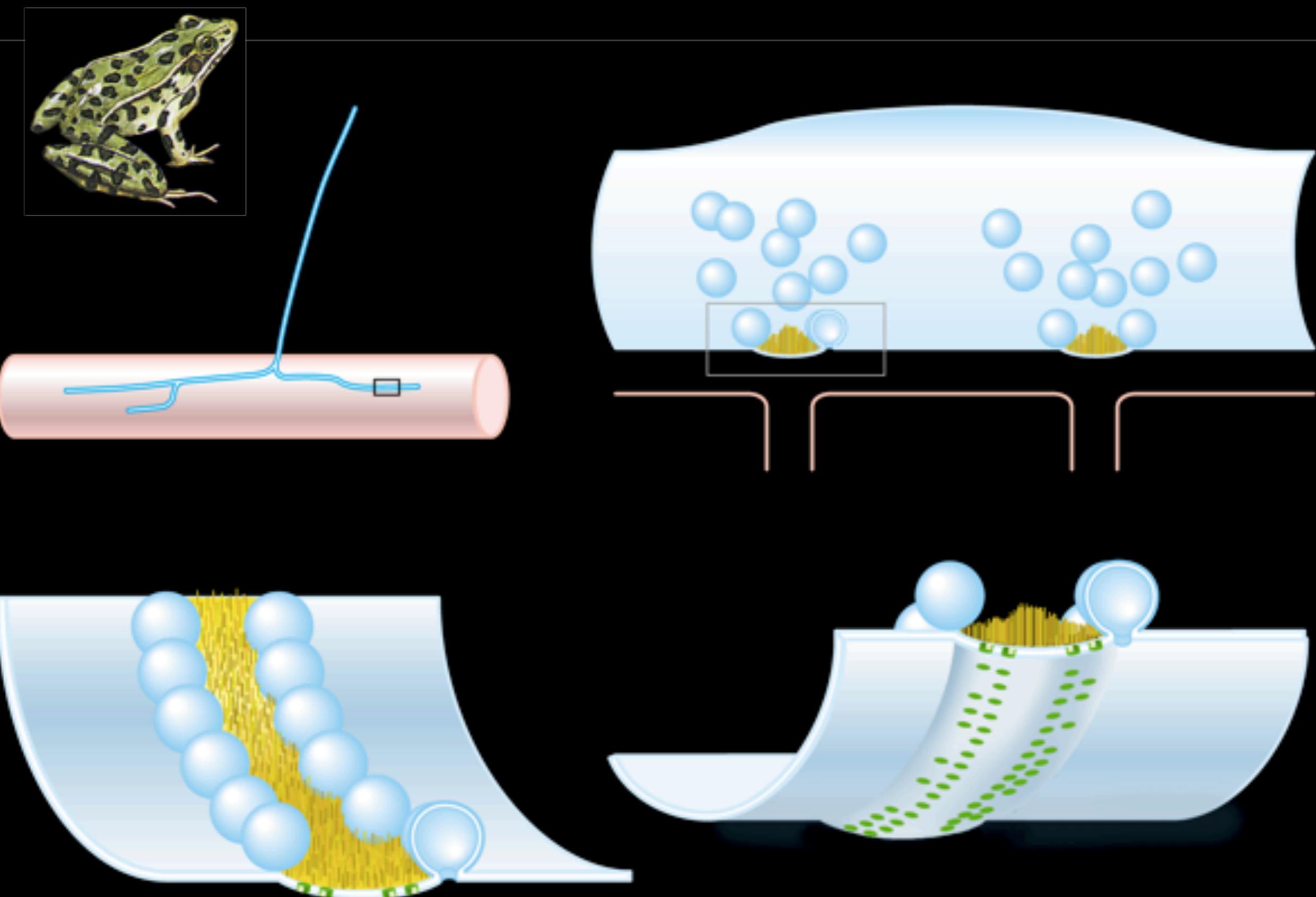
50  $\mu$ m

Frog NMJ/ ZIO stain. McMahan, 1972

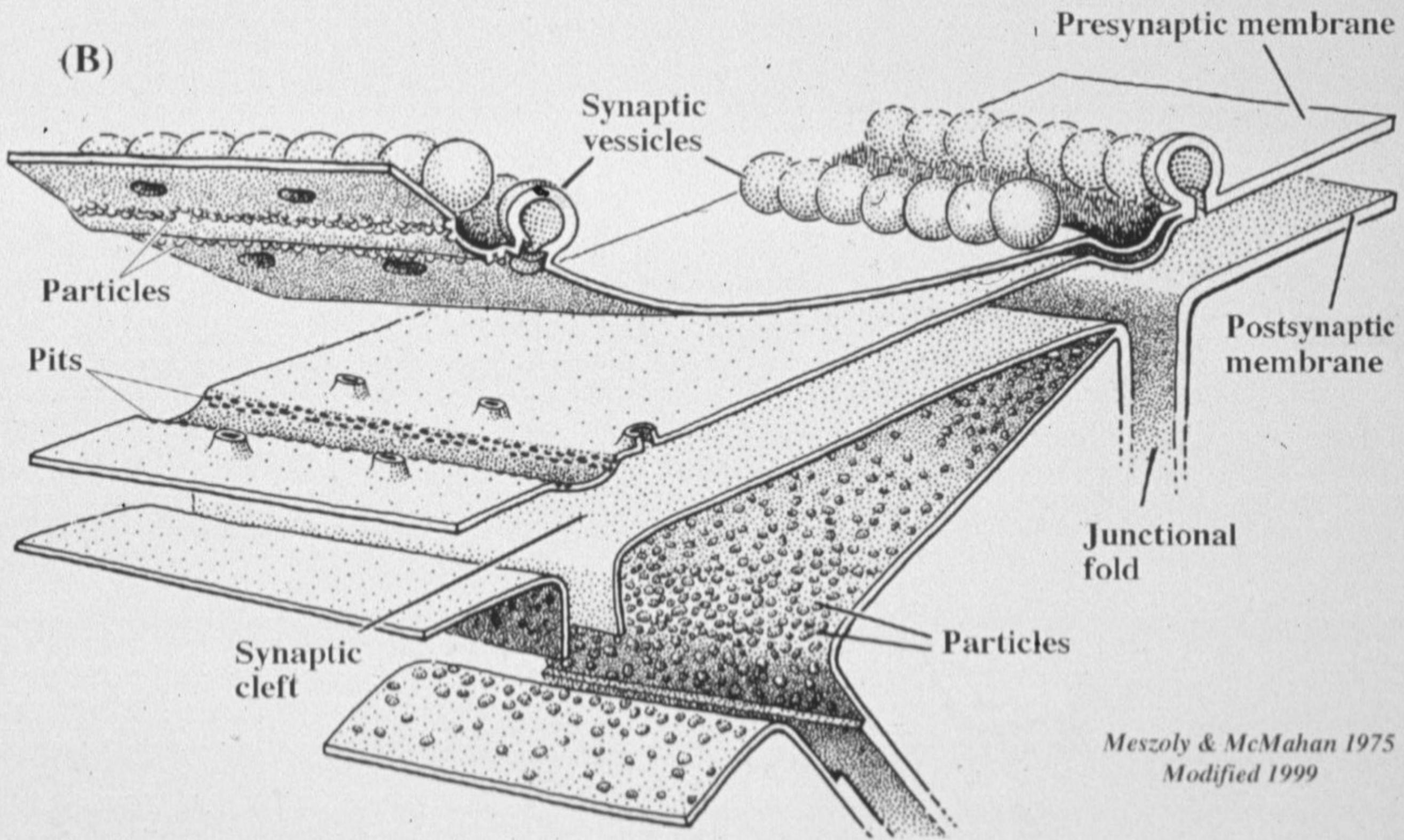
# Frog's Neuromuscular Junction



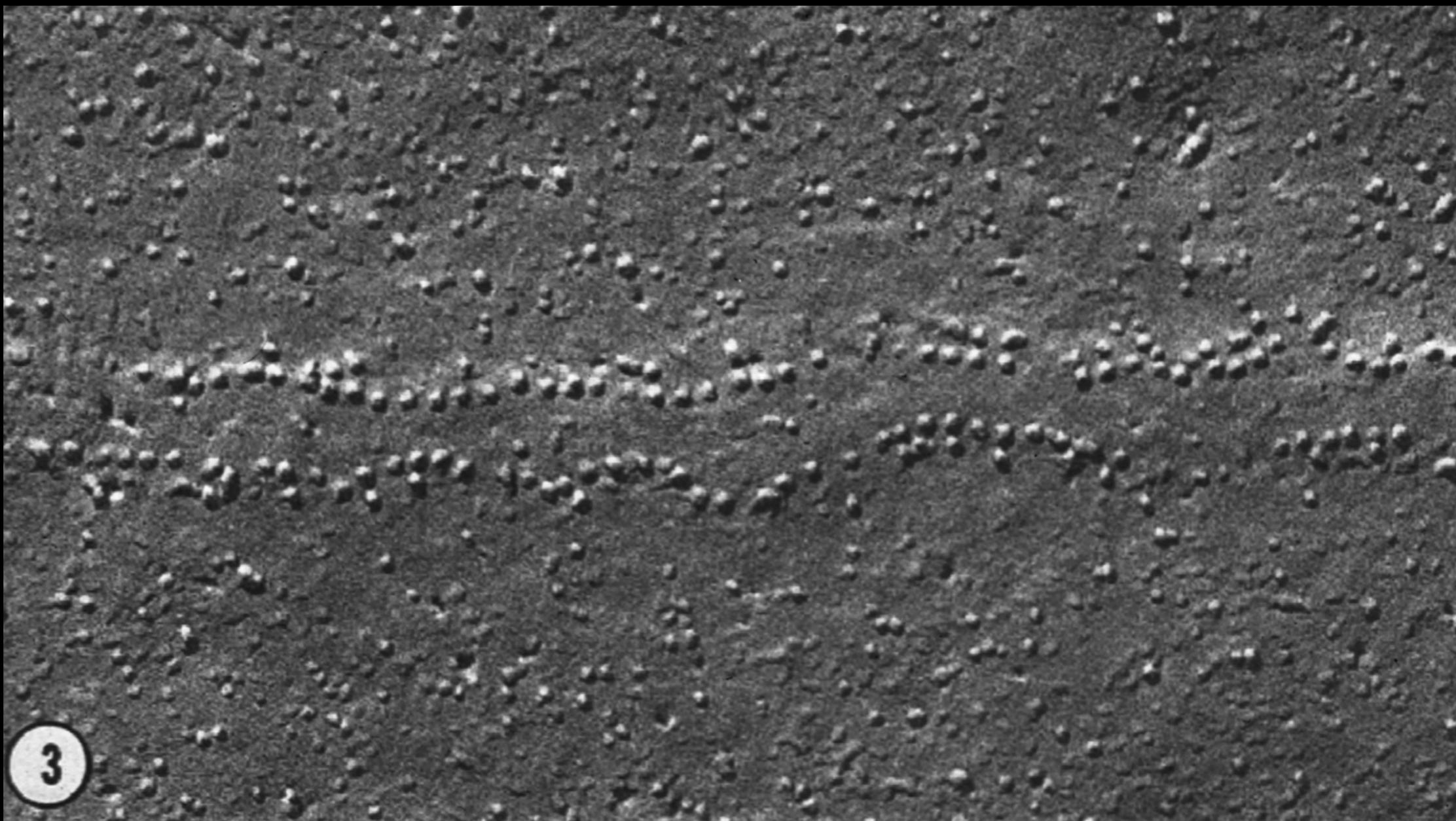
McMahan,  
1970



Colyear / McMahan 1999

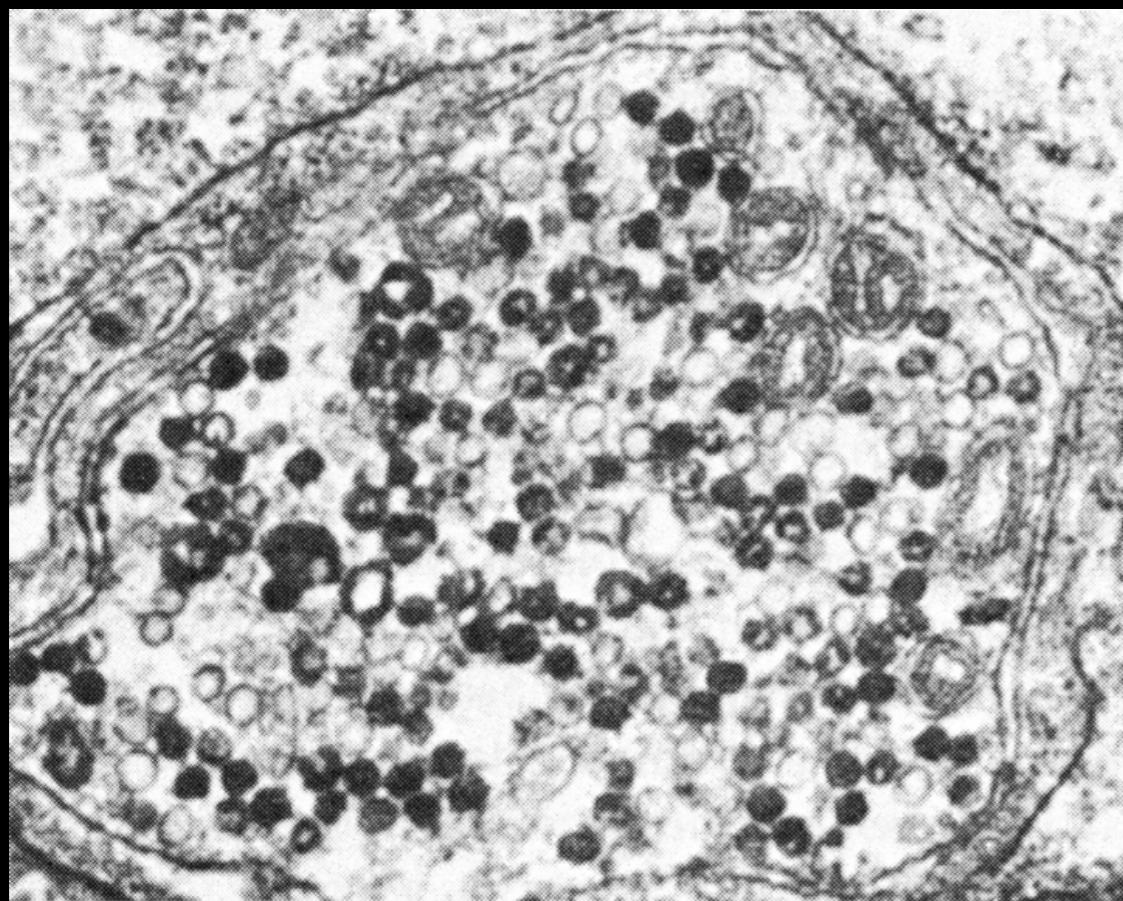


Meszoly & McMahan 1975  
Modified 1999

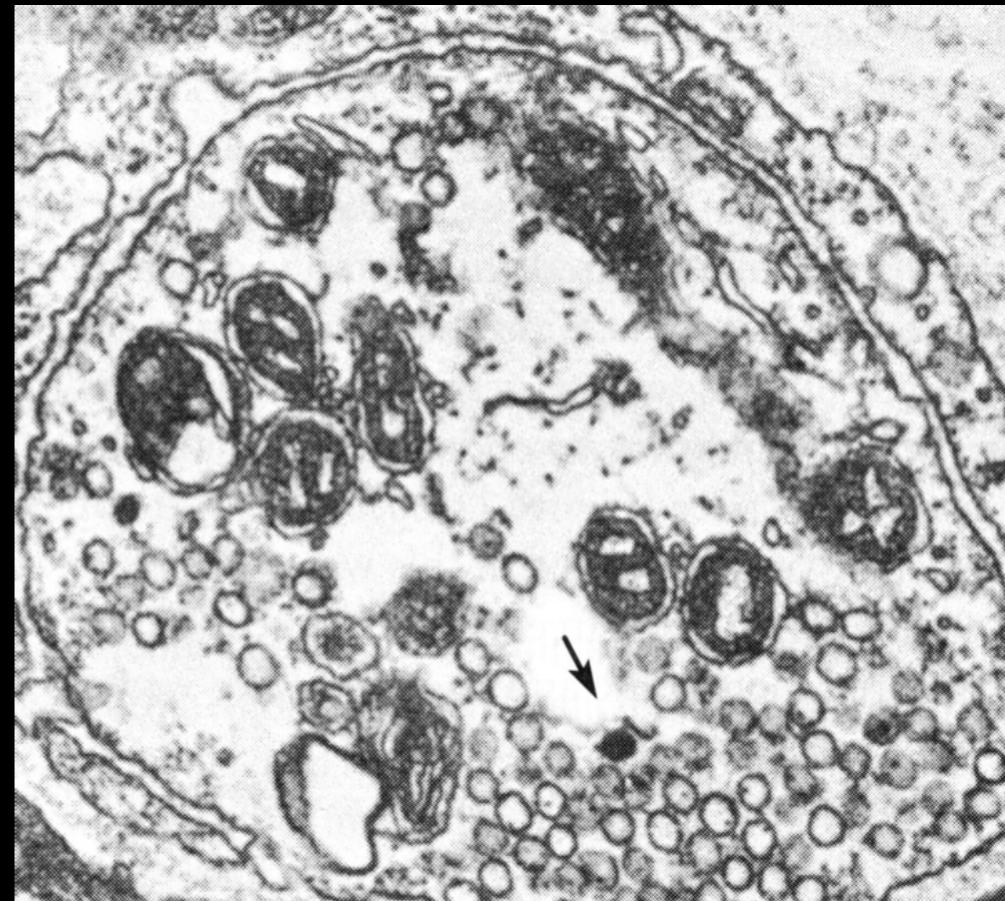




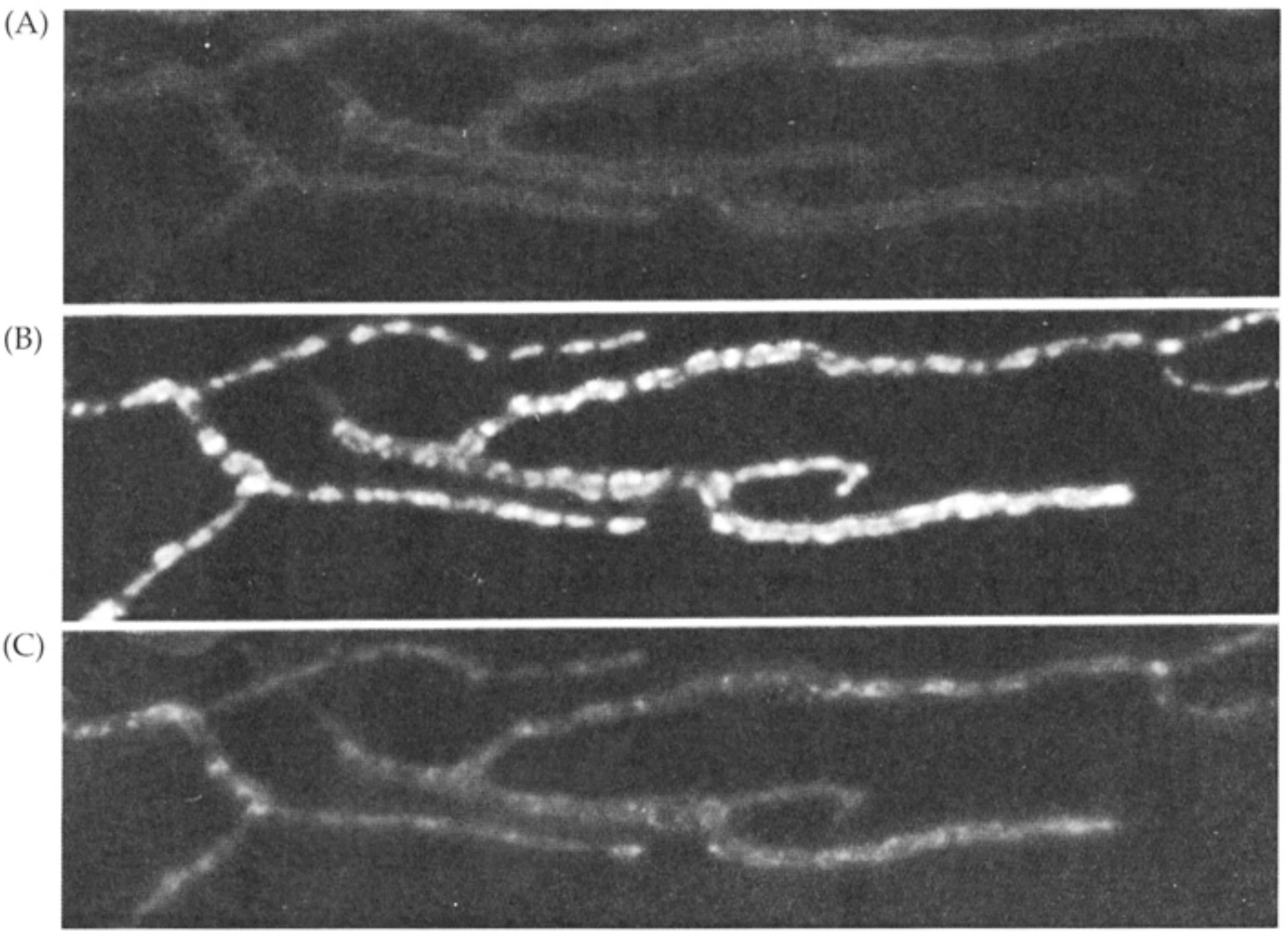
(A)



