Characterization of Bacteriorhodopsin Reconstituted in Lipid Bilayer Membrane

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**Background/Relevance**
- Existing solar energy conversion methods are:
  - not biodegradable and,
  - require expensive maintenance

**Innovation**
- Build a new system that can be used to:
  1. Characterize lipid membranes.
  2. Generate photocurrent with Bacteriorhodopsin (BR) or Halorhodopsin (HR); as fundamental biological species.
  3. Capture the structure of the current generating membrane with an imaging equipment.

**Approach**
- Proteins are reconstituted in a solid supported Nanolipid bilayers membrane on a transportable silicon substrate.
- A laser is used to activate Ion-pumping and a Photocurrent is measured across the membrane.
- The silicon substrate hosting the membrane is inserted into a Transmission Electron Microscope (TEM) and the structure of the current generating membrane is captured.

**Key Results**
The proteins characterization in lipid bilayer membrane was realized through:
- the fabrication and testing of an experimental setup to form bilayer membranes;
- the characterization of membrane capacitance and resistance;
- the successful generation of photocurrent.

**Conclusions**
This work supports the understanding of the theory and principle of:
- producing bio-photocurrent with Bacterio- or Halorhodopsin as an example of biological species and
- characterizing membranes through image and electrical parameters.

**Future Work**
The next step in this work is to stabilize the generation of photocurrent, and to capture the structure of Bacteriorhodopsin, and Halorhodopsin through modern imaging equipment such as Transmission Electron microscope (TEM).