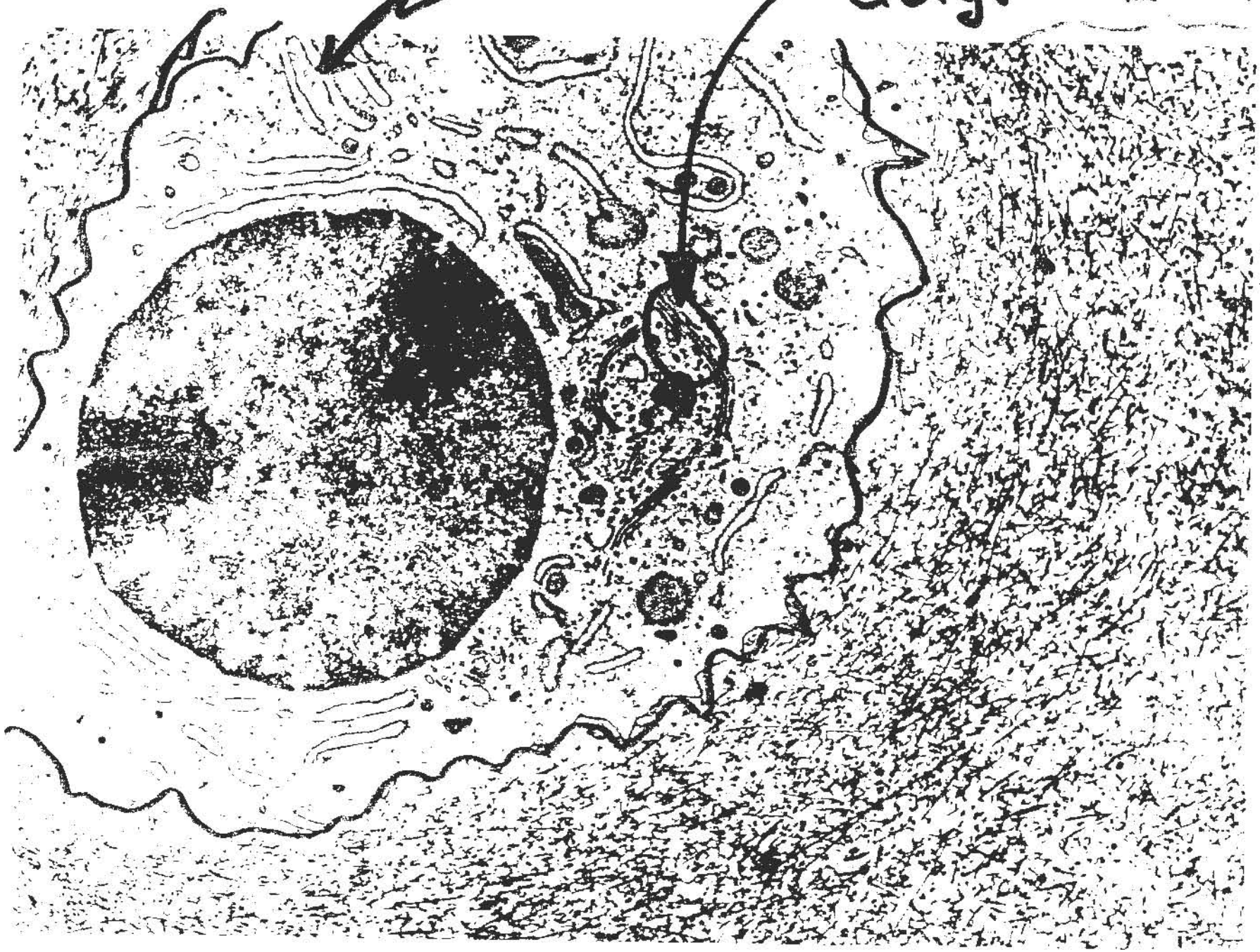
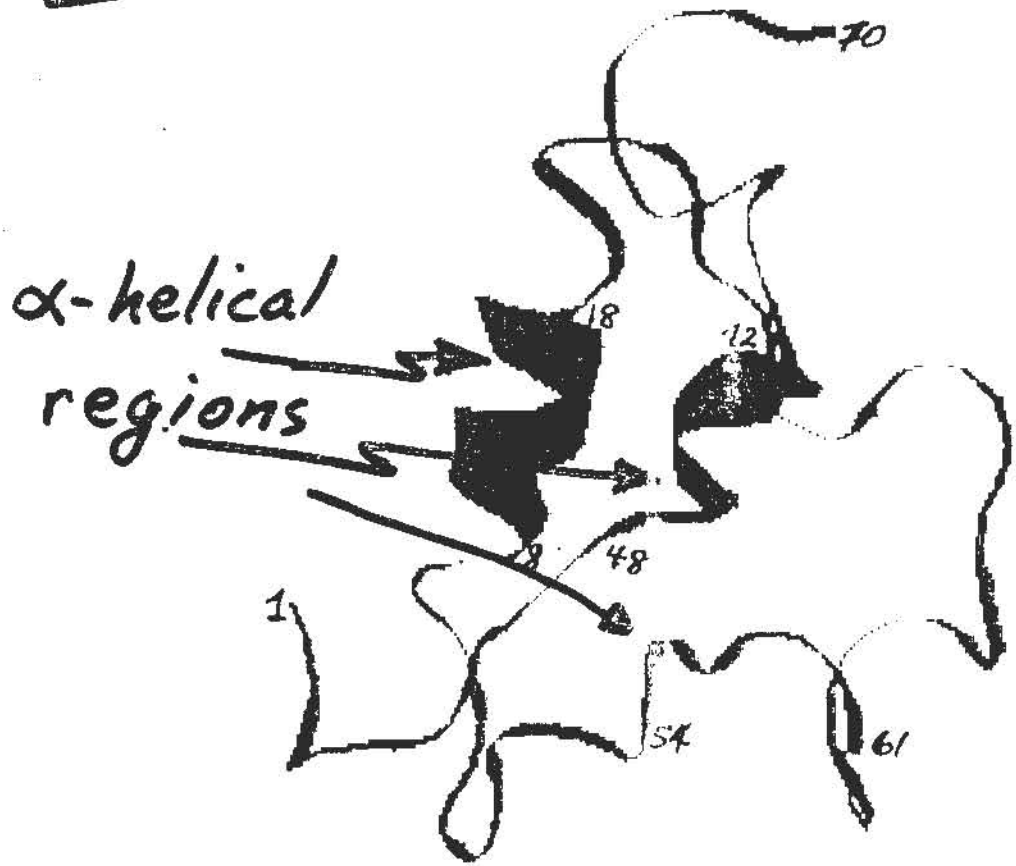