(B)

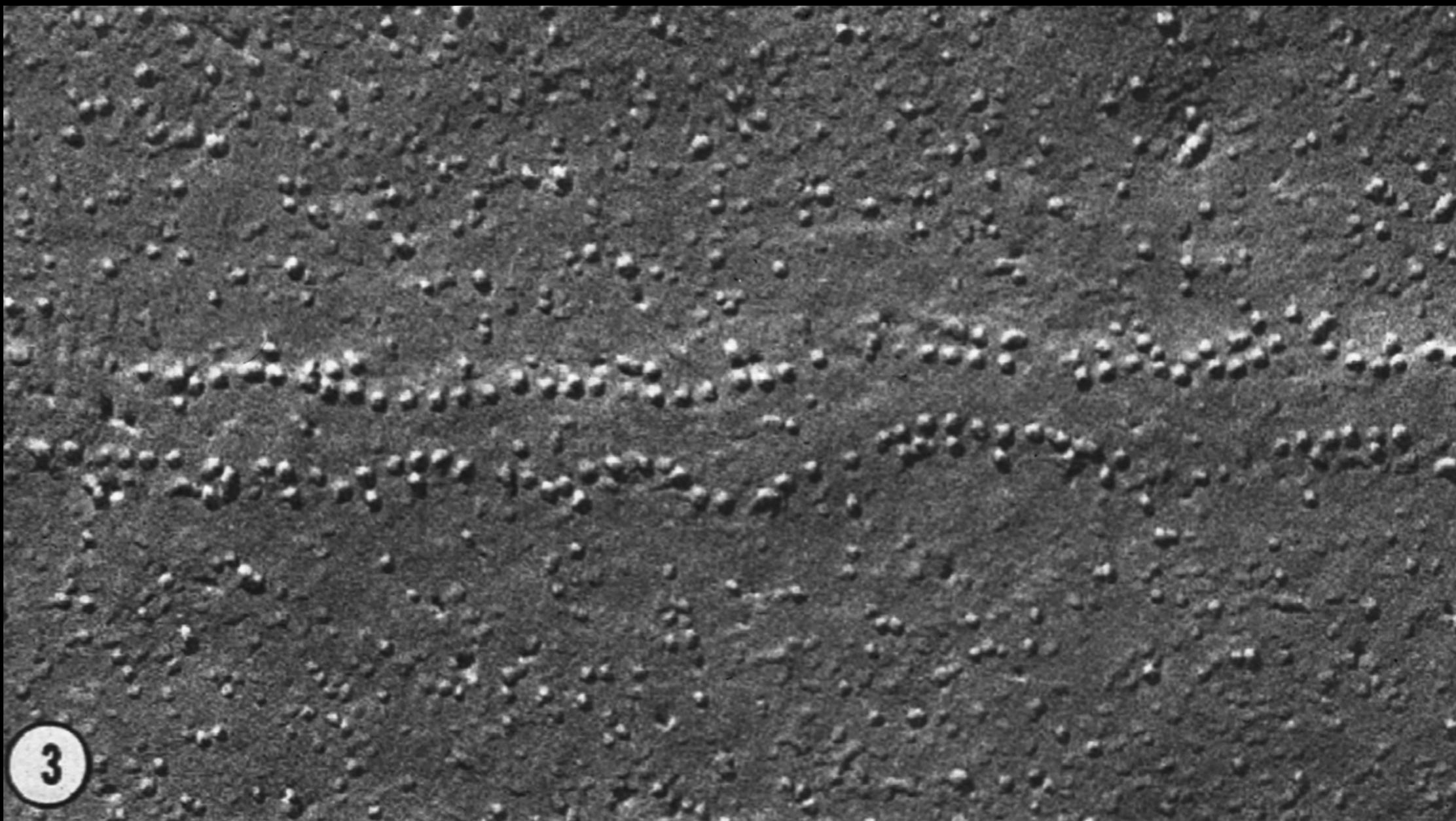


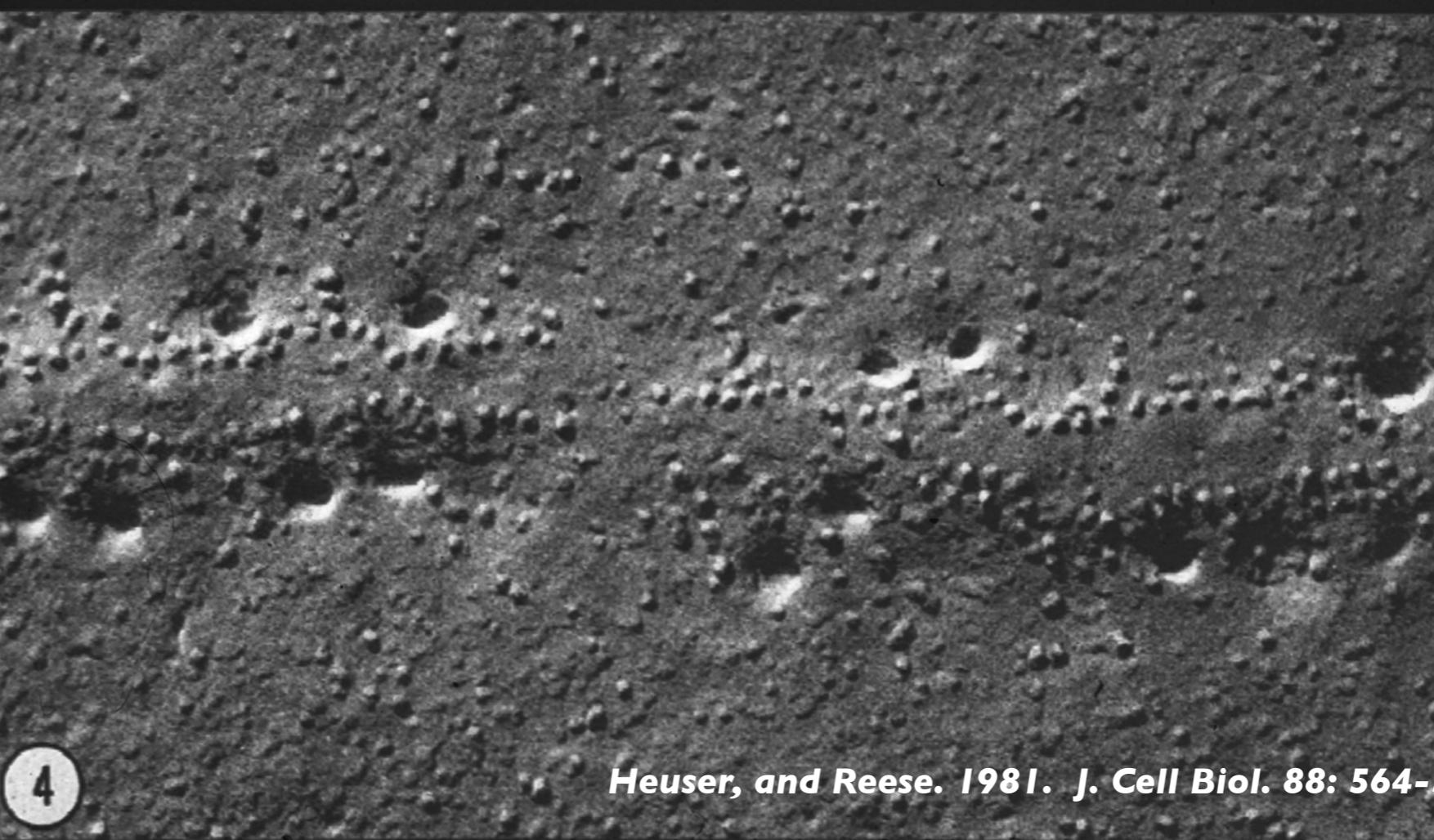
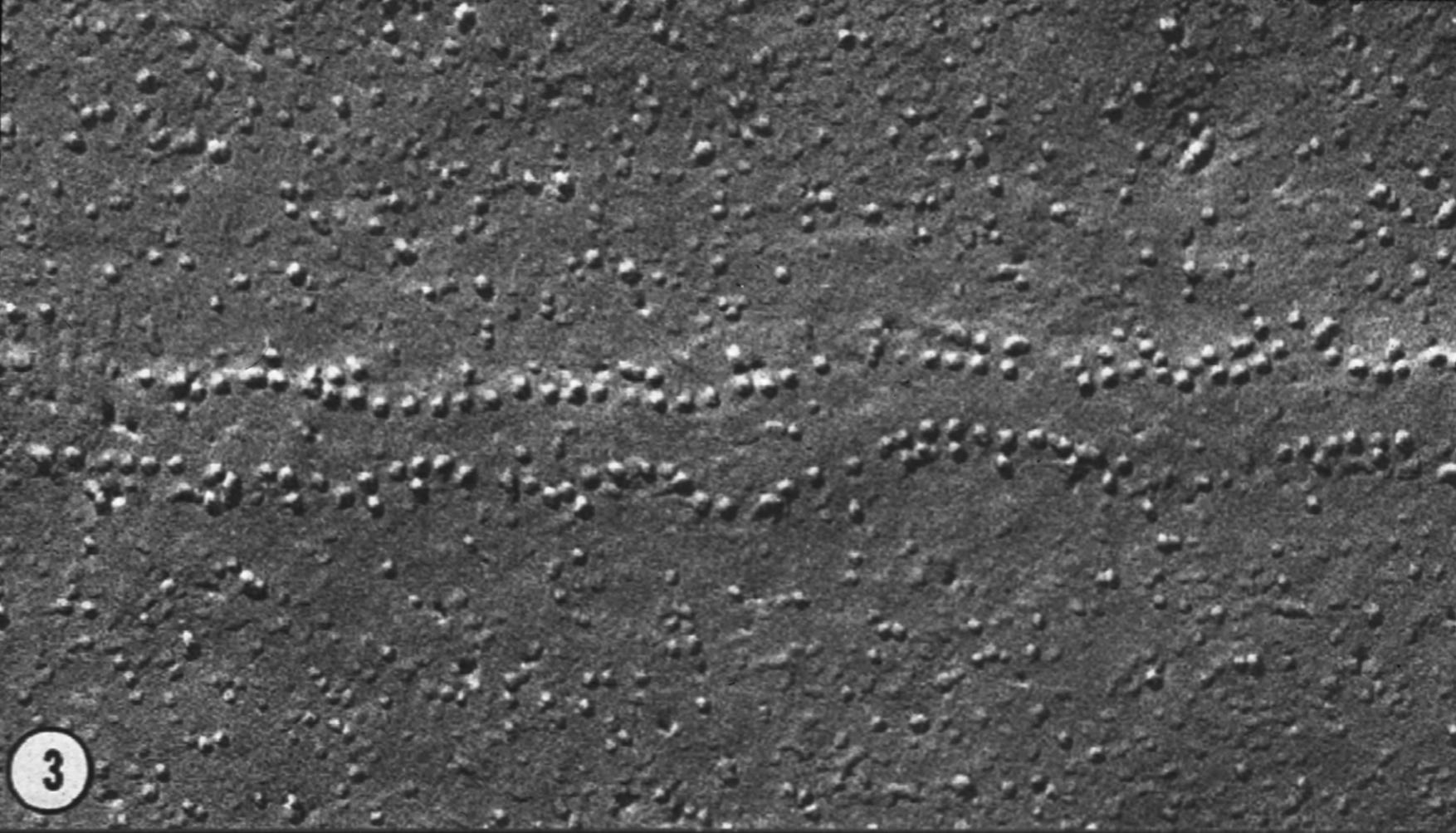
Heuser, J.E. & Reese, T.S. 1973 J. Cell Biol. 57:315-344.



