NYU·poly
POLYTECHNIC INSTITUTE OF NEW YORK UNIVERSITY

Mechatronics Project

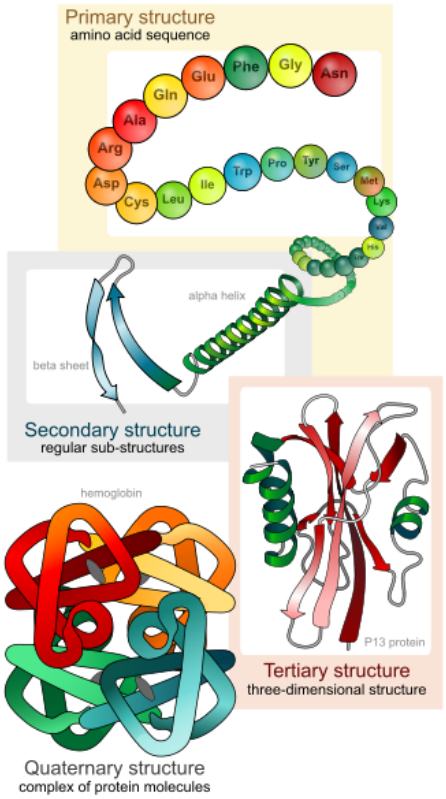
EMMET System
ElectroMechanical Membrane-Enabled Transfer System

Carlo Yuvienco
Keeshan Williams
Alberto Giacomello

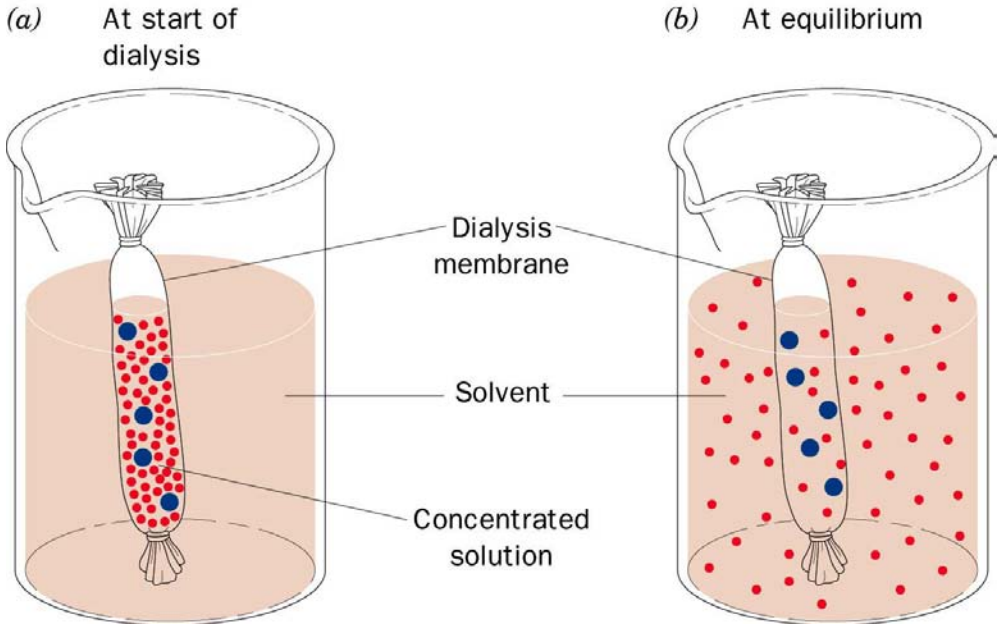
C. Yuvienco; K. Williams; A. Giacomello

EMMET System

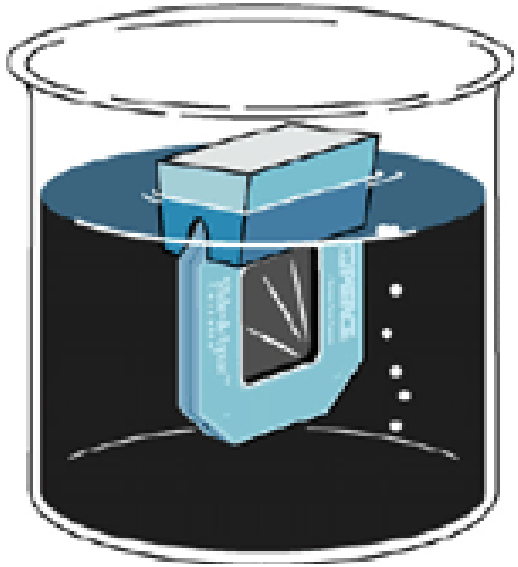
Objective: Protein Purification



Process



Present Implementation



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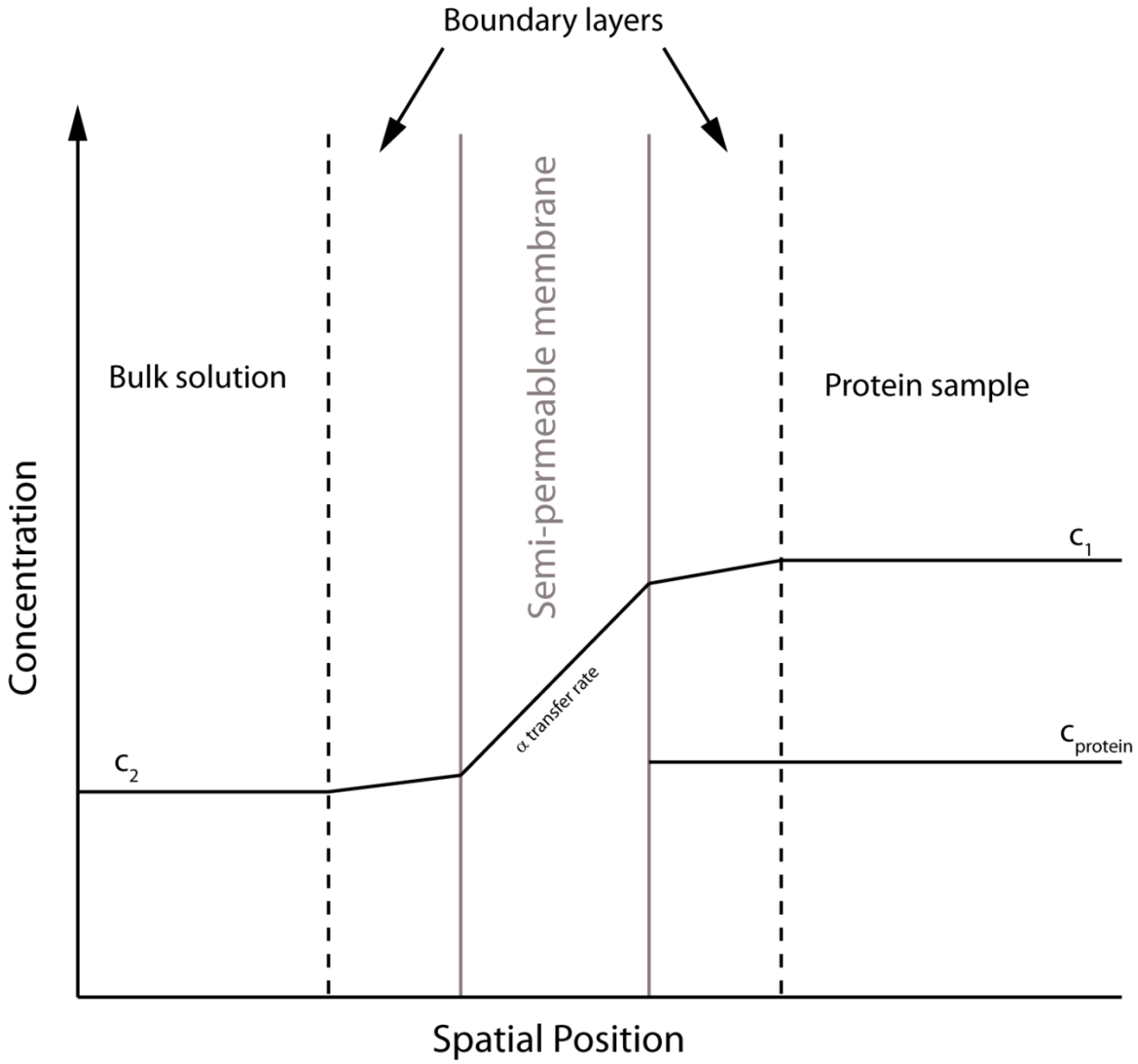

