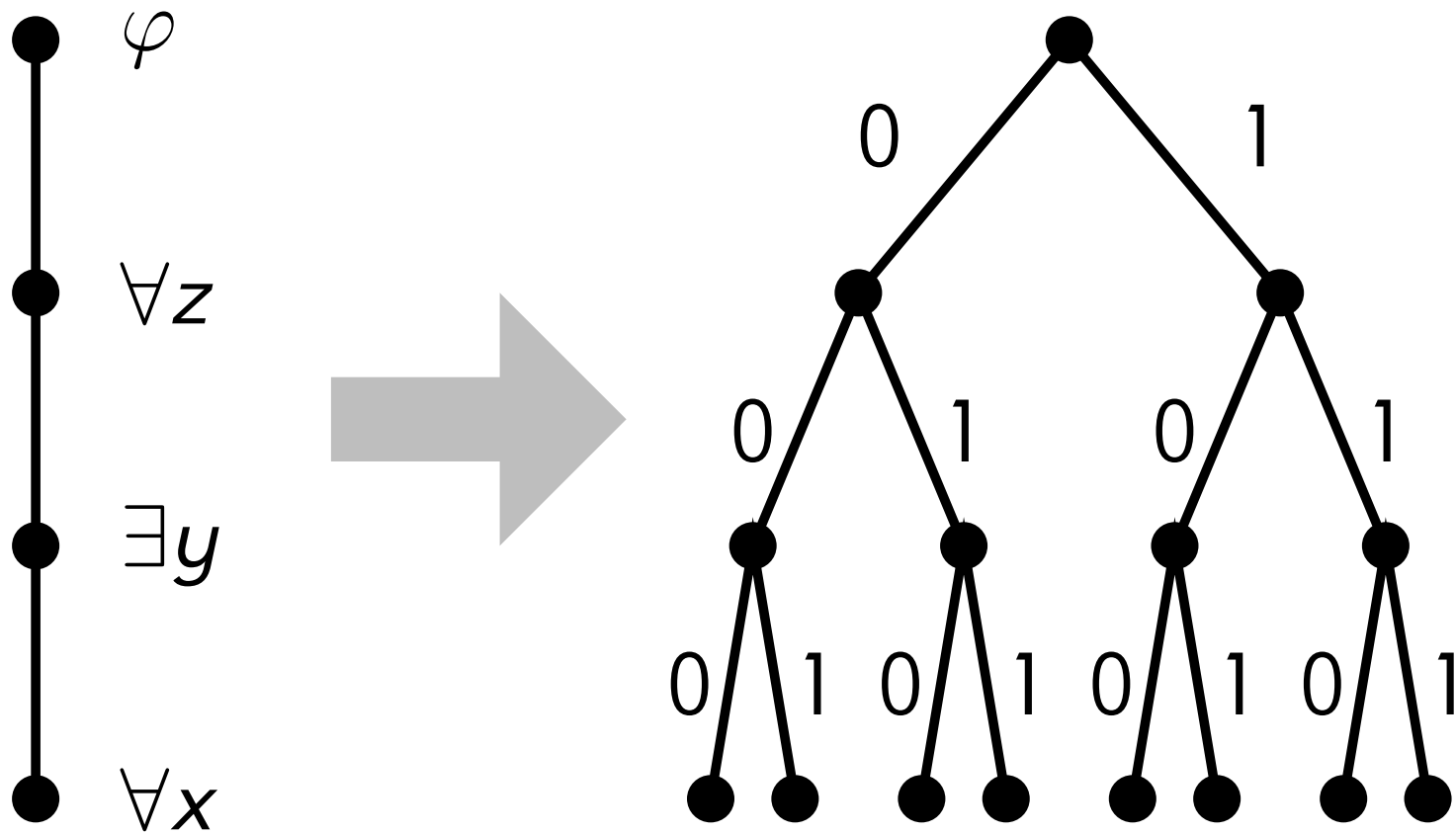# Depth of P systems with active membranes and their computational complexity

