

# PLAN

[P.LEMARCHAND](#)

## INTRODUCTION

- Lipides hydrophobes/lipides hydrophiles ([1](#))
- Lipides et eau([2](#))
- membrane : généralités ([3,4](#))
- Cryofracture ([5,6,7](#))

## COMPOSITION ([8](#))

- Lipides membranaires ([9,10](#))
  - Types ([11](#))
  - Rôle
  - Répartition ([12,13,14,15,16,17](#))
- Protéines membranaires ([18](#))
  - Répartition
  - Rôle
  - Protéines intrinsèques ([19](#))
  - Ancrage protéique et lipidique ([20,21](#))
  - Fonctions ([22](#))
- Glycannes ([23,24,25,26,27](#))
- Architecture ([28](#))
- Mouvements ([29,30](#))

## ELEMENTS DIFFERENCIÉS ([31](#))

- Augmentation de la surface([32,33](#))
- Jonctions intercellulaires ([34,35,36,37](#))

## BIOSYNTHESE

- Renouvellement
- Étapes de la biosynthèse

## PATHOLOGIE

- membranes des cellules tumorales ([38](#))
- Modification de la fluidité
- Autres troubles
- Lésions membranaires
- Toxine cholérique ([39,40,41,42,43](#))

# Lipides hydrophobes / lipides amphiphiles

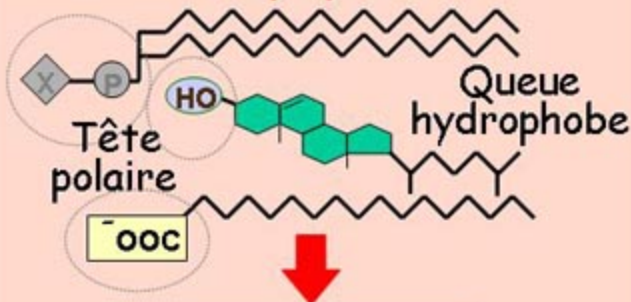
## Hydrophobe

Structure  
hydrocarbonée




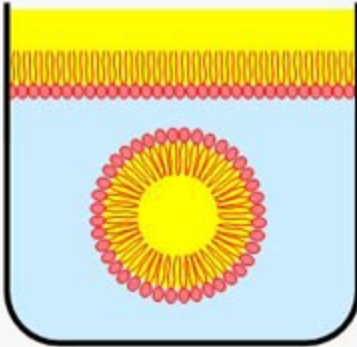
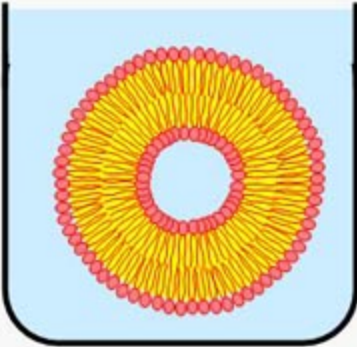
TRIGLYCERIDES  
CERIDES  
STERIDES

## Amphiphile

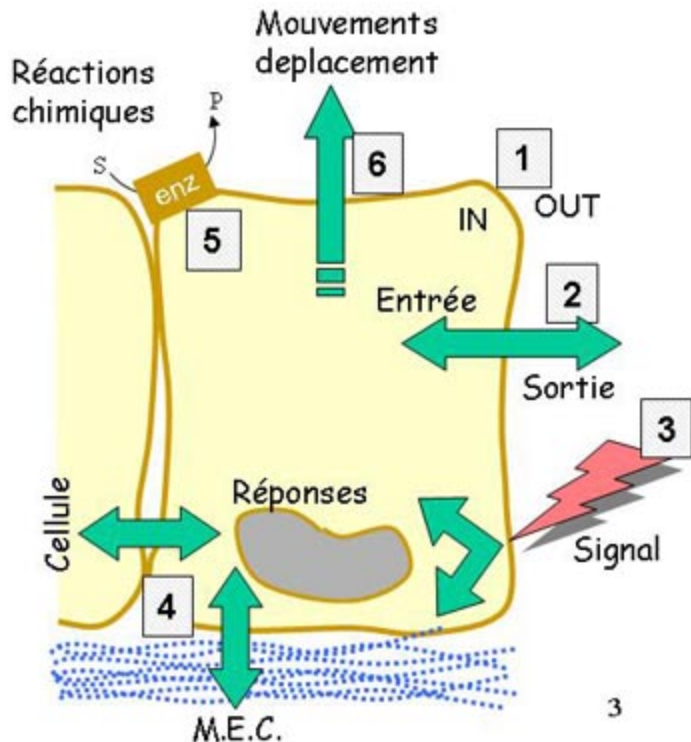


ACIDES GRAS  
CHOLESTEROL  
PHOSPHOLIPIDES  
SPHINGOLIPIDES

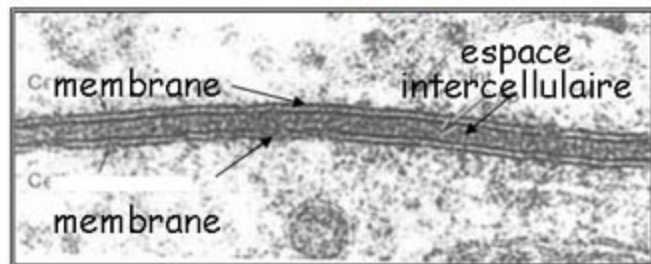
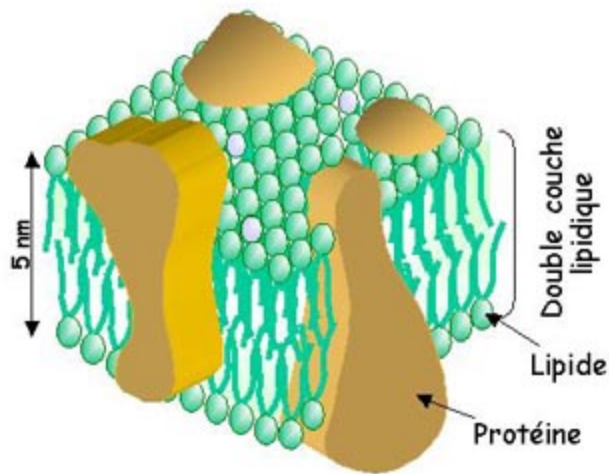
# Lipides et eau

Lipides hydrophobes	Lipides hydrophobes + amphiphiles	Lipides amphiphiles
<p>insolubles ou non miscibles</p> 	<p><b>monocouche :</b> séparation de 2 compartiments de composition <math>\neq</math> → <i>formation d'une émulsion</i></p> 	<p><b>bicouche :</b> séparation de 2 compartiments aqueux → <i>individualisation d'un espace dedans/dehors</i></p> 

# Membrane cellulaire

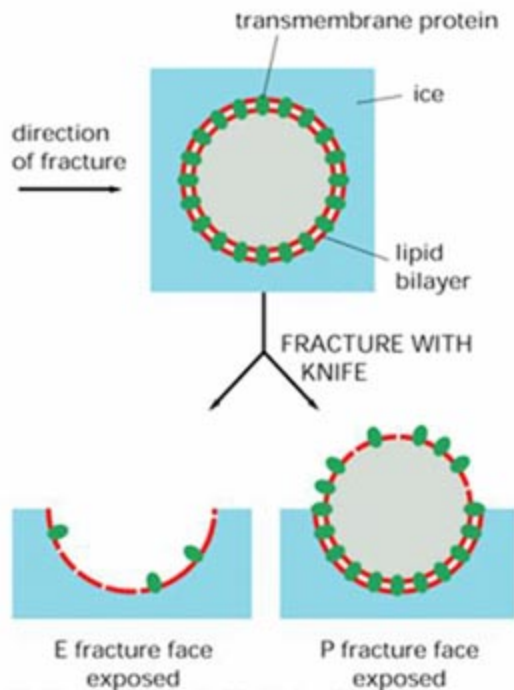
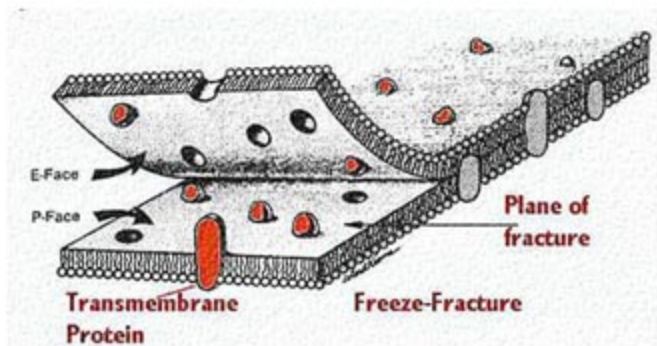