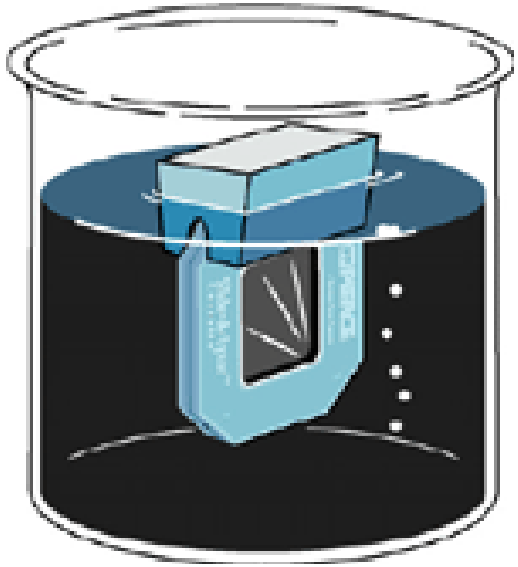

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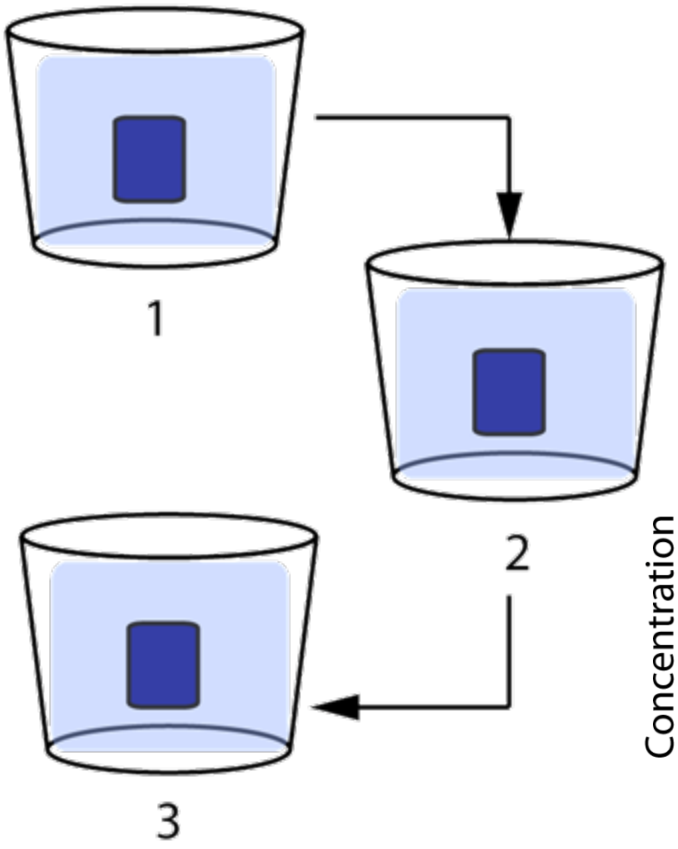

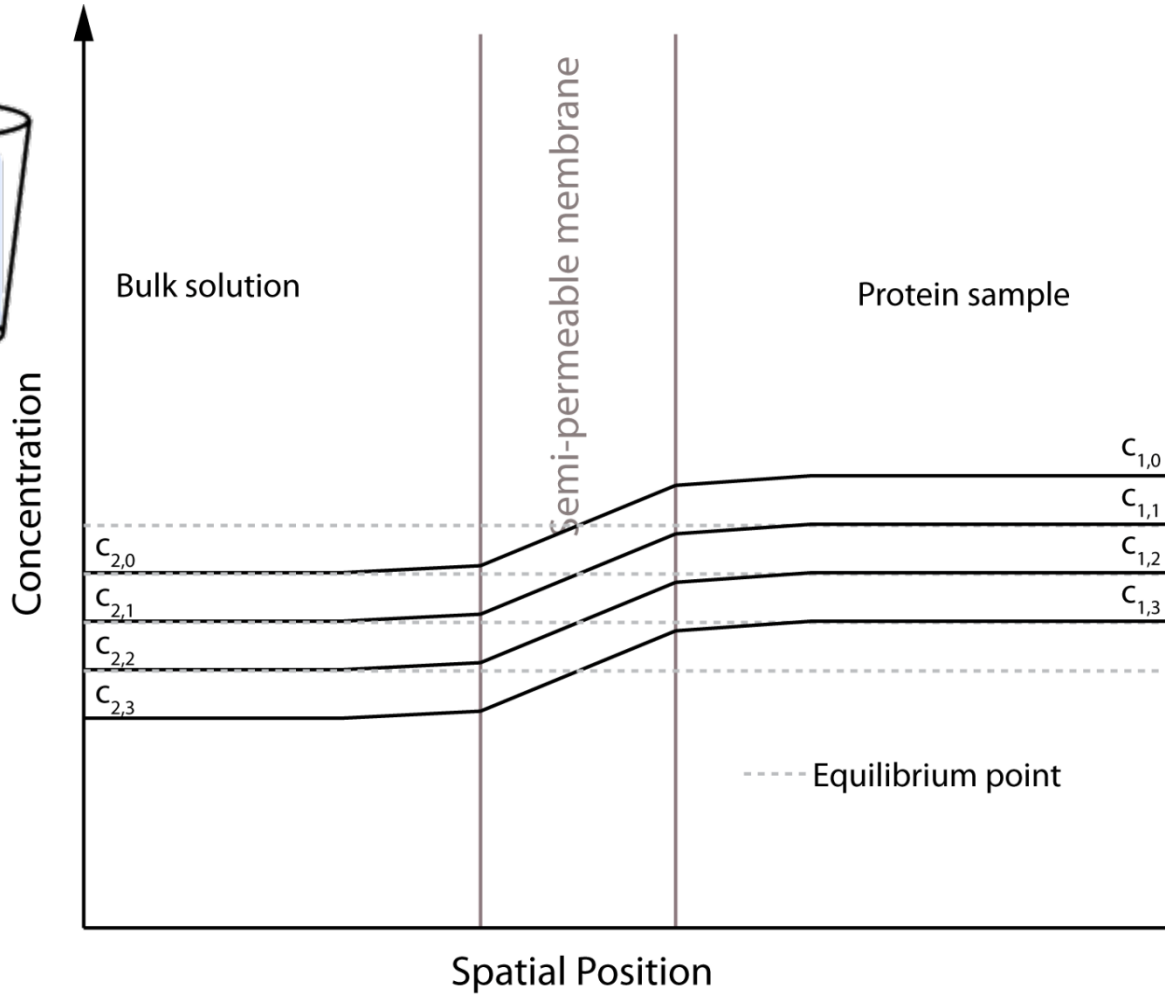

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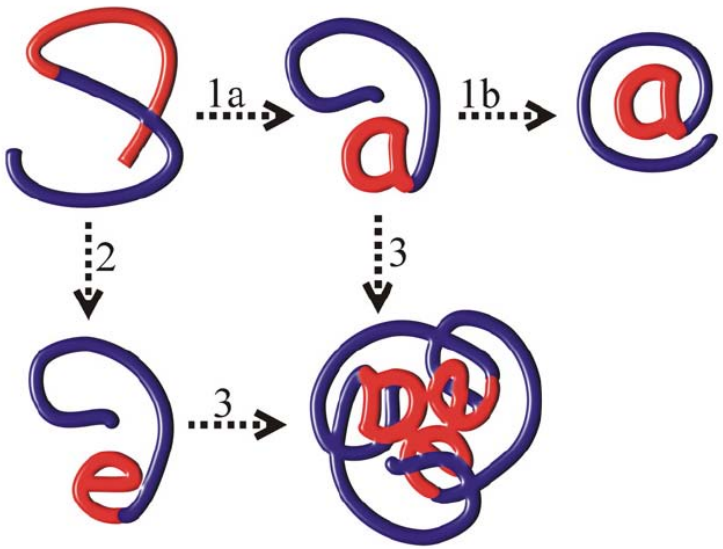