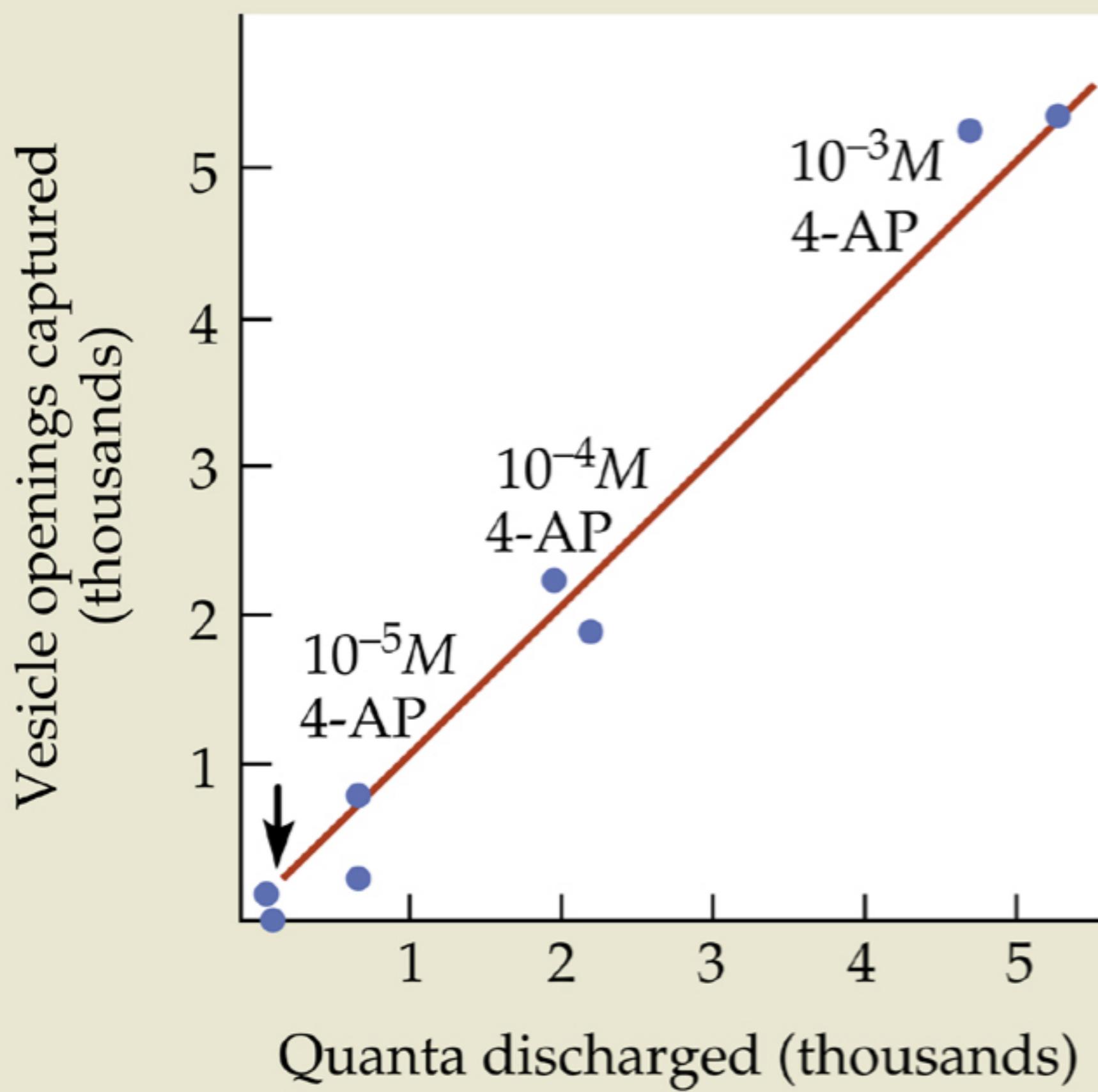
50  $\mu$ m



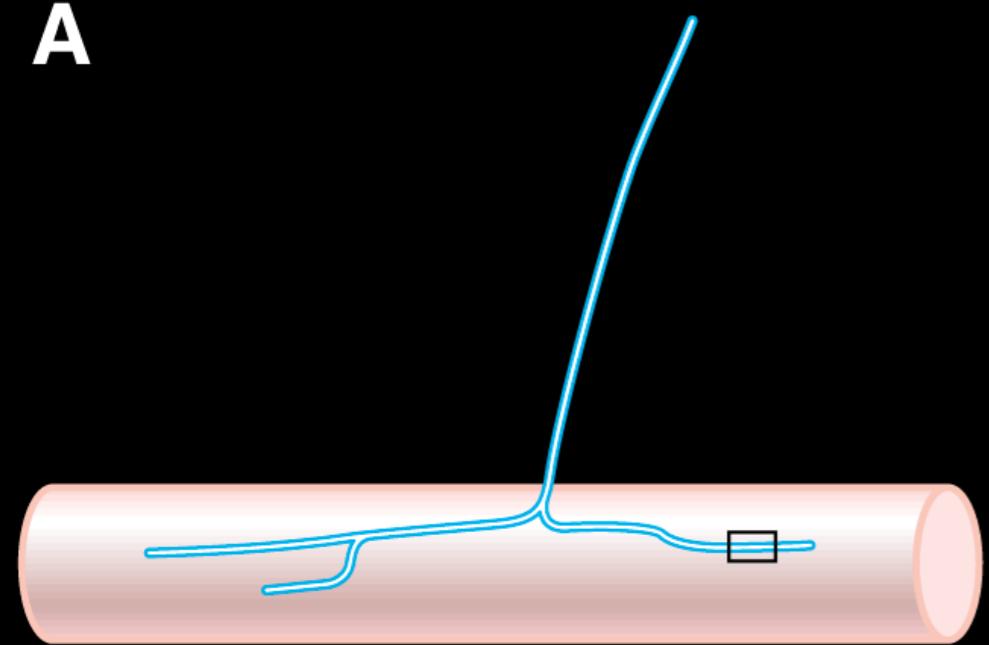
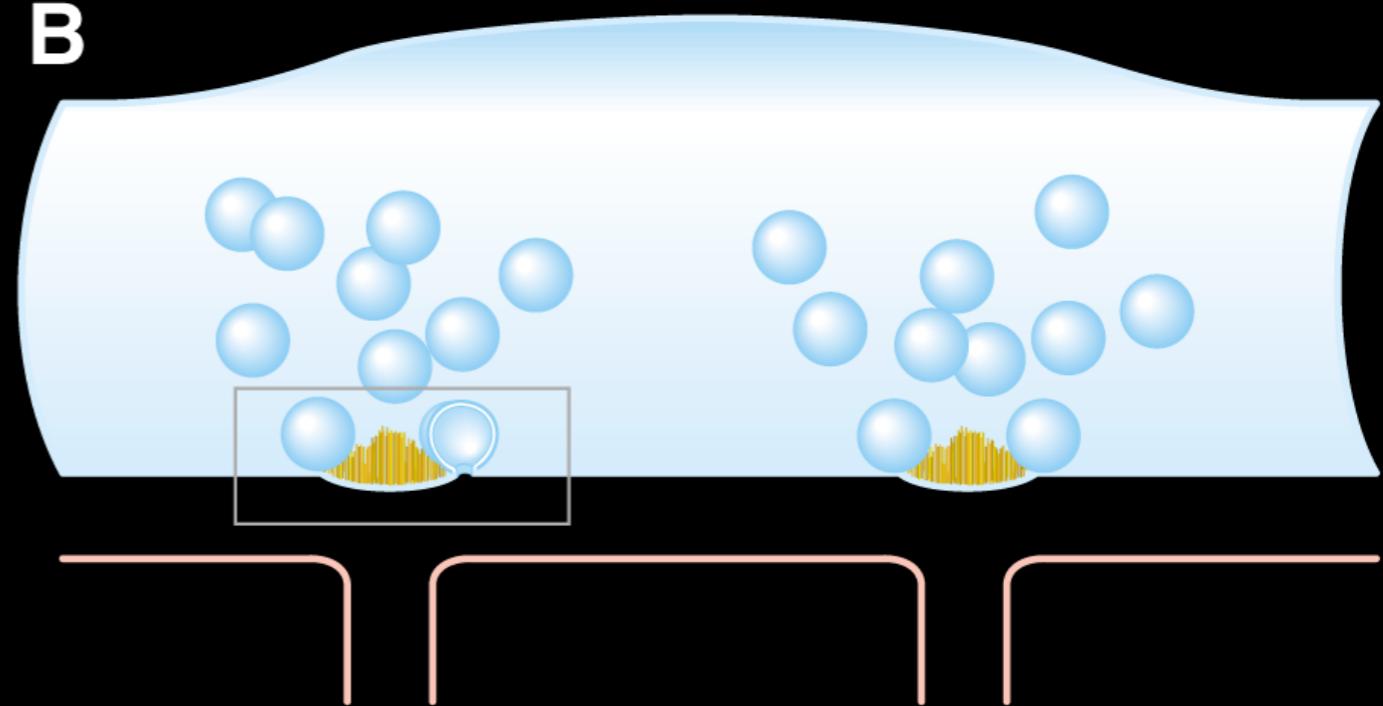
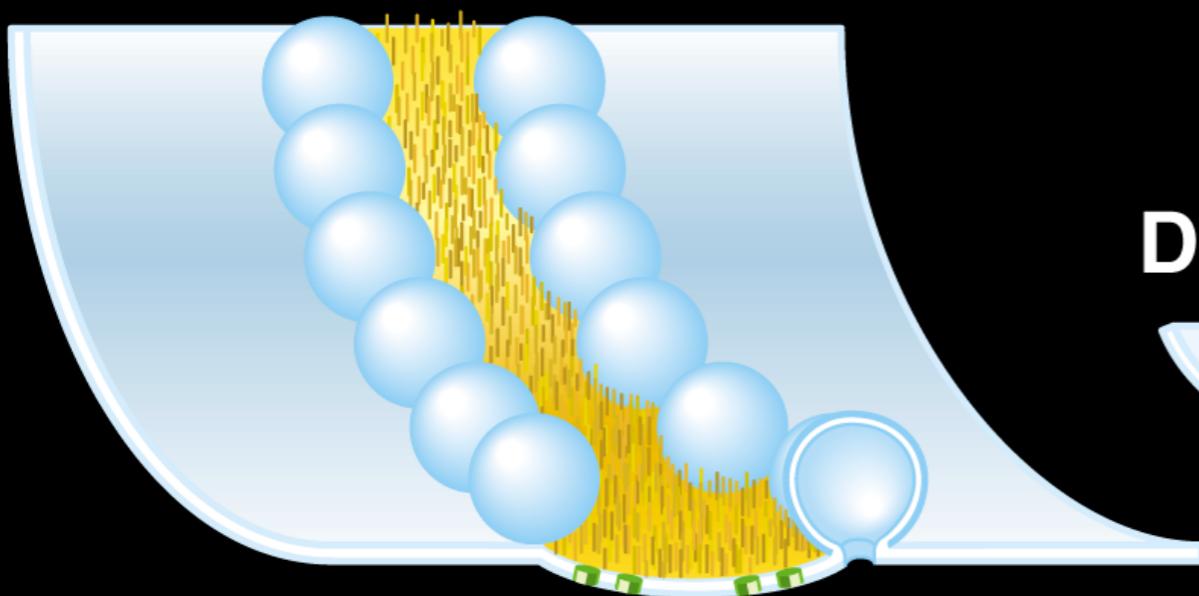




(C)





**A****B****C****D**

*Colyear / McMahan 1999*

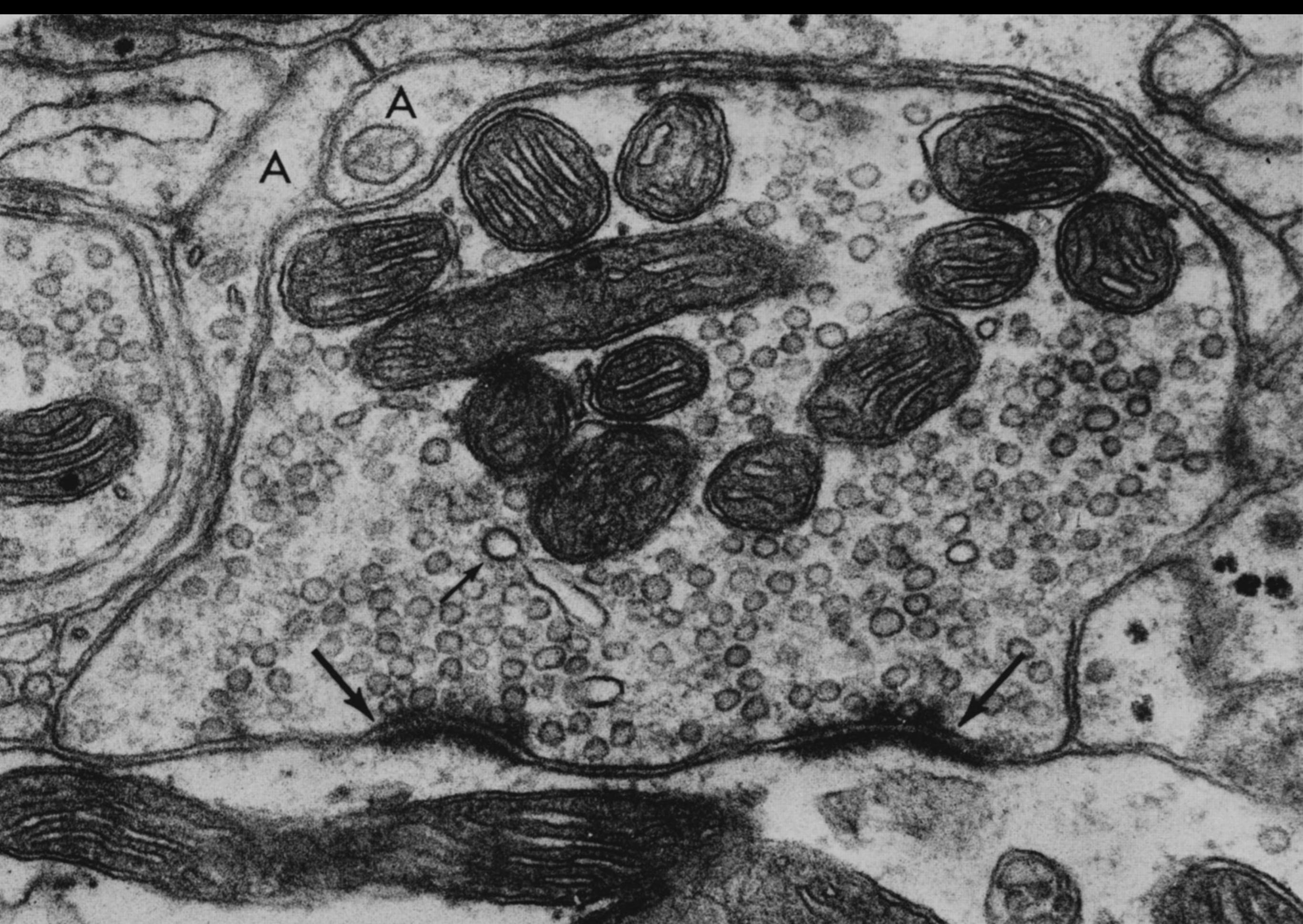
CaCh

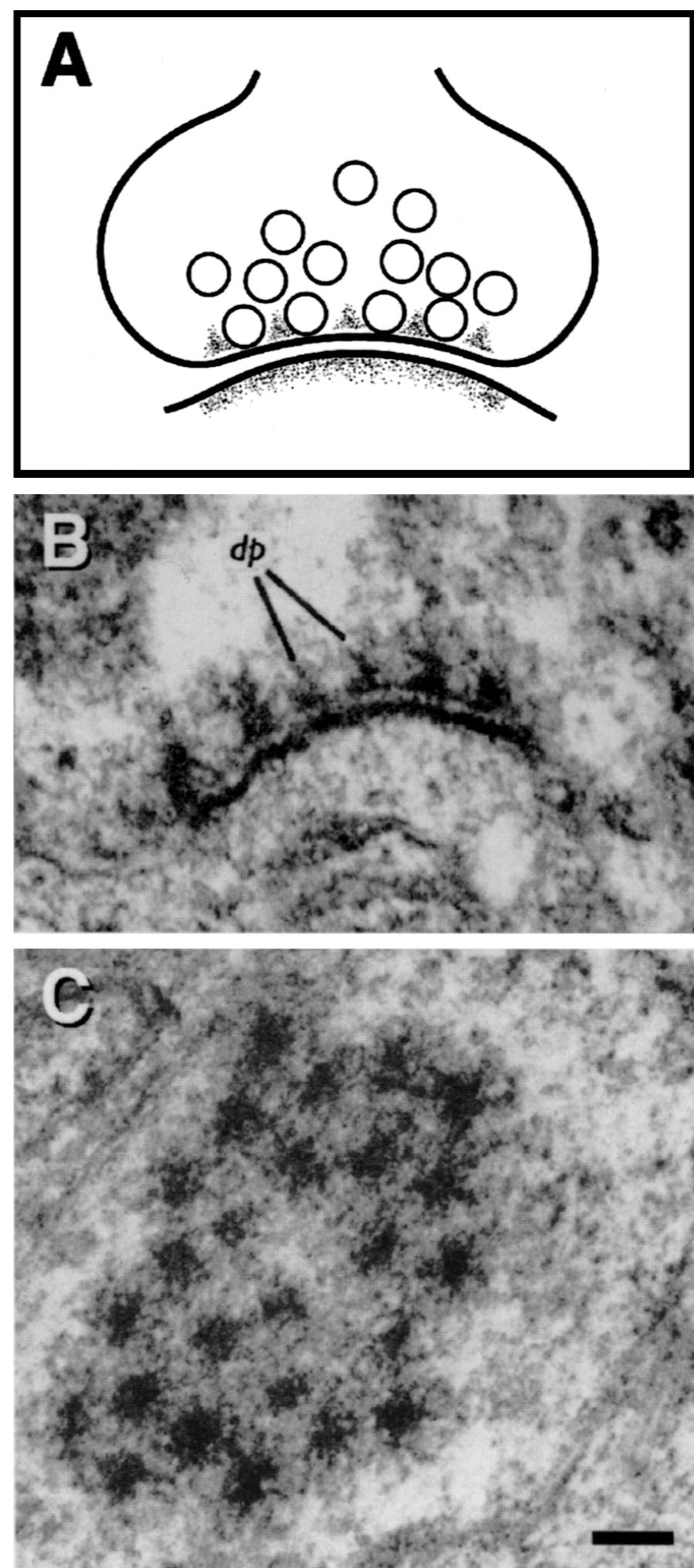


AChR



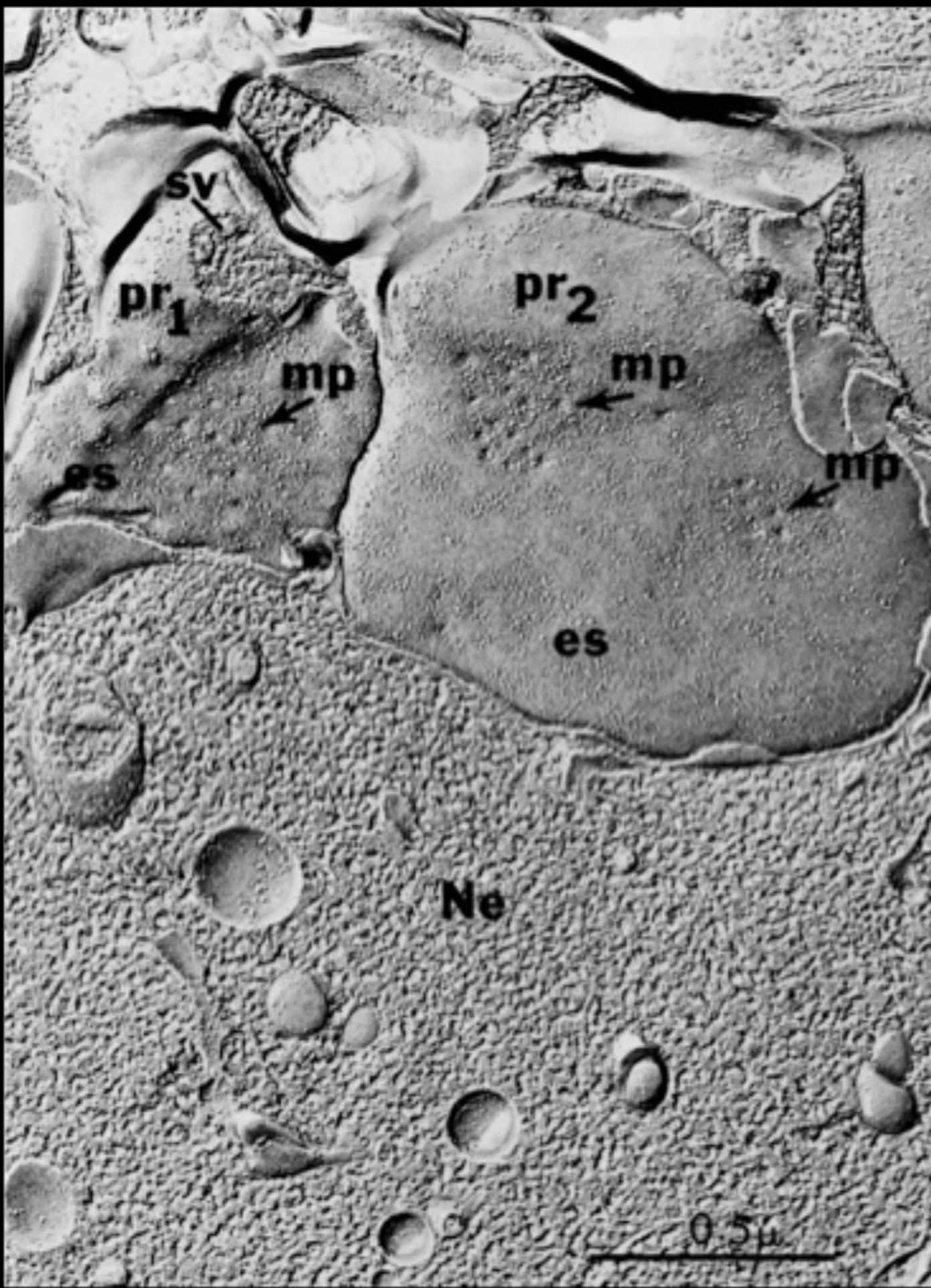
Robitaille, Alder & Charlton. *Neuron* 5, 773-779 (1990).



