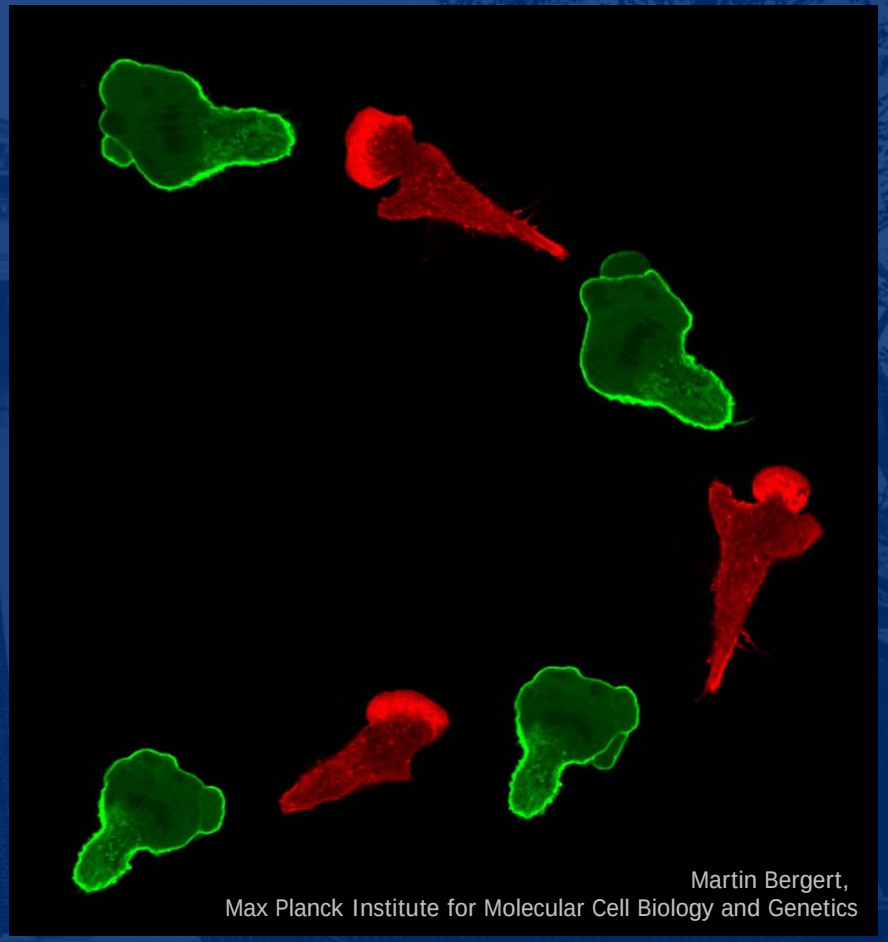
JOHNS HOPKINS
UNIVERSITY

Cell and Tissue Engineering

Cell Migration, Part 1



Martin Bergert,
Max Planck Institute for Molecular Cell Biology and Genetics

Cell migration

Cell Type	Why migrate?
Neutrophil	Phagocytosis bacteria
Lymphocyte	Destroy infected cells
Macrophage	Antigen presentation
Endothelial cell	Angiogenesis
Epidermis cell and fibroblast	Would healing
Tumor cell	Metastasis
Neurons and axons	Development and regeneration
Embryonic stem cell	Embryogenesis

Adapted from Tissue Engineering, Saltzman; Reading.ac.uk

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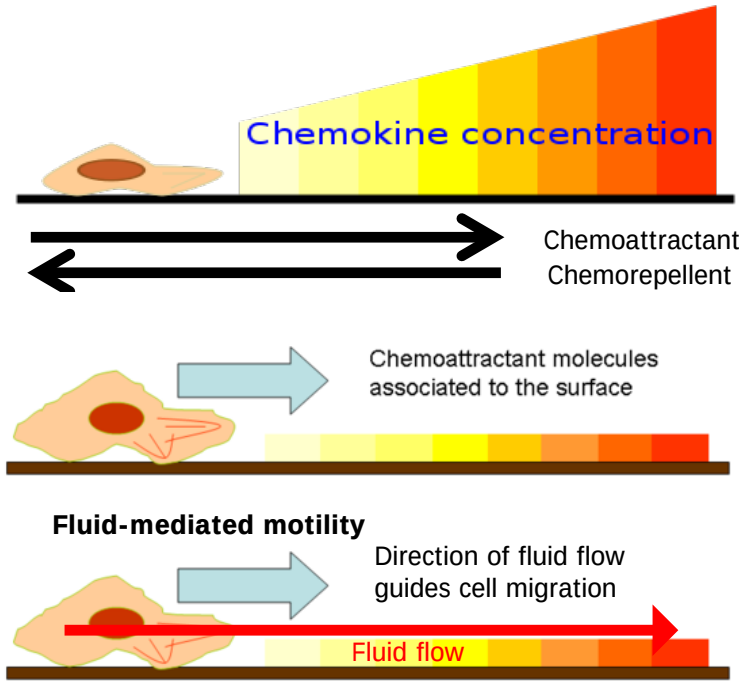
Build replacement tissues and get into biomaterial scaffolds!