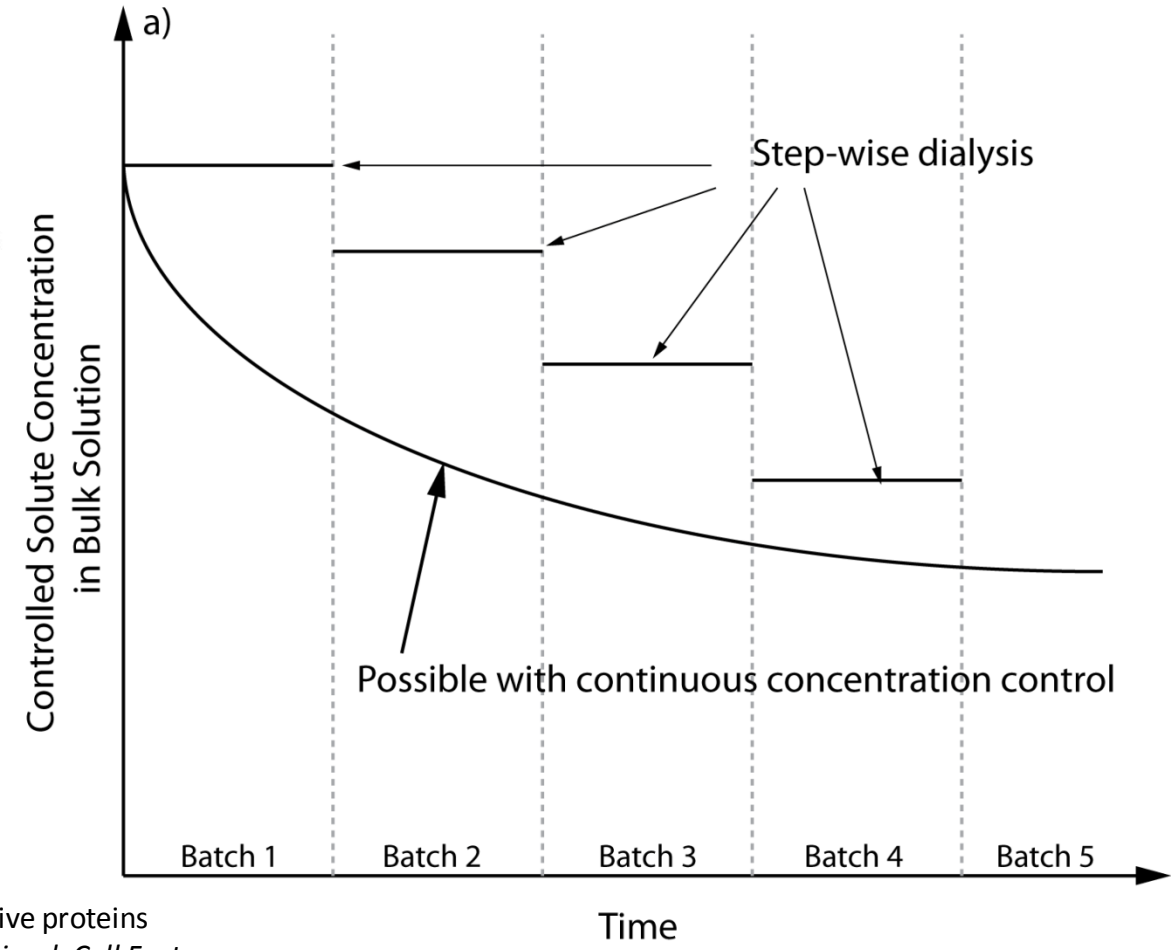

Vallejo, L. F. & Rinas, U. Strategies for the recovery of active proteins through refolding of bacterial inclusion body proteins. *Microb Cell Fact* ***3, 11, doi:10.1186/1475-2859-3-11***

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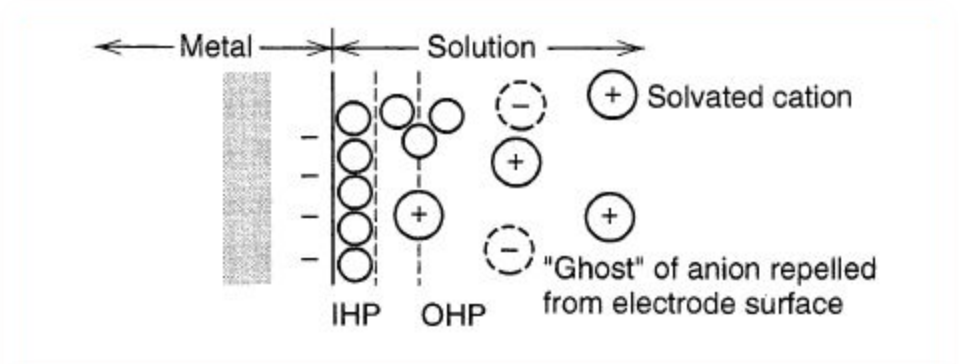
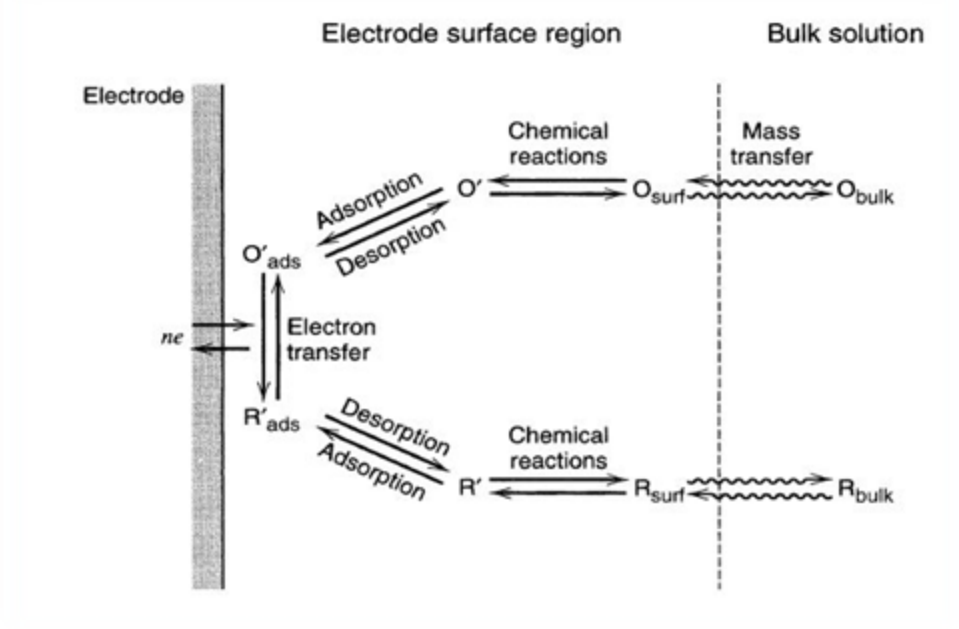
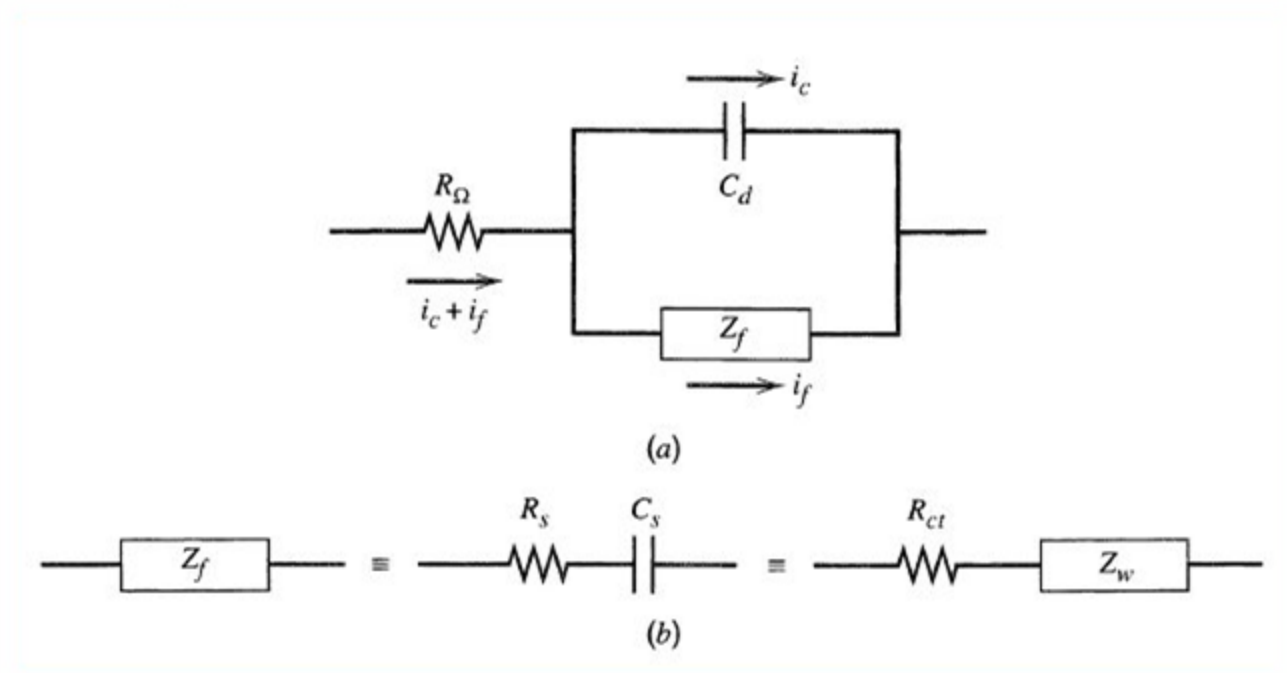
The Electrode Surface