INTRA- & EXTRACELLULAR TRANSPORT

IGF-I

INSULIN-LIKE GROWTH FACTOR-I



α-helical regions

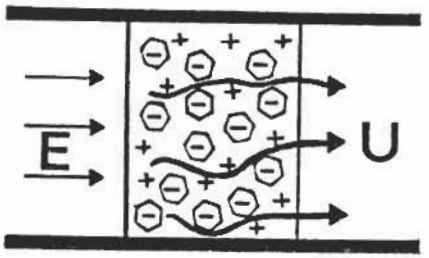
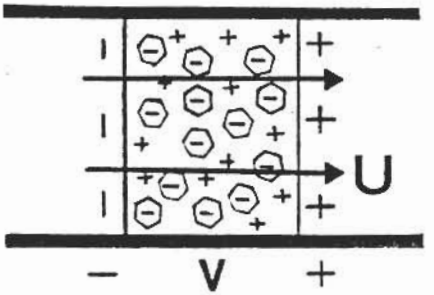
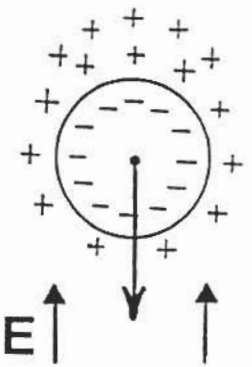
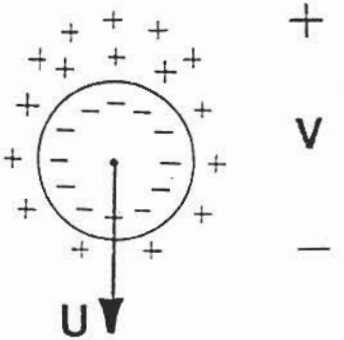
"Folds" like Insulin in Aqueous Solution