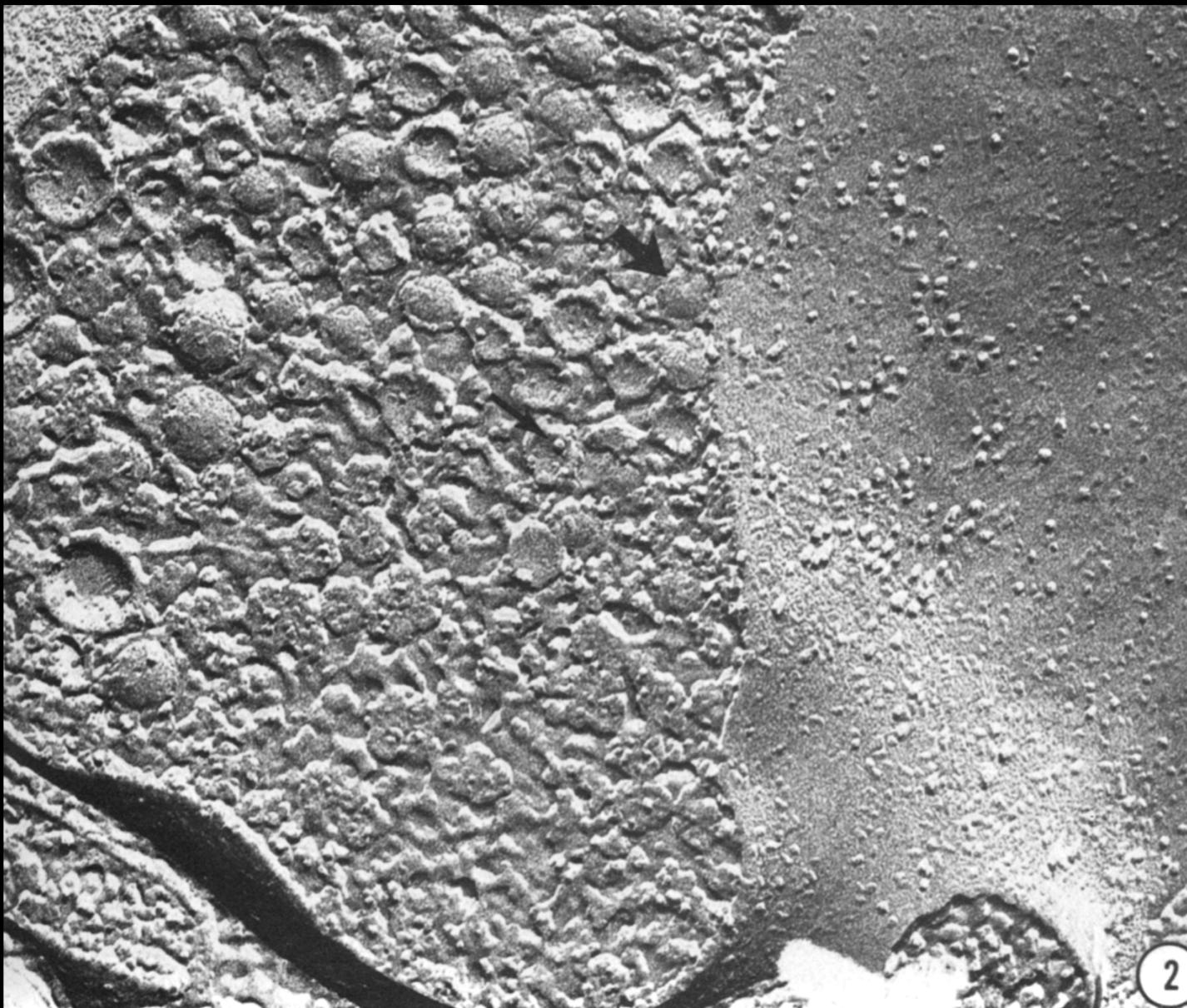
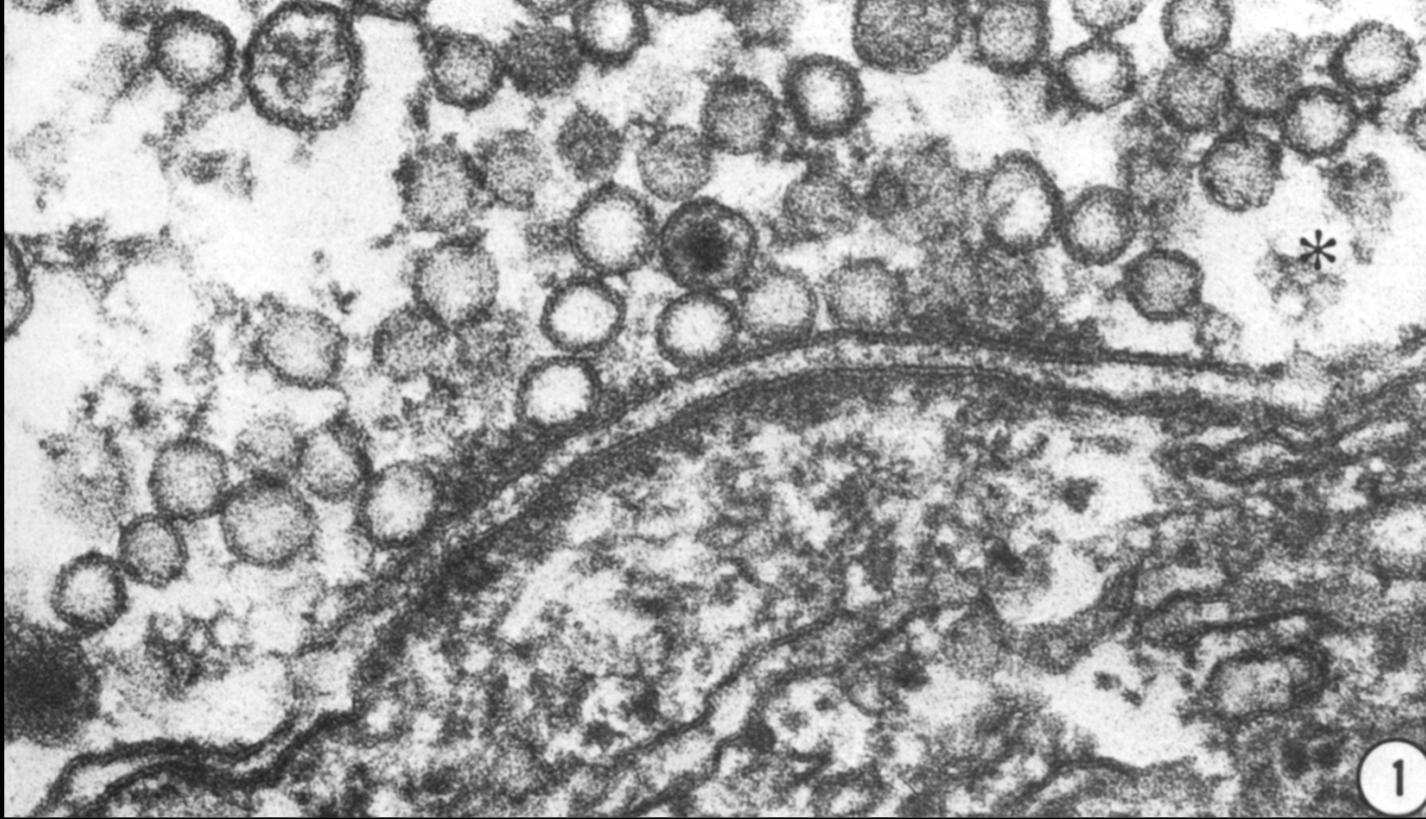


Gray, E. G. 1963 *J. Anat.* 97:101-106.

From: De Camilli P. et al. in *Synapses* (Cowan, Südhof & Stevens, eds., Johns Hopkins Univ. Press/ Baltimore) pp 89-134 (2001).

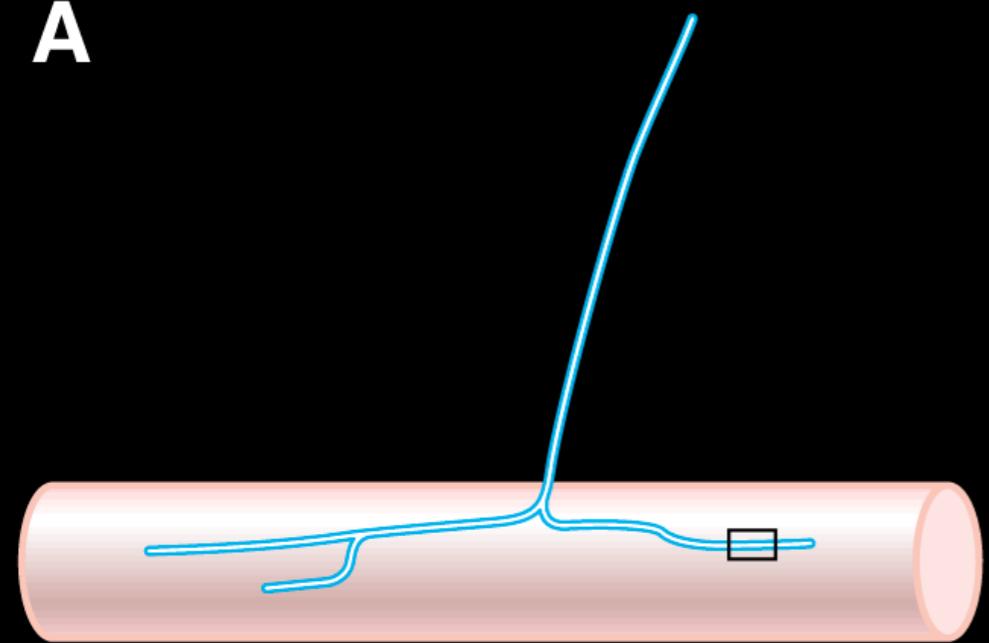
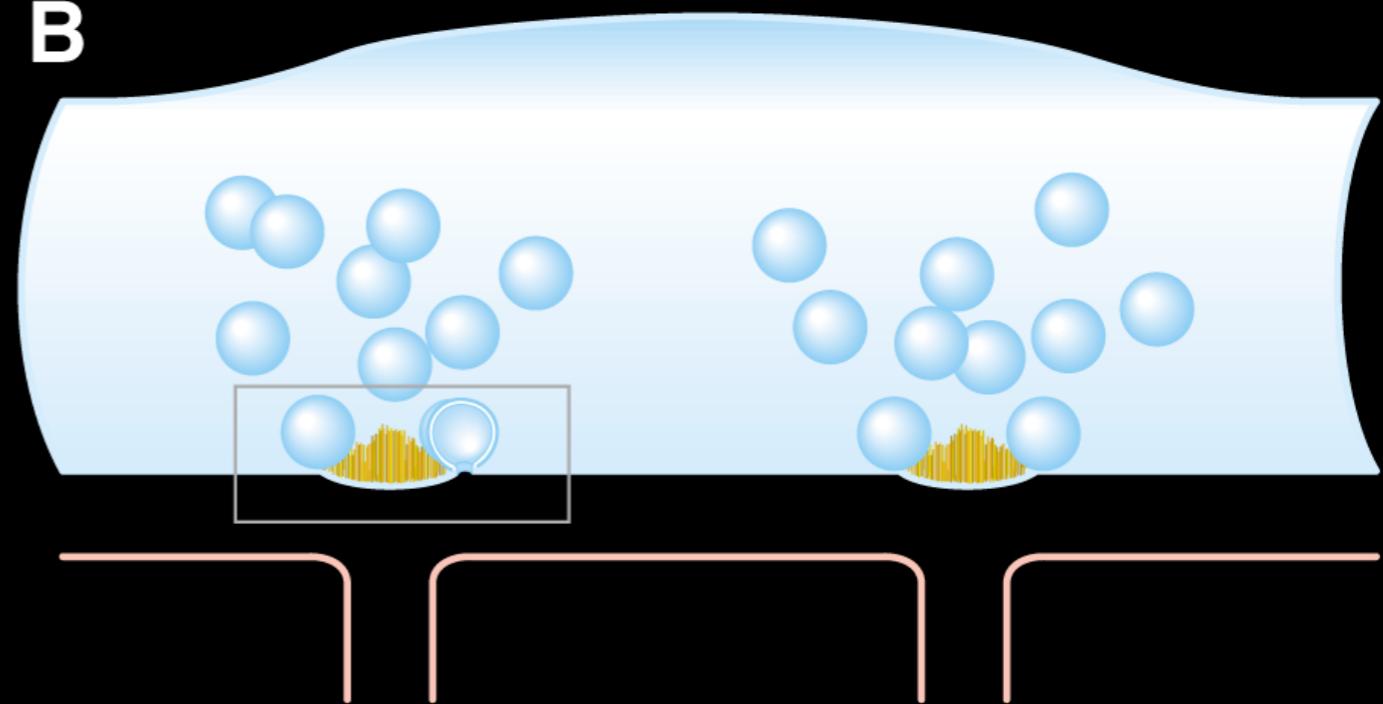
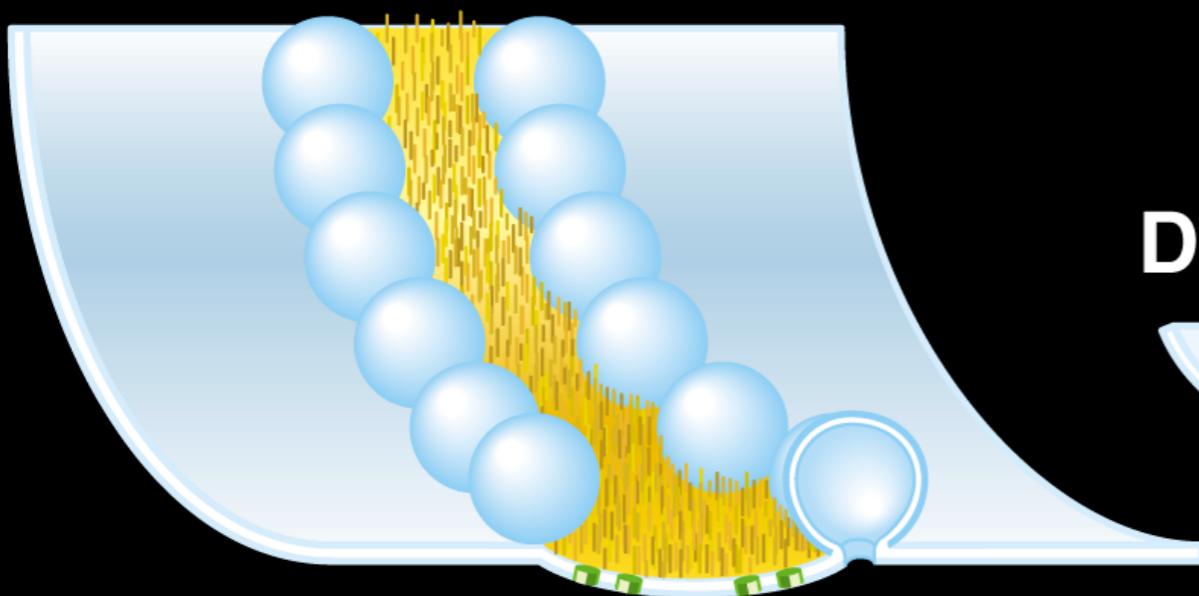


Akert, Pfenninger, Sandri & Moor in *Structure and Function of Synapses* (eds. Pappas & Purpura) Raven Press, New York 1972

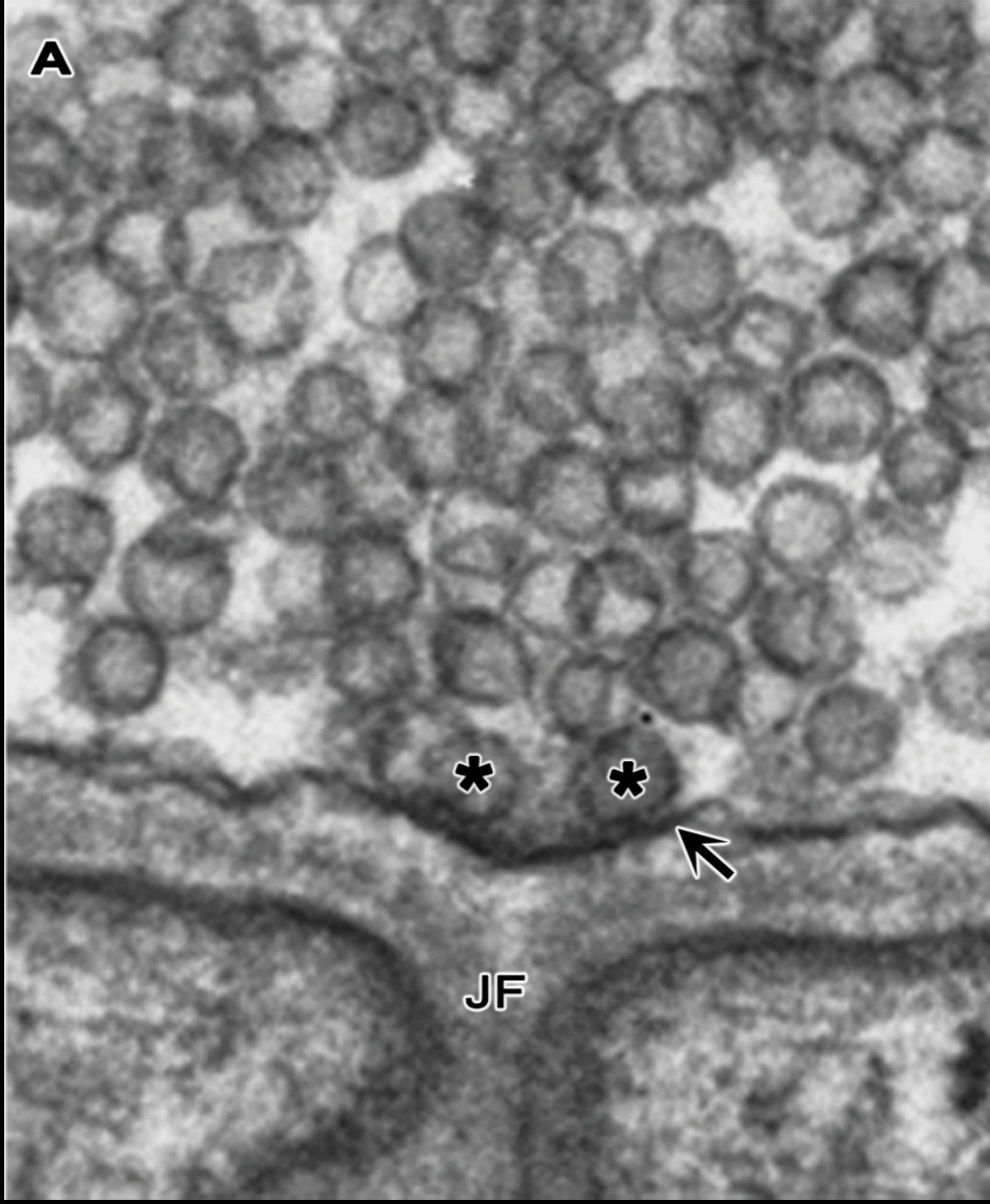


Dickinson-Nelson A. & Reese TS.  
*J. Neurosci.*, 3:42-52 (1983).