The Electrode Surface – Equivalent Circuit



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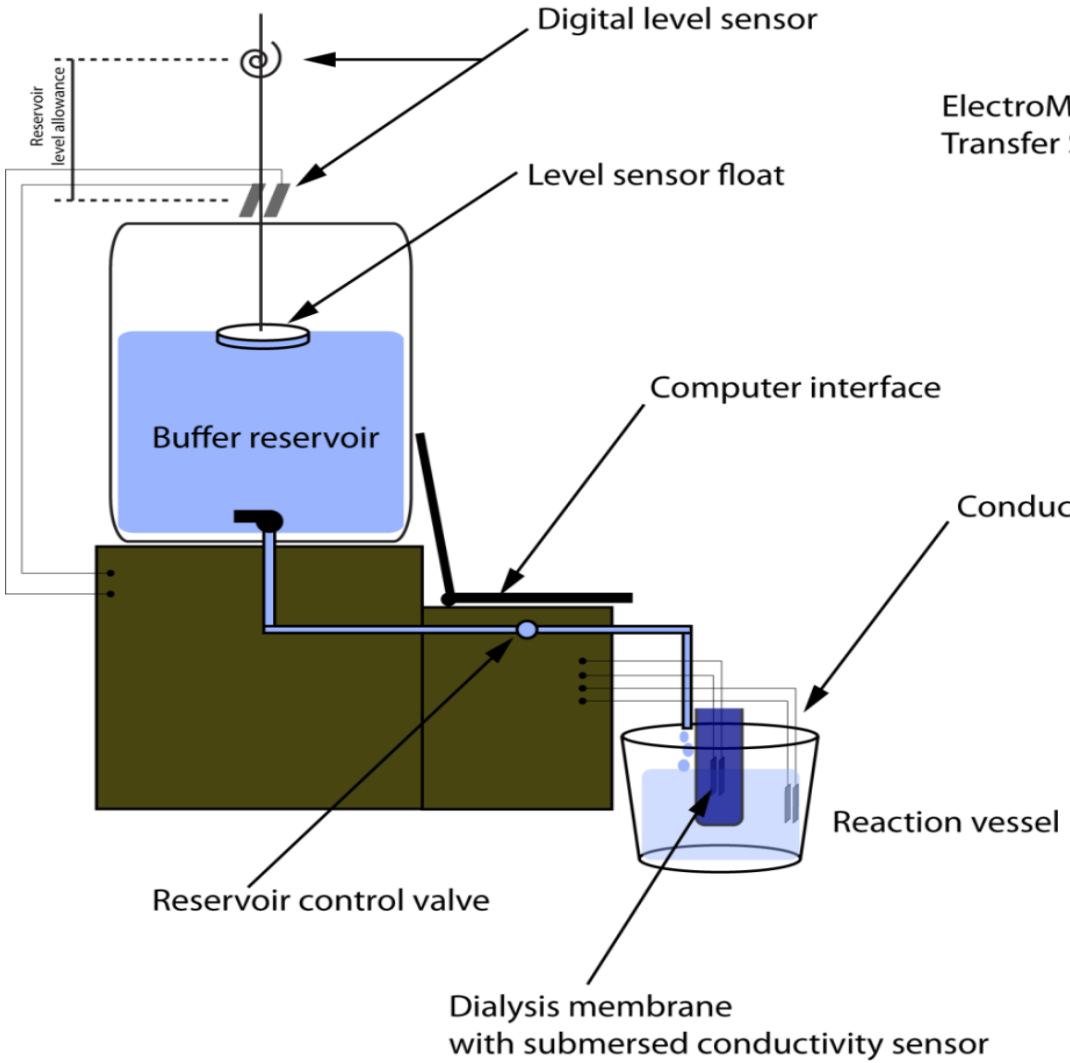
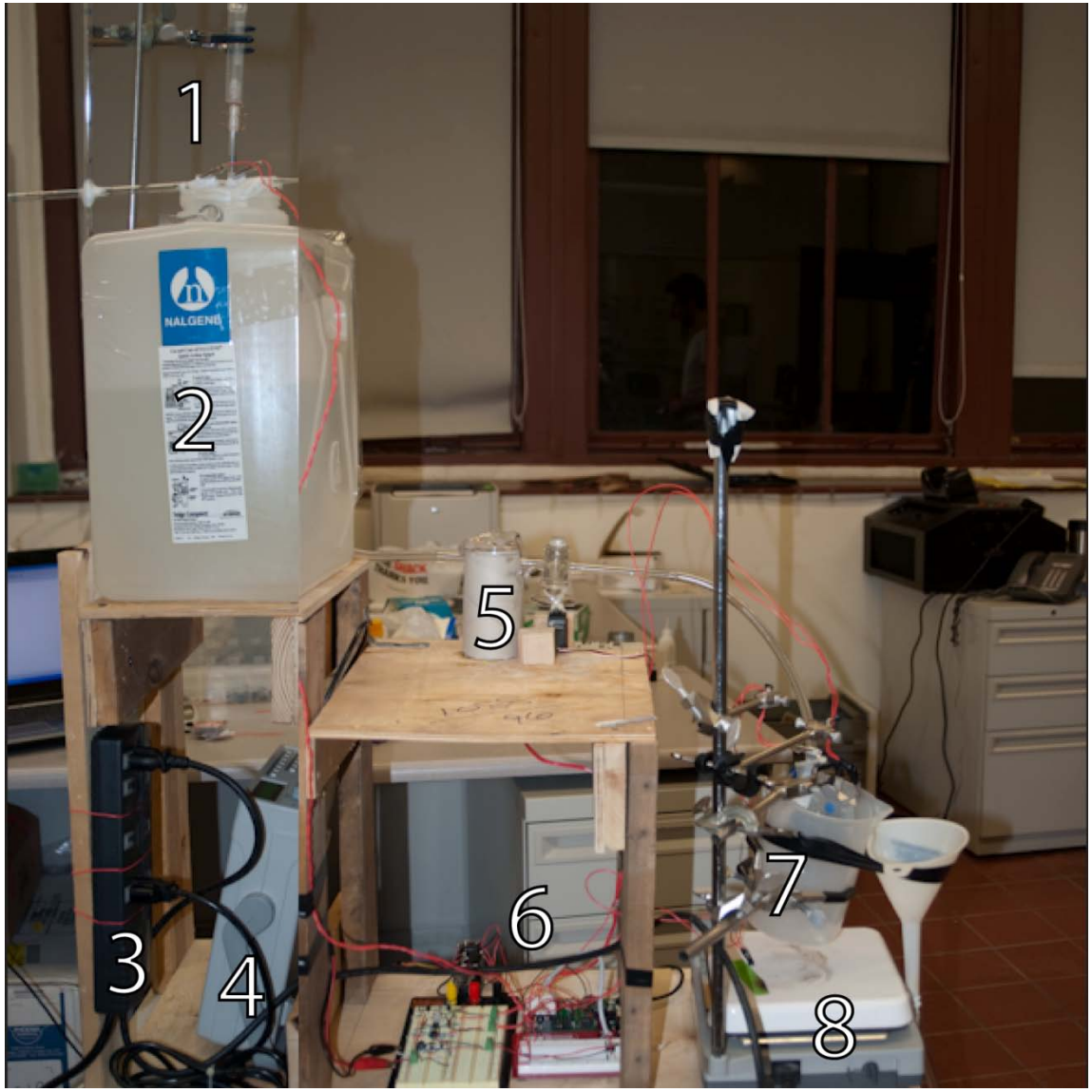