Antonio E. Porreca & Milano Team
Università degli Studi di Milano-Bicocca, Italy
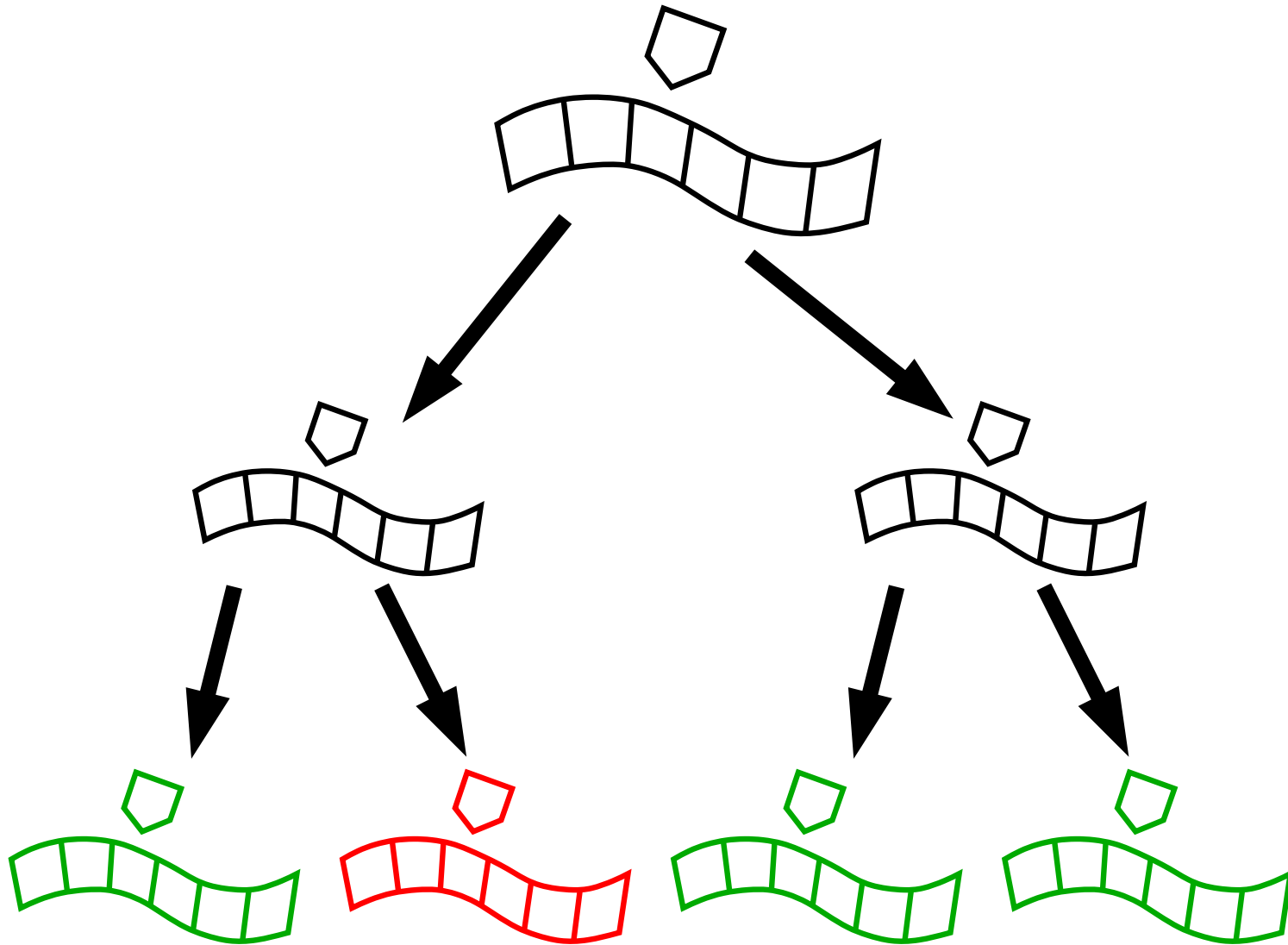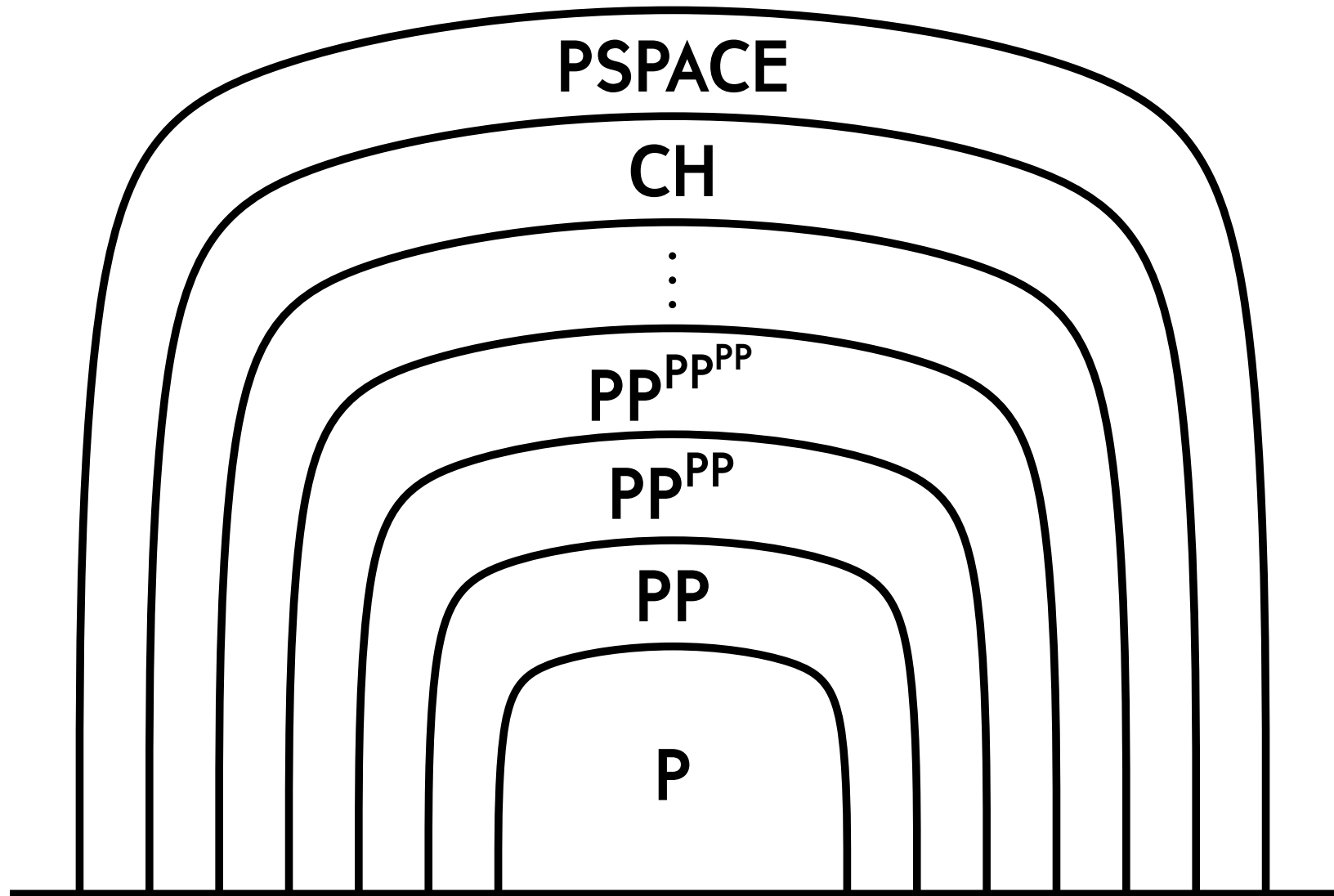
Membrane division and Boolean formulae