Adapted from Tissue Engineering, Saltzman Reading.ac.uk

Modes of cell migration

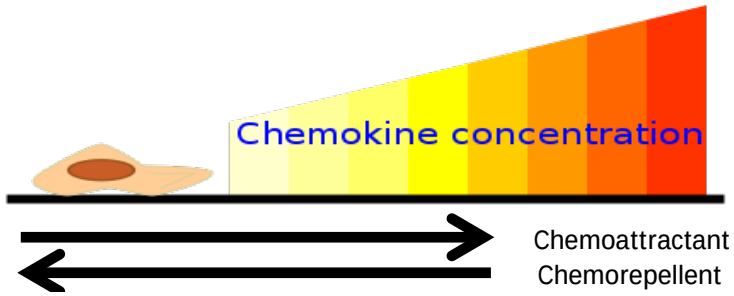


Chemotaxis
Soluble gradient

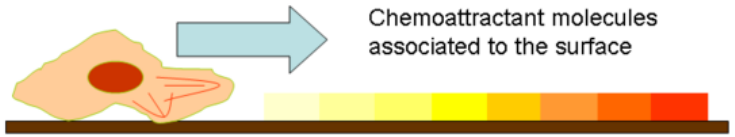
Haptotaxis
Bound gradient

Mechanotaxis
Mechanical force

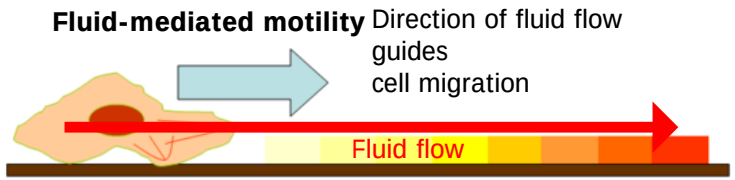
Modes of cell migration