ElectroMechanical Membrane-Enabled Transfer System (EMMETS)

Our Proposal

C. Yuvienco; K. Williams; A. Giacomello

EMMET System



Primary System Components

1. Digital level sensor
2. Reservoir
3. Power strip
4. Signal generator
5. Reservoir valve (servo controlled)
6. μ controller and circuit boards
7. Reaction vessel
8. Stir bar

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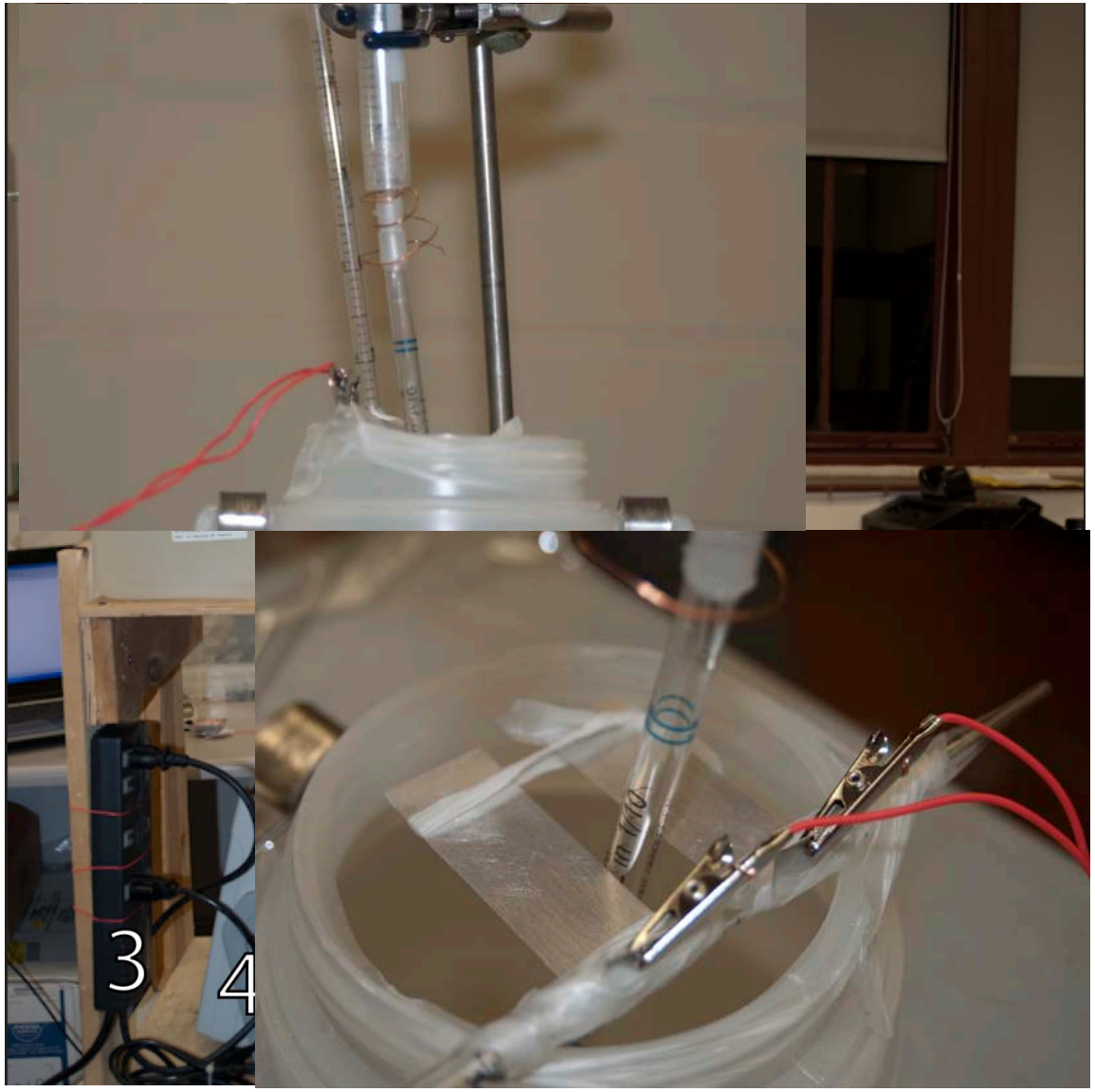

