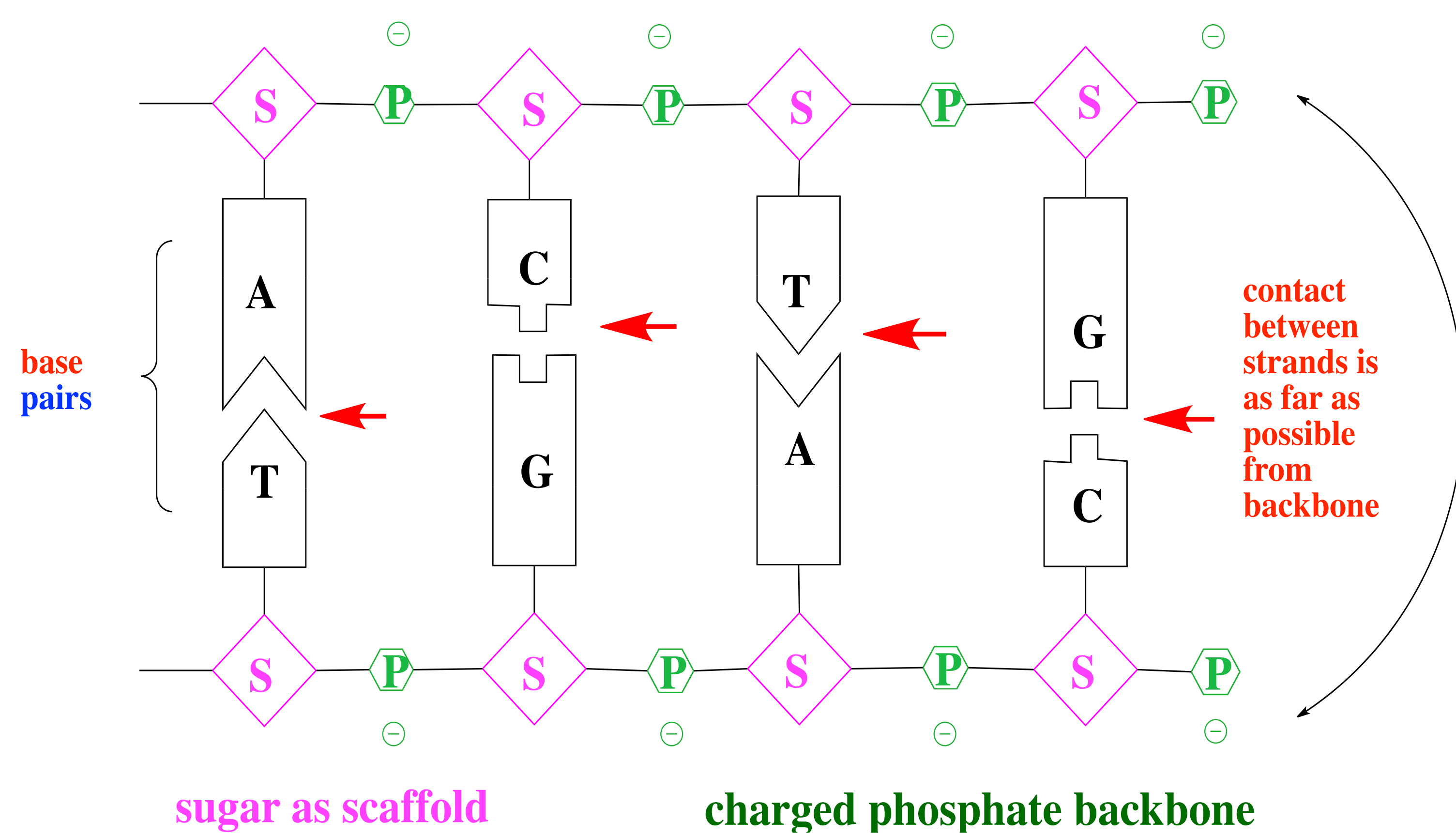


Instrument for Universal Darwinism Detection

Steven Benner, Nilesh Karalkar, and the FfAME Team

The universal Darwinian biopolymer in water must have

- a **polyelectrolyte backbone**
- building blocks of **uniform size/shape** that fit **Schrödinger's aperiodic crystal lattice**
- **Hydrogen bonds** to gain **directional binding**
We know this because we synthesized variants of DNA/RNA
- that *differ* from terran DNA/RNA, but *fit* these rules, **and they work**
- that *resemble* terran DNA/RNA, but *violate* these rules, **and they do not work**