Chemotaxis
Soluble gradient



Haptotaxis
Bound gradient

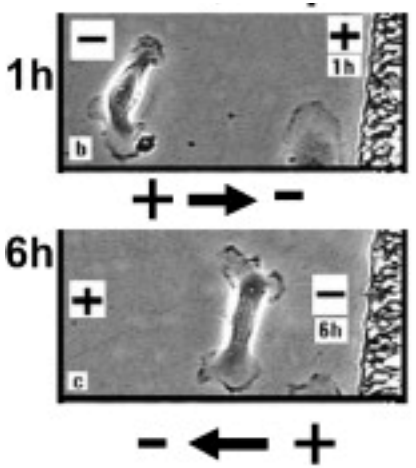


Mechanotaxis
Mechanical force

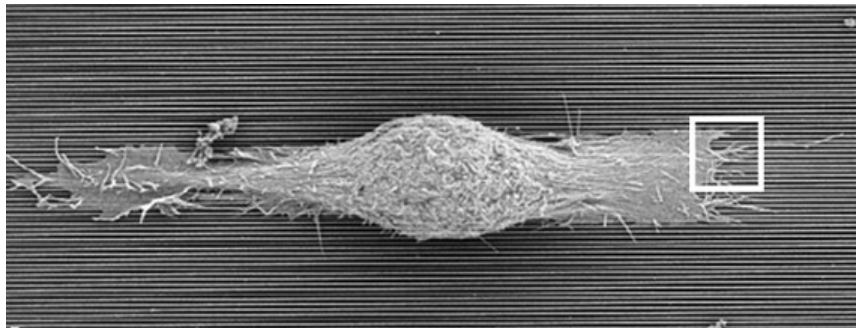
Durotaxis
Substrate mechanics

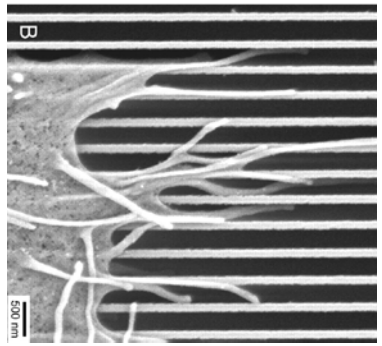
Phototaxis
Light

Galvanotaxis/Electrotaxis
Electrical currents