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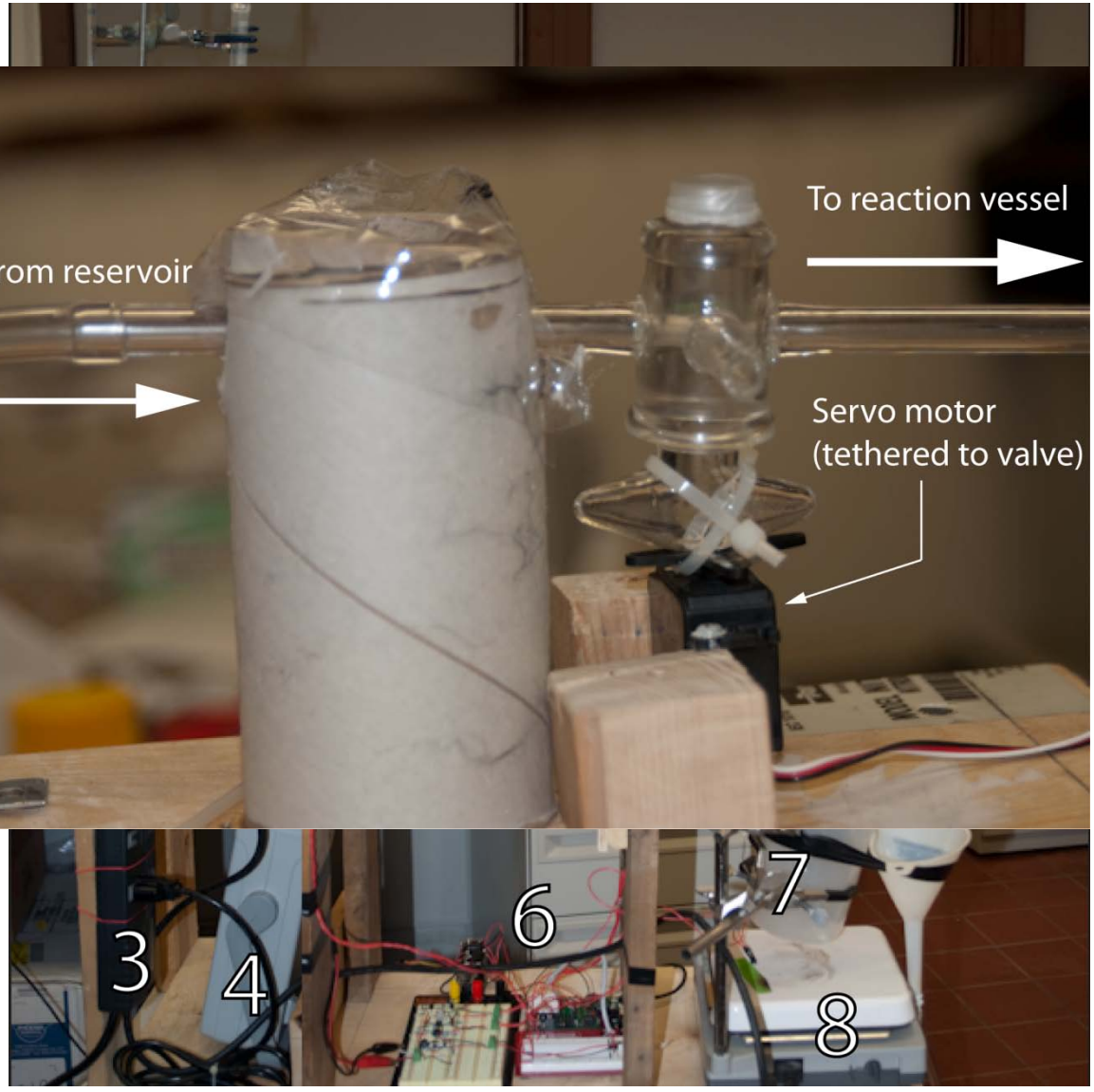

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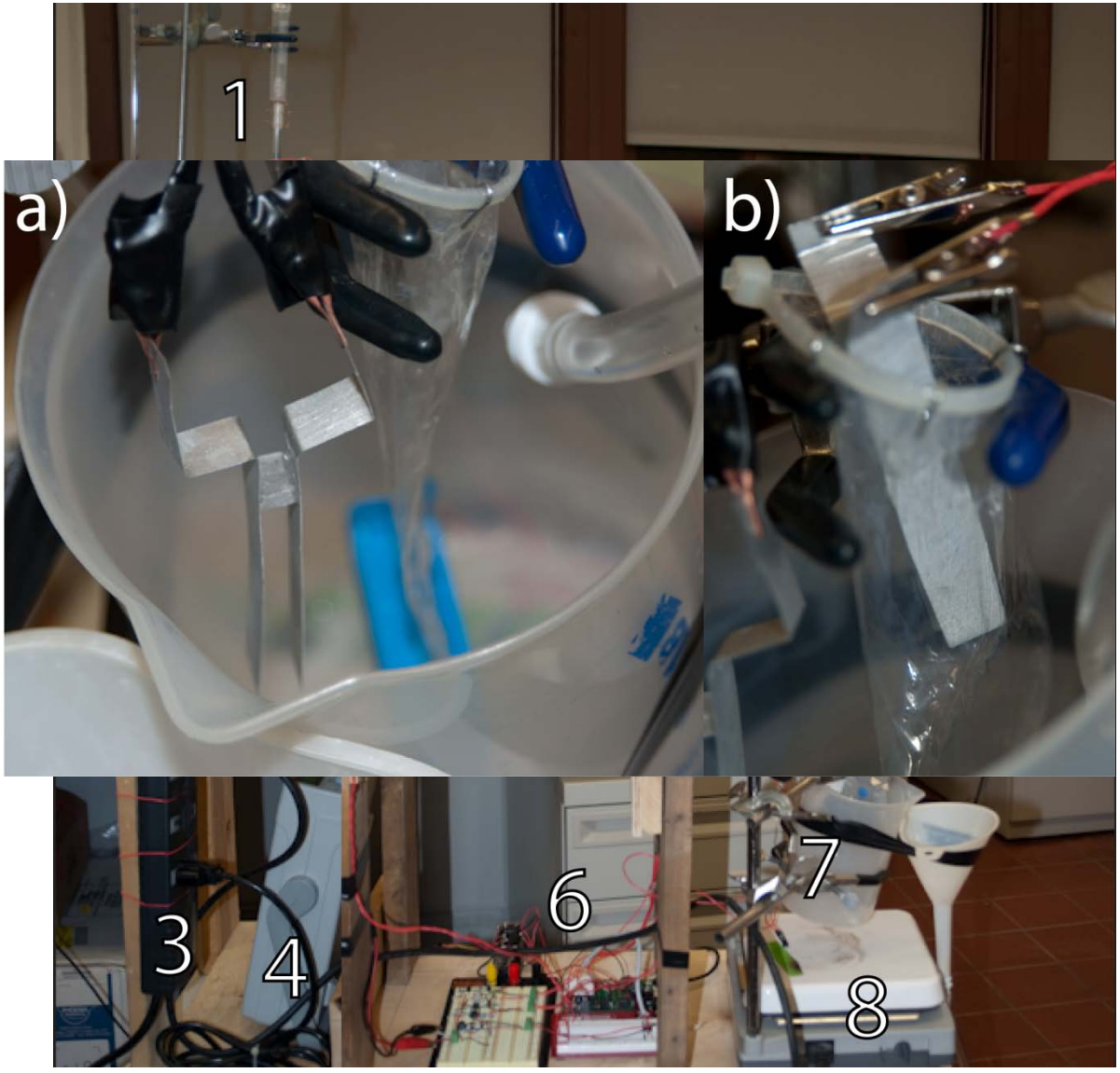