- M.W. ~ 7,600 Da
- pI ~ 8.4 (basic)

PROTEIN: (70 amino acids) (⊕ at pH ~ 7)

Figure removed due to copyright considerations. See Stix, Gary. “Trends in Micromechanics: Micron Machinations.” *Scientific American* (November 1992): 107-117.

ELECTROKINETIC PHENOMENA

	Electrical → Mechanical	Mechanical → Electrical
Liquid Moves w.r.t. Solid	 ELECTROOSMOSIS (Reuss, 1809)	 STREAMING POTENTIAL (Quincke, 1859)
Solid Moves w.r.t. Liquid	 ELECTROPHORESIS (Reuss, 1809)	 SEDIMENTATION POTEN. (Dorn, 1880)

"Complete Description" of Coupled Transport

$$\underline{N}_i = -D_i \nabla c_i + \frac{z_i}{|z_i|} u_i c_i \underline{E} + c_i \underline{v}$$

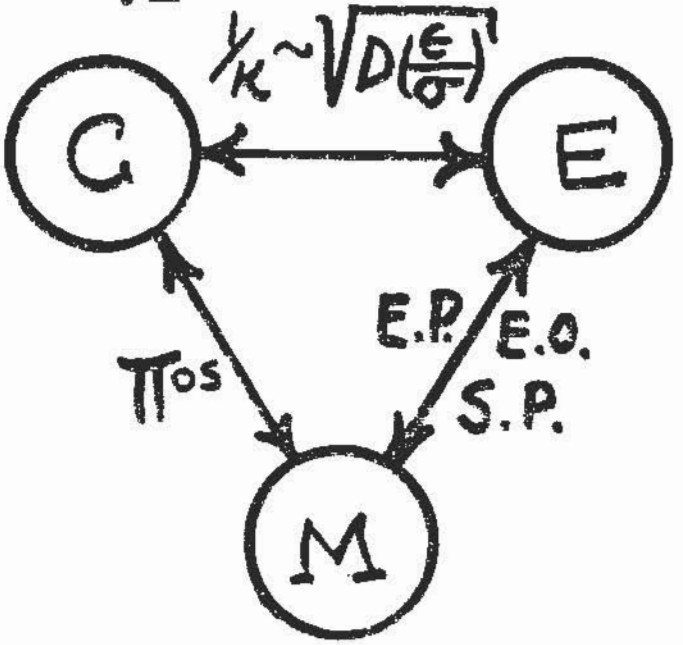
$$\frac{\partial c_i}{\partial t} = -\nabla \cdot N_i + R_{vi}$$