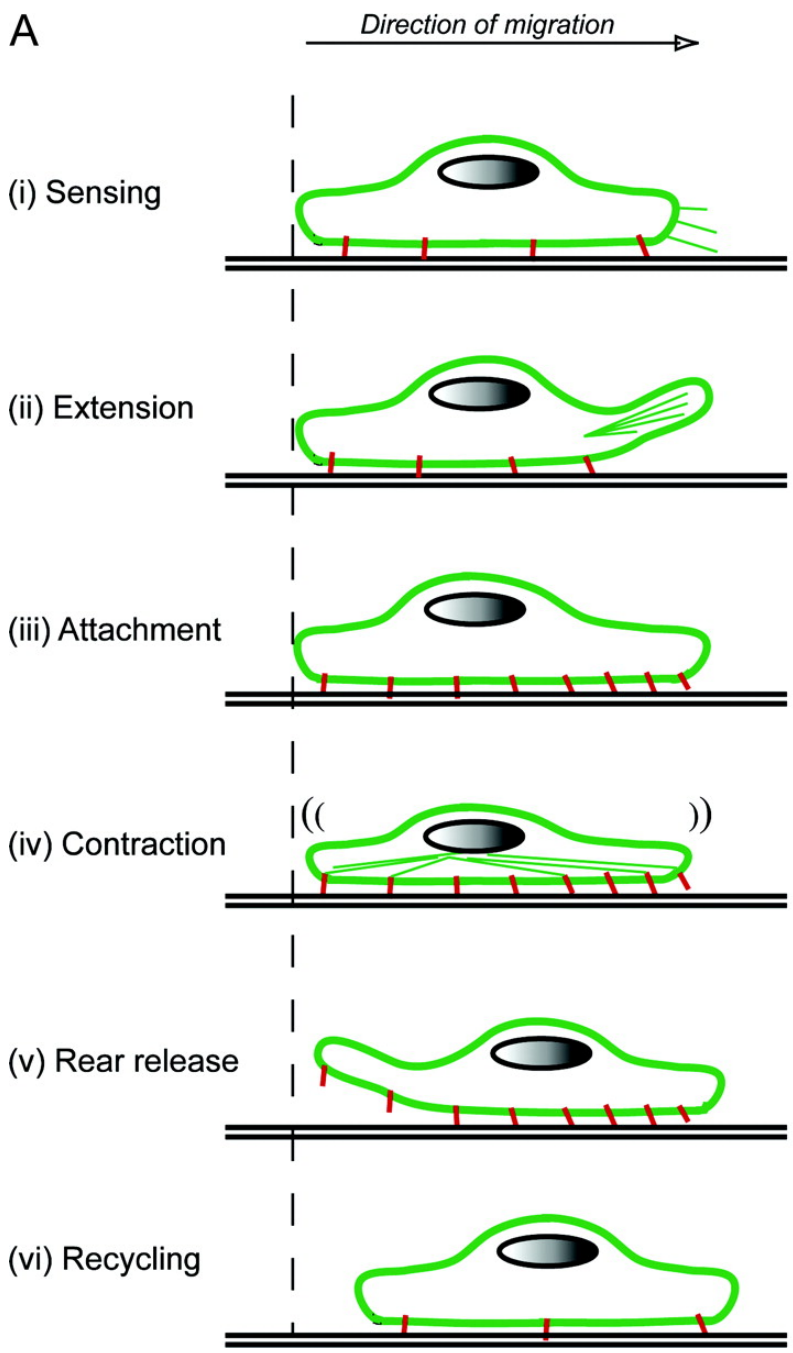
Contact guidance
Surface topology



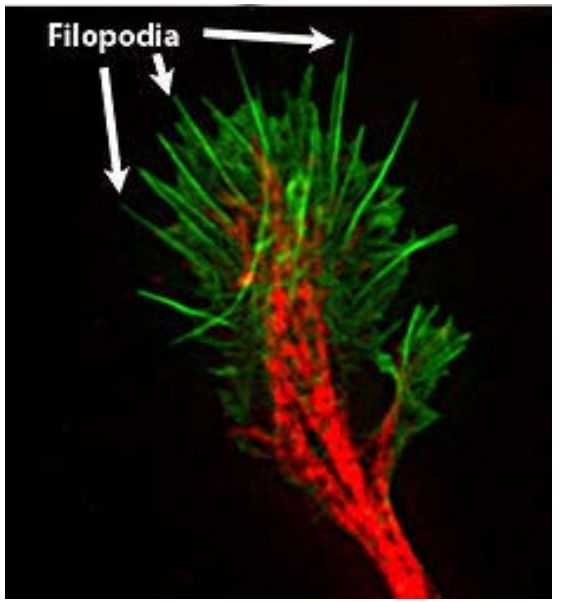


Zhao, 2009; Tiexera et al 2003

The underlying processes in migration

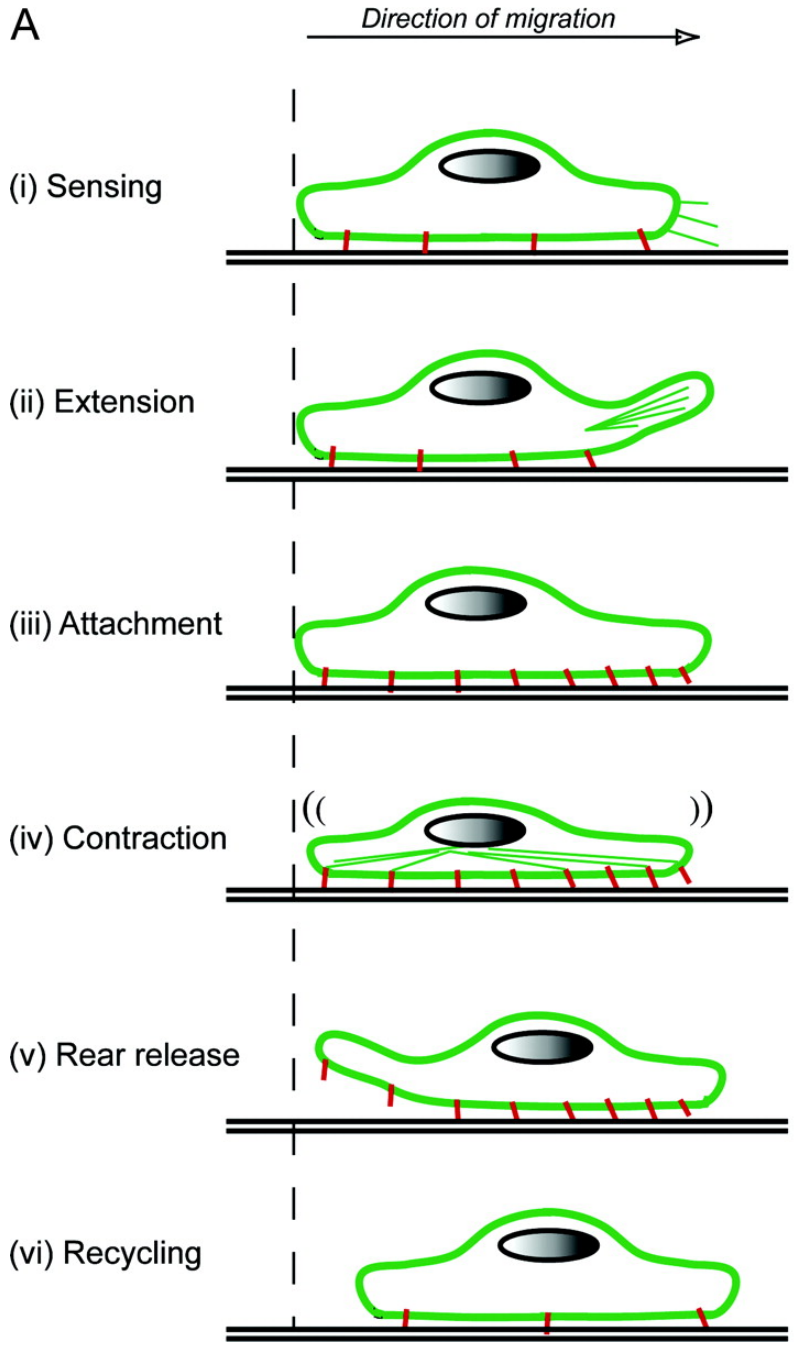


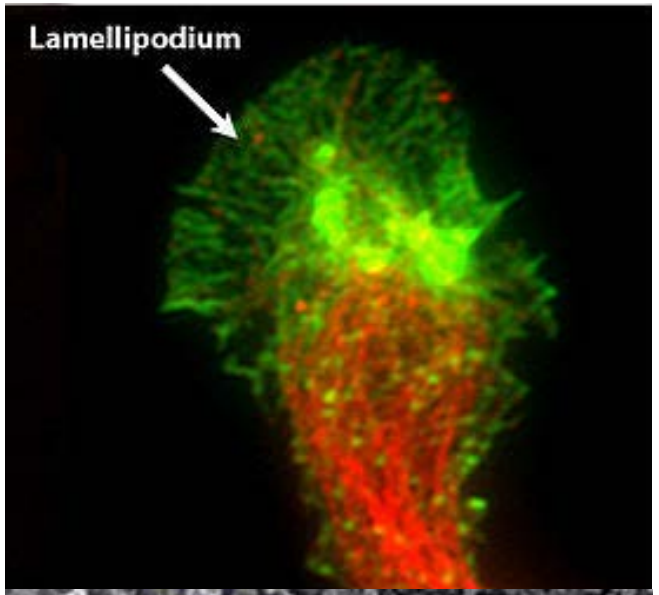
Cell migration happens in a six step process