polynomial depth = **PSPACE**

What about constant depth?

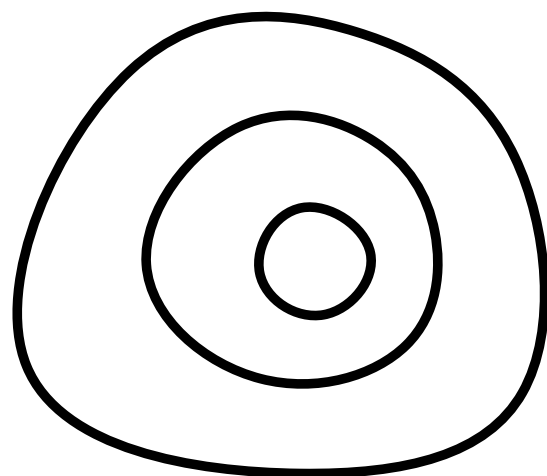# Counting machines and **PP**

The counting hierarchy **CH**

Solving the counting hierarchy

$$\bigcirc = \mathbf{P}$$
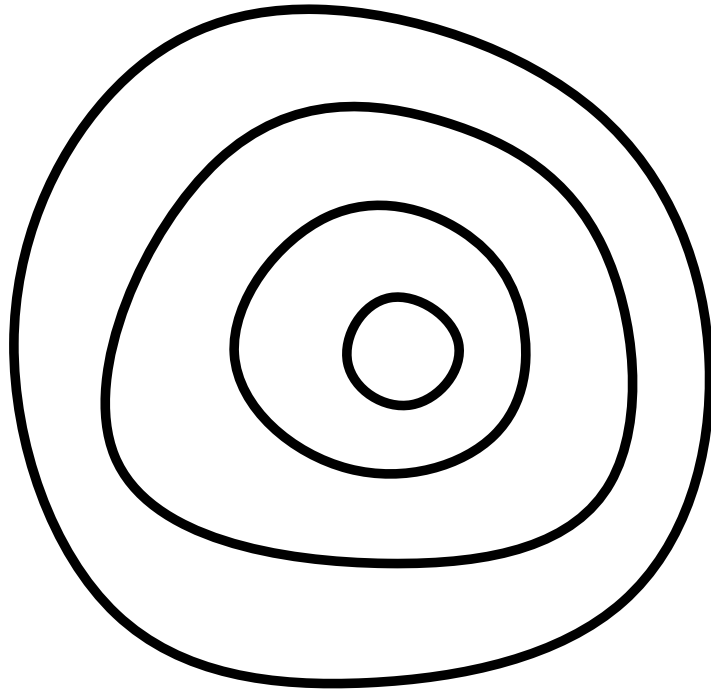
Solving the counting hierarchy