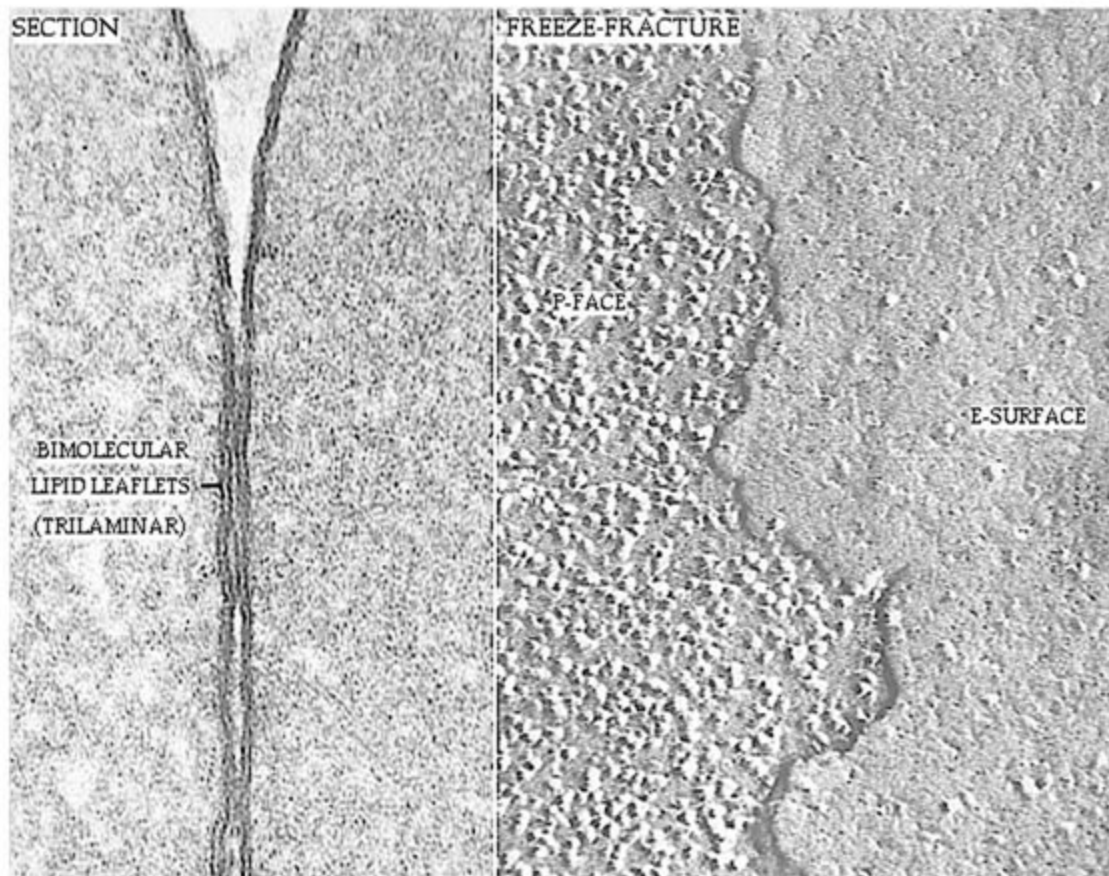
# Membrane : généralités



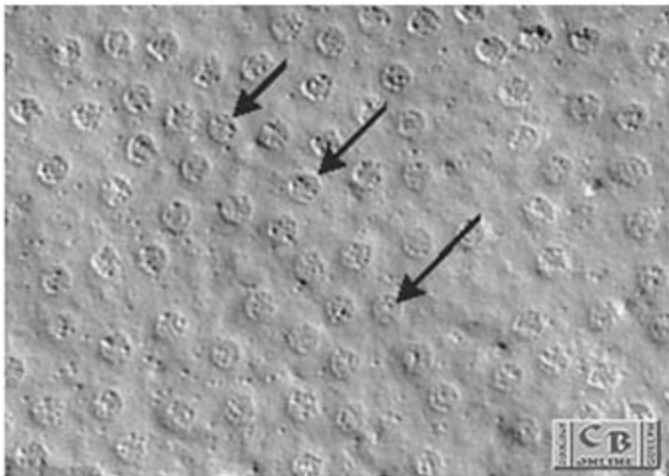
*P. Lustenberger. Reproduction interdite*

# Cryofracture microscopie électronique



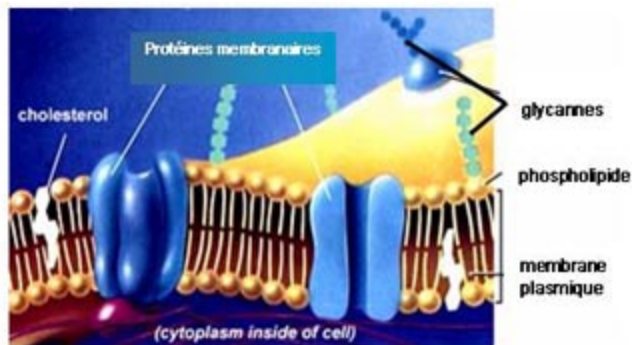


*suite*



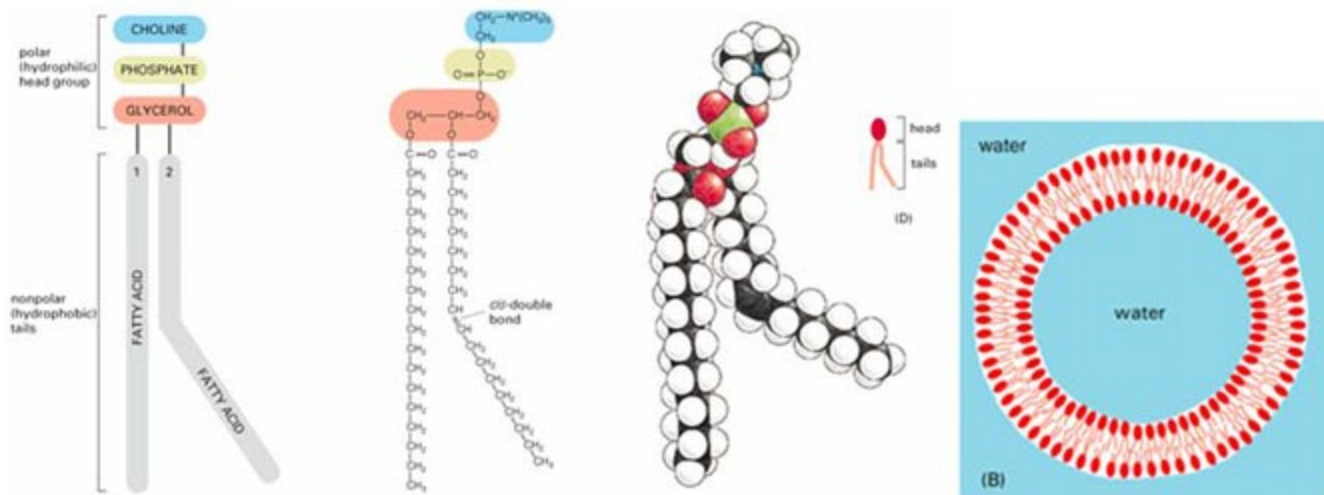


# Composition chimique



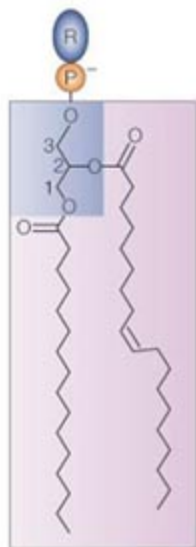
Myéline	18% protéines 76% lipides
Membranes d'hépatocytes et d'hématies	45 % protéines 50 % lipides
Membrane mitochondriale interne	76 % protéines 24 % lipides

# Lipides membranaires



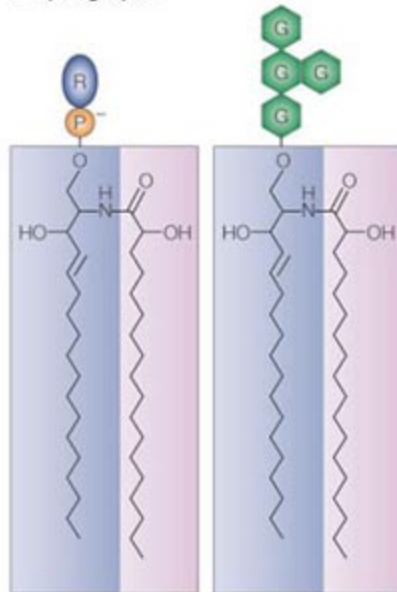
# Classes de lipides

**a** Glycerolipids



DAG, PA, PS, PI, PE, PC

**b** Sphingolipids



Cer, SM, EPC, GlcCer, GalCer, GM3, IPC

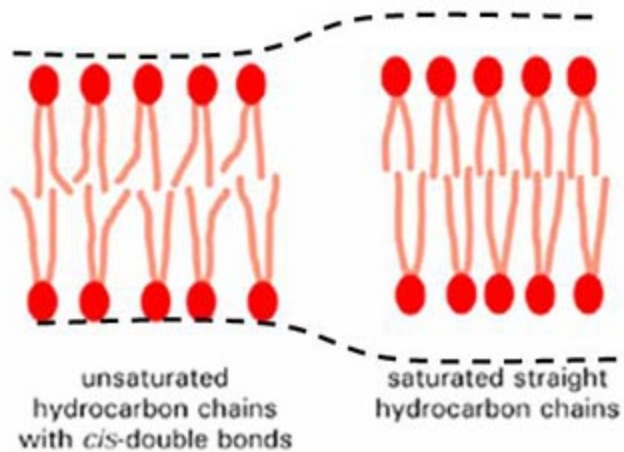


# Répartition dans l'espace



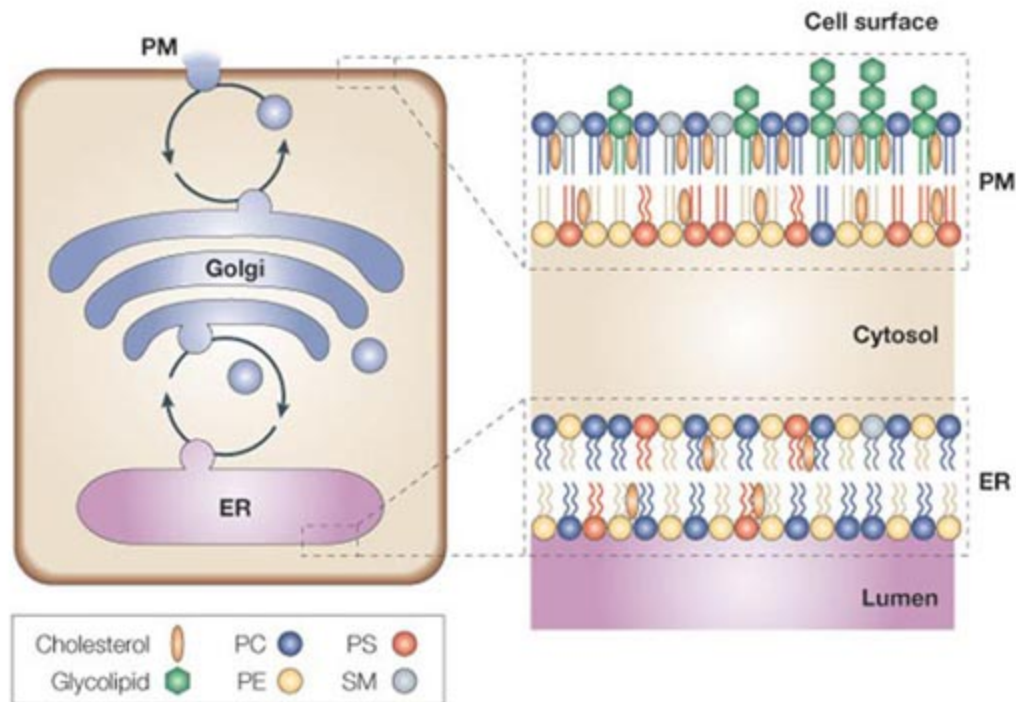
- **Cylindrique: pas de courbe**
- **Cône inversé : courbes +**
- **Cône : courbes -**