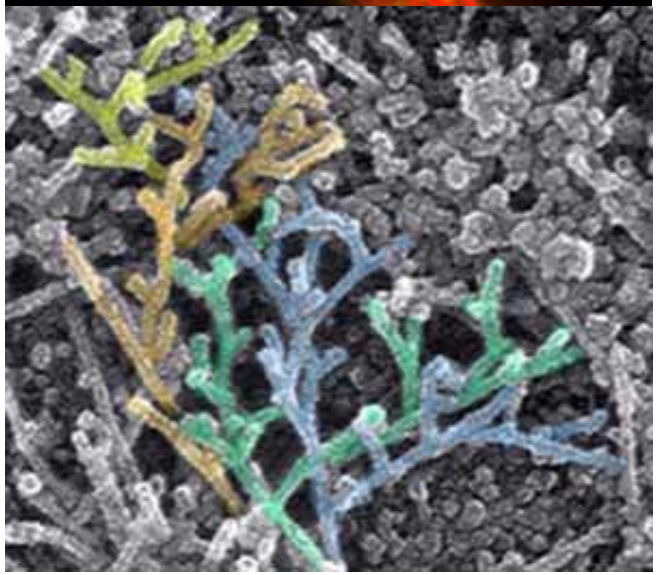


Wikipedia.org; Lamalice et al 2007; Bio.upenn.edu

The underlying processes in migration

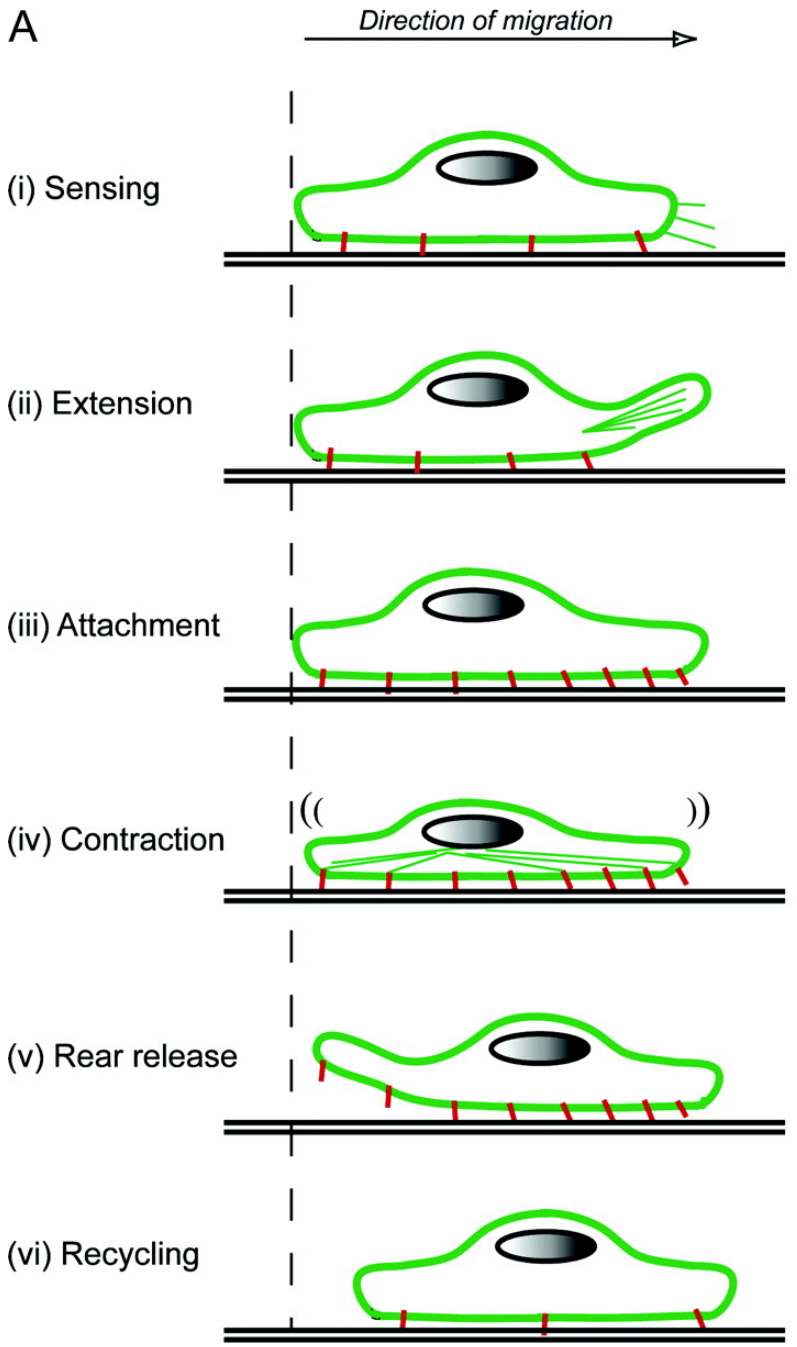


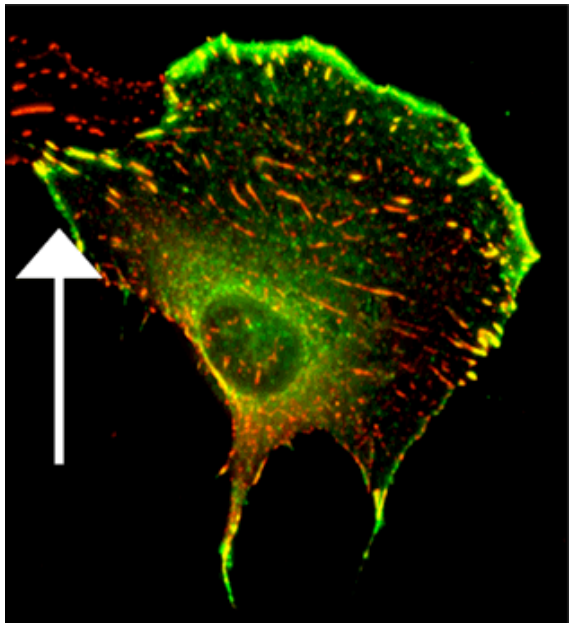




Wikipedia.org; Lamalice et al 2007

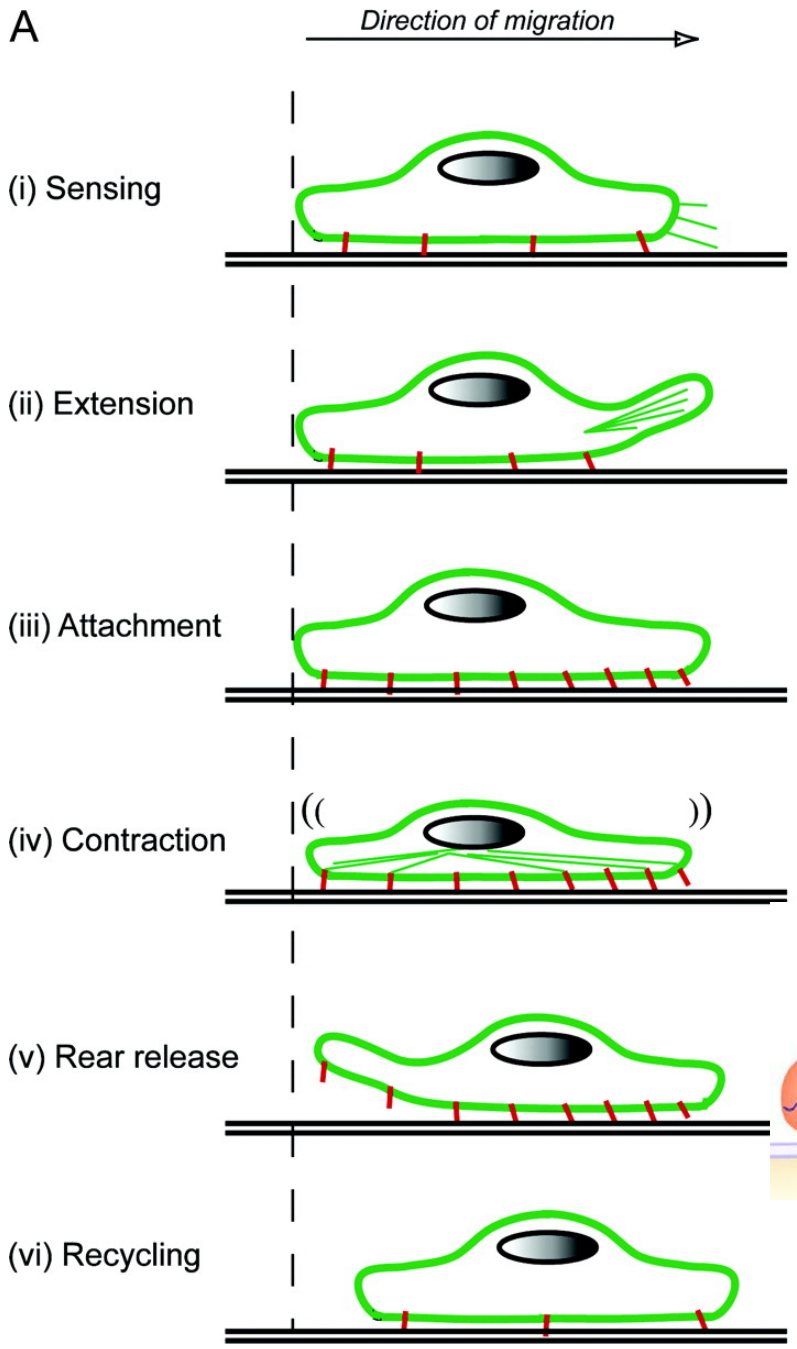