 $= \mathbf{P^{PP}}$

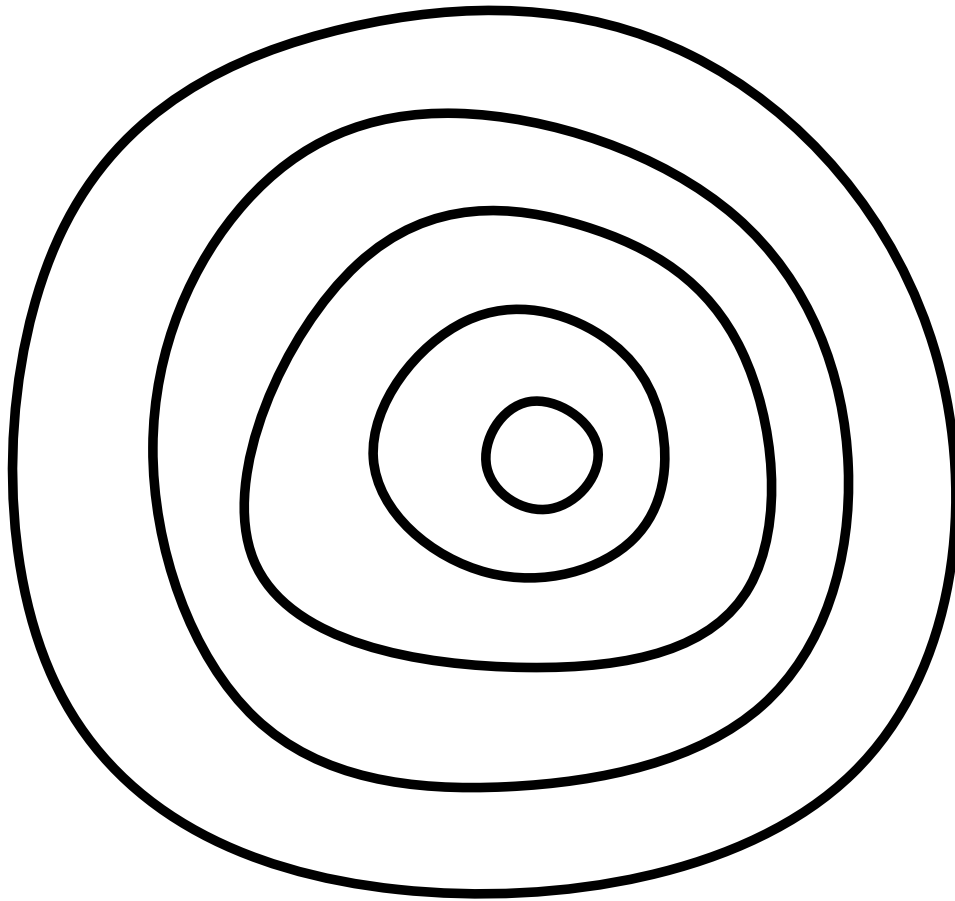# Solving the counting hierarchy

$$\supseteq \mathbf{P}^{\mathbf{P}^{\mathbf{P}^{\mathbf{PP}}}}$$

Solving the counting hierarchy

$$\supseteq \mathbf{P}^{\mathbf{P}^{\mathbf{P}^{\mathbf{P}^{\mathbf{P}}}}}$$

Solving the counting hierarchy

$$\supseteq \mathbf{P}^{\mathbf{PP}^{\mathbf{PP}^{\mathbf{PP}^{\mathbf{PP}}}}}$$

Do the reverse inclusions hold?

Do the reverse inclusions hold?

They do indeed!*

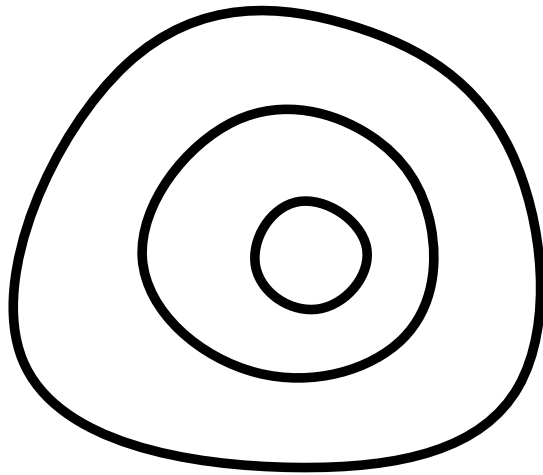* Technical details still to be checked. Drink responsibly.