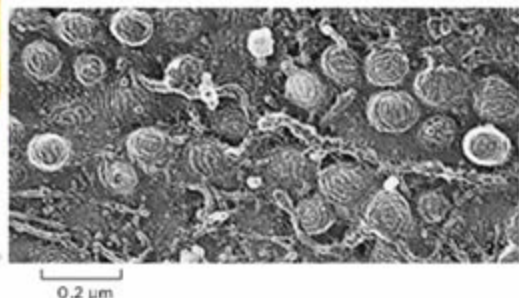
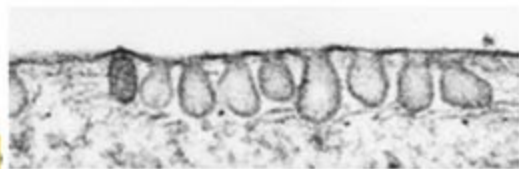
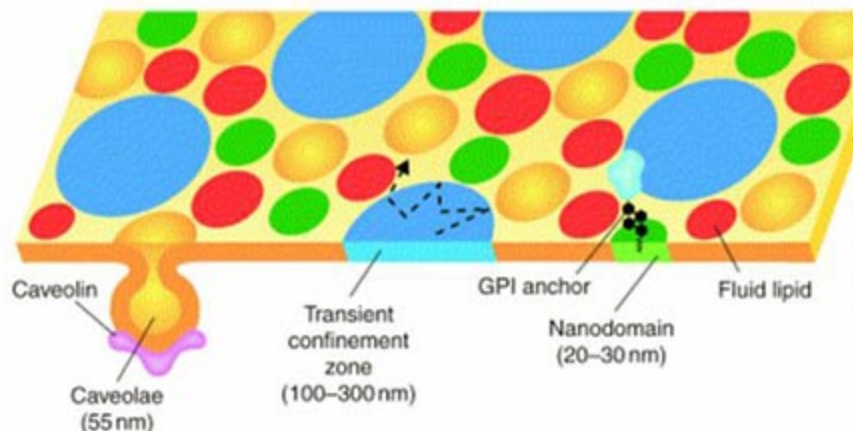


*Molecular Biology of the Cell, 3rd edn*

# Répartition des lipides



□ Répartition en domaines

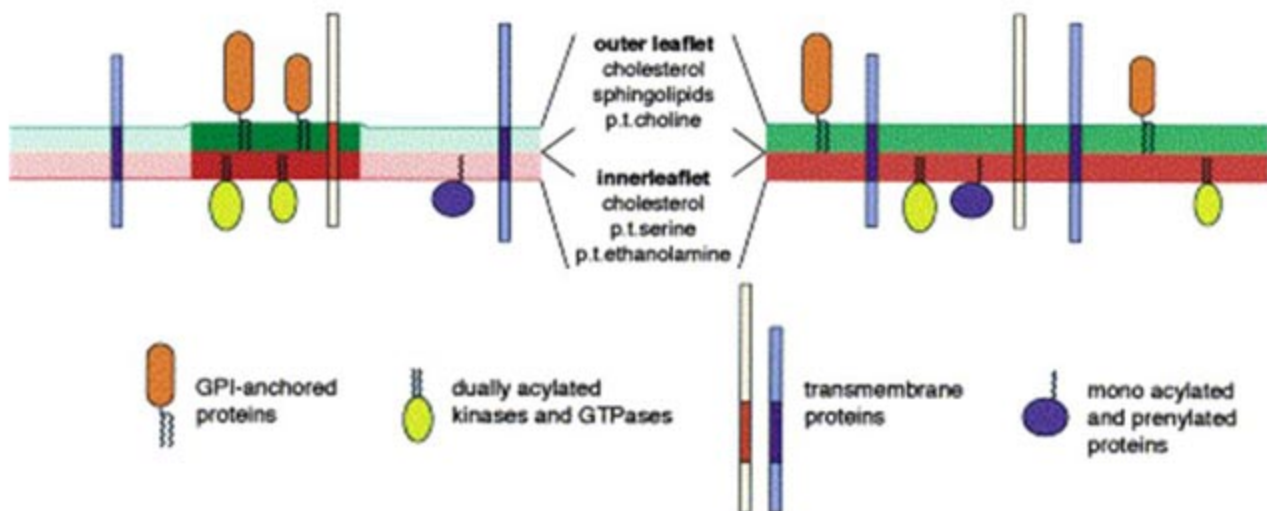


*Molecular Biology of the Cell, 3rd edn*

## □ Rafts

A Lipid rafts

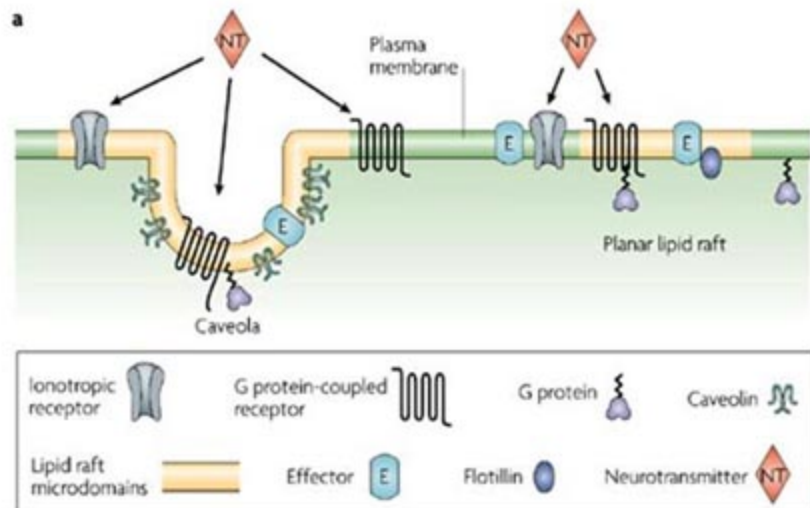
B Continuous bilayer



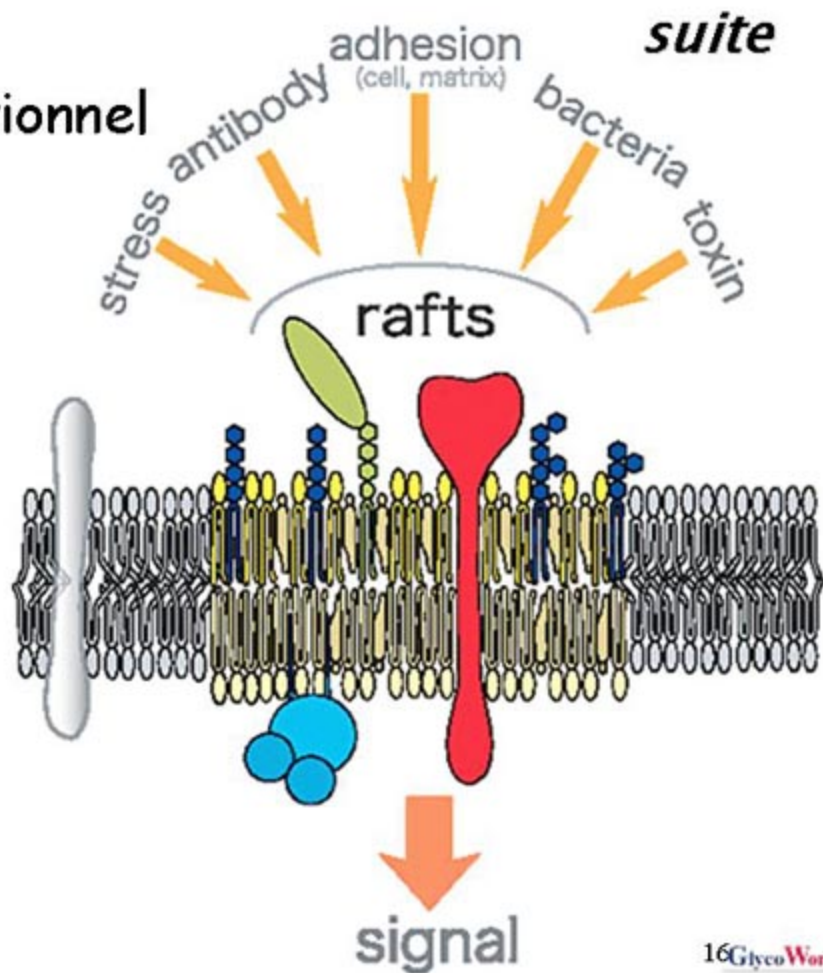
*Cell* 2003, Vol 115, 377-388  
 Copyright 2004 from Elsevier