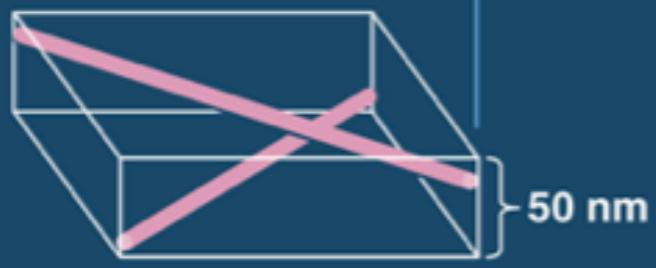
t

**A****B****C****D**

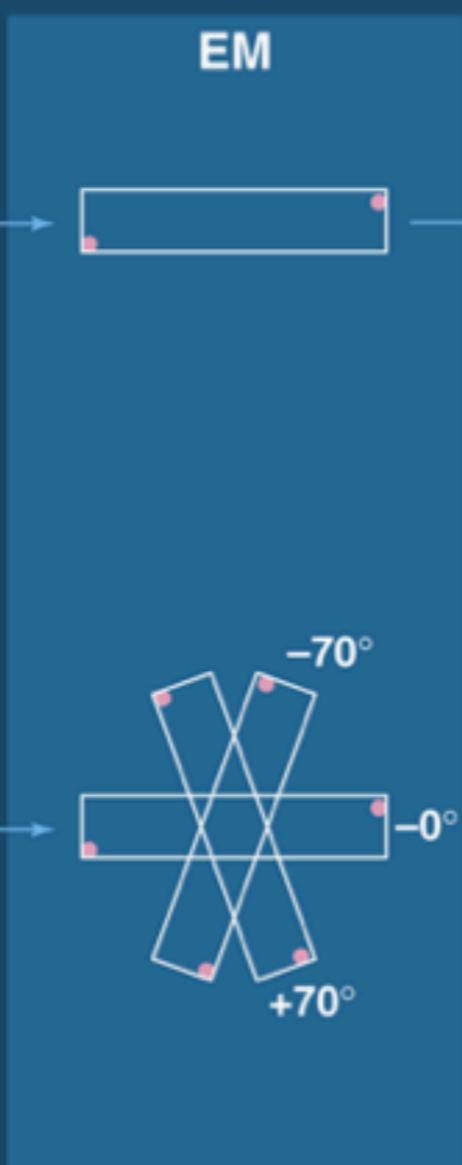
*Colyear / McMahan 1999*

**A**

### Tissue Section



### EM

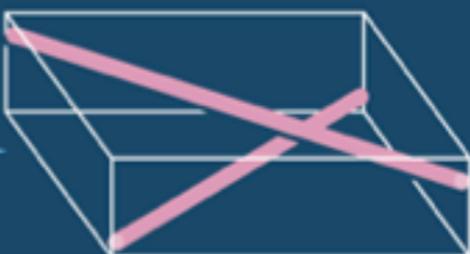


### Imaging

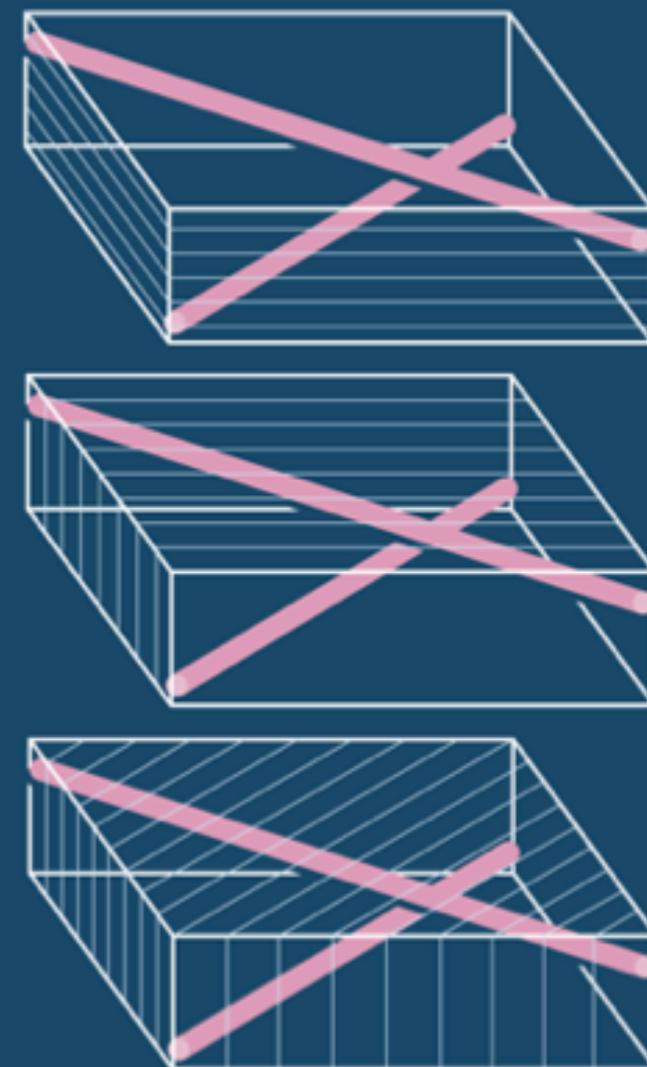
#### 2D



#### 3D



### Computer Generated Slices Through 3D Volume



McMahan / Colyear '97

Department of Neurobiology  
Department of Structural Biology

Stanford University  
Laboratory of Uel Jackson McMahan

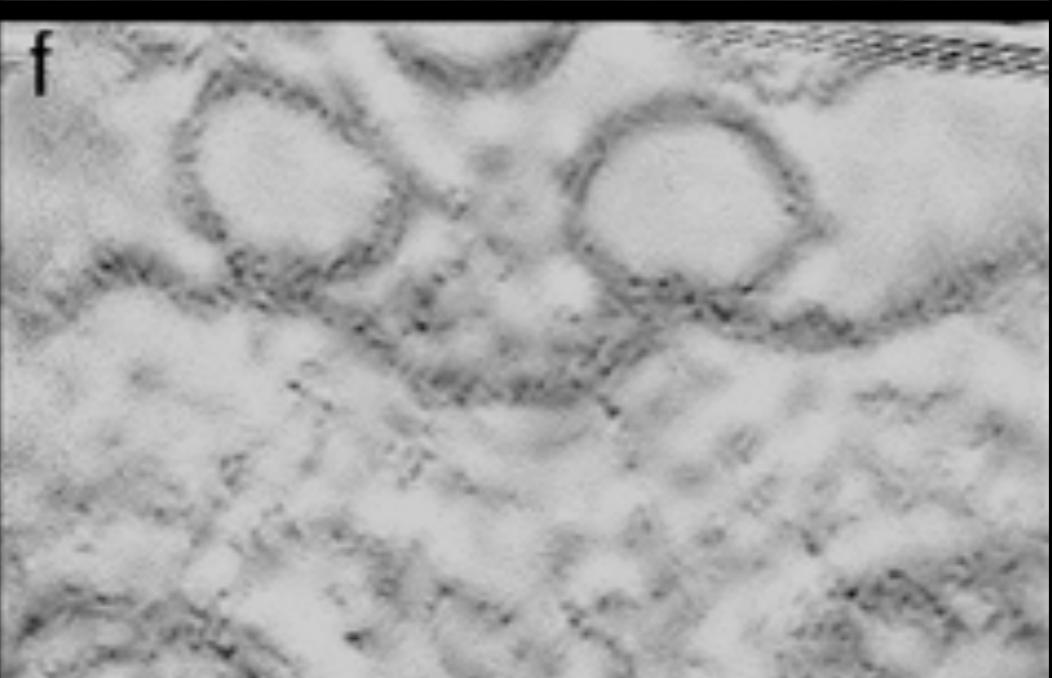
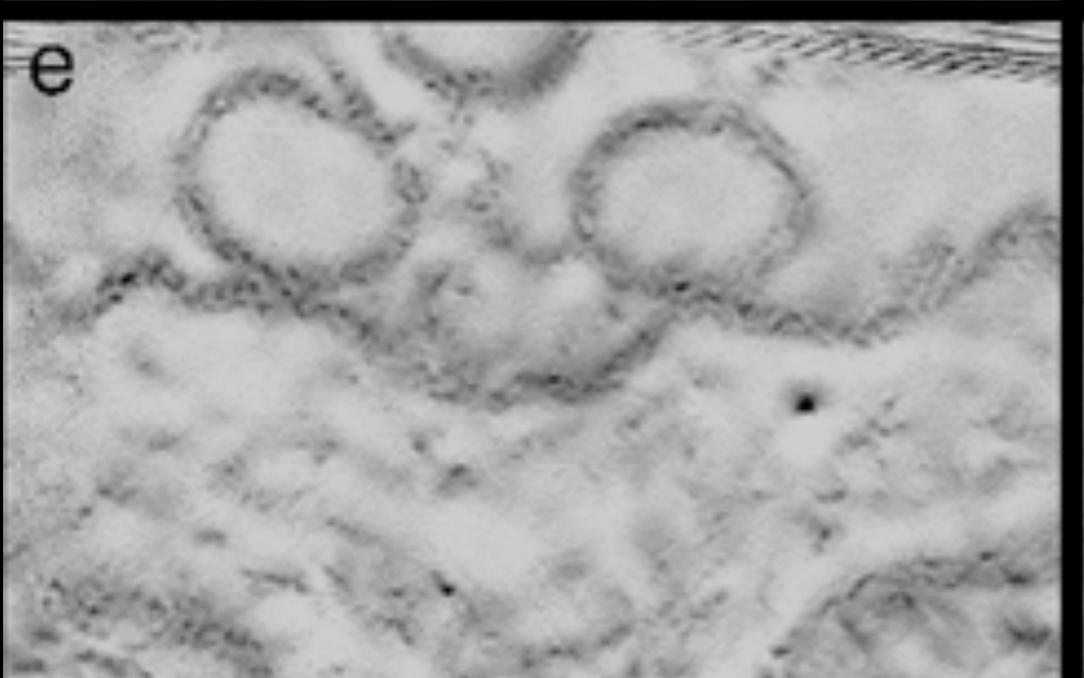
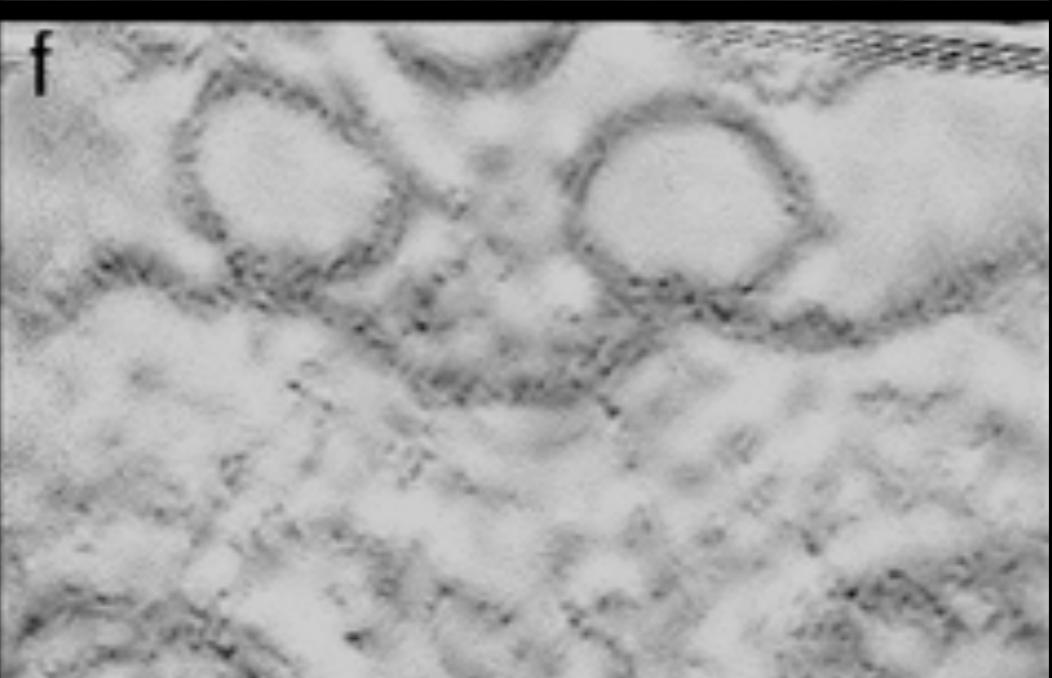
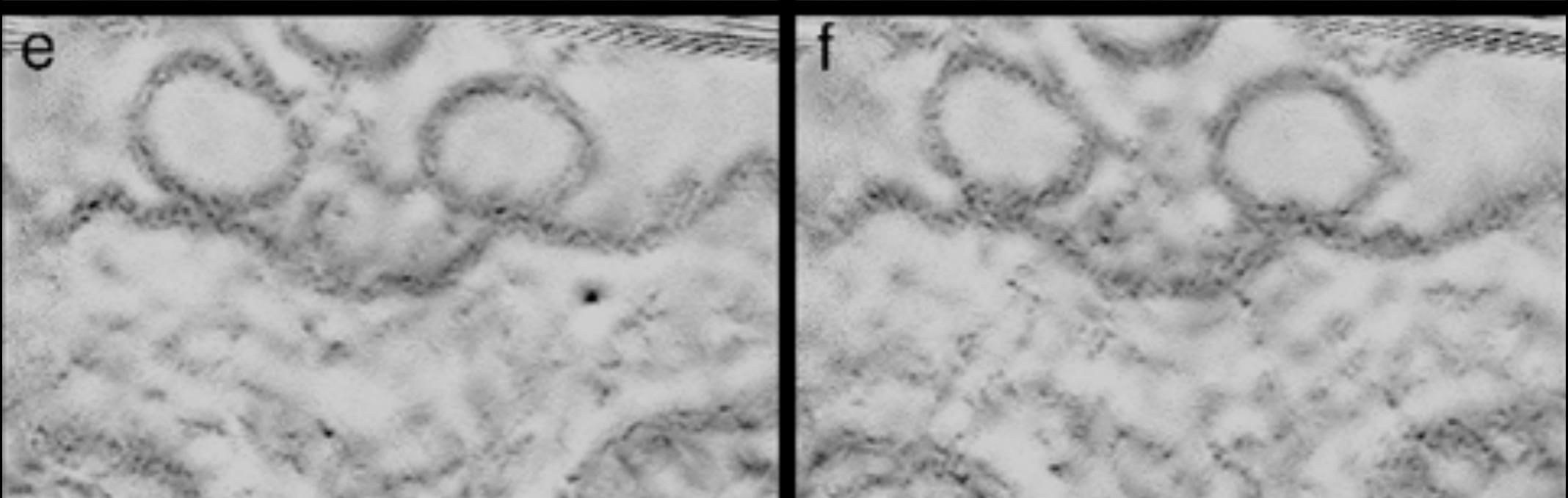
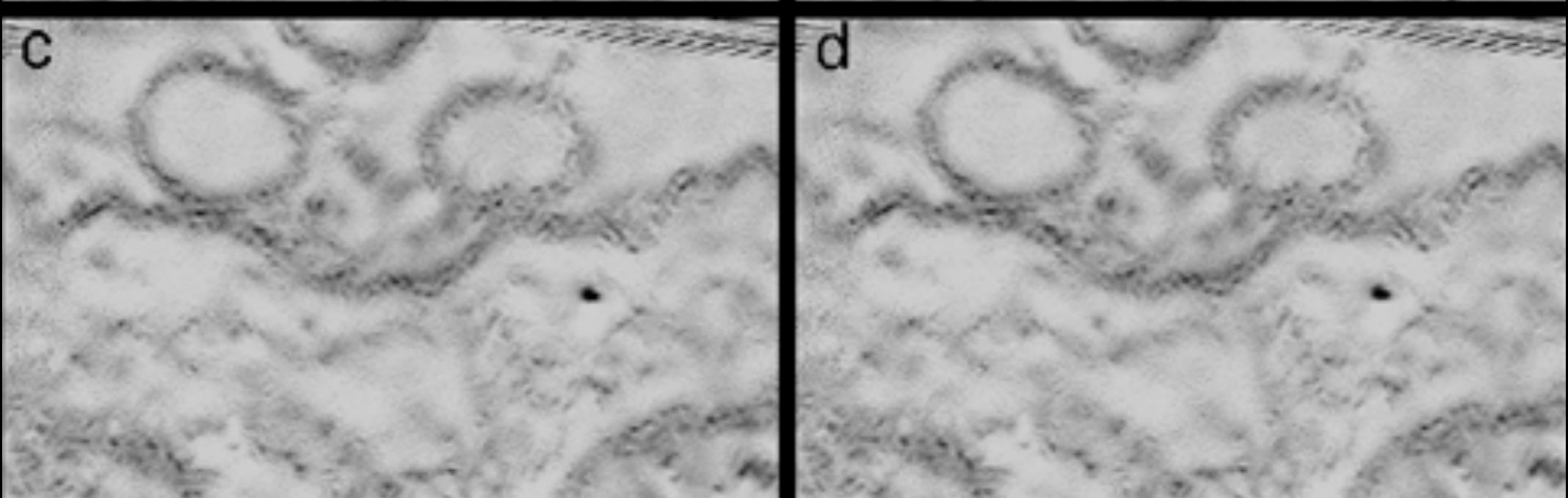
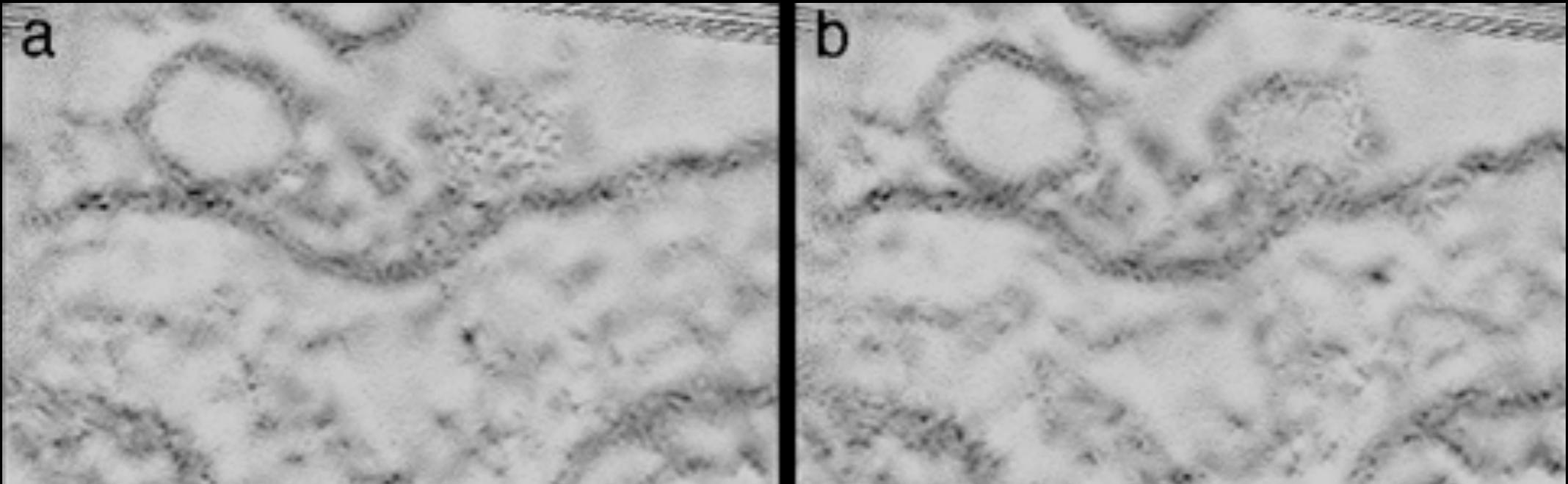