The underlying processes in migration

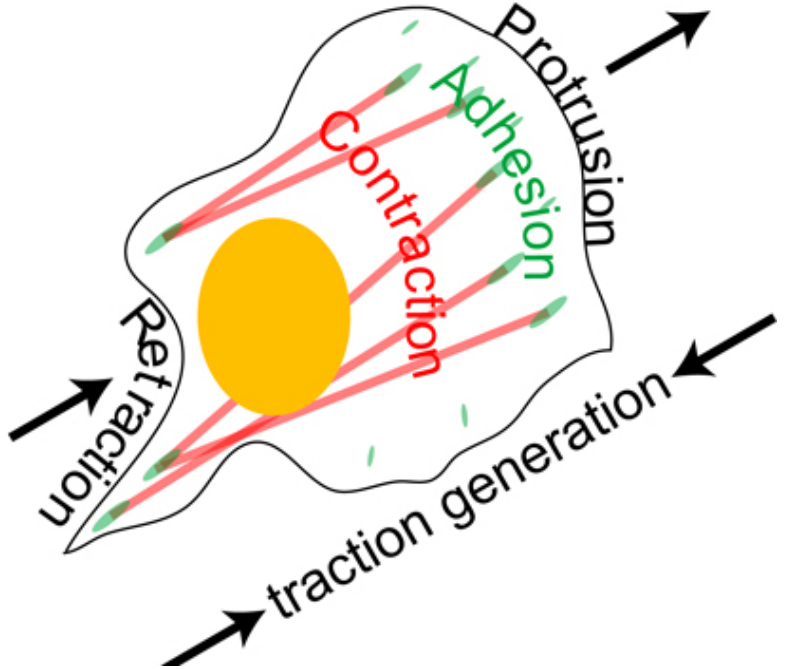


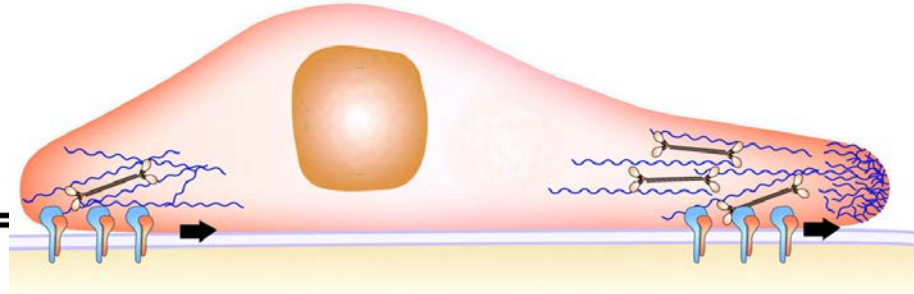


Wikipedia.org; Klemkelab.ucsd.edu

The underlying processes in migration

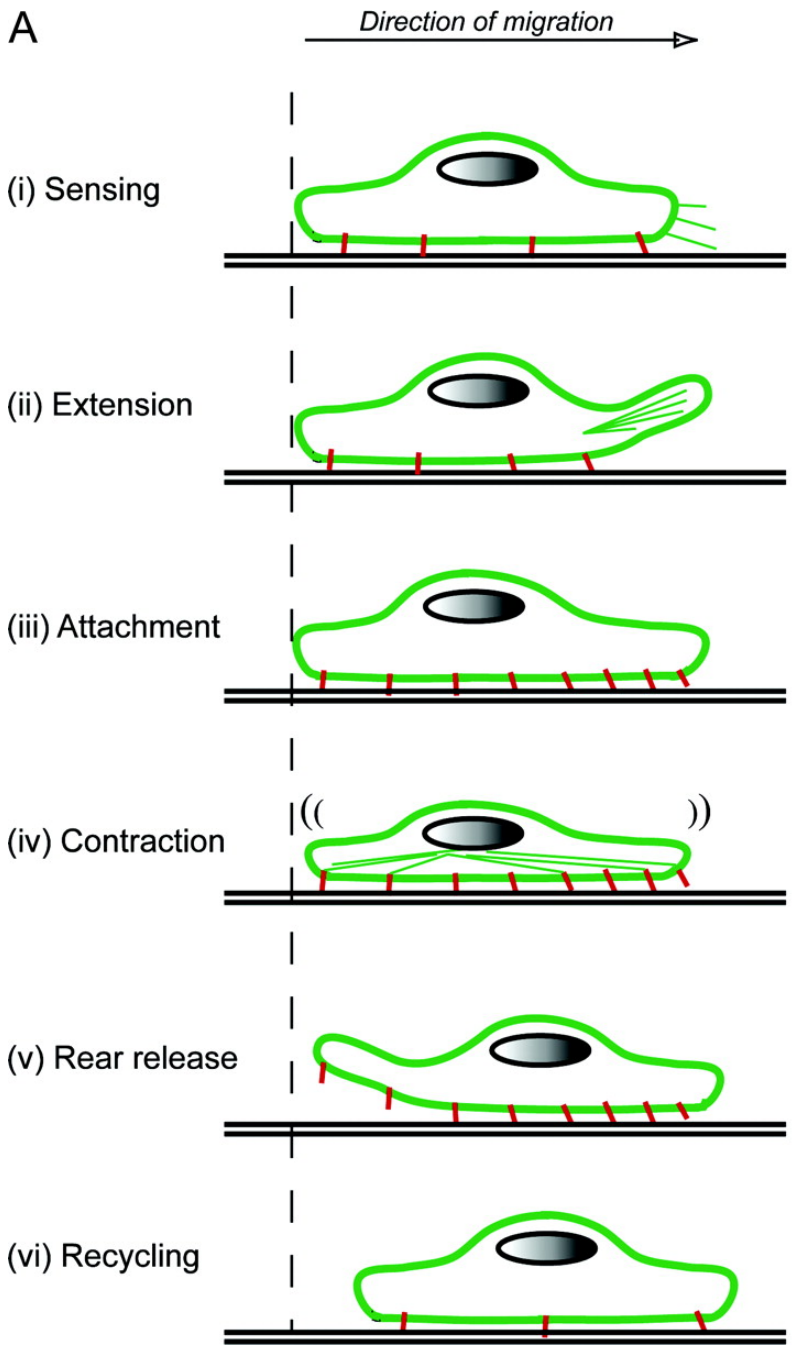


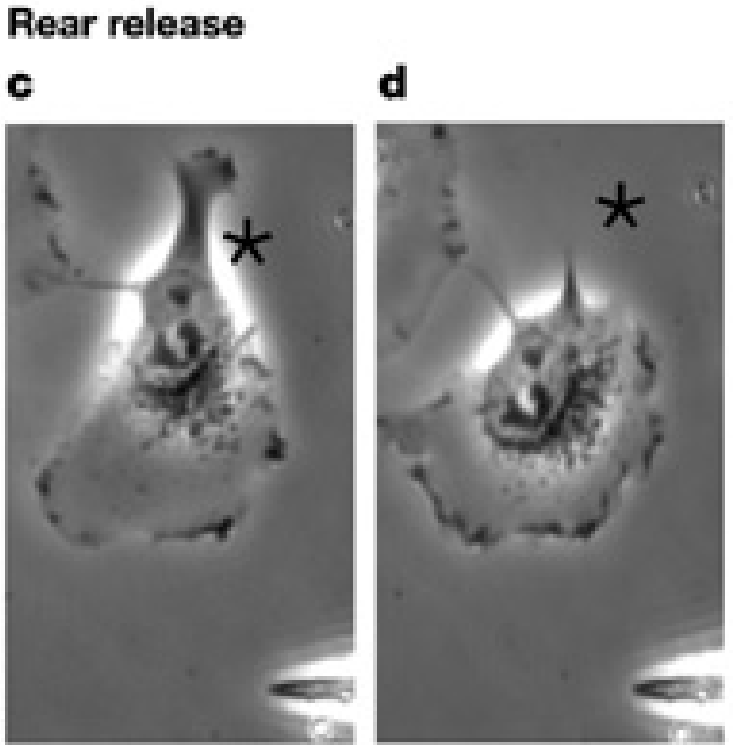