Solving the counting hierarchy

$$\bigcirc \quad = \mathbf{P}$$

Solving the counting hierarchy

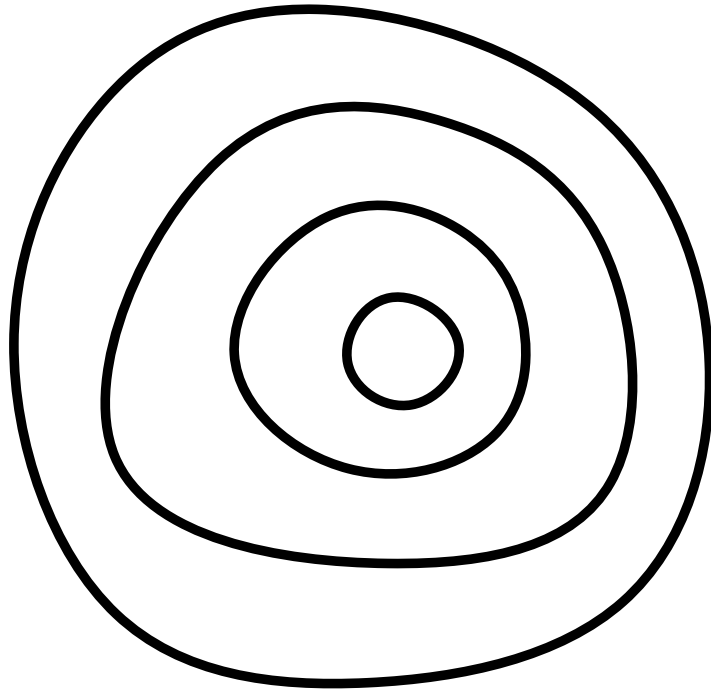$$\bigcirc = \mathbf{P}^{\mathbf{PP}}$$

Solving the counting hierarchy

$$\subseteq \mathbf{P^{PP^{PP}}}$$
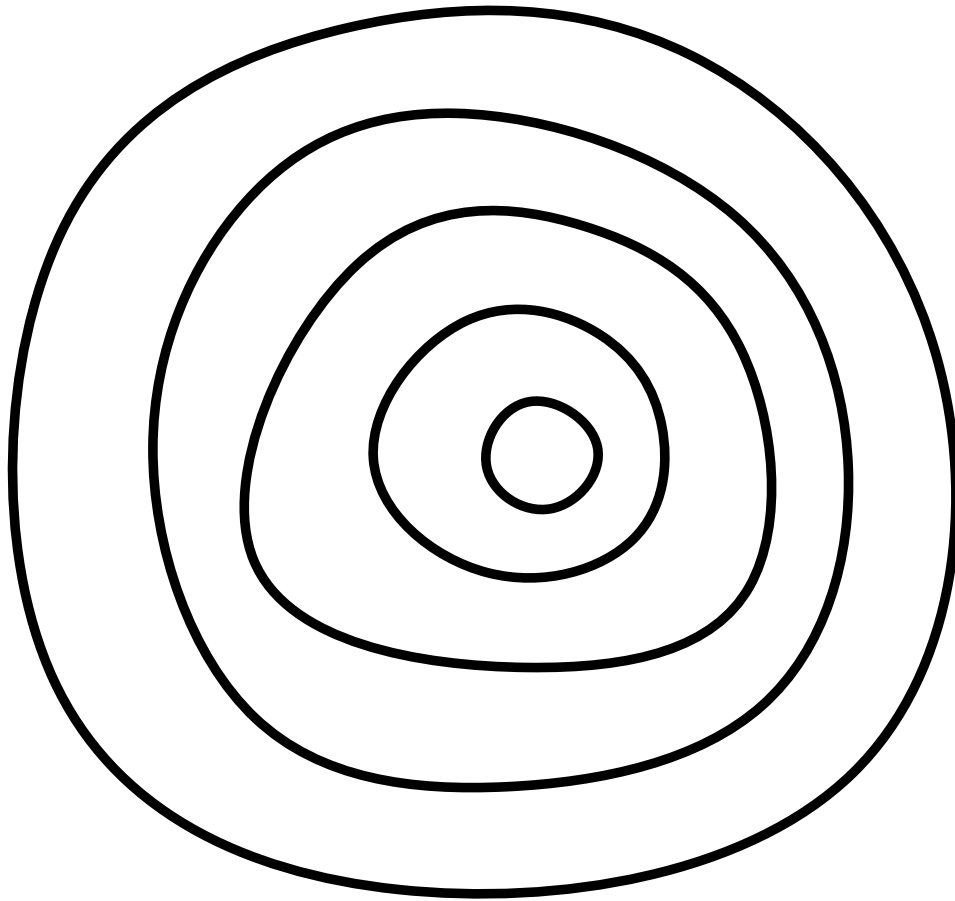
Solving the counting hierarchy