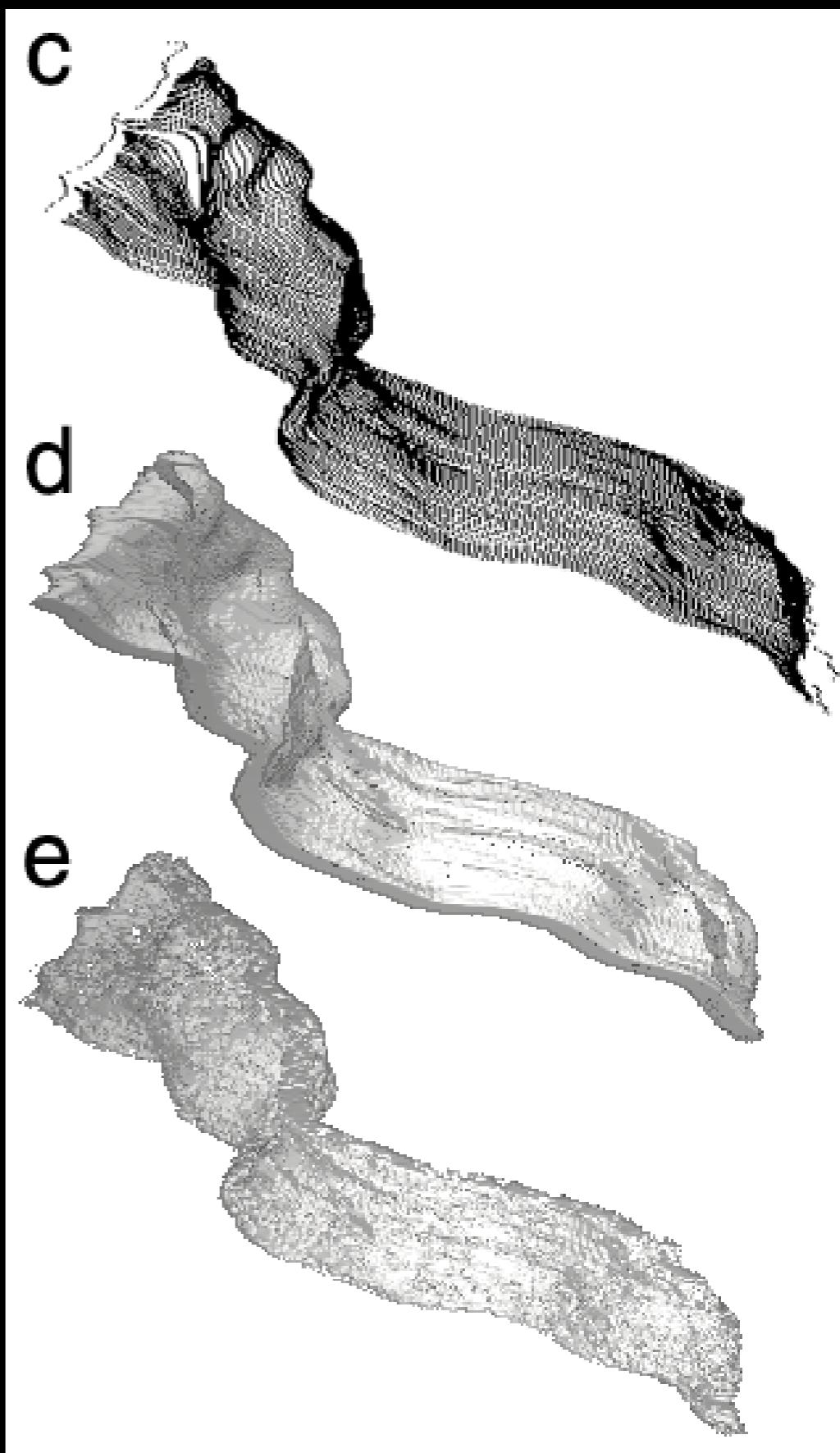
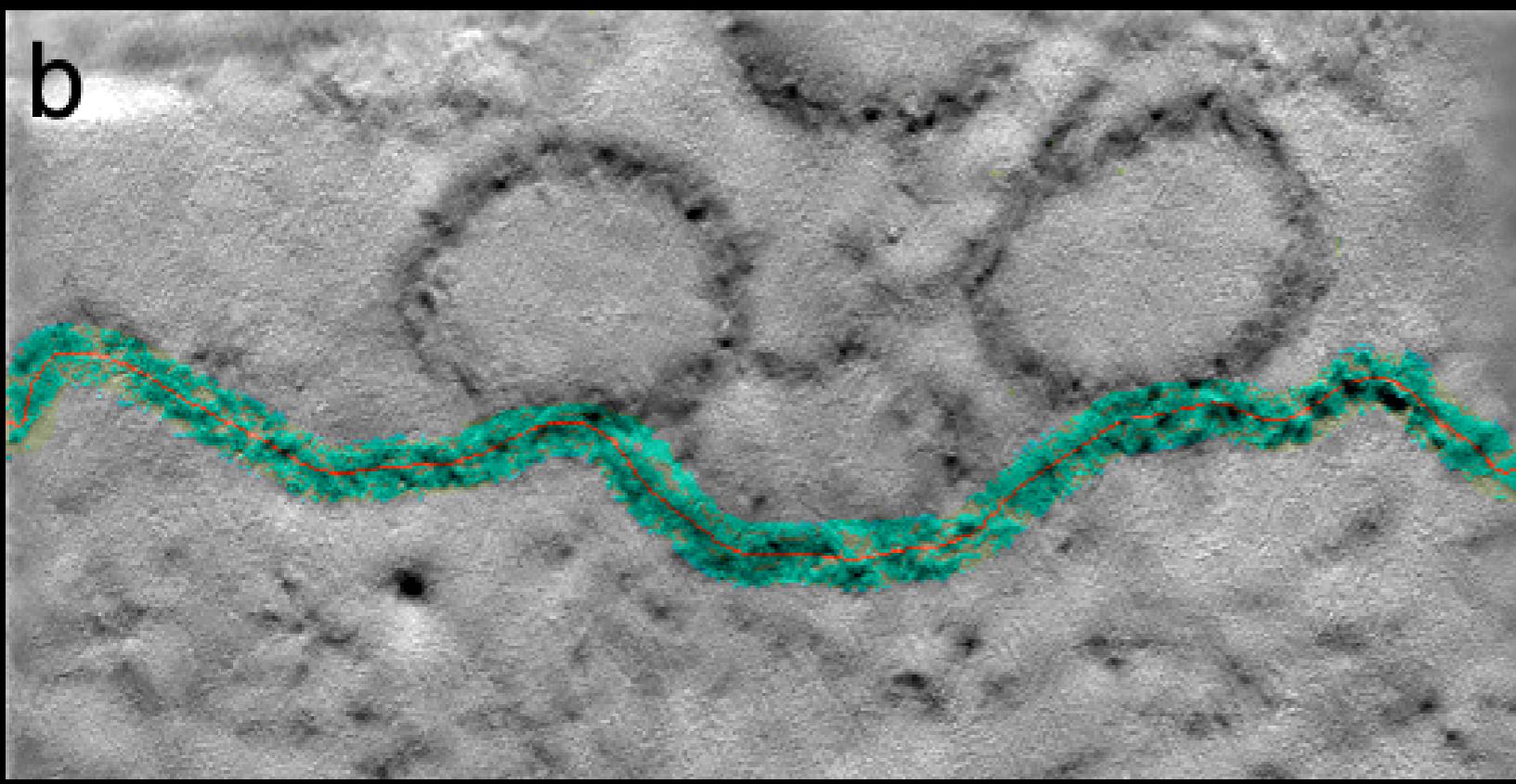
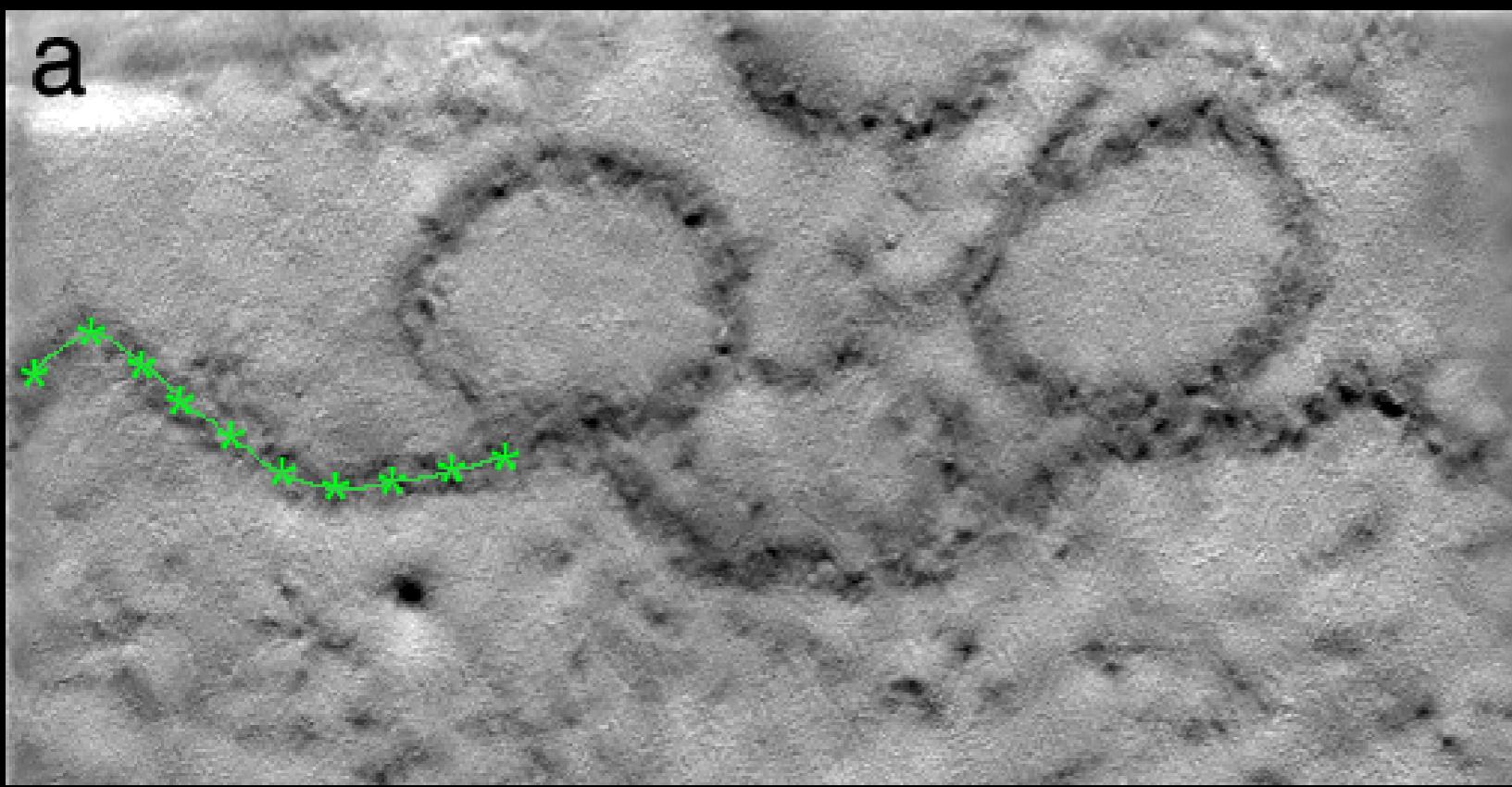
**Using EM3D<sup>®</sup>**  
*Software for Electron Microscope Tomography*

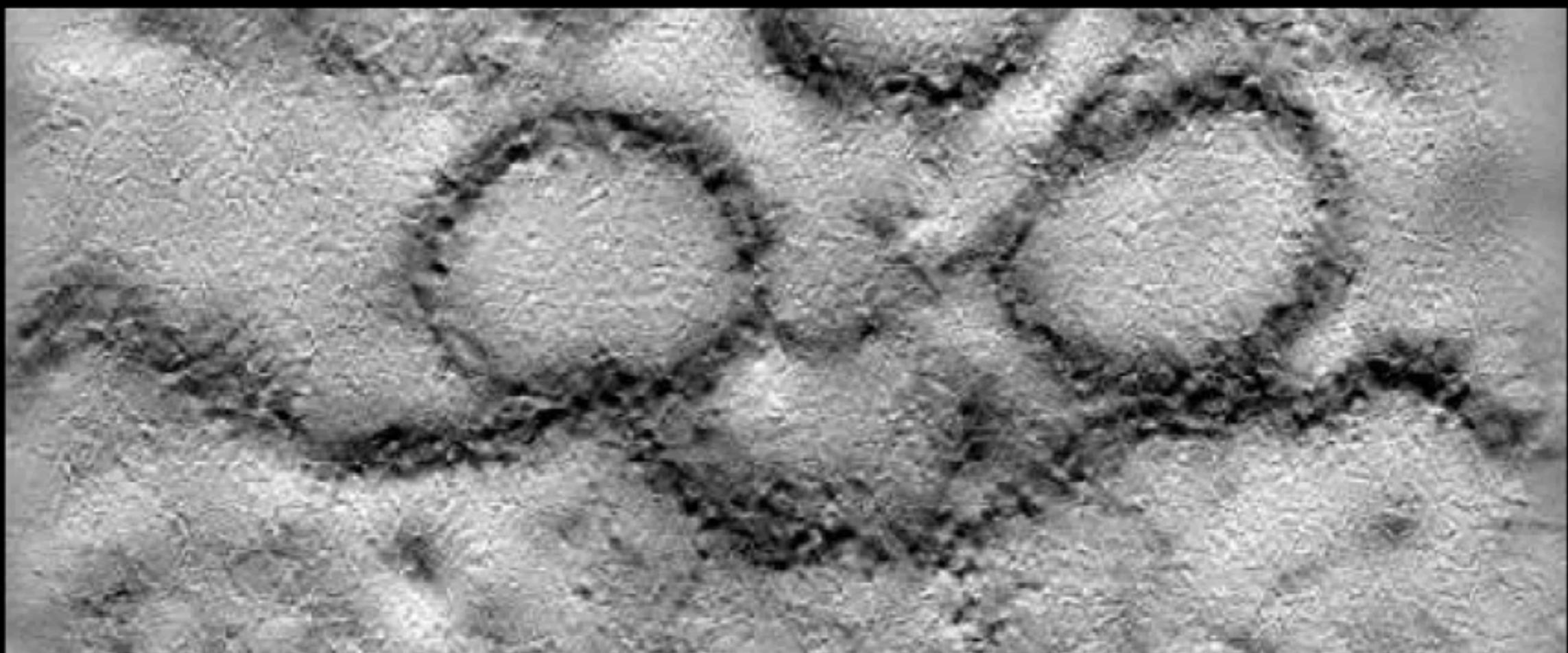
David Ress, Mark Harlow, Robert Marshall, Cornelia Koch-Stoschek, David Yip,  
Mira Roman and U.J.McMahan