## □ Sur le plan moléculaire



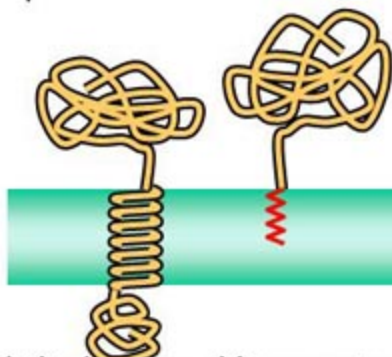
□ Sur le plan fonctionnel



# Protéines membranaires

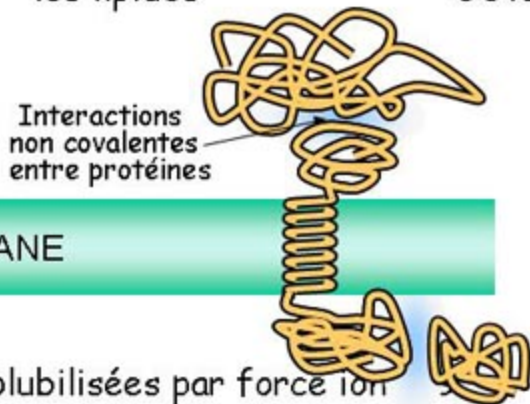
*P. Lustenberger. Reproduction interdite*

- **Protéines intrinsèques**  
- Contact direct avec les lipides  
70%



Solubilisées par détergents

- **Protéines extrinsèques**  
- Pas de contact direct avec les lipides  
30%



Solubilisées par force ion

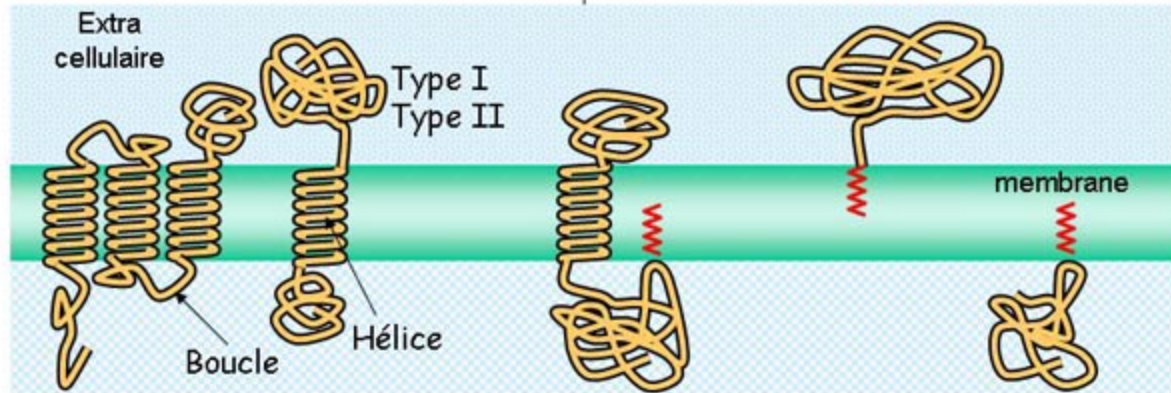
# Protéines intrinsèques

## Ancrage par la protéine

- Protéine transmembranaire
- Domaine en hélice avec des aa de nature hydrophobe, unique ou multiple

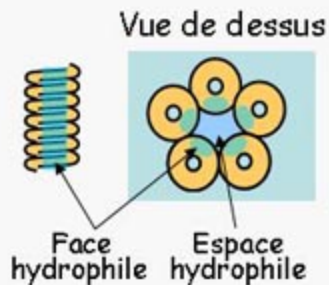
## Ancrage par un lipide

- Liaison covalente entre la protéine et un élément lipidique
- Unique



## Ancrage par la protéine

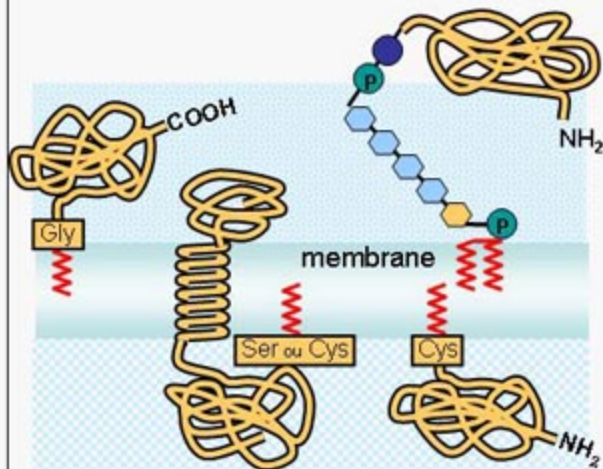
- Nature de l'hélice :
  - hydrophobe
  - amphiphile, réunies → canal



*P. Lustenberger. Reproduction interdite*

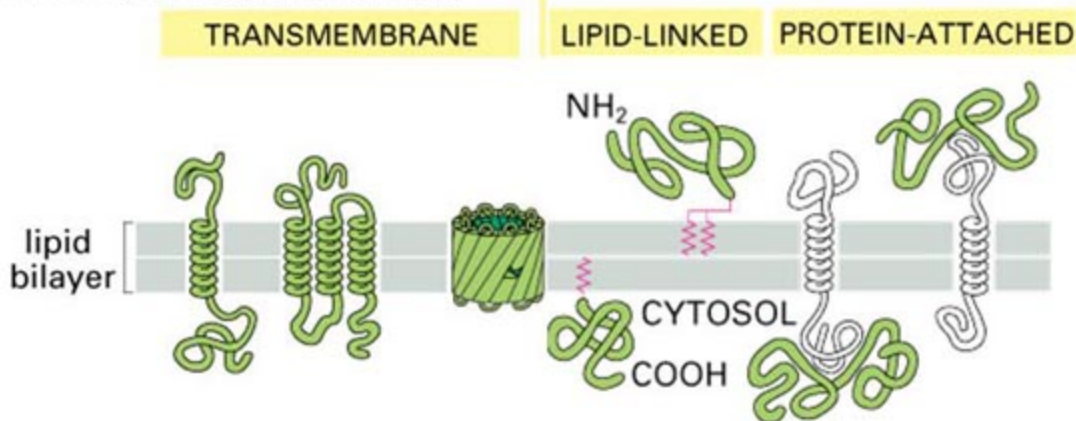
## Ancrage par un lipide <sup>suite</sup>

- Nature du lipide
  - Acide gras : palmitique ou myristique
  - Phospholipide : phosphatidyl inositol
- Protéine liée aux acides aminés des extrémités ou intrachaine

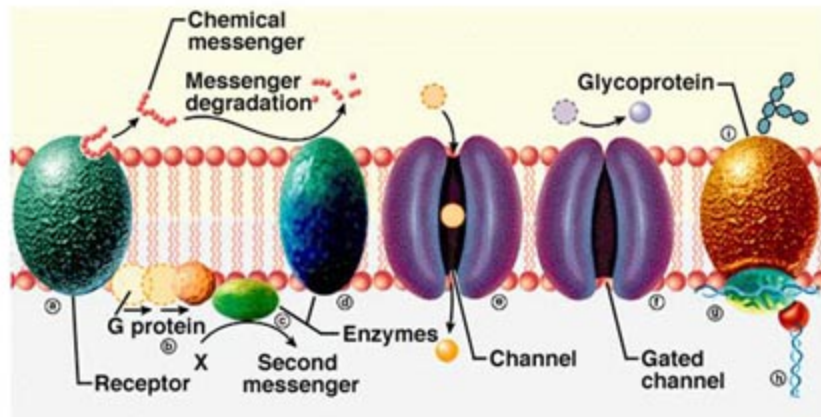
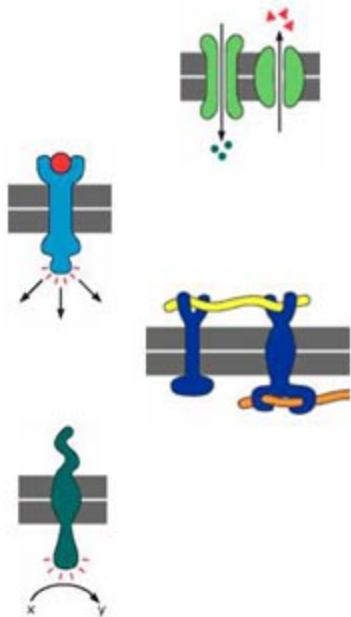


Ancrage par la protéine	Ancrage par un lipide
<p>Représente un élément structural (canal ou récepteur)</p> <p>Assure la continuité pour la transduction des signaux</p> <p>Peut servir de voie de passage au travers de la membrane</p>	<p>⇒ Élément assurant la mobilité</p> <p>- N'appartient qu'à un feuillet, ne traverse pas la membrane</p> <p>- N'est pas une solution pour le passage trans membranaire</p>

Essential Cell Biology 2004 Figure 11-21 (Garland)