$$\subseteq \mathbf{P}^{\mathbf{PP}^{\mathbf{PP}^{\mathbf{PP}}}}$$
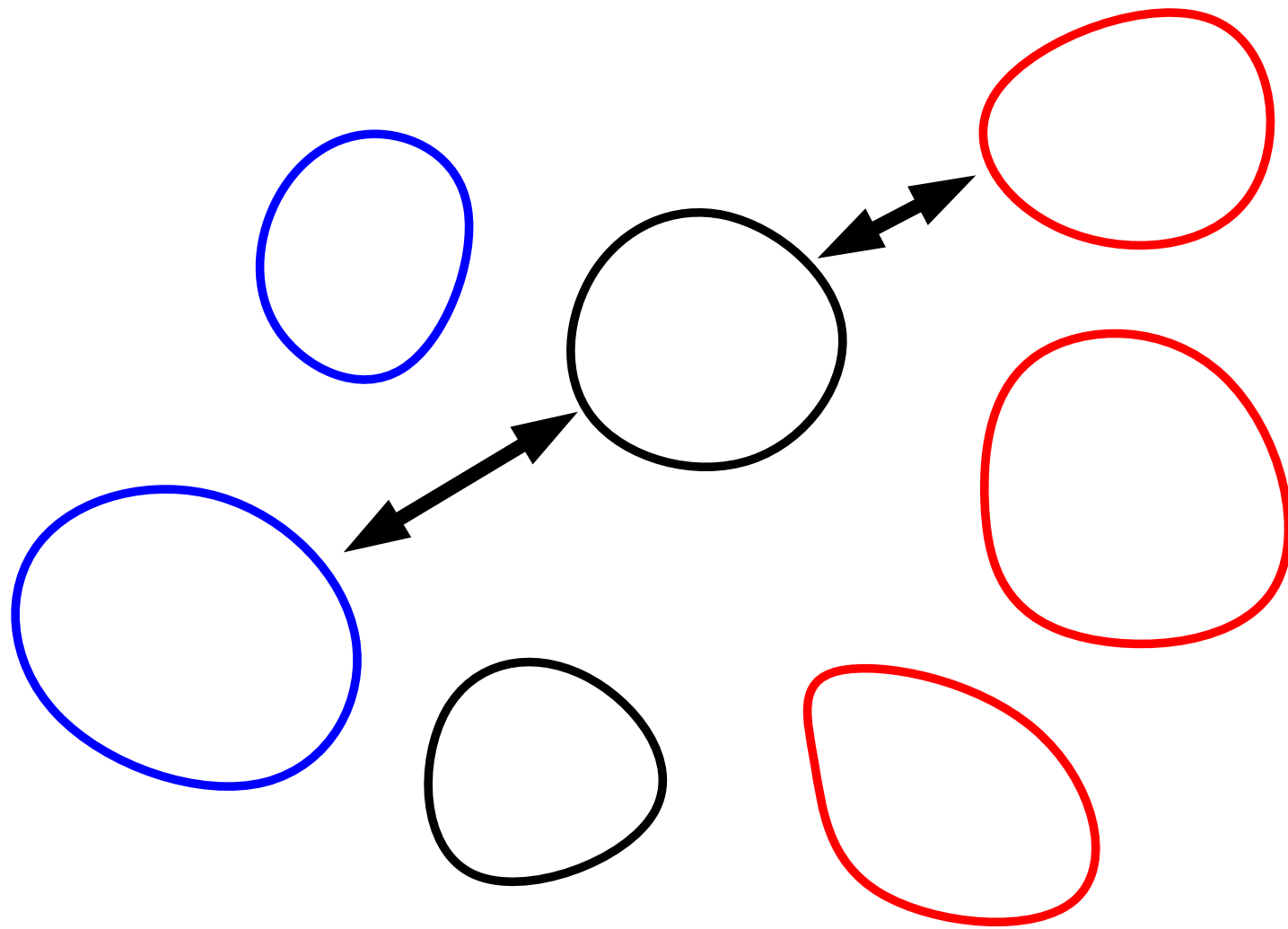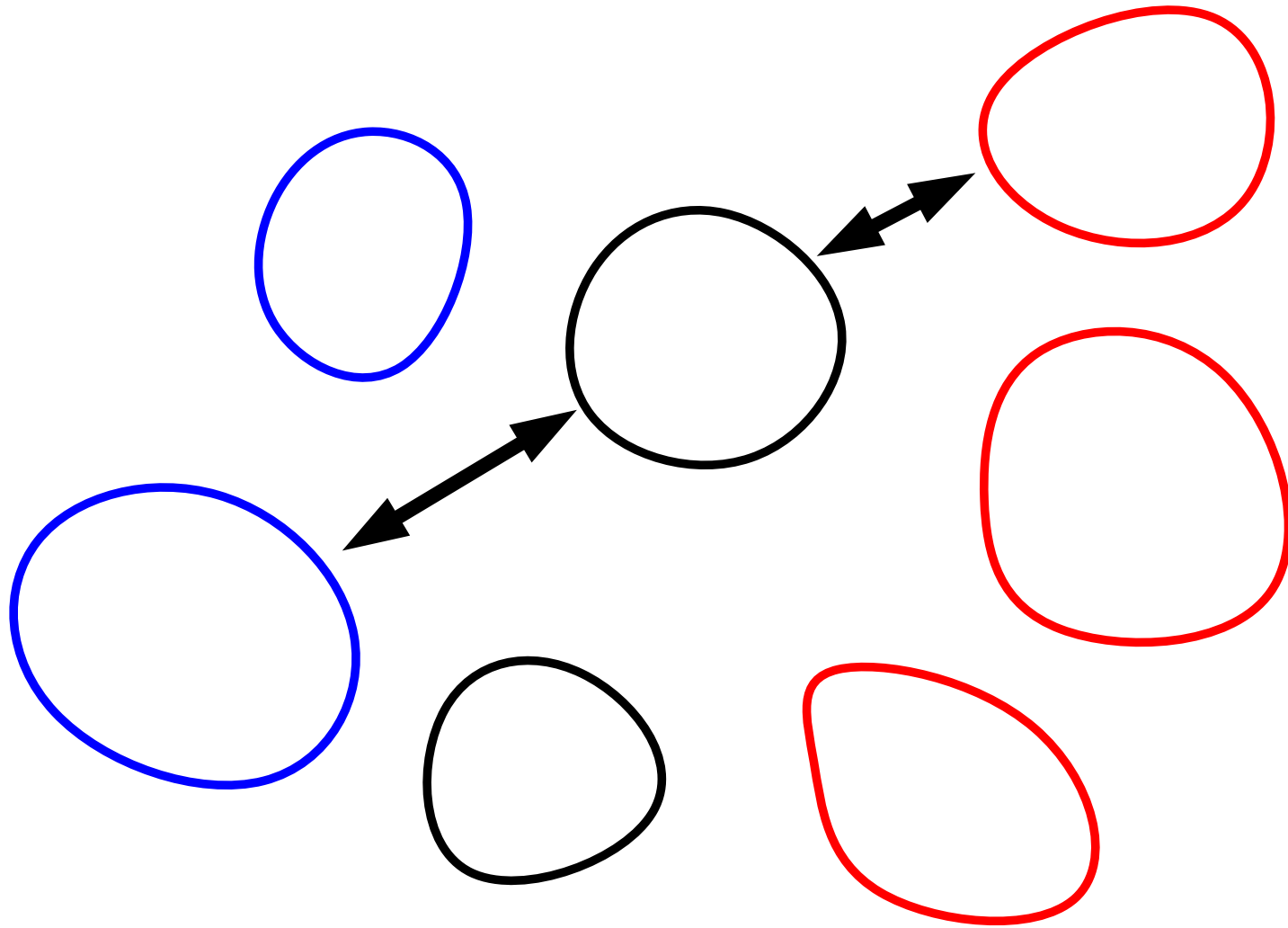
Solving the counting hierarchy