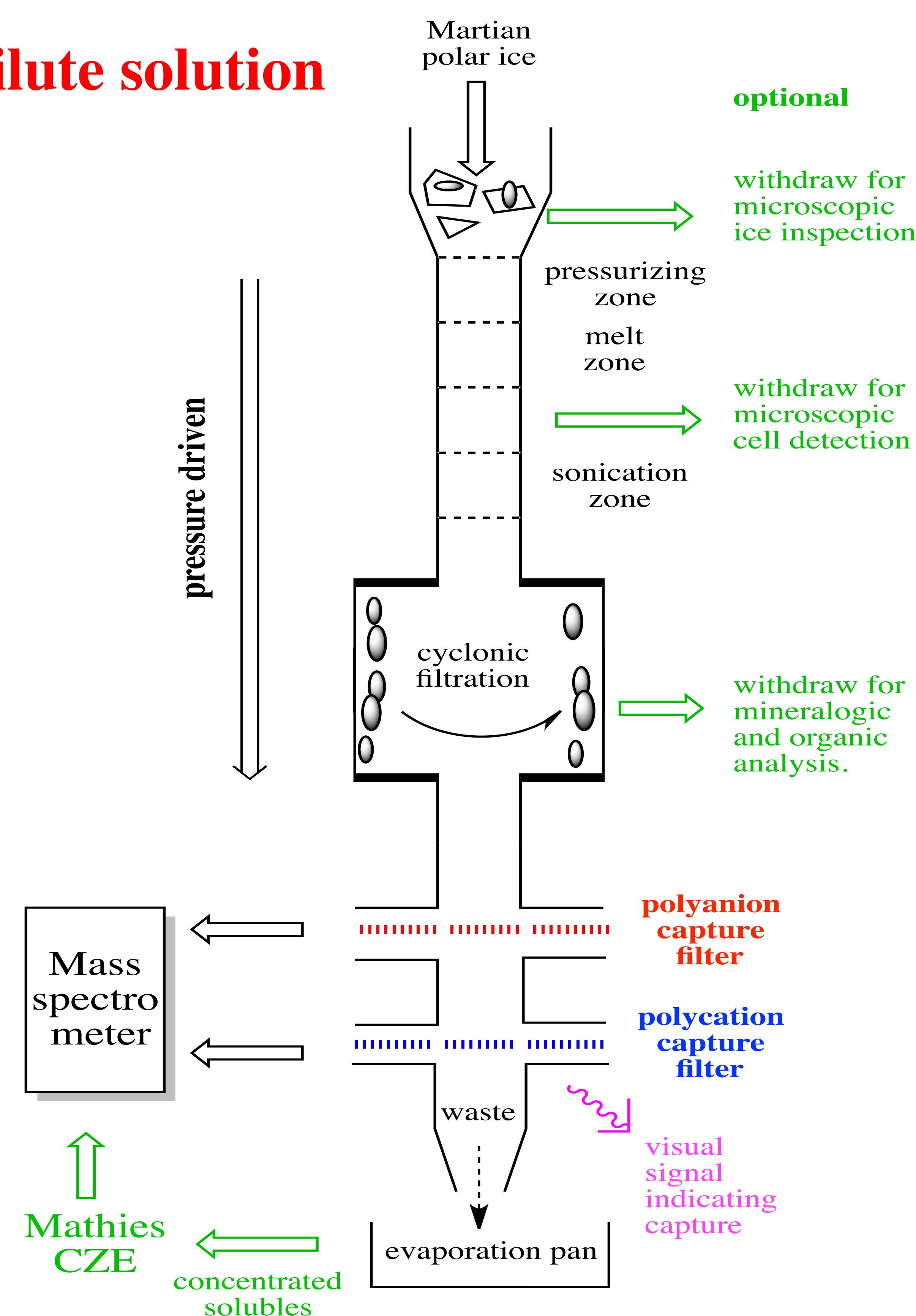
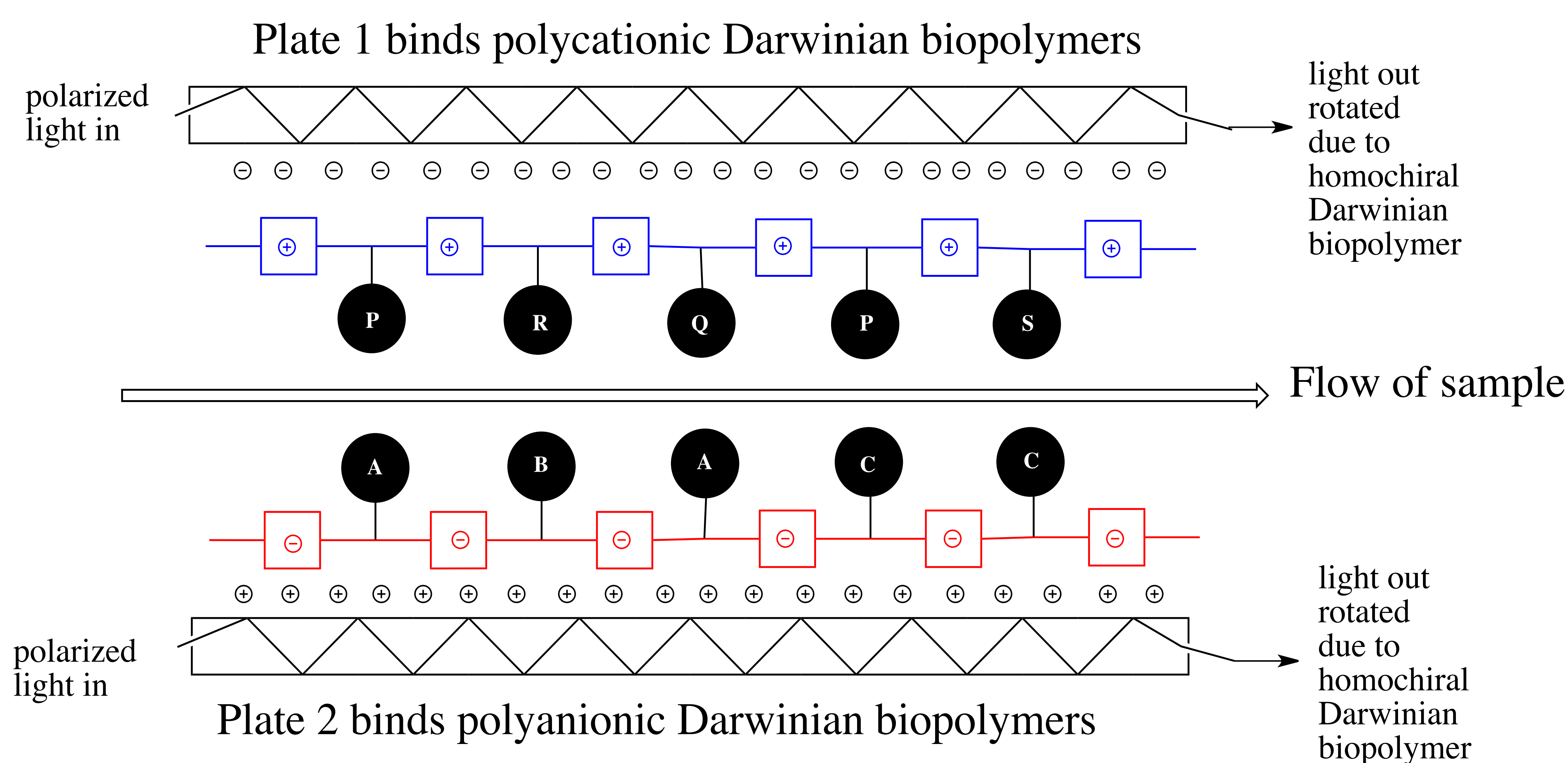