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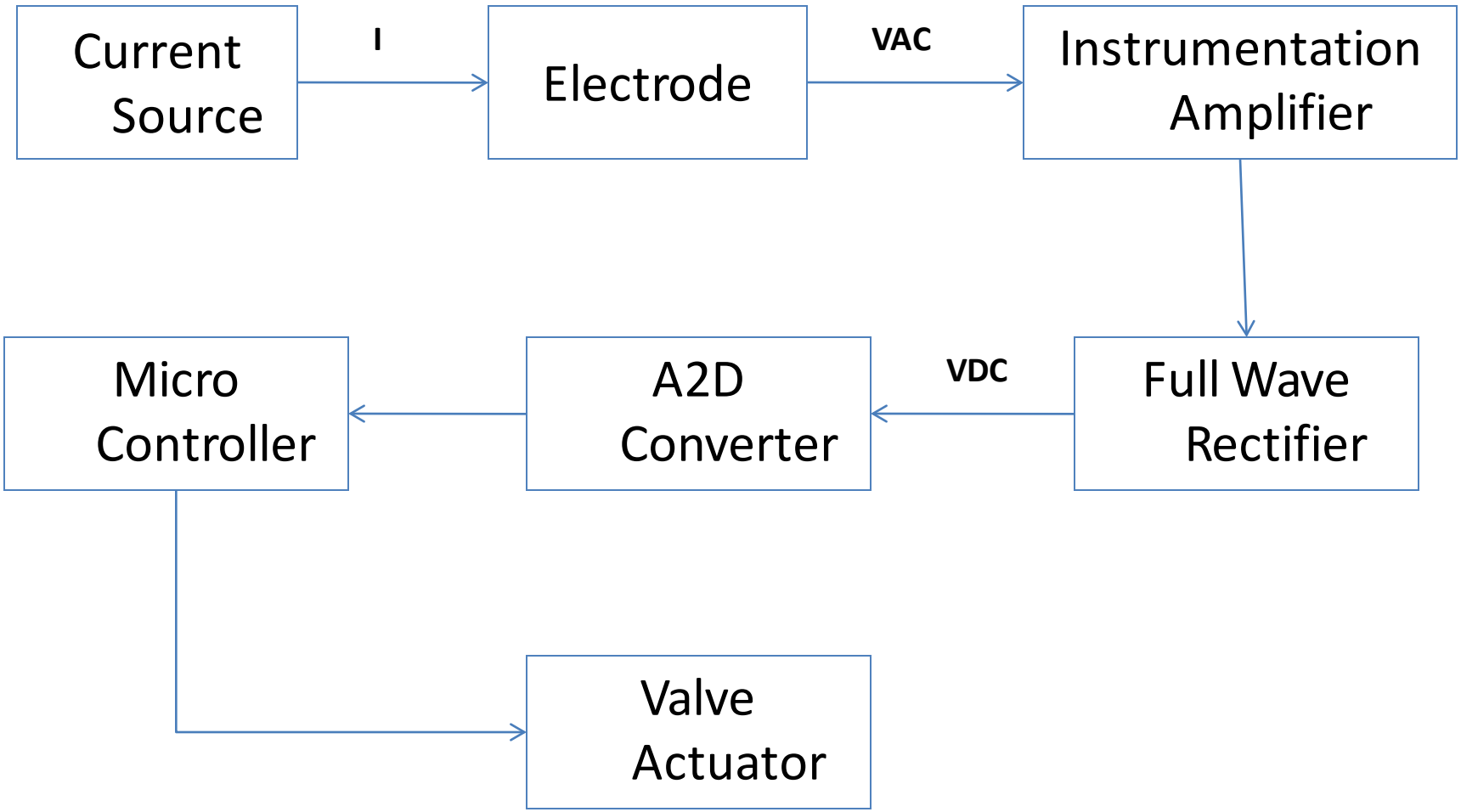
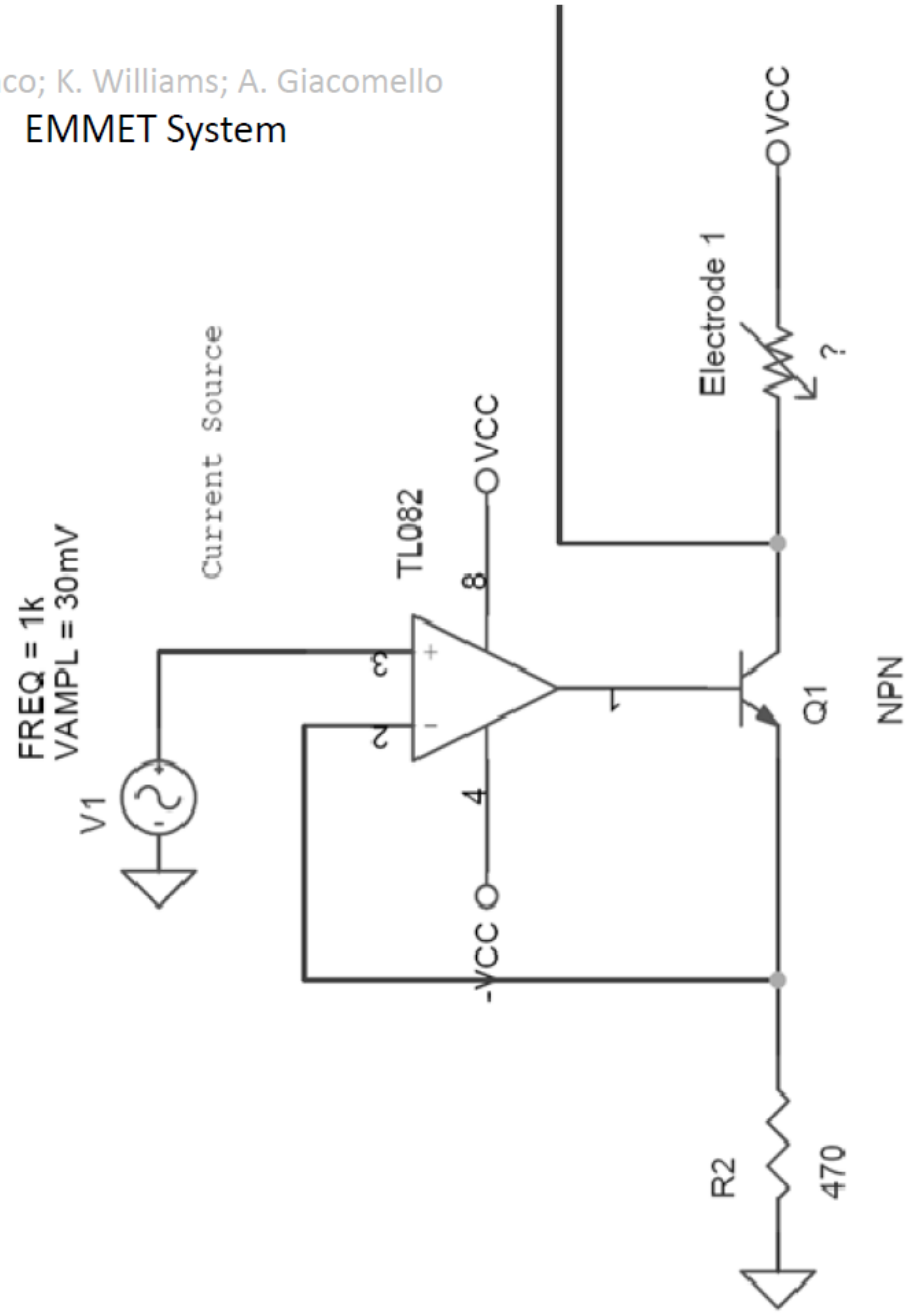
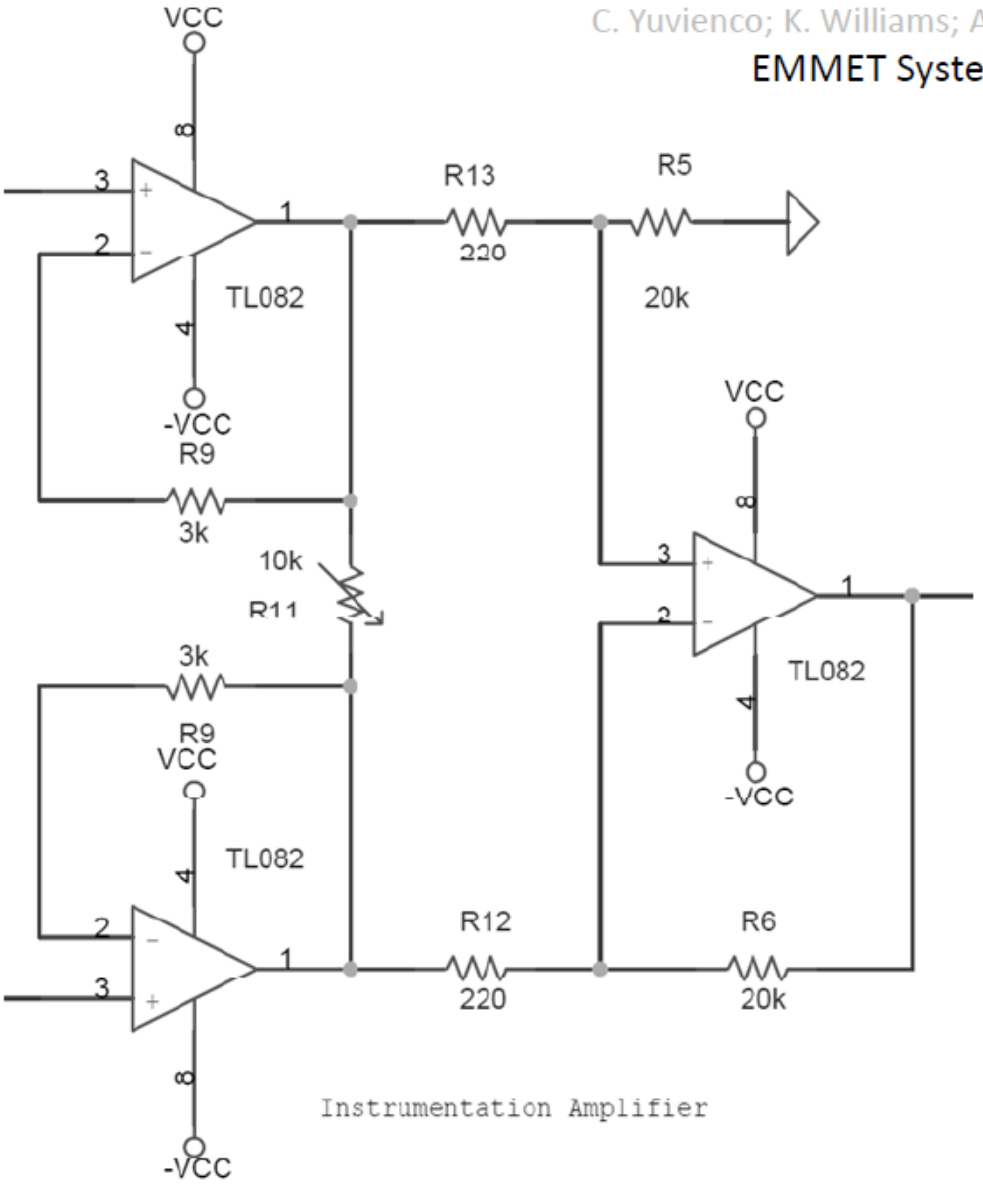


