PLASMODESMATA – NANOPORES IN PLANT TISSUES

Michael Knoblauch, Washington State University, Pullman
Plant- Versus Animal Cells

From: https://byjus.com/biology/difference-between-plant-cell-and-animal-cell/
Mimosa pudica
Plant Cell Connections - Plasmodesmata

From:
https://www.daviddarling.info/encyclopedia/P/plant_cell.html
Plasmodesmata and the control of symplastic transport

A. G. ROBERTS, K. J. OPARKA
First published: 20 January 2003

“Based on model in Ding et al. 1992”

Peters WS, Jensen KH, Stone HA, Knoblauch M.
Plasmodesmata and the problems with size: Interpreting the confusion. J Plant Physiol. 2021

PD model
Selectivity of plasmodesmata

Terry and Robards “Hydrodynamic radius alone governs the mobility of molecules through plasmodesmata”. Planta 1987 171, 145-57.)


Howard Stone, Mechanical and Aerospace Engineering. Princeton University

Kaare H. Jensen, Physics. Technical University of Denmark
Diffusive Injection Micropipette (DIMP)
DIMP Analysis

time

AF 488
570 Da

AF 633
1150 Da
Surface enhanced diffusion


Phloem unloading

Effect of geometry on PD resistance


Plasmodesma Diversity

We need artificial modifiable probes!

We tested commercially available, coated, water soluble quantum dots and nanoclusters. But all soluble probes we were able to acquire immediately bind to cellular components and do not remain soluble in the cytoplasm.

Probes need to be in the range of 0.5 nm to 10 nm diameter. Surface coatings need to be adjustable.

https://www.bu.edu/articles/2017/quantum-dots-breast-cancer-tumors/
Probes to monitor fluxes in leaves (e.g. CO$_2$, H$_2$O)
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