# Fonction des protéines membranaires



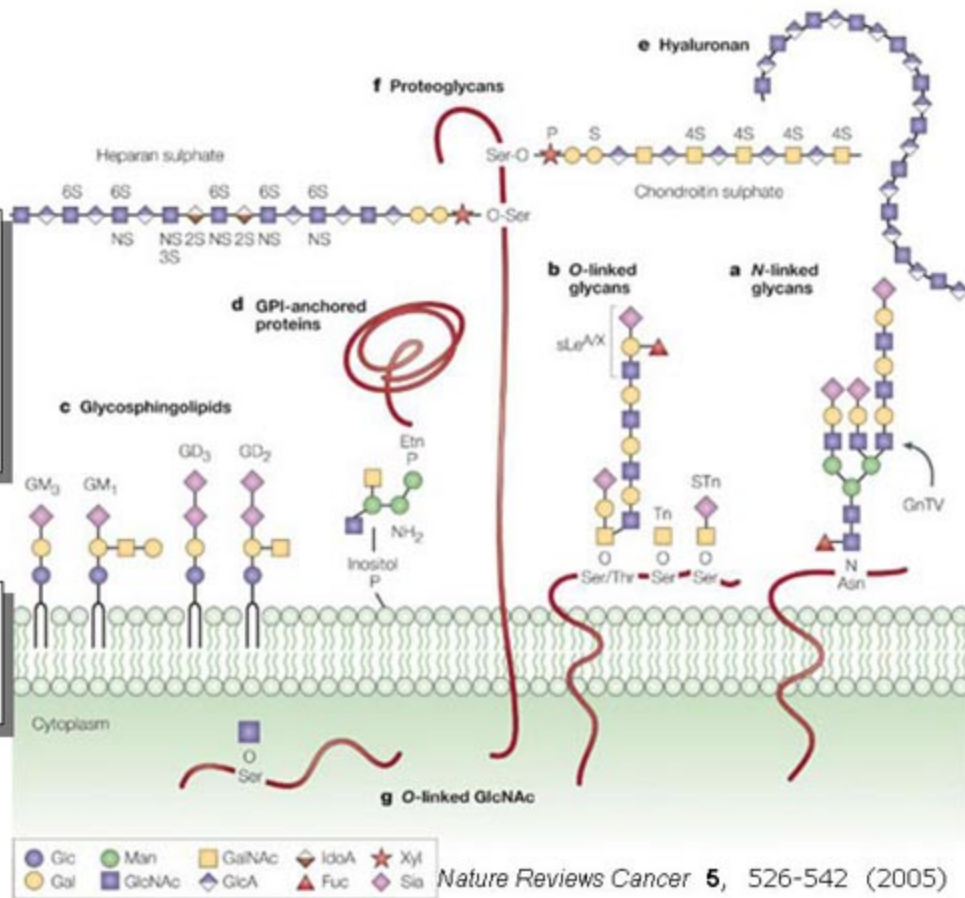
# Glycannes

## GLYCOPROTEINES

Chaîne glycanne ± longue et ramifiée,  
liée à des AA particuliers :  
Sérine, Thr → *O* glycoprotéines  
Asparagine → *N* glycoprotéines

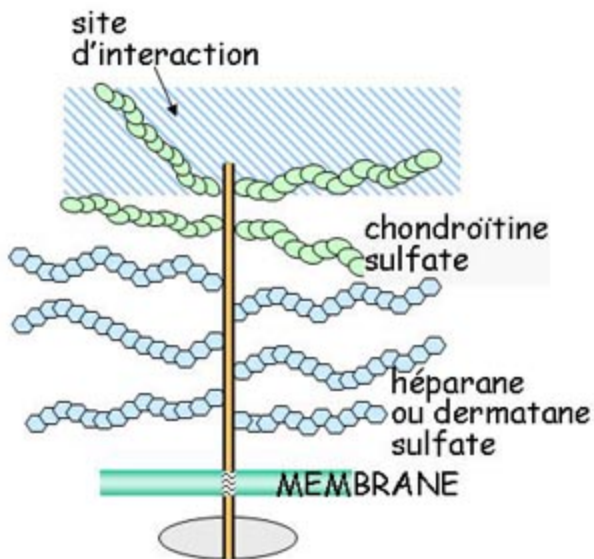
## GLYCOLIPIDES

Chaîne glycanne ± longue et ramifiée liée à la sphingosine

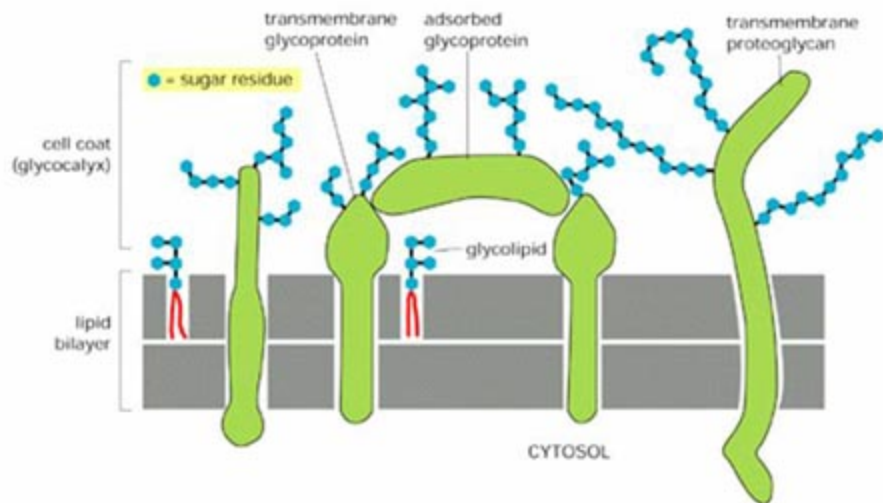
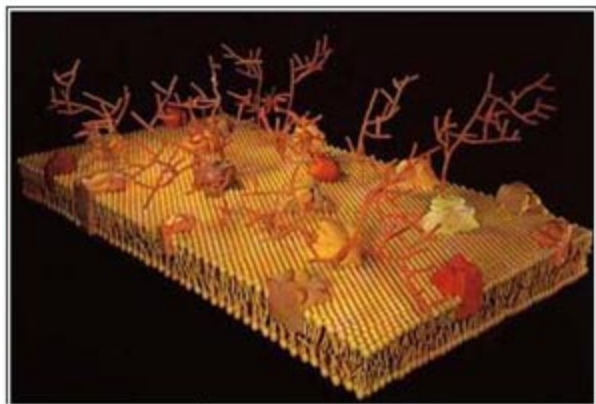