Cbe.iastate.edu
Conti & Adelstein, 2008

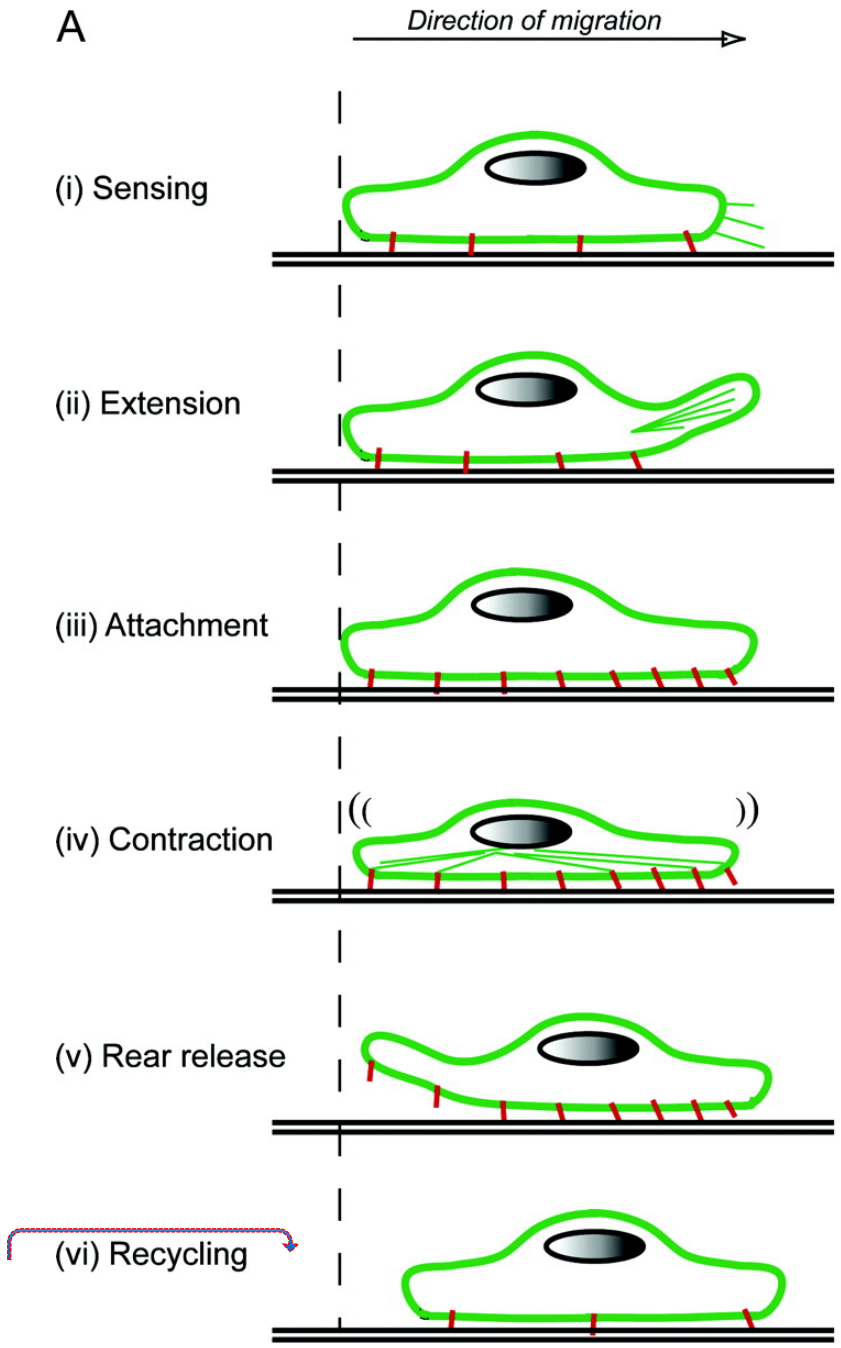
The underlying processes in migration

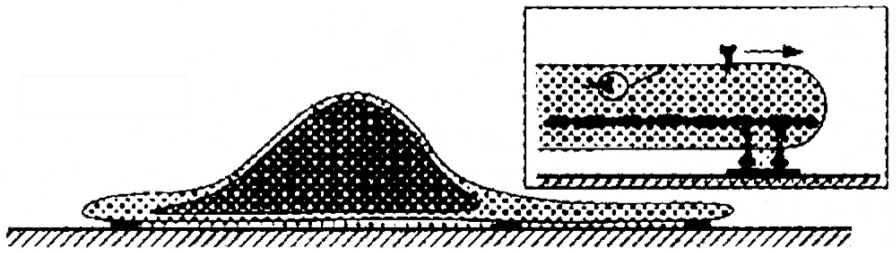




Hood & Cheresh, 2002

The underlying processes in migration





Apl.org; Tissue Engineering, Palsson & Bhatia

Rewind and review

Modes of directed migration

Chemotaxis
Soluble gradient

Haptotaxis
Bound gradient

Mechanotaxis
Mechanical force

Galvanotaxis/Electrotaxis
Electrical currents

Contact guidance
Surface topology

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Migration steps