$$\subseteq \mathbf{P}^{\mathbf{P}^{\mathbf{P}^{\mathbf{P}^{\mathbf{P}^{\mathbf{P}}}}}}$$
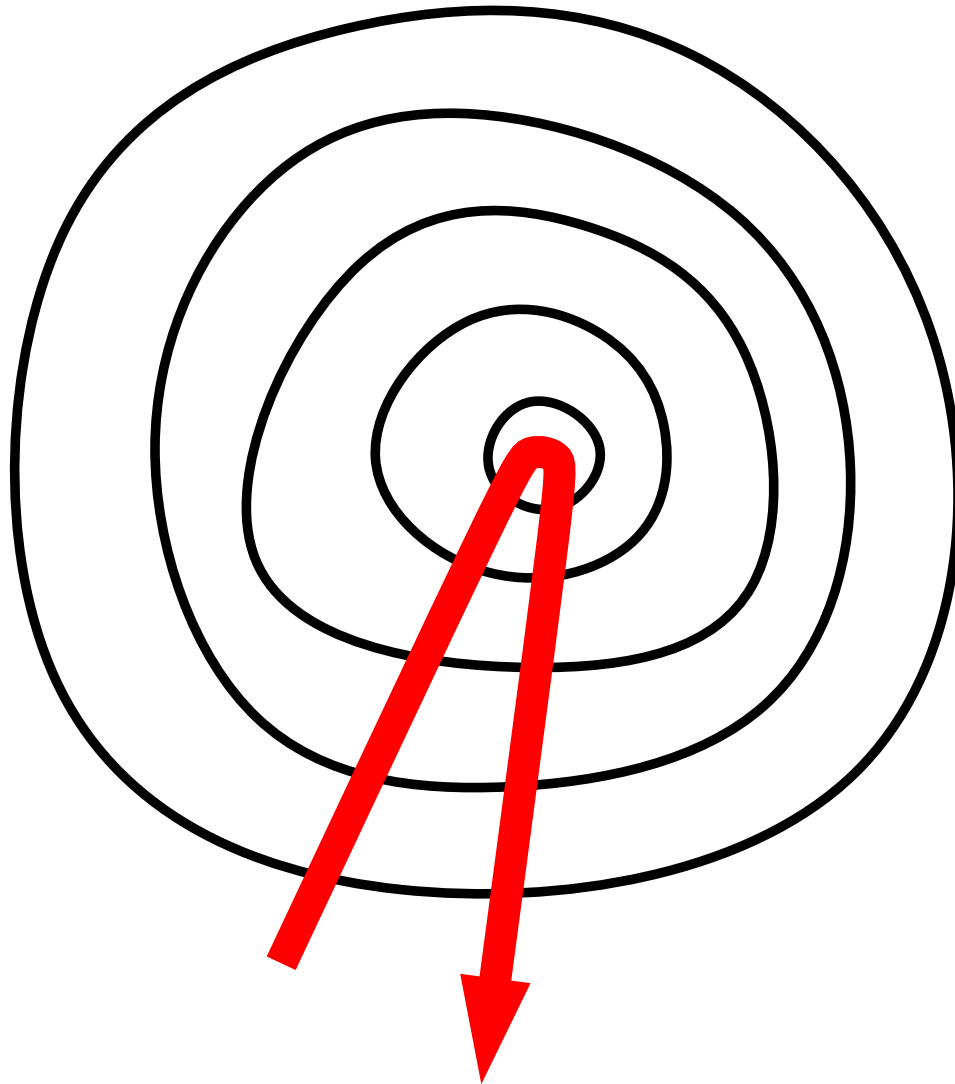
Also: a corollary for tissue P systems
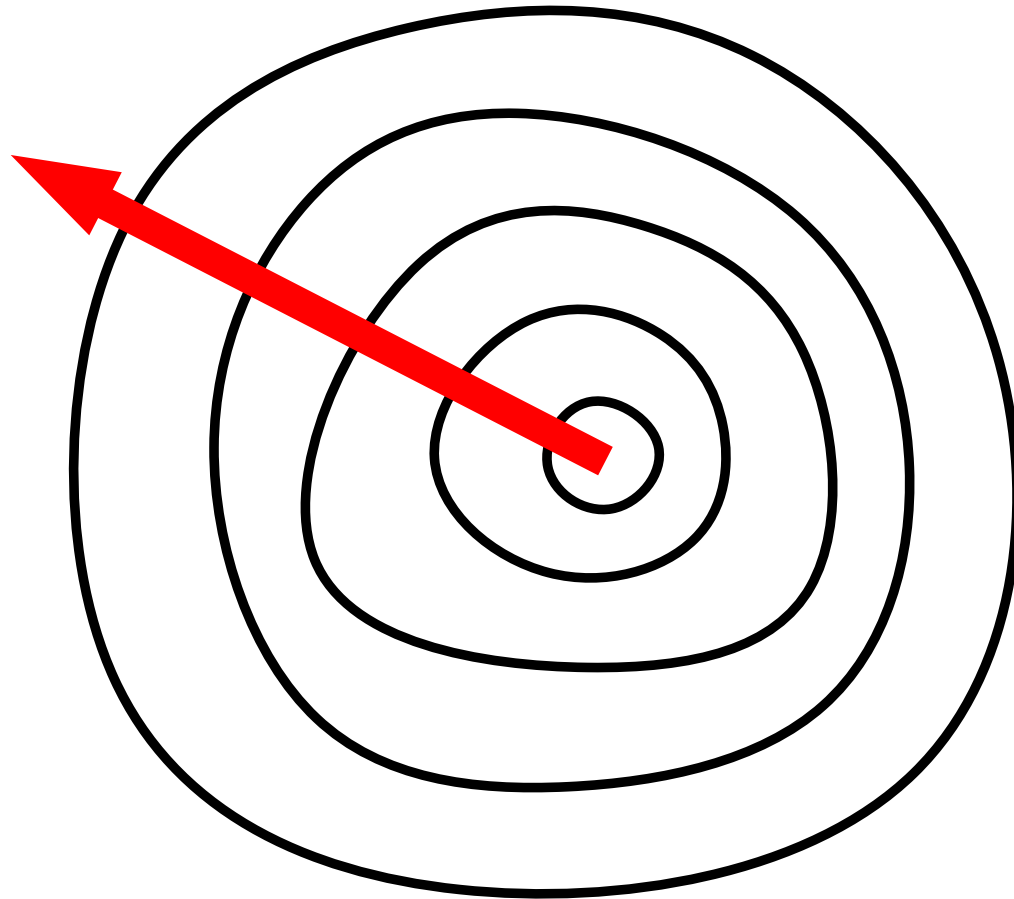
Also: a corollary for tissue P systems