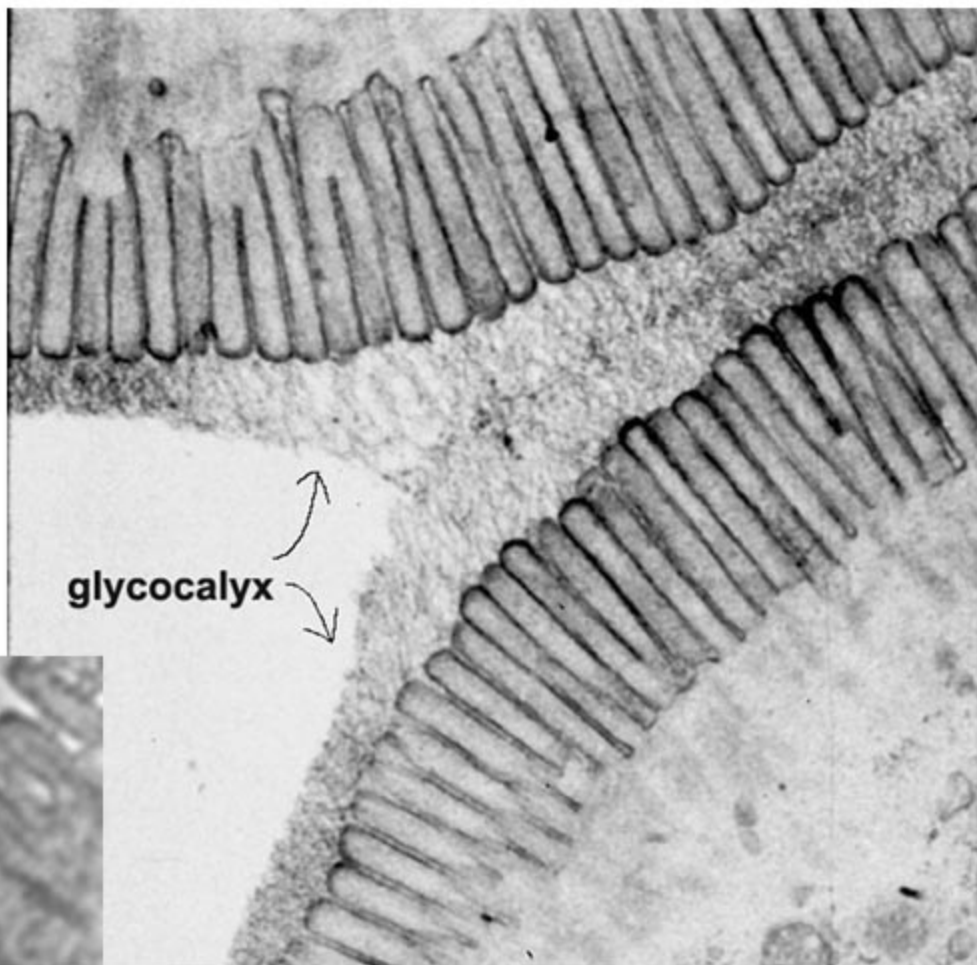


# Protéoglycannes membranaires

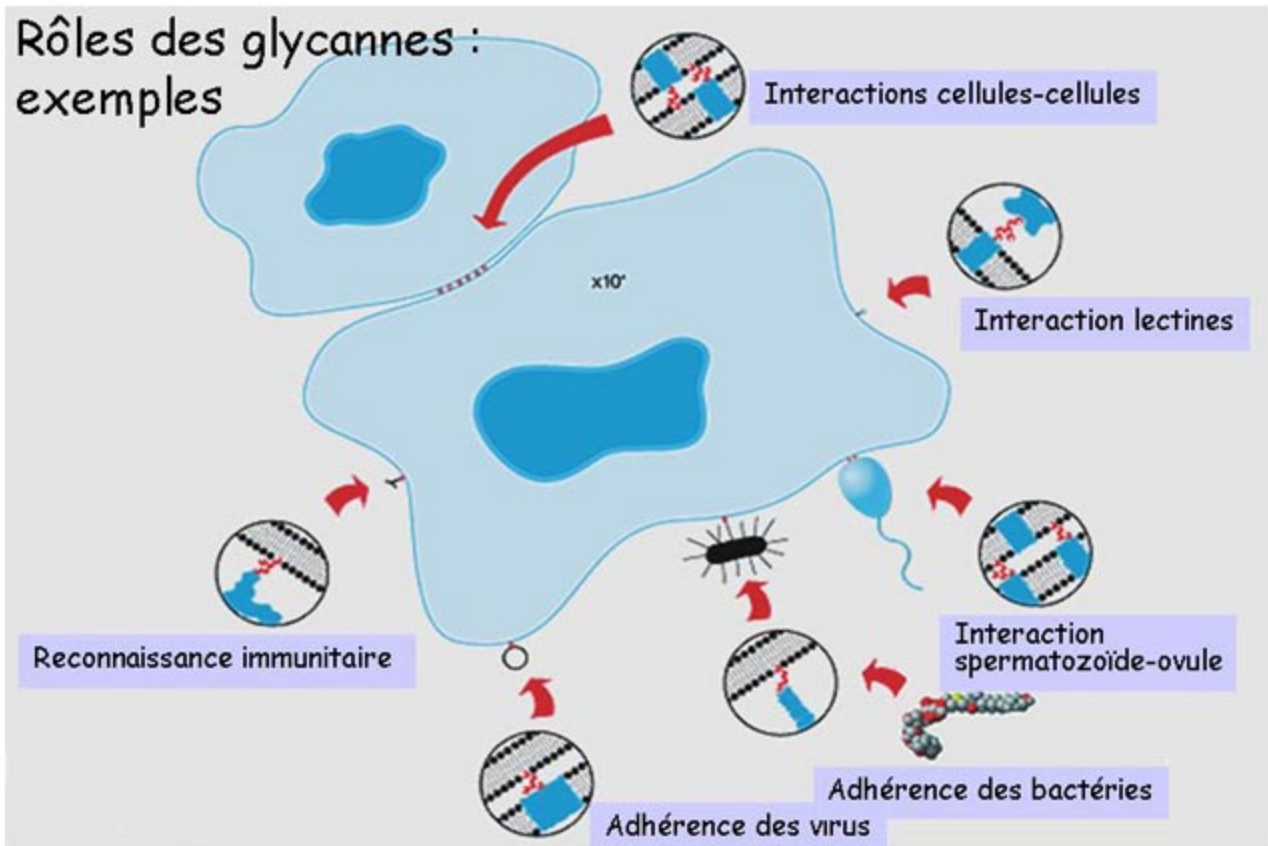


*Molecular Biology of the Cell, 3rd edn*

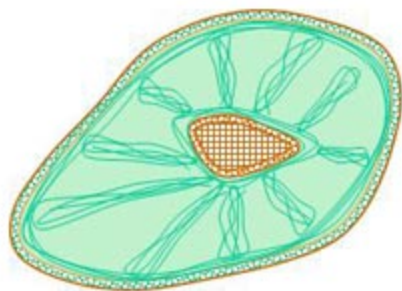




## Rôles des glycanes : exemples

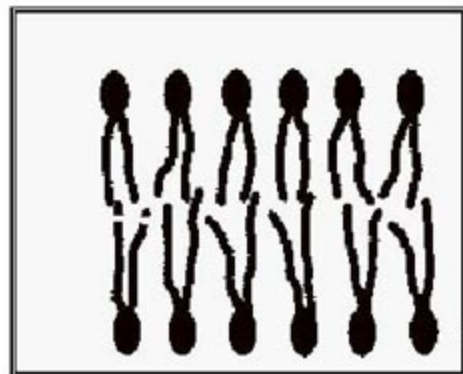
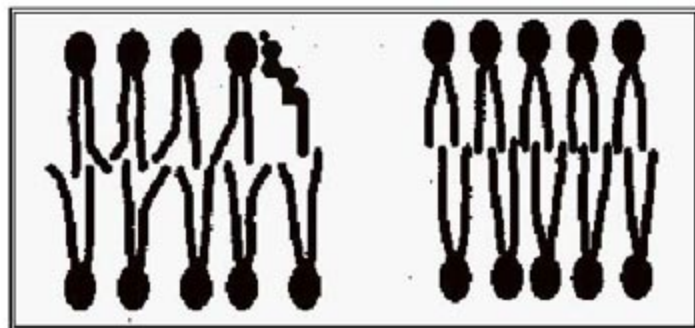


# *Architecture fonctionnelle*



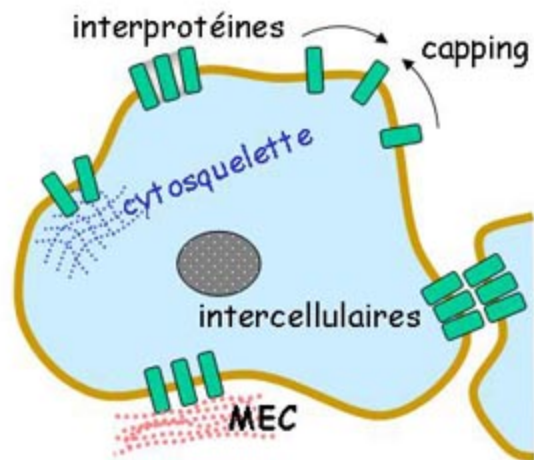
# *Mouvements membranaires*

## □ Lipides

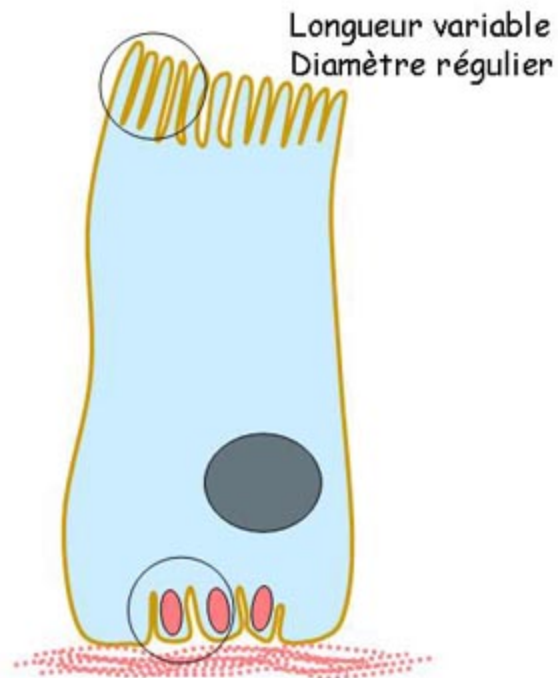


*suite*

## □ Protéines

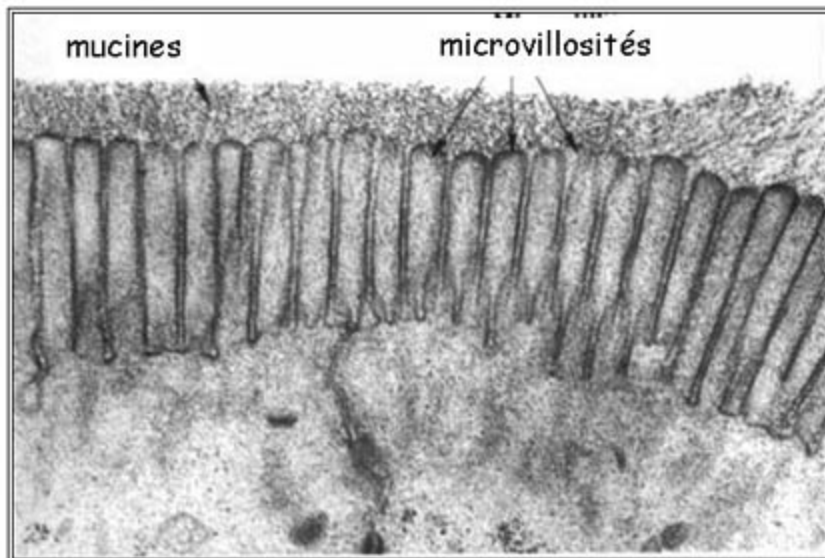


# *Eléments différenciés*



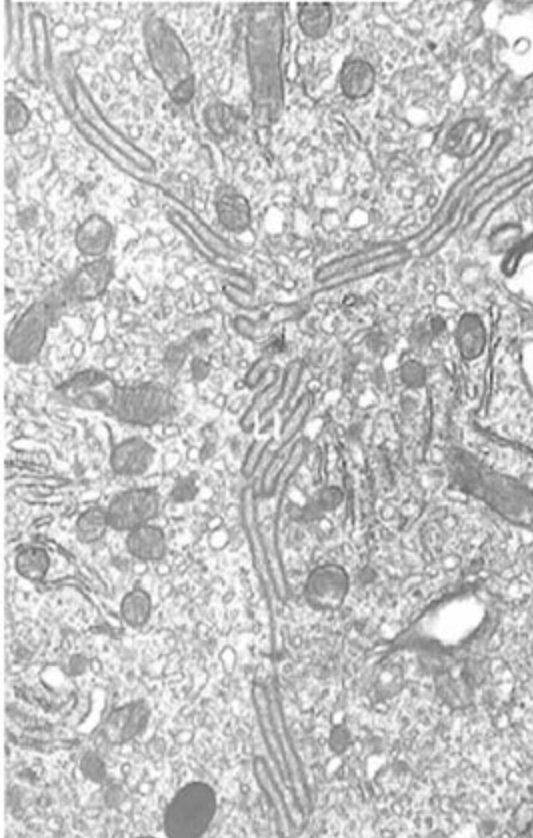


- ❑ Cellules épithéliales intestinales
- ❑ Technique : microscopie électronique
- ❑ Grossissement : x 6 480