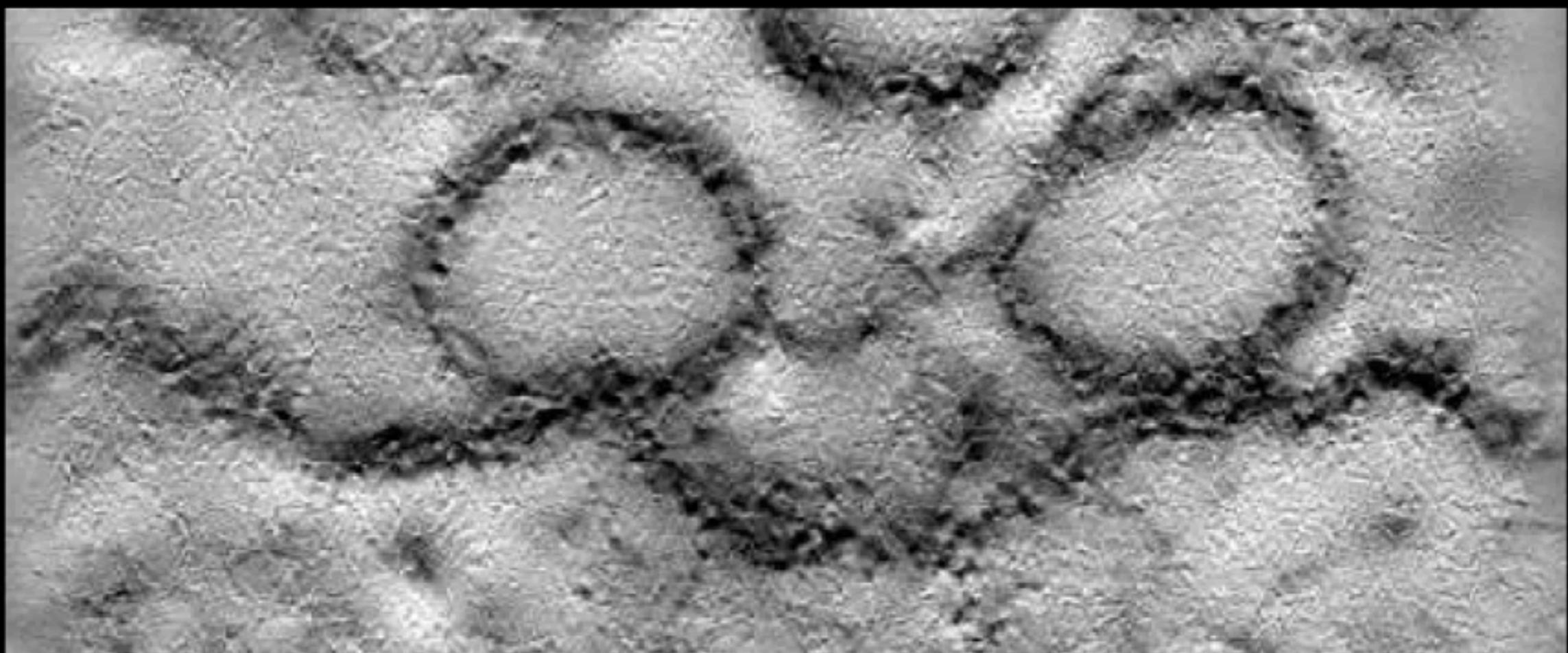


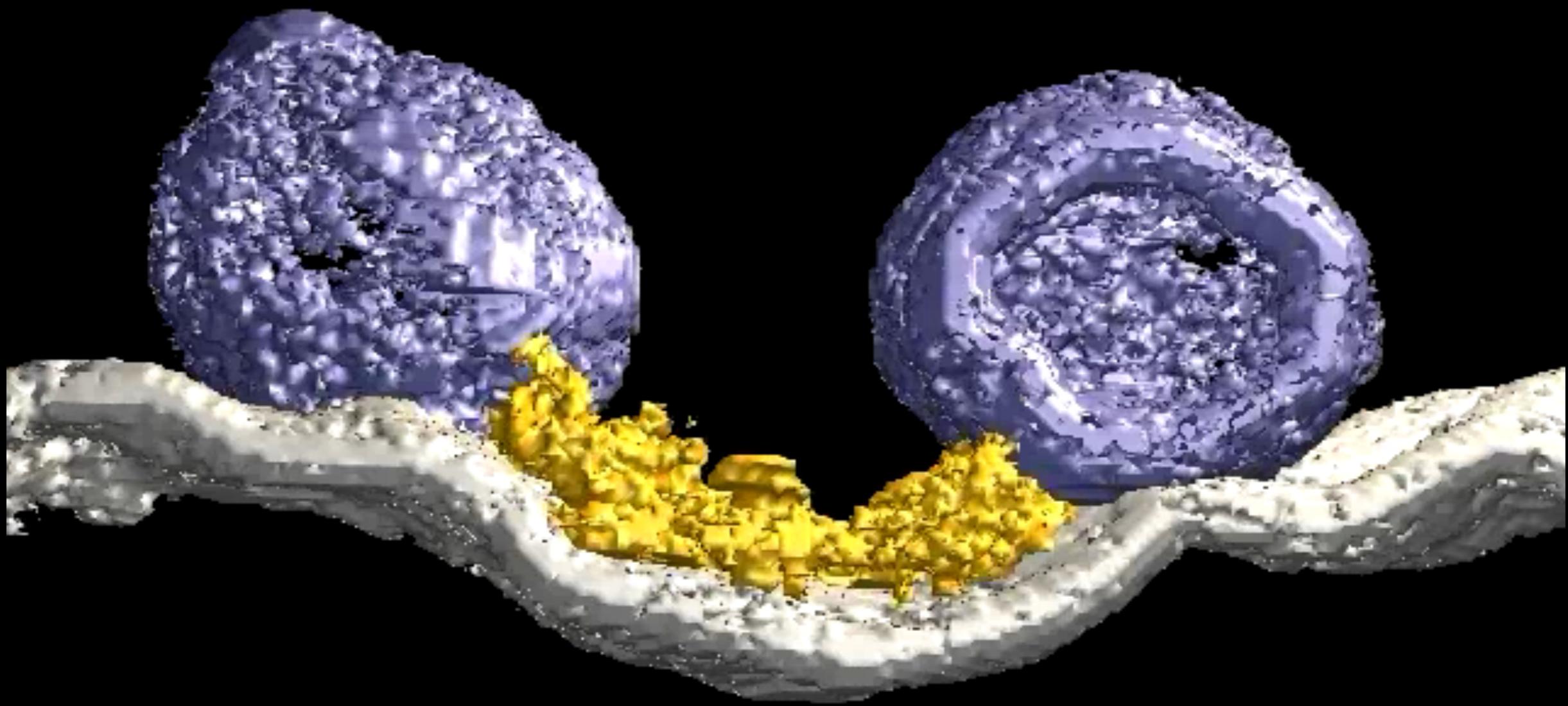
This Human Brain Project/Neuroinformatics  
research is funded by the  
National Institute of Mental Health

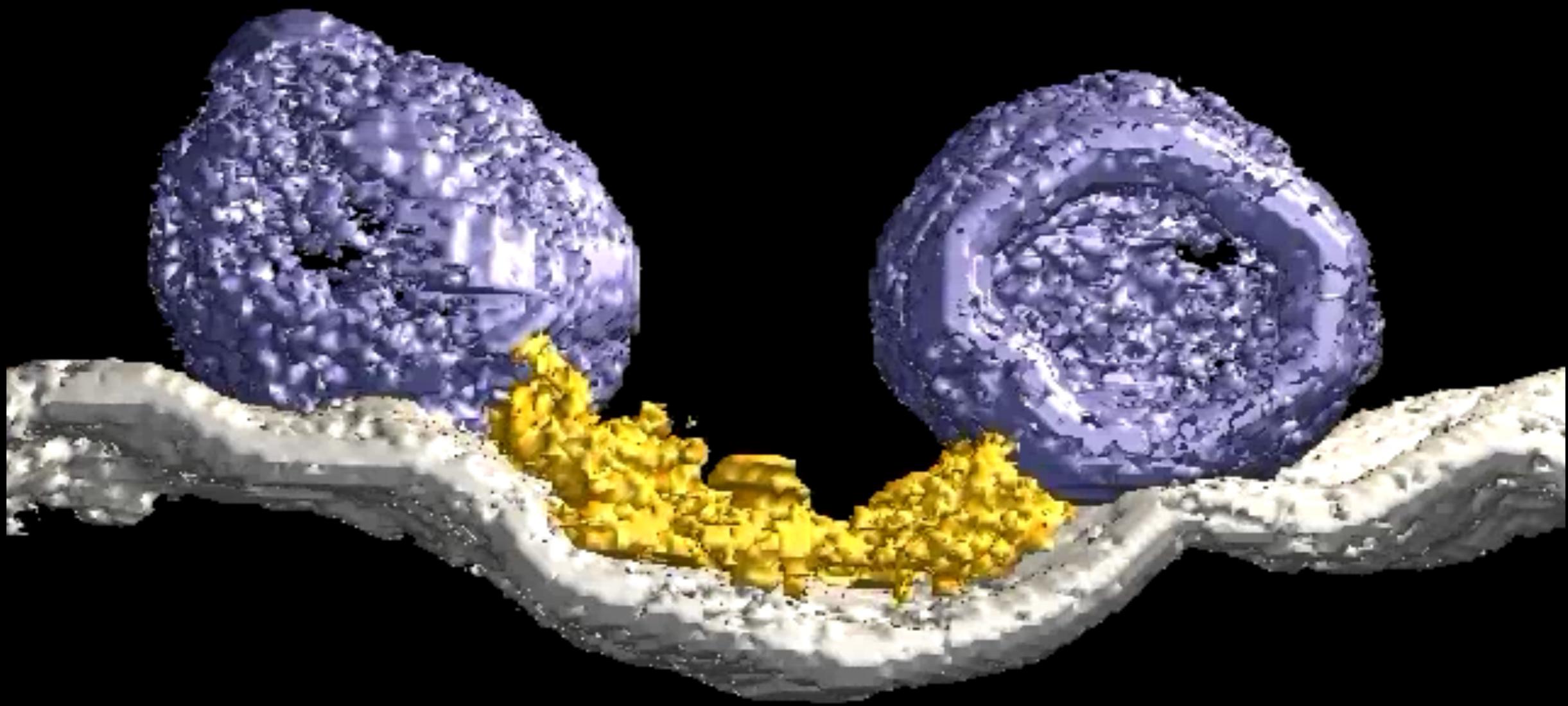


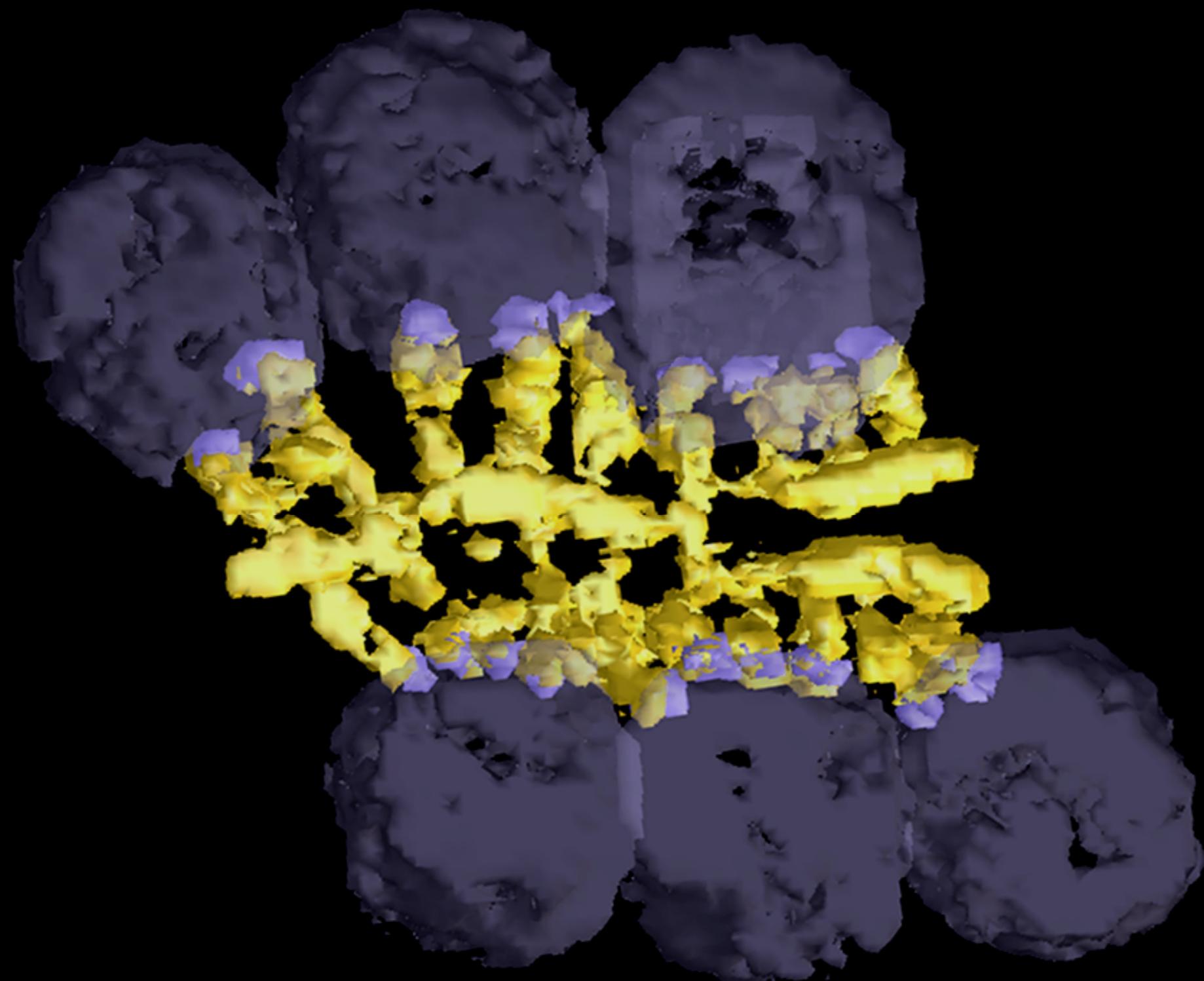








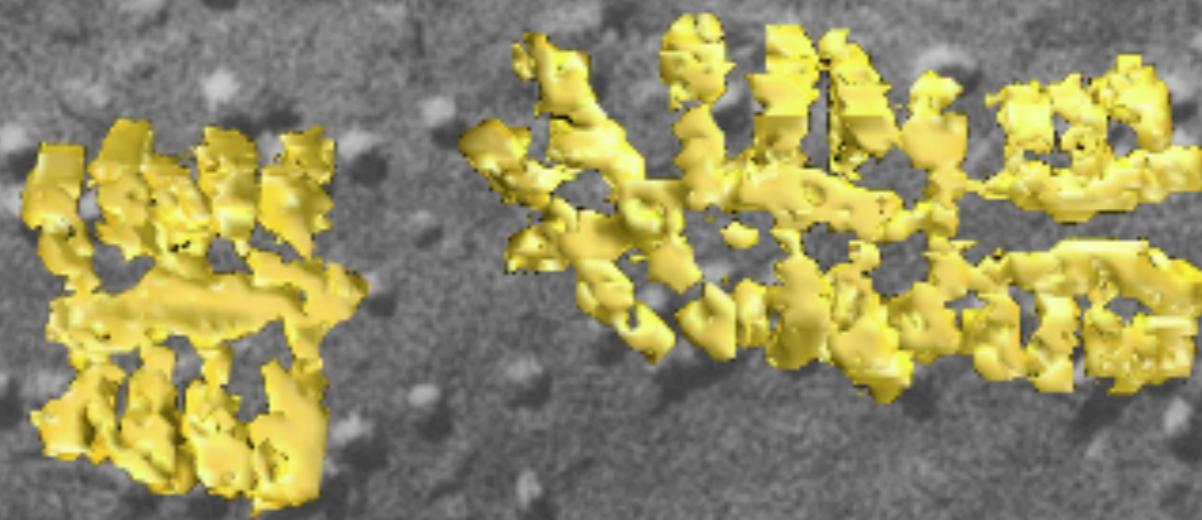




*Harlow, Ress, Marshall & McMahan (2001) Nature 409: 479-484.*

**h**

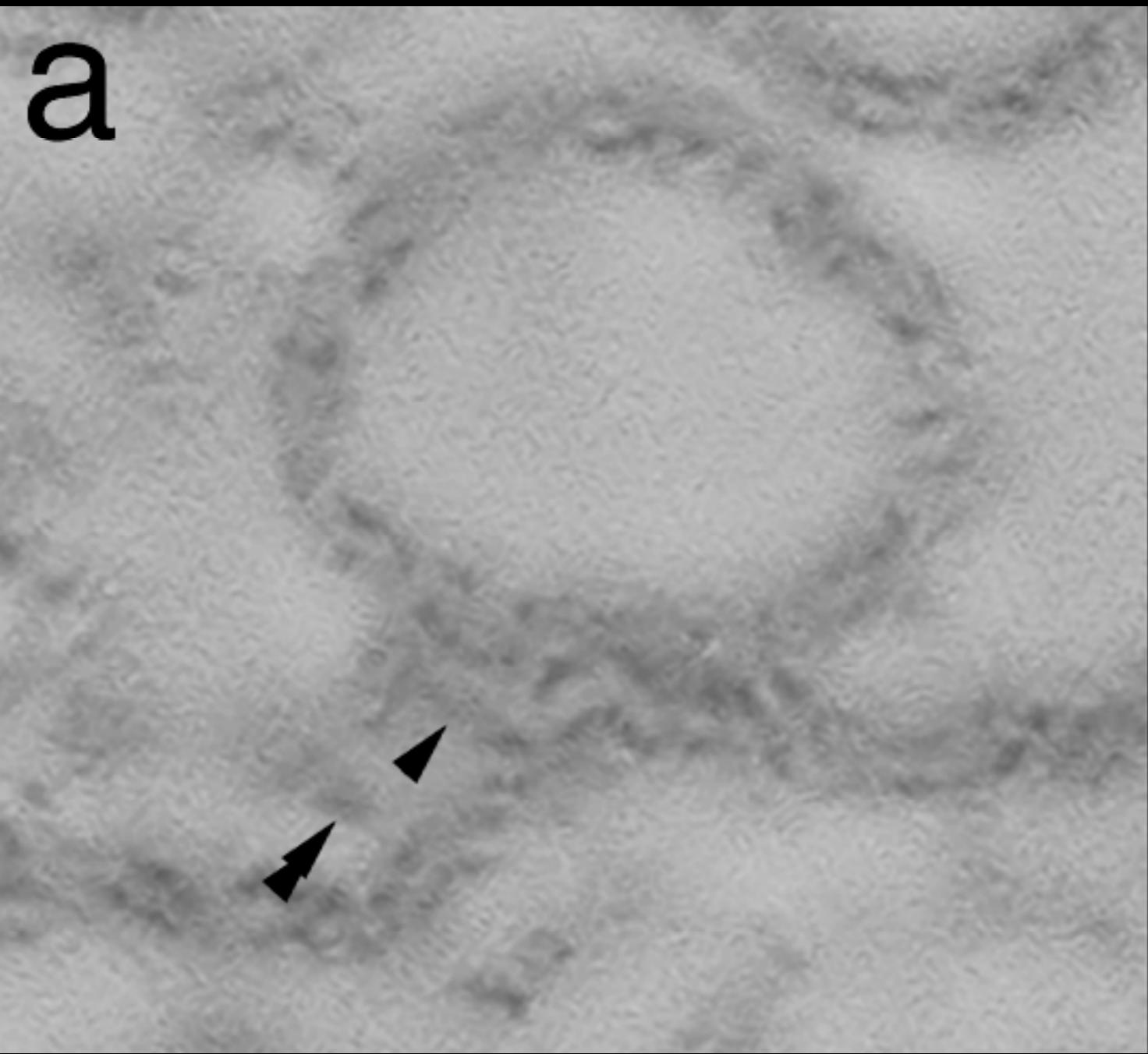
**i**



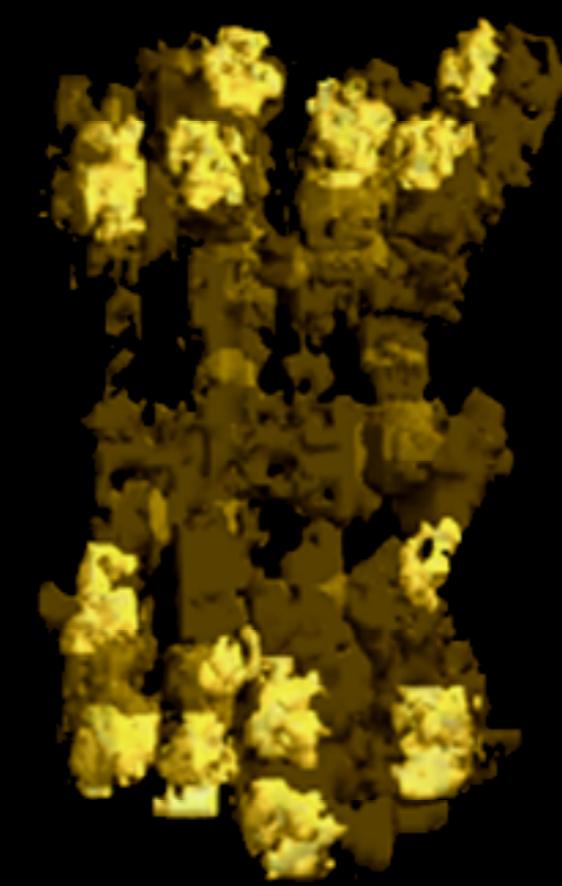
*Heuser & Reese (1981) J. Cell Biol. 88: 564-560.*

