

Spontaneity: Blind chance & dumb luck

CH102 Spring 2012
Boston University

The essence of change

all complexity is *an illusion* ...

things happen simply because they *can* happen and because they are statistically *most likely* to happen.”

Michael Munowitz, "Principles of Chemistry," W. W. Norton, 2000

Stuff happens. Why?

Everything that happens
— *absolutely everything*—
happens *solely* because of
blind chance and *dumb luck*.

Really?

A gas **fills** its container



Gas **all on left** of container

A gas **fills** its container



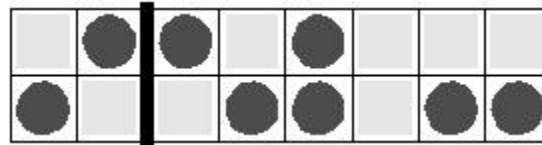
Gas **evenly distributed** throughout container

Pressure in a gas is **uniform**



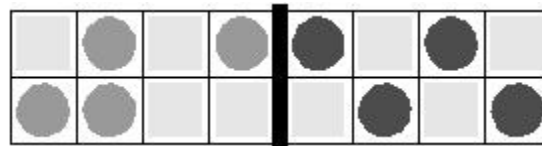
P proportional to n/V (“lattice gas”)
Too low on left; **too high** on right

Pressure in a gas is **uniform**



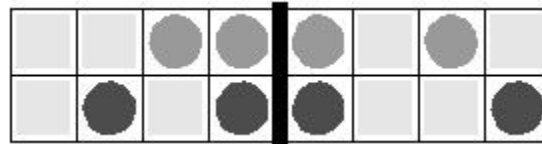
P proportional to n/V (“lattice gas”)
The same on the left and right

Gases **mix** evenly



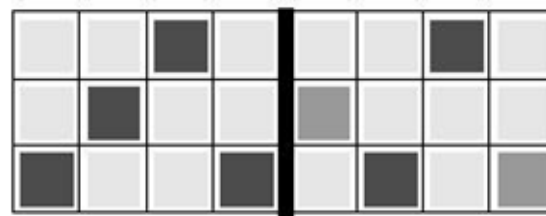
One gas on **left**, the other on **right**