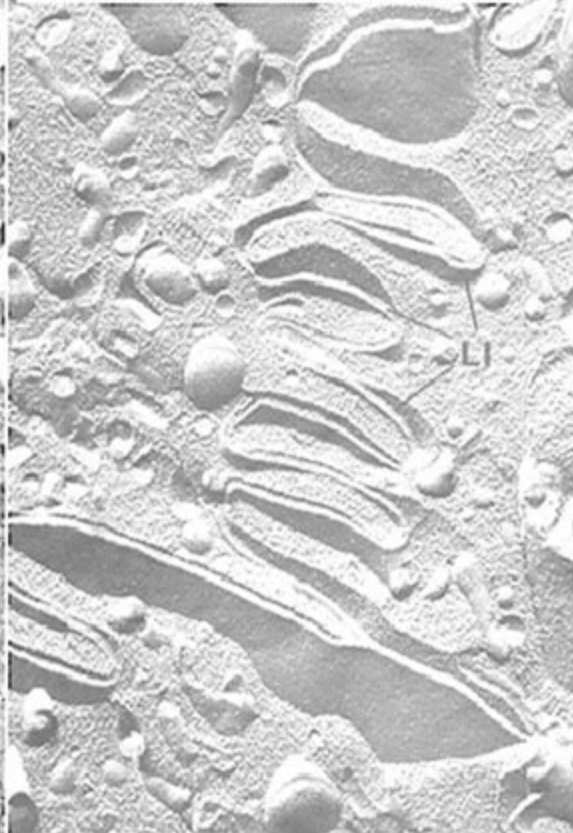


# *Interdigitations latérales*

SECTION-LATERAL INTERDIGITATIONS



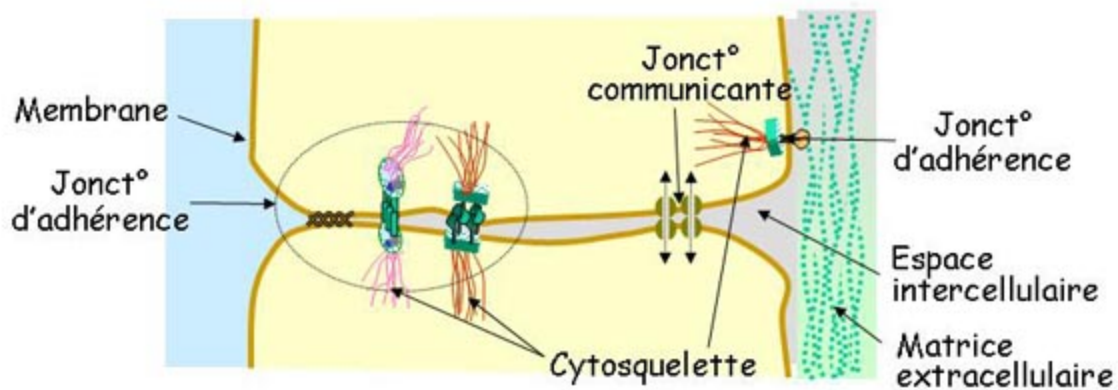
FREEZE-FRACTURE-LATERAL INTERDIGITATIONS



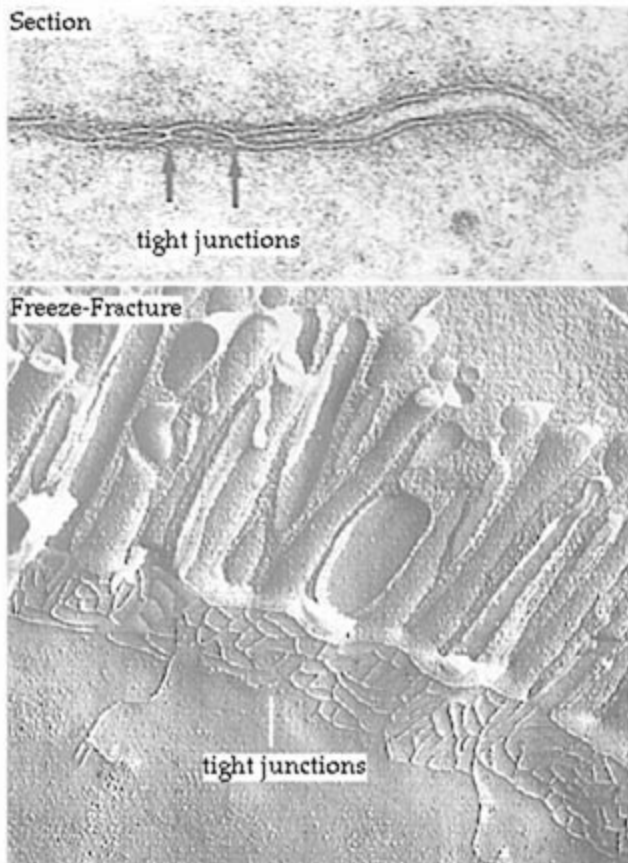
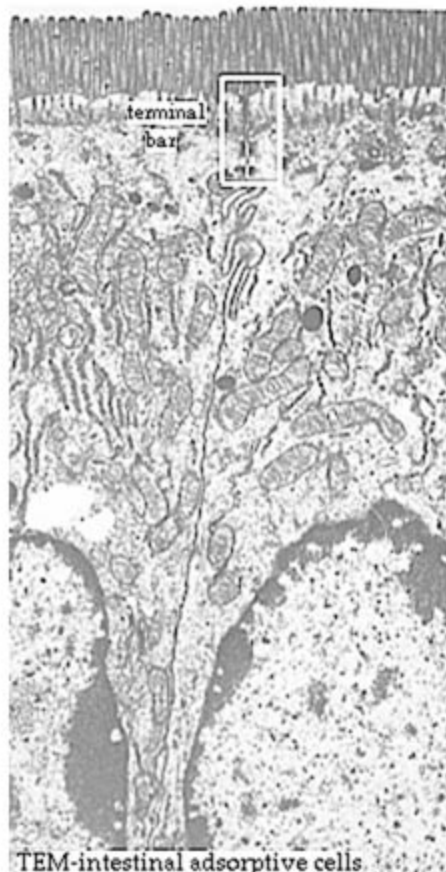
# *Jonctions intercellulaires*