$$\nabla \cdot \epsilon \underline{E} = \rho_e = \sum_i z_i F c_i$$

$$(\underline{E} = -\nabla \Phi)$$

$$\nabla \cdot \underline{J} = -\frac{\partial \rho_e}{\partial t}$$

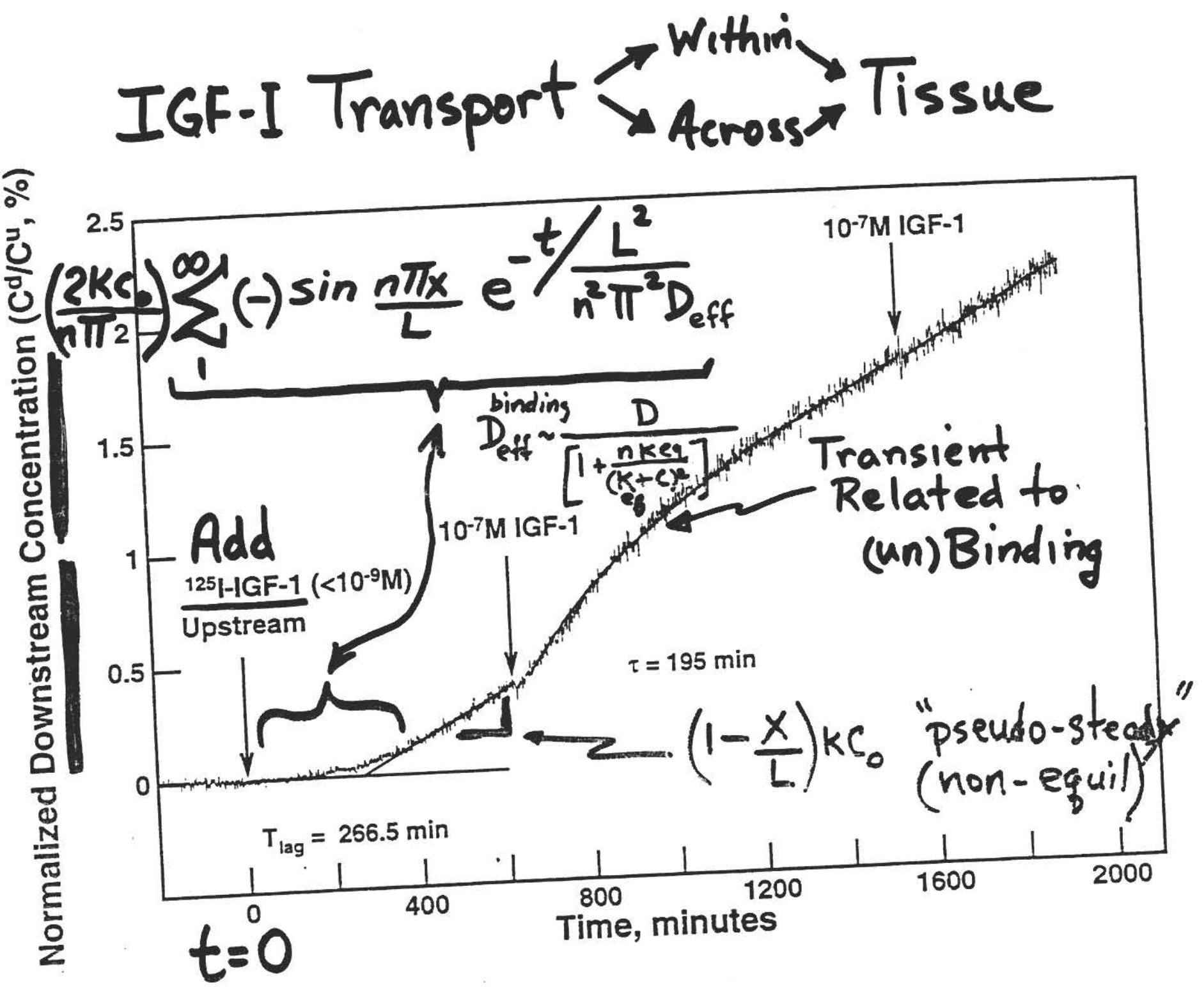
$$\underline{J} = \sum_i z_i F \underline{N}_i$$