*Harlow, Ress, Marshall & McMahan (2001) Nature 409: 479-484.*

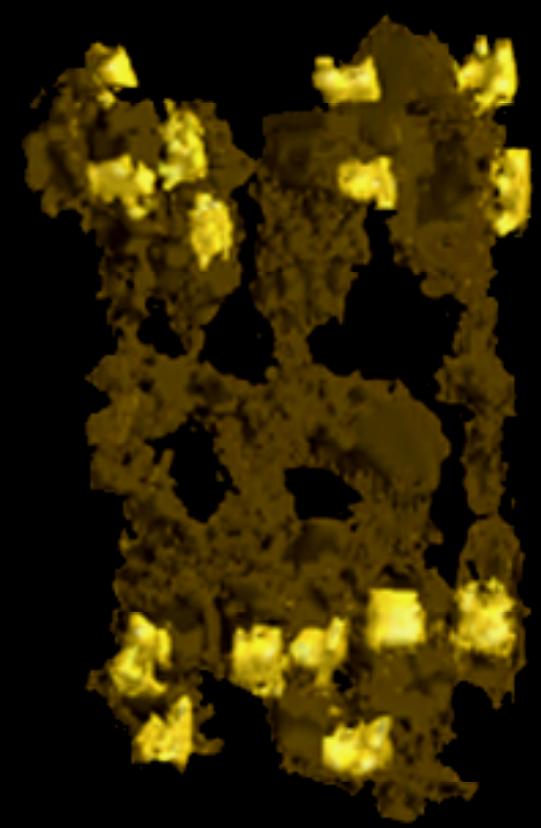
**a**



**b**



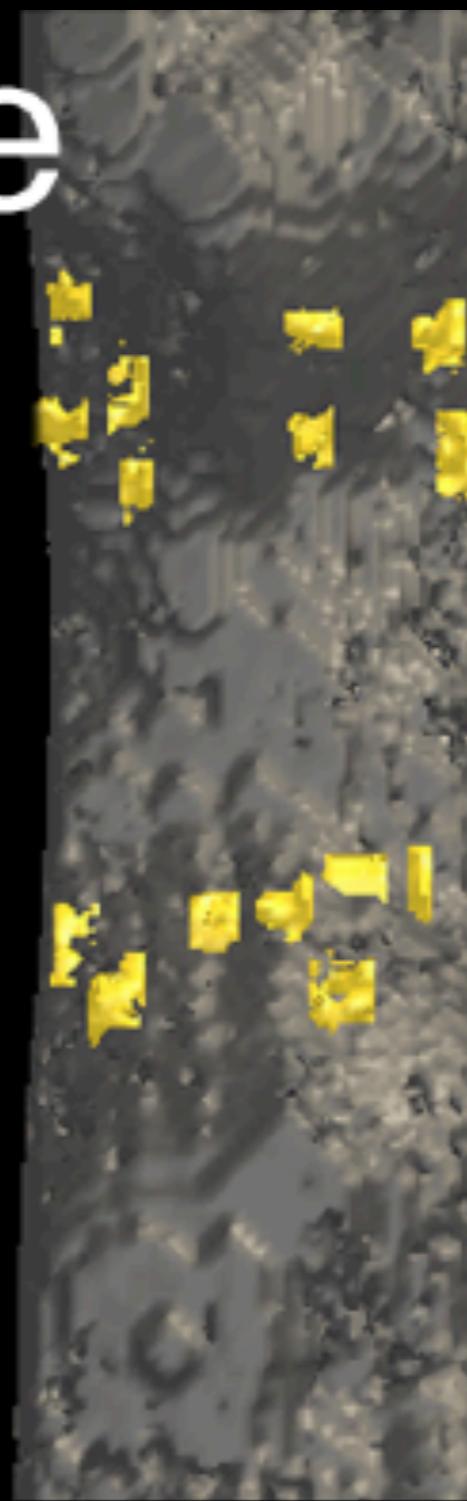
**c**



d



e

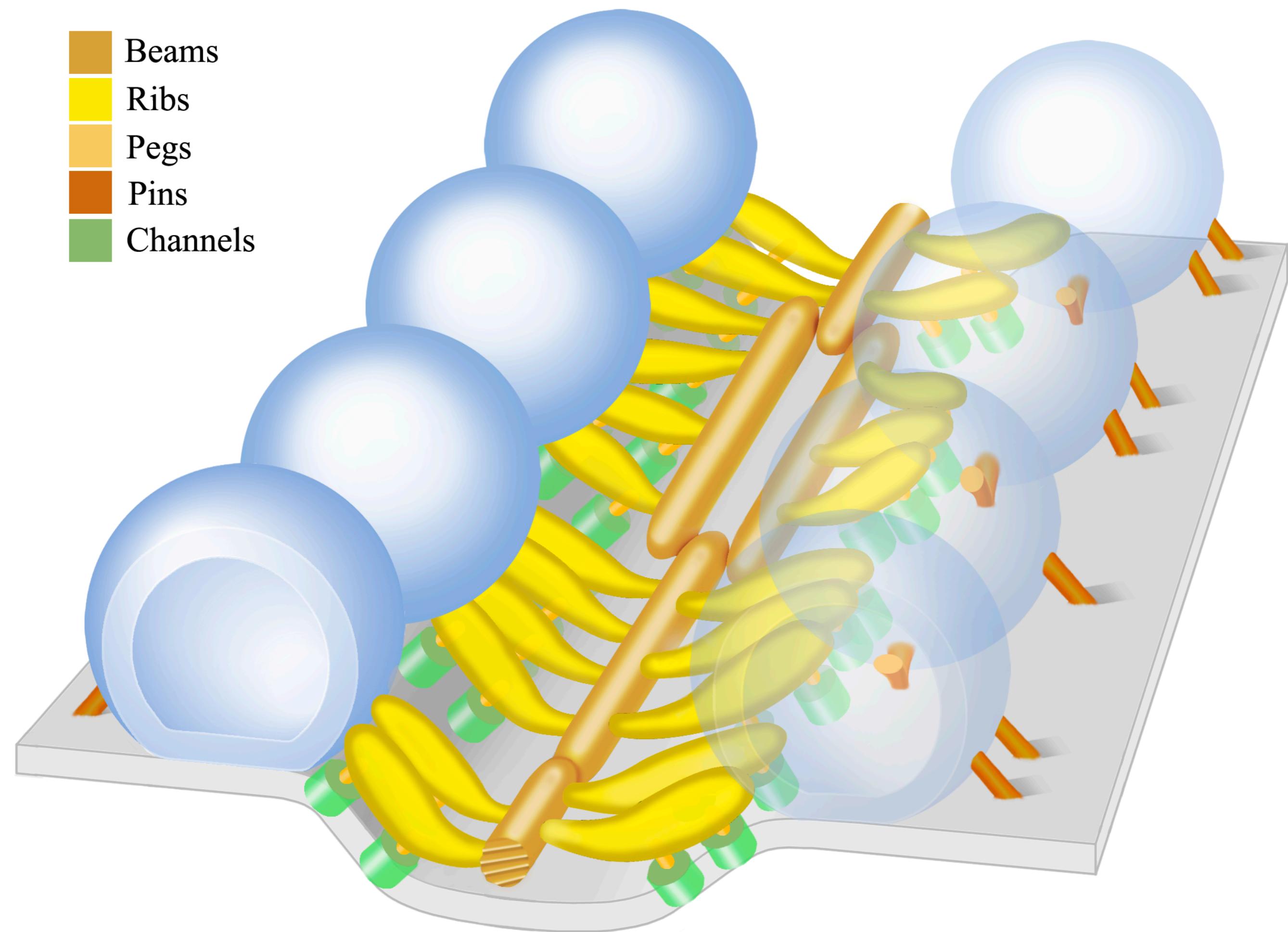


f

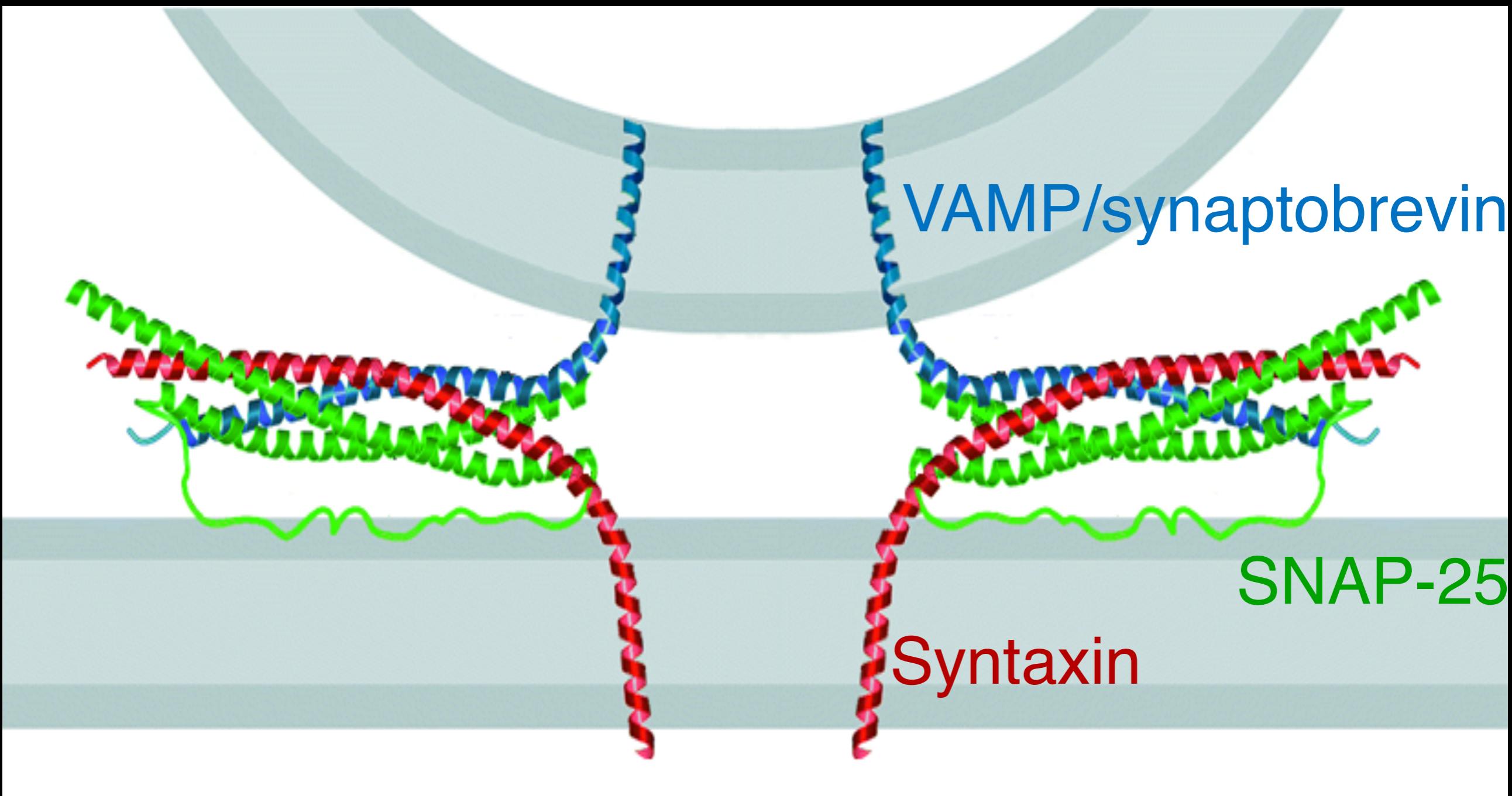


Harlow, Ress, Marshall & McMahan (2001) Nature 409: 479-484.

Beams  
Ribs  
Pegs  
Pins  
Channels

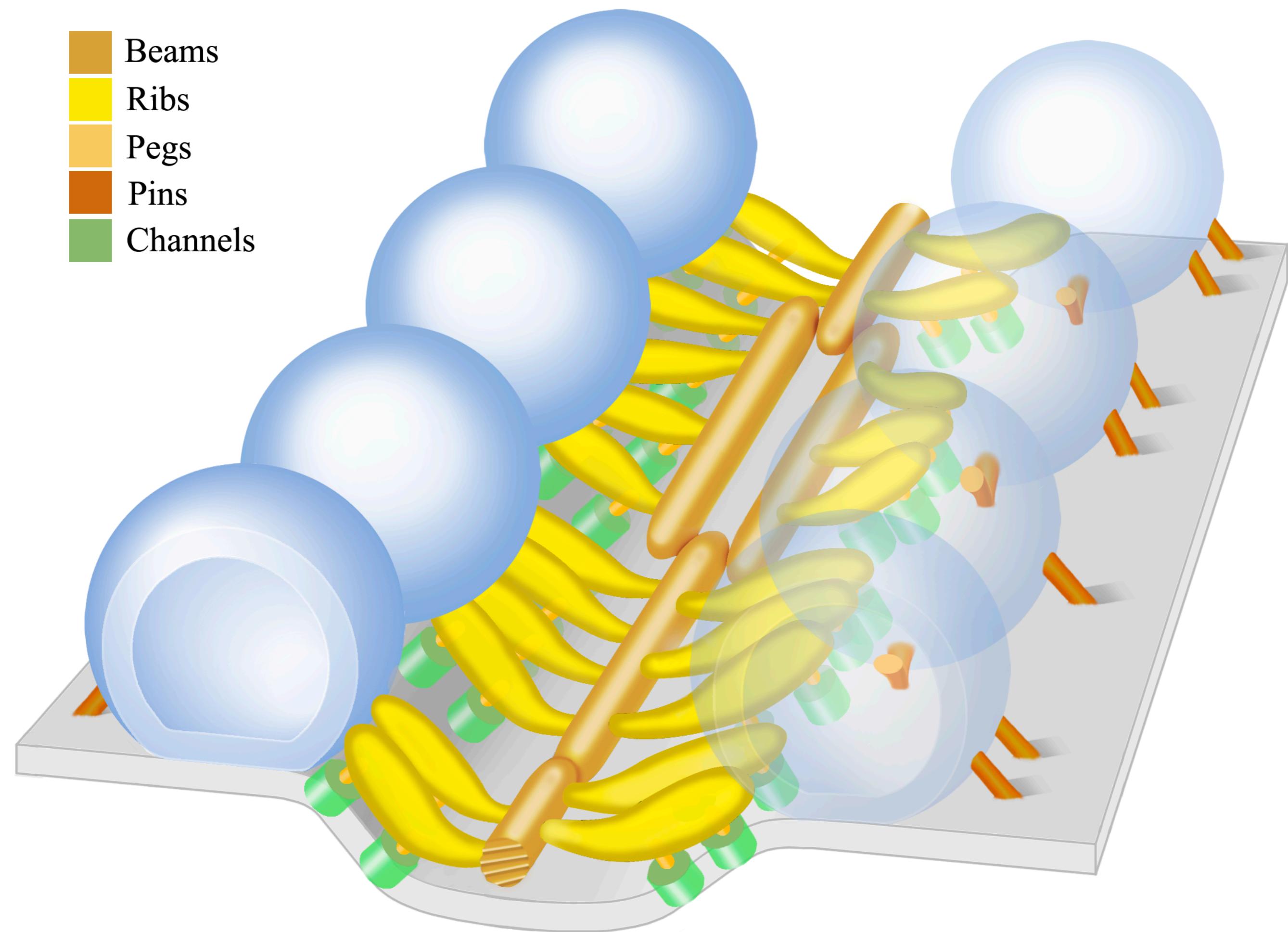


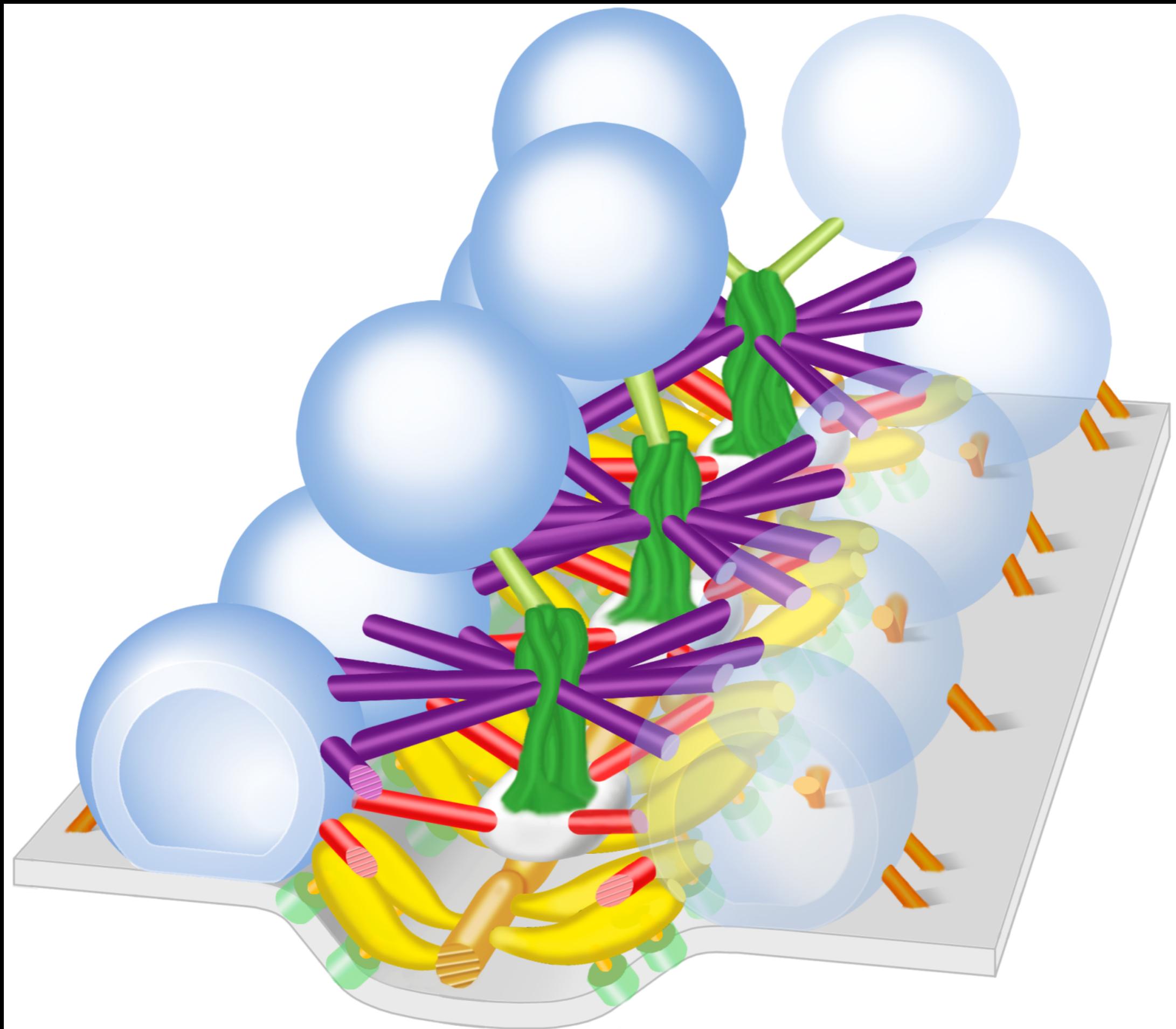
# SNARE Hypothesis



Adapted from Sutton et al. (1998) Nature 395:347-353

Beams  
Ribs  
Pegs  
Pins  
Channels





Szule, Harlow, Jung, De-Miguel, Marshall, McMahan (2012) PLoS ONE 7(3): e33333.