No **PSPACE** here (unless $\mathbf{P^{PP}} = \mathbf{PSPACE}$)

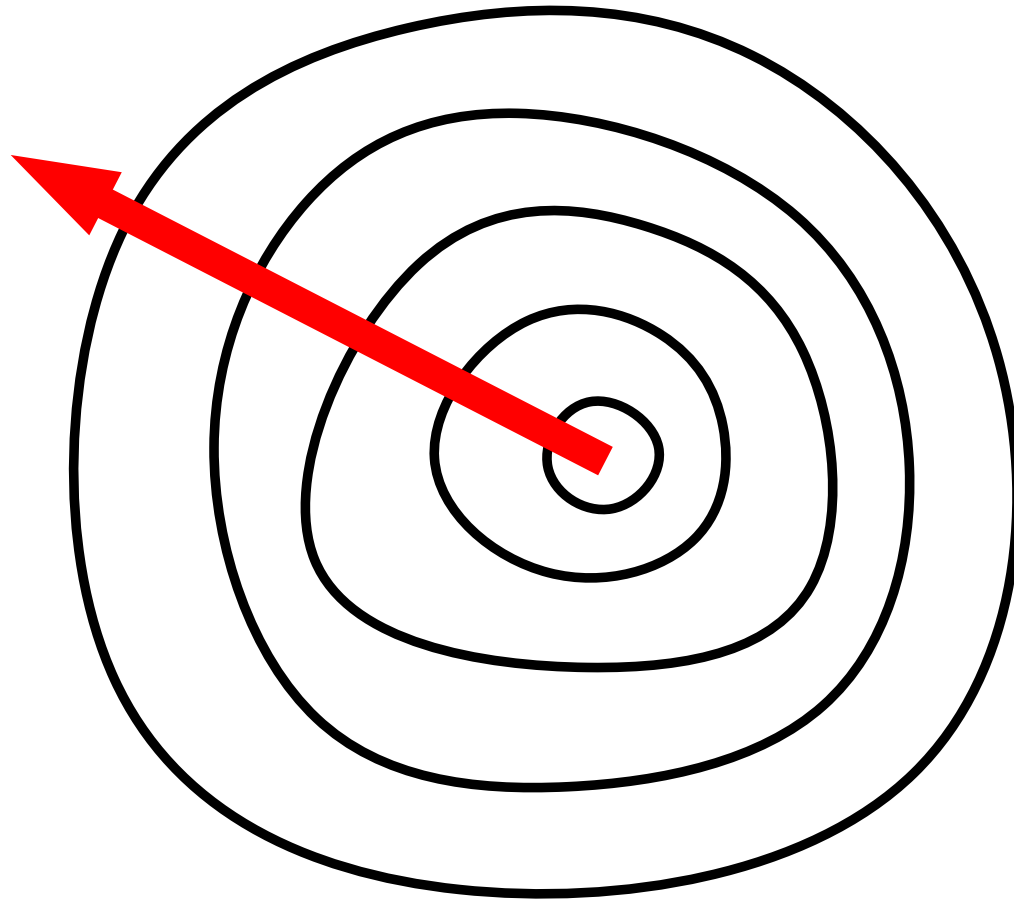# Coming next: unidirectional communication

Coming next: unidirectional communication

Coming next: unidirectional communication

Conjecture: P^{NP} instead of **PSPACE**

Thanks for your attention!
¡Gracias por su atención!