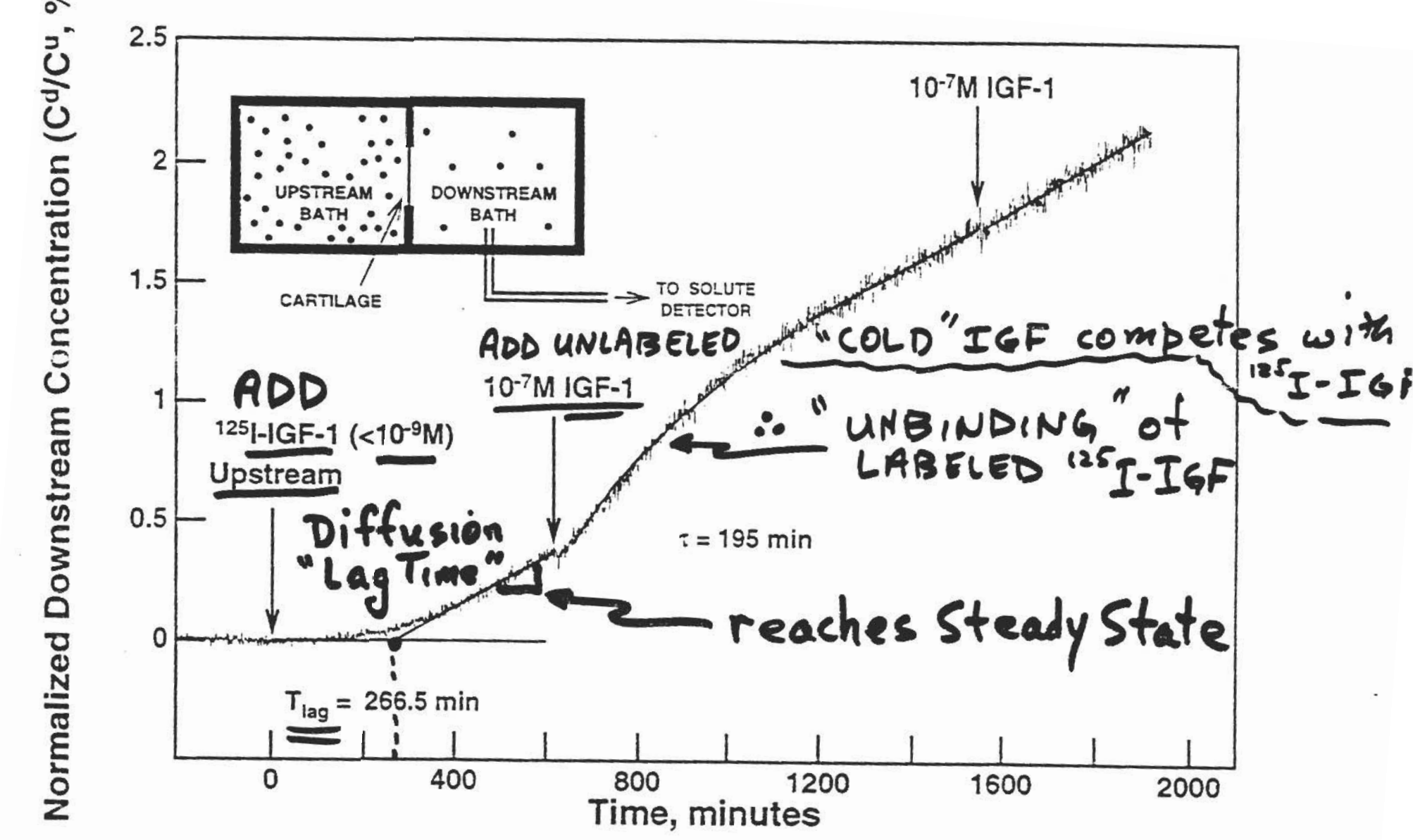


$$\rho \frac{D\underline{v}}{Dt} = -\nabla p + \mu \nabla^2 \underline{v} + \rho_e \underline{E} + \cdots$$

$$\nabla \cdot \underline{v} = 0$$

IGF-I Transport Within / Across Tissue





$T_{lag} >> T_{diff\ \omega\ no\ BINDING} \Rightarrow$ BINDING Within Tissue

Figure removed due to copyright considerations. See Lodish, H., et. al. *Molecular Cell Biology*. 4th ed. New York: W. H. Freeman & Co., 1999, 284. [glycocalyx]

