

Mercury For Dinner?

Aqueous Heavy Metal Sequestration

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Abstract

Heavy metals threaten the aquatic life and are a danger to human health. Multiple sites are reporting an increase in heavy metal concentration. Through a three-step process – pumping, filtration, and removal – it is possible to responsibly remove the toxic metals. A pumping device will provide a microfluidic, filtration device with a continuous flow of solution. The filtration device will then separate out a high concentration, metal ion solution using an electric field. The solution will then move on to the removal phase. Using a charged gold mesh, the metal ions will reduce and form a solid which can be removed and disposed of in an environmentally responsible manner.

Motivation



Jordan River, Utah

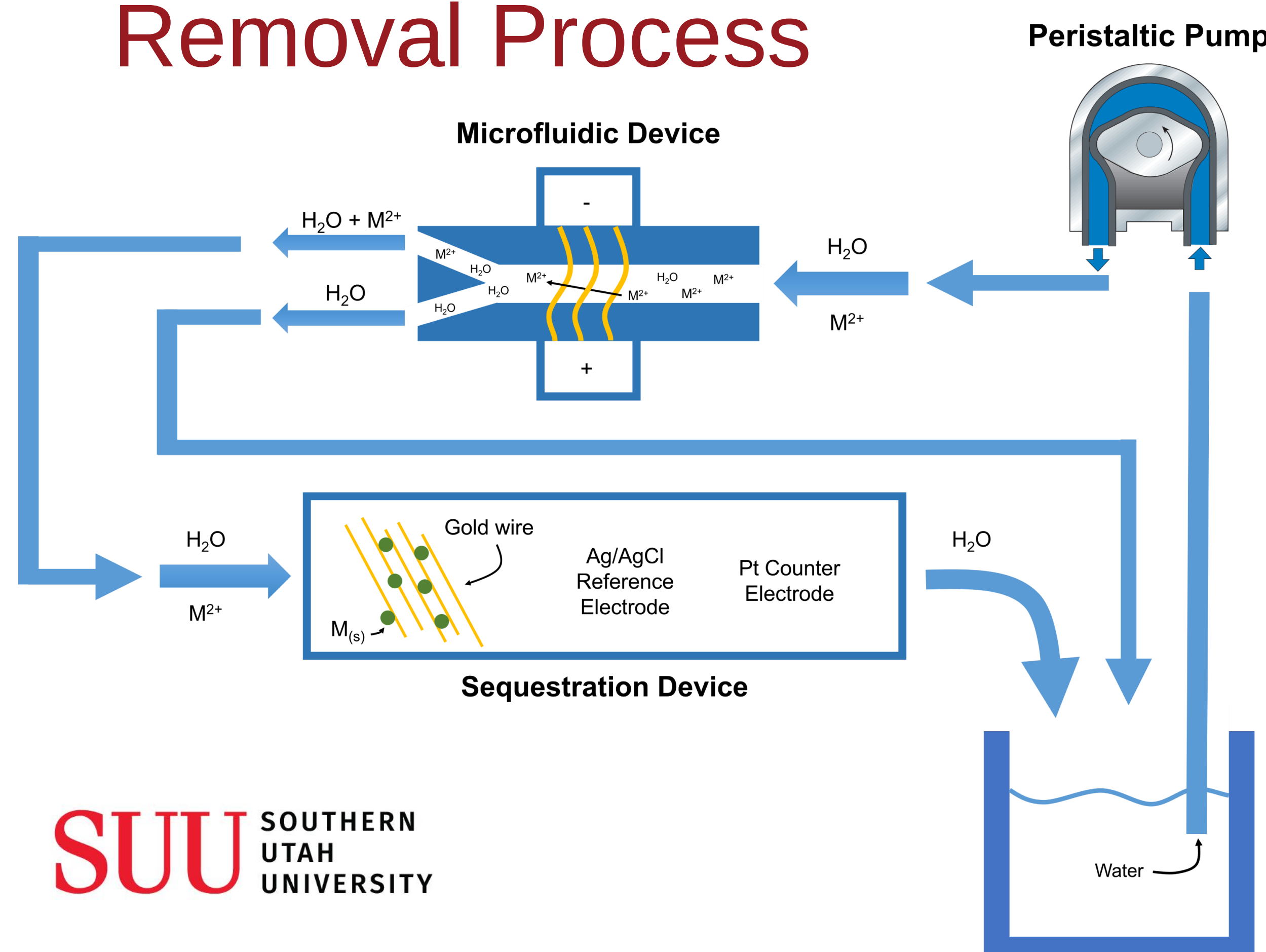


Toxic metals in food & water

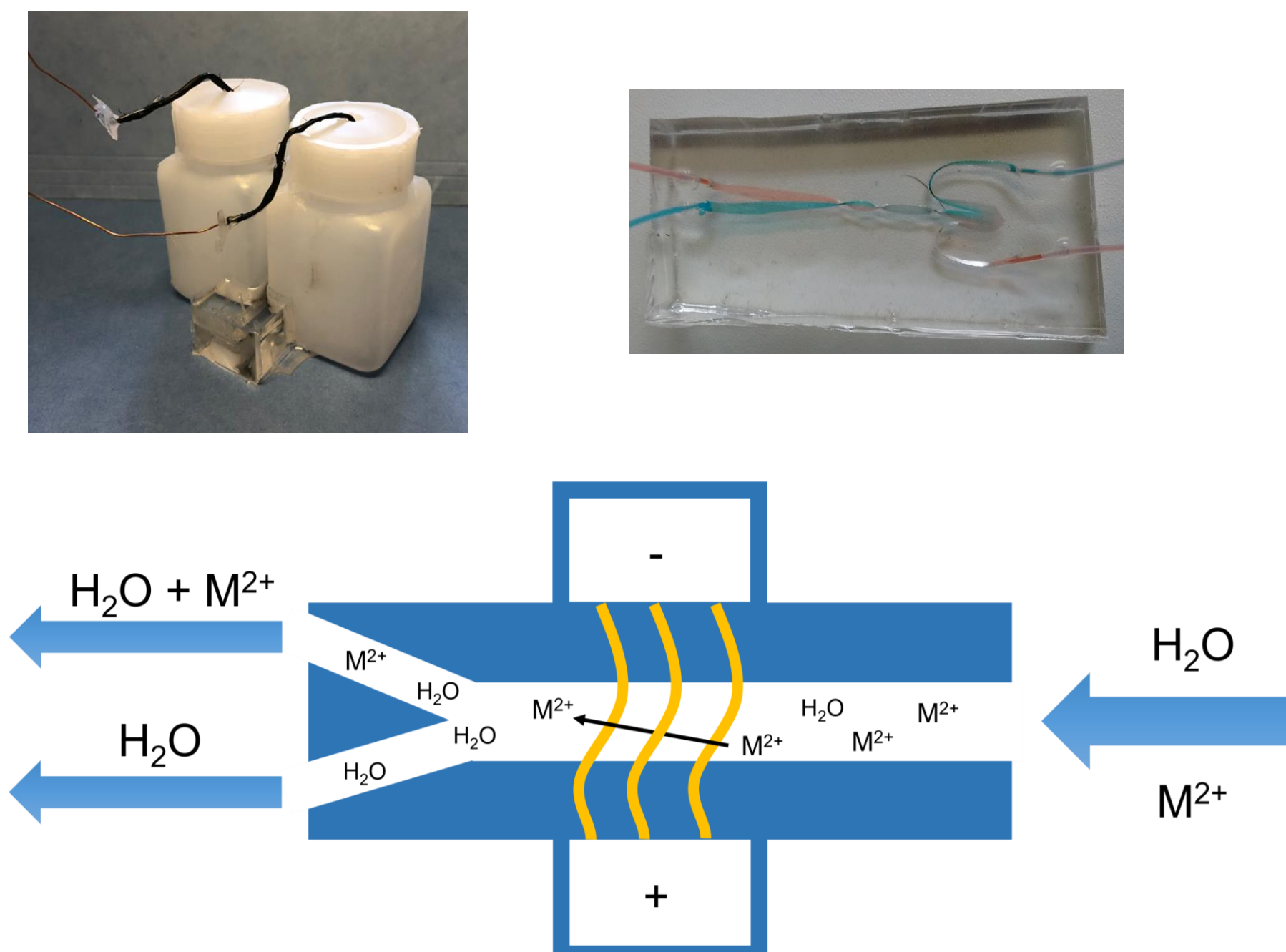


Harmful during pregnancy

Removal Process

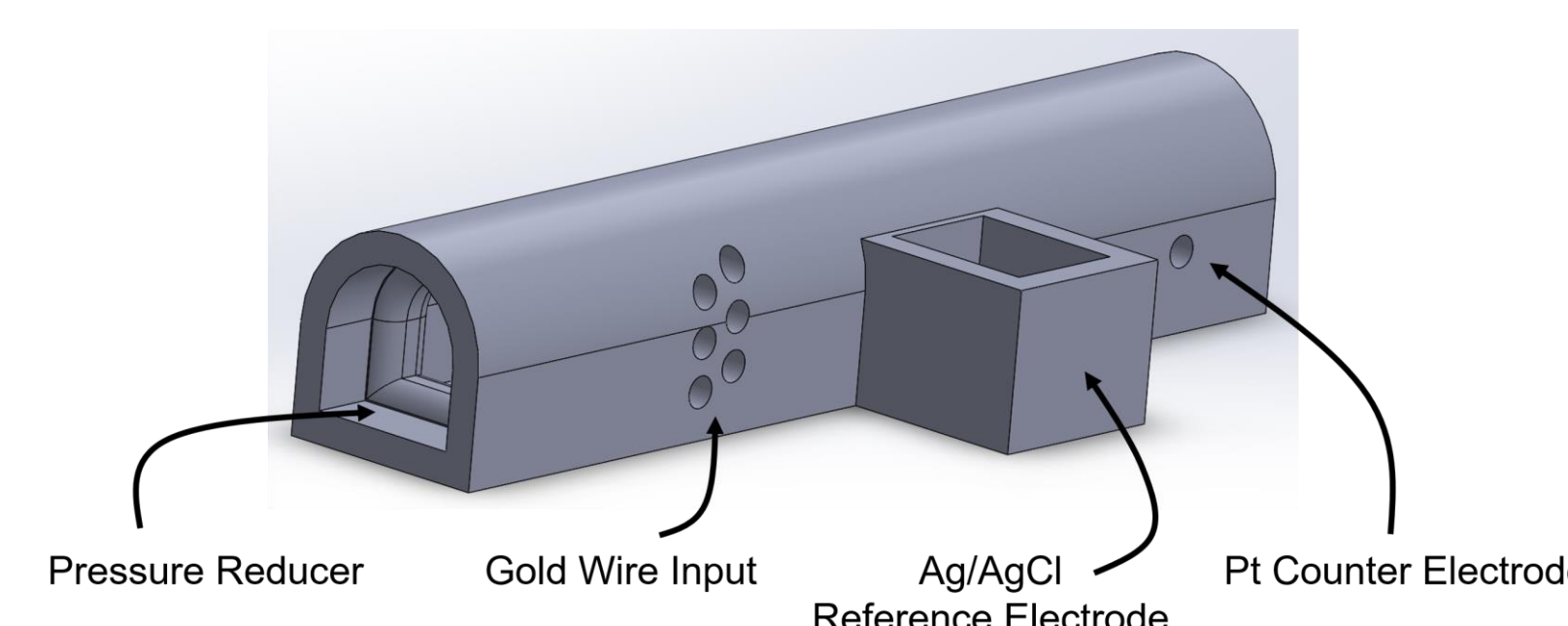
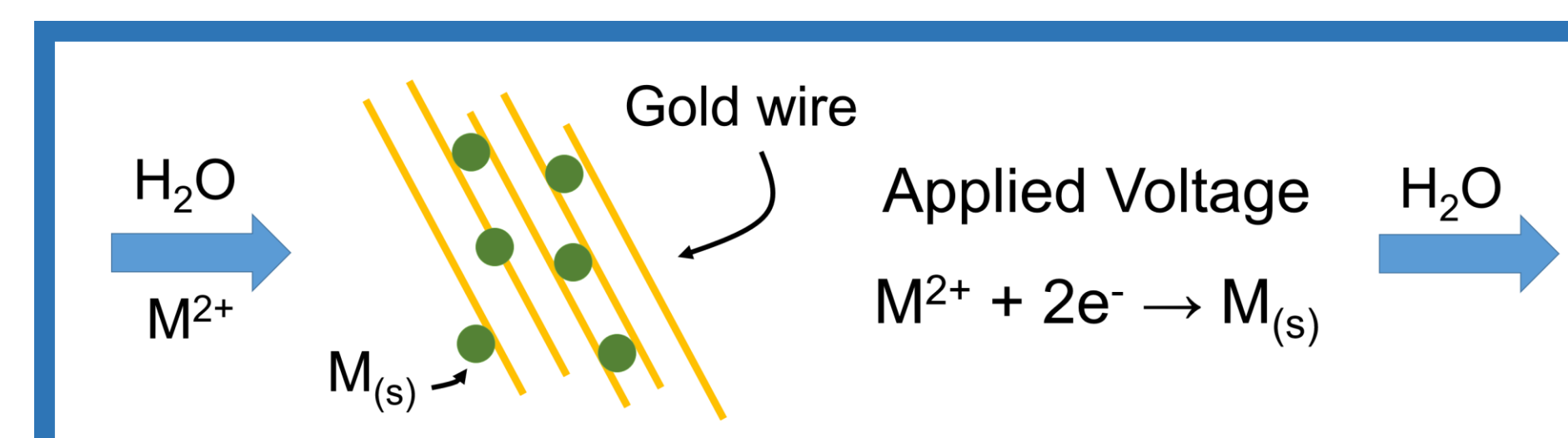