Benner, S. A. (2017) Detecting Darwinism from molecules in the Enceladus plumes, Jupiter's moons, and other planetary water lagoons. *Astrobiology* **17**, 840



- **A source of meltable water**, for example, Mars polar ice caps that sample the entire accessible regolith via dust storms
- **A power source** to evaporate dry ice, melt the water
- **Sharpless continuous flow centrifuge**; grit disrupts cells
- Soluble material passes into capture sites

Polyelectrolytes are easily captured coulombically from very dilute solution



Not essential to the architecture, but possible adjuncts

- Mass spectroscopic analysis of captured materials
- analysis of non-captured solutes, including metabolites

Removing guesswork. Schrödinger's "aperiodic crystals" arose from the need for "phase transition physics" to ensure fidelity of transfer of information for life. A pure crystal has a high and sharp melting temperature involving cooperative disruption of an ordered structure. If impure, the phase transition is less sharp. Schrödinger extended this to a crystal with different building blocks that hold information. For phase transition physics to ensure faithful replication, all blocks must have same size, shape, and chirality to fit an *aperiodic* crystal lattice.

If the captured polyelectrolyte is homochiral, this amplifies the chirality of the building blocks via superchirality. This is a metric for a Schrödinger biopolymer that has been concentrated due to its polyelectrolyte backbone.