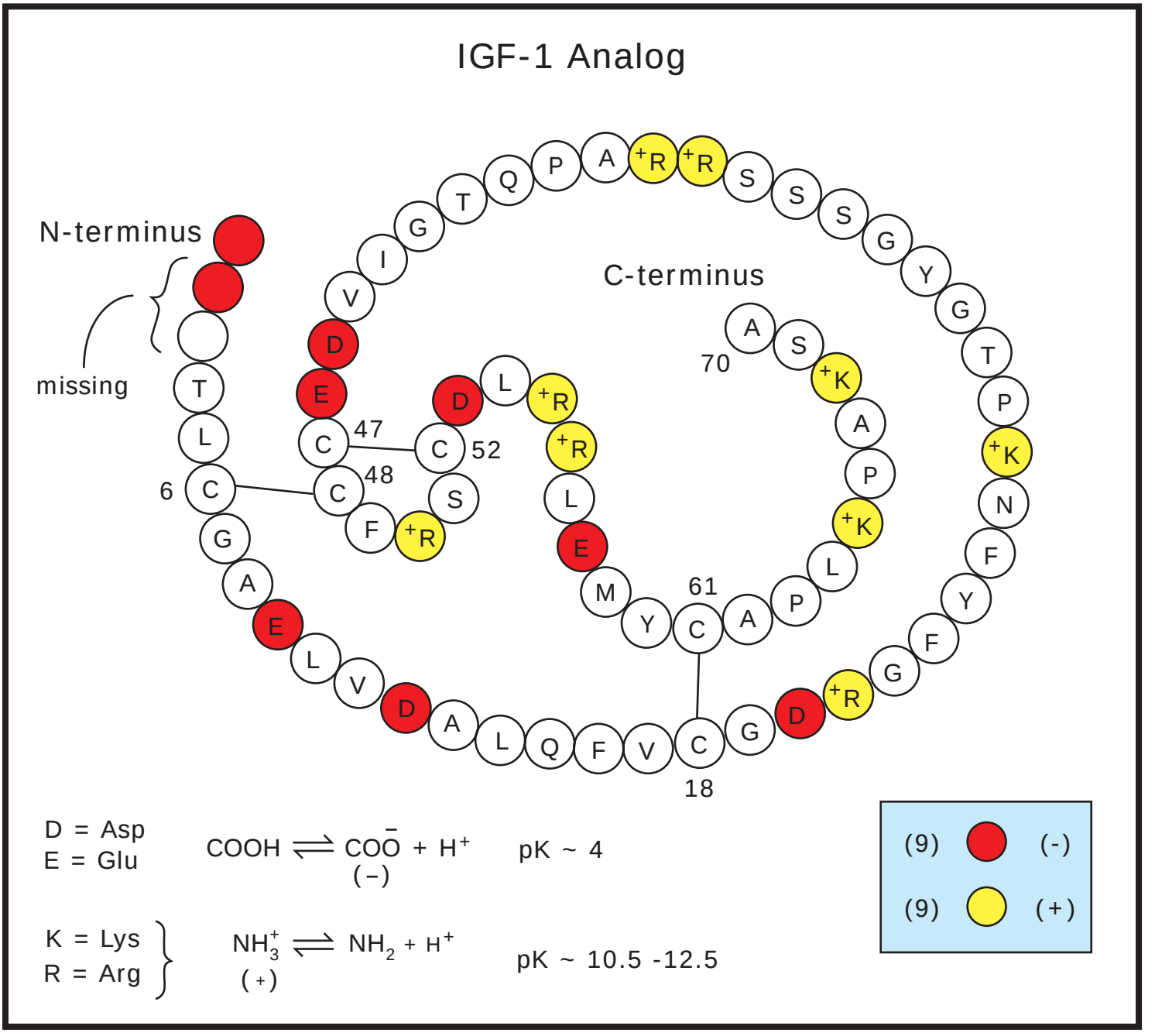
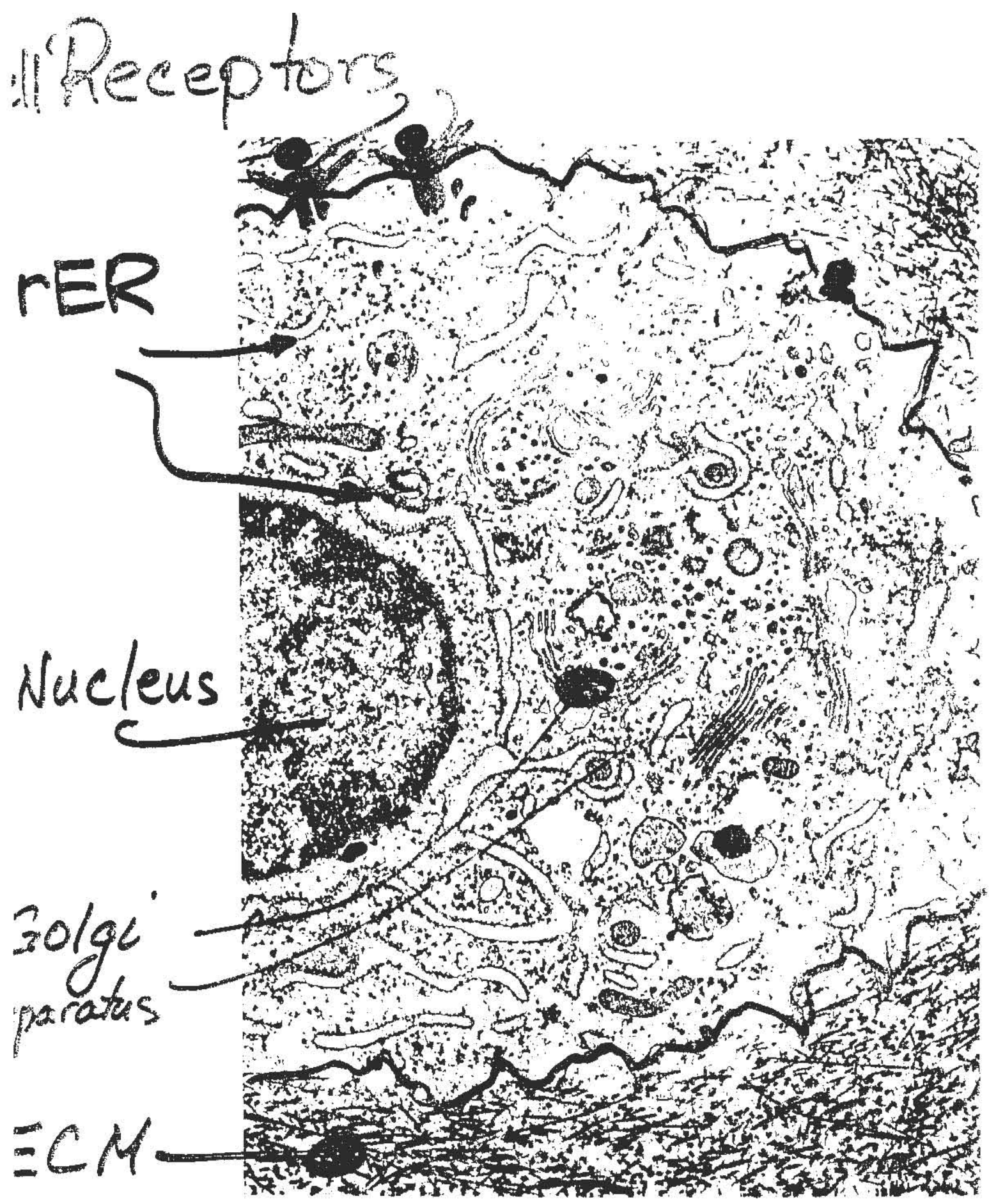
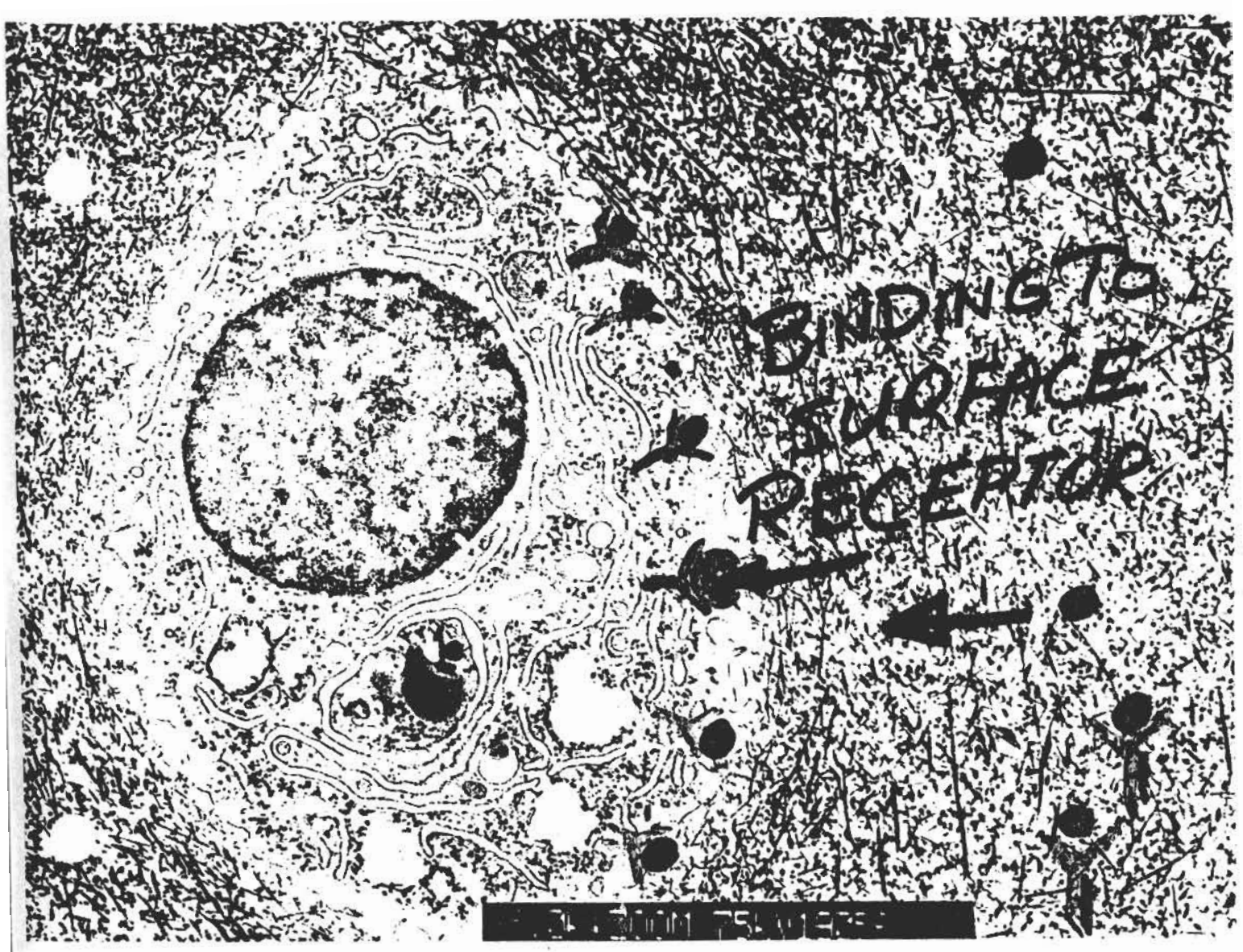


Figure by MIT OCW.


Receptors
rER
Nucleus
Golgi apparatus
ECM



IGF-1 TRANSPORT TO CELL THROUGH DENSE ECM

(or "Tissue-Engineered" Scaffold)

Y = cell surface receptor

Y = IGF "Binding Protein" in ECM

Figure removed due to copyright considerations. See Fig. 3-3 in Lodish, H., et. al. "Hydrophilic and Hydrophobic Amino Acid Structures." *Molecular Cell Biology.* 4th ed. New York: W. H. Freeman & Co., 1999.

MEMs with Micro-Gel Electrophoresis

Figures removed due to copyright considerations. See Burns, M. A., et. al. "An Integrated Nanoliter DNA Analysis Device." *Science* 282, no. 484 (Oct. 1998).