Microfluidic Device



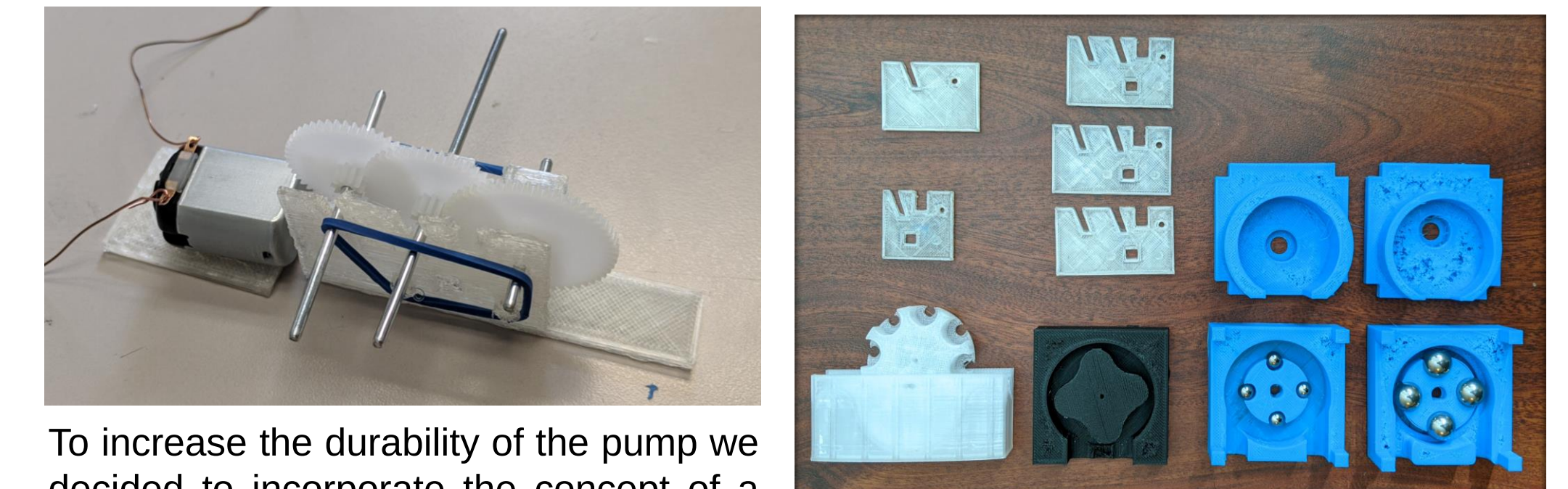
An electric field is applied across a channel containing an aqueous solution. This results in the metal ions migrating towards the negatively charged electrode, separating the solution into high and low-concentration metal ion solutions.

Sequestration Device