Current source generator





Instrumentation Amplifier

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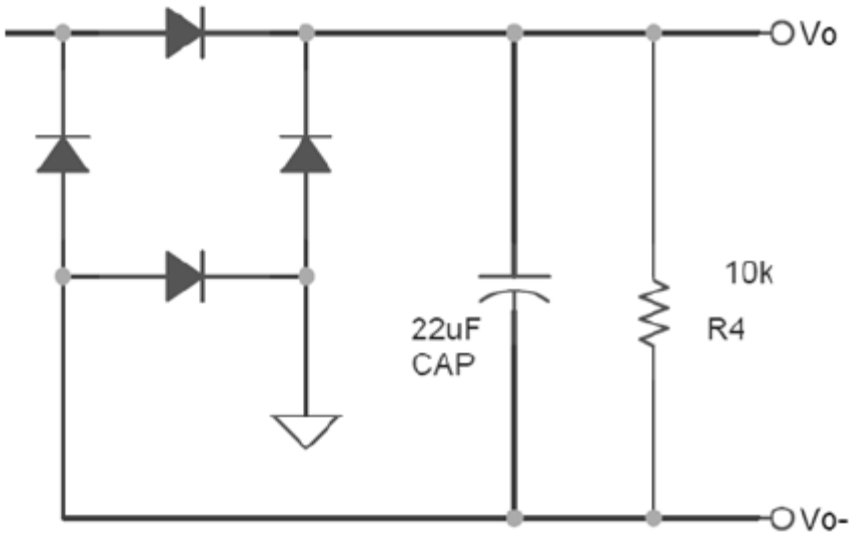
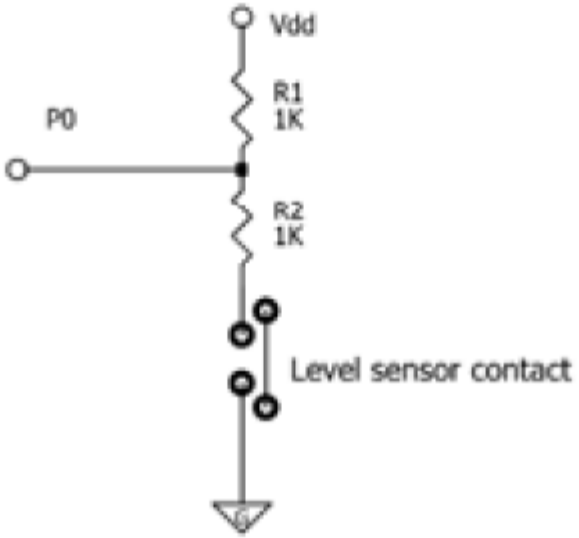
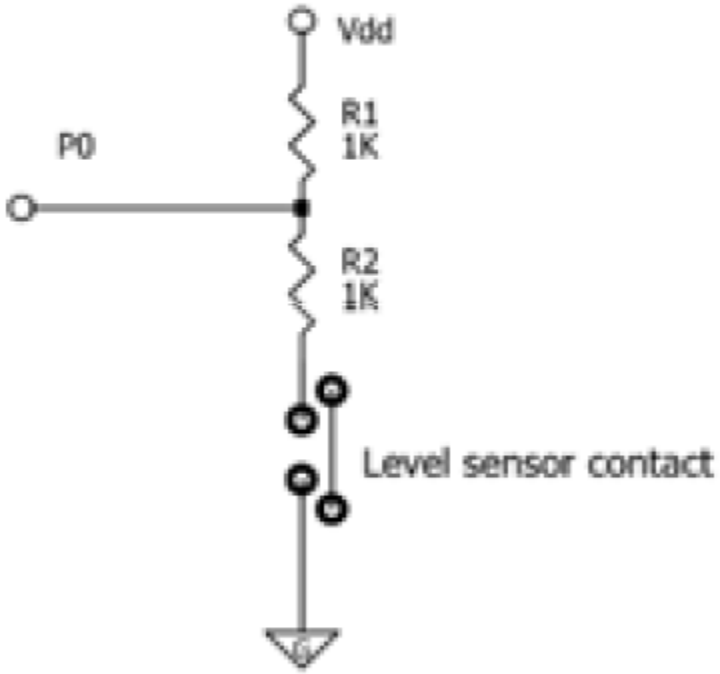
Full Wave Rectifier



Full Wave Rectifier





Level Sensor

User Interface and Usage

1. User is prompted to input 3-4 parameters that defines the sensitivity and operation of the system
2. System reports measured voltage differential and status of valve and reservoir liquid level
3. System is automated to control and maintain the concentration gradient of solutes across the membrane

Advantages

- saving on time, materials, manpower
- enables a precise control of the process
- completely automatizable, customizable
- dyalisis may follow desired protocols

Future Improvements

- use of Ion Selective Electrodes
- improvement of the user interface
- concentration readings on LCD