Gases **mix** evenly



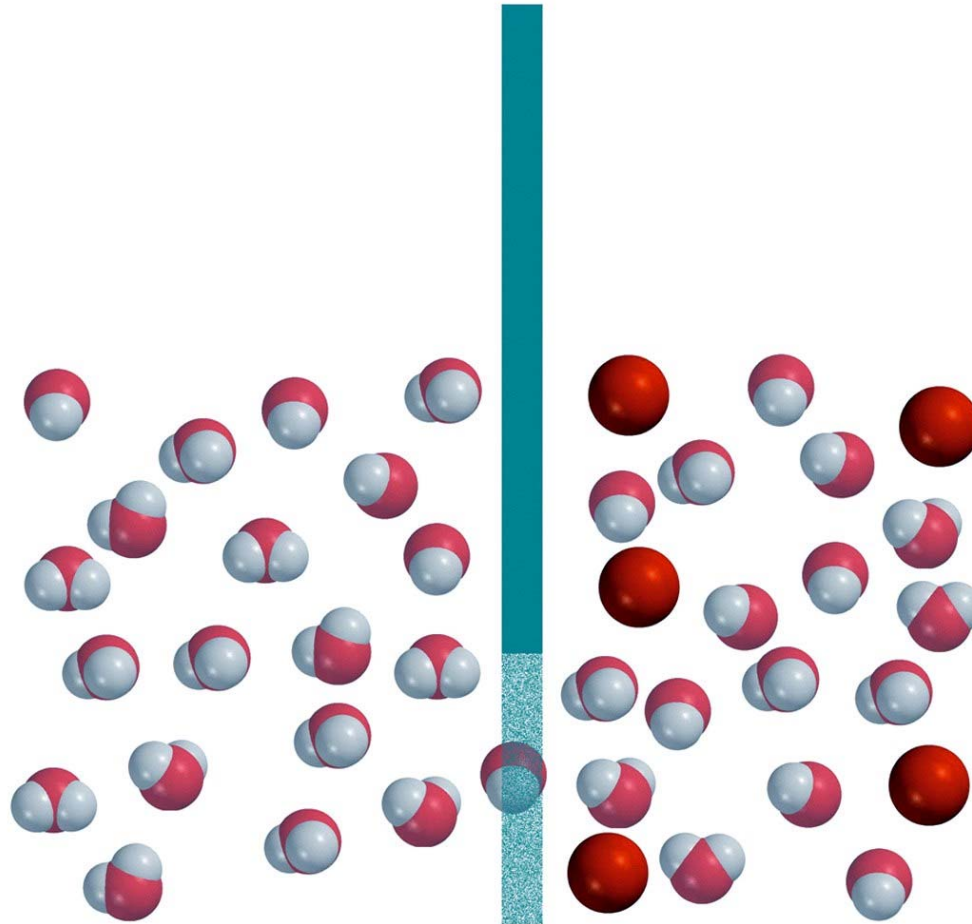
Equal amounts throughout

Osmotic pressure across **semipermeable** membrane

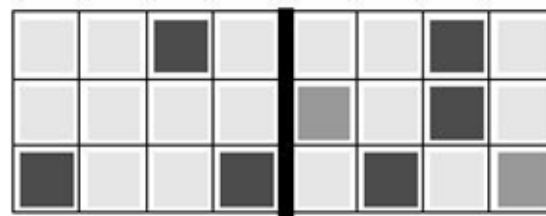


Pressure equal (n/V) on both sides of membrane,
but solute cannot pass across membrane to left

Dumb luck

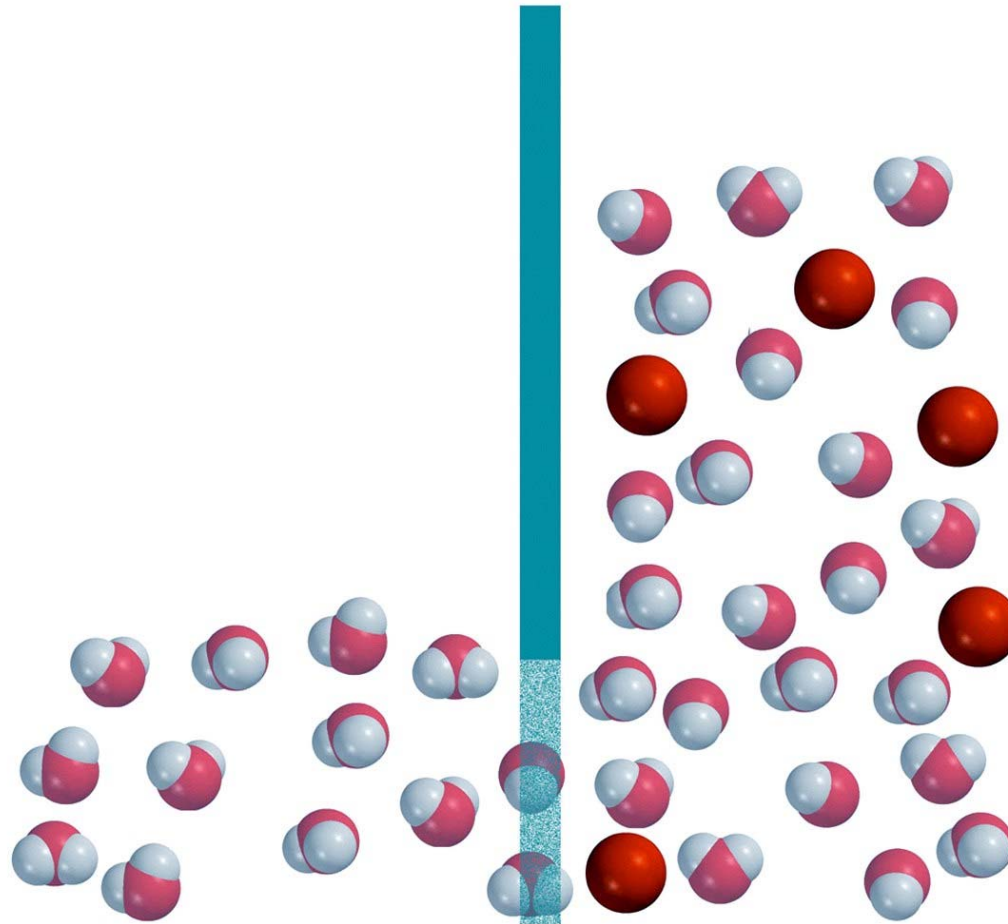


Osmotic pressure across **semipermeable** membrane



Solvent passes across membrane to right
making **pressure higher** (n/V) **on right**

Blind chance



Blind chance & dumb luck

Everything—***absolutely everything***—that happens, happens ***solely*** because of ***blind chance*** and ***dumb luck***.

To quantify this ...

1. Learn to ***count*** the ways
2. Search for ***greatest number*** of ways