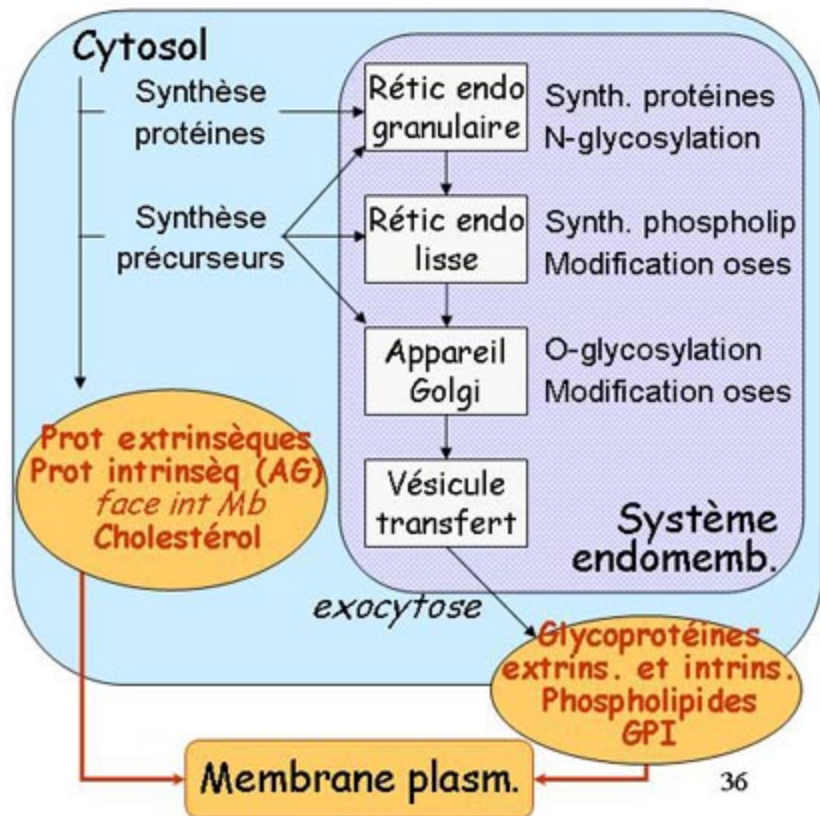
*suite*



# *Jonctions intercellulaires*

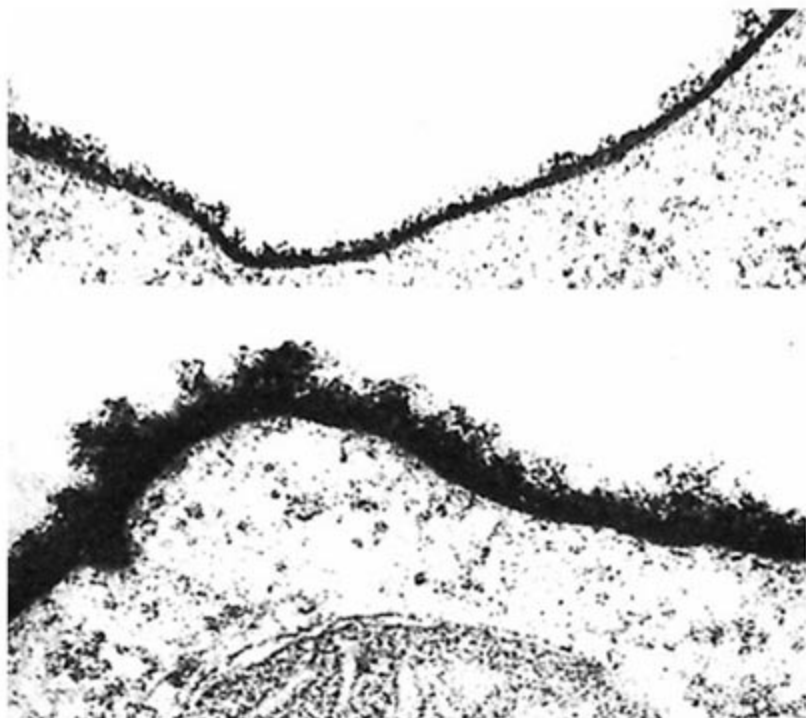


# Biosynthèse des membranes

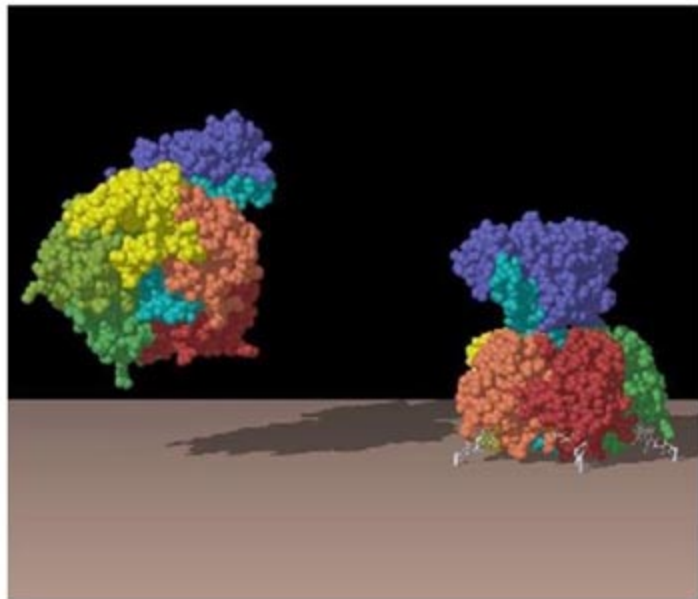


*suite*

Glycocalyx de lymphoblastes :  
en haut cellule normale, en bas cellule leucémique

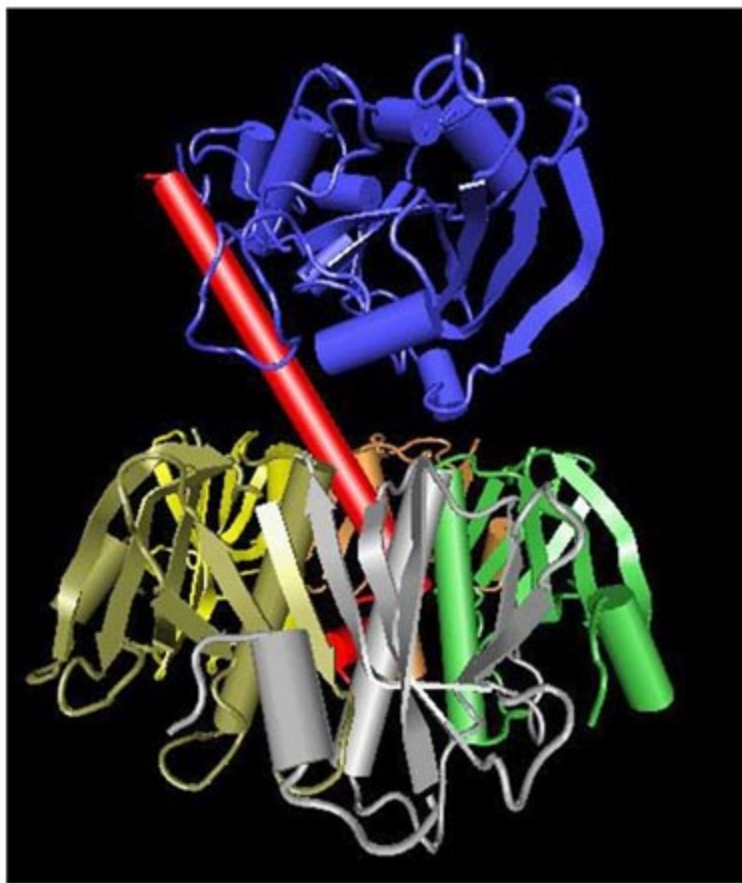


# *Toxine cholérique*

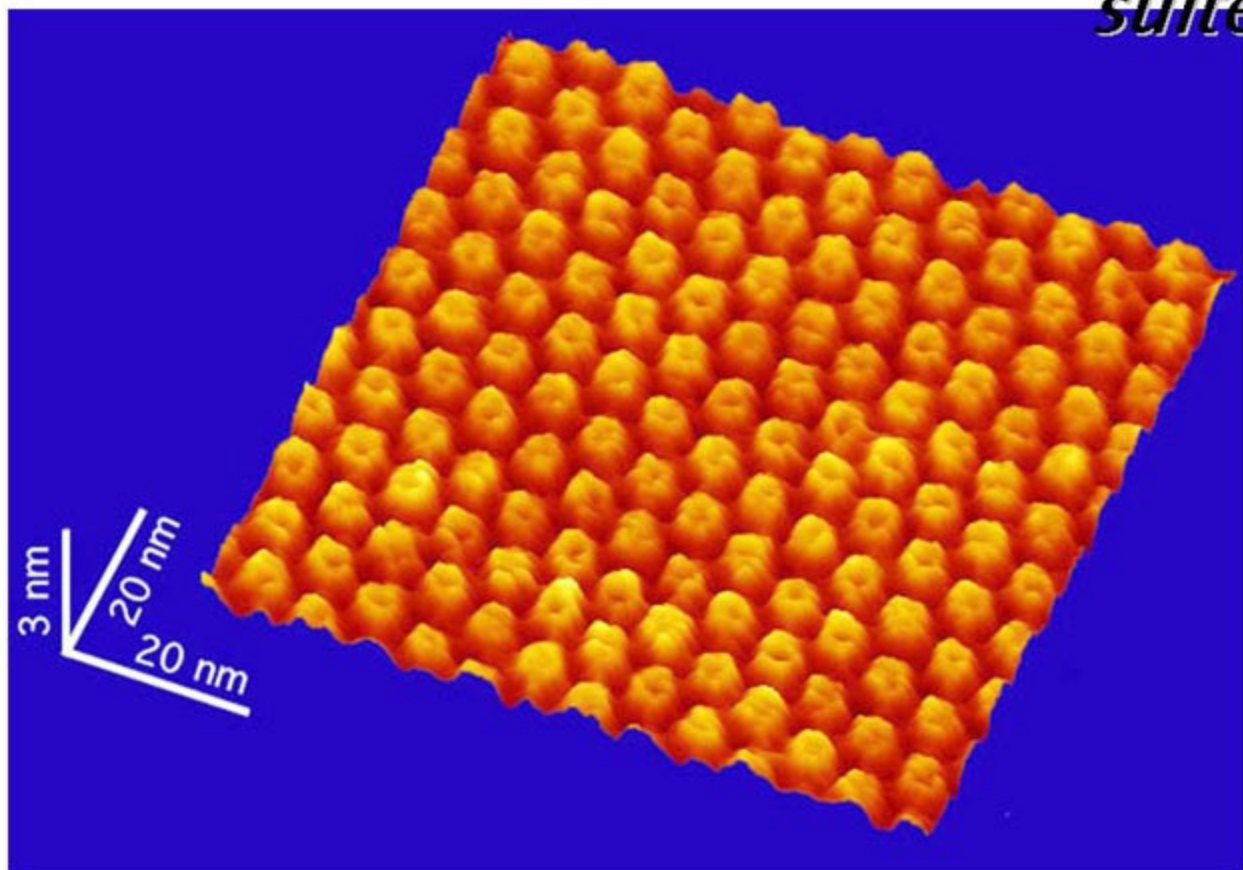




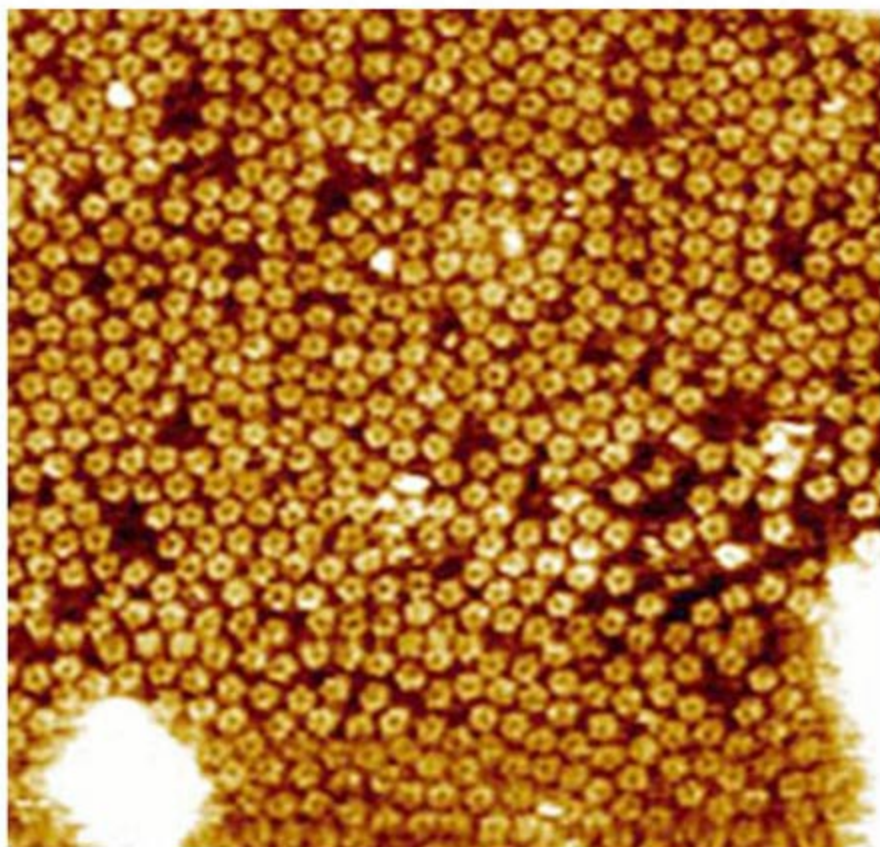
*suite*



*suite*



*suite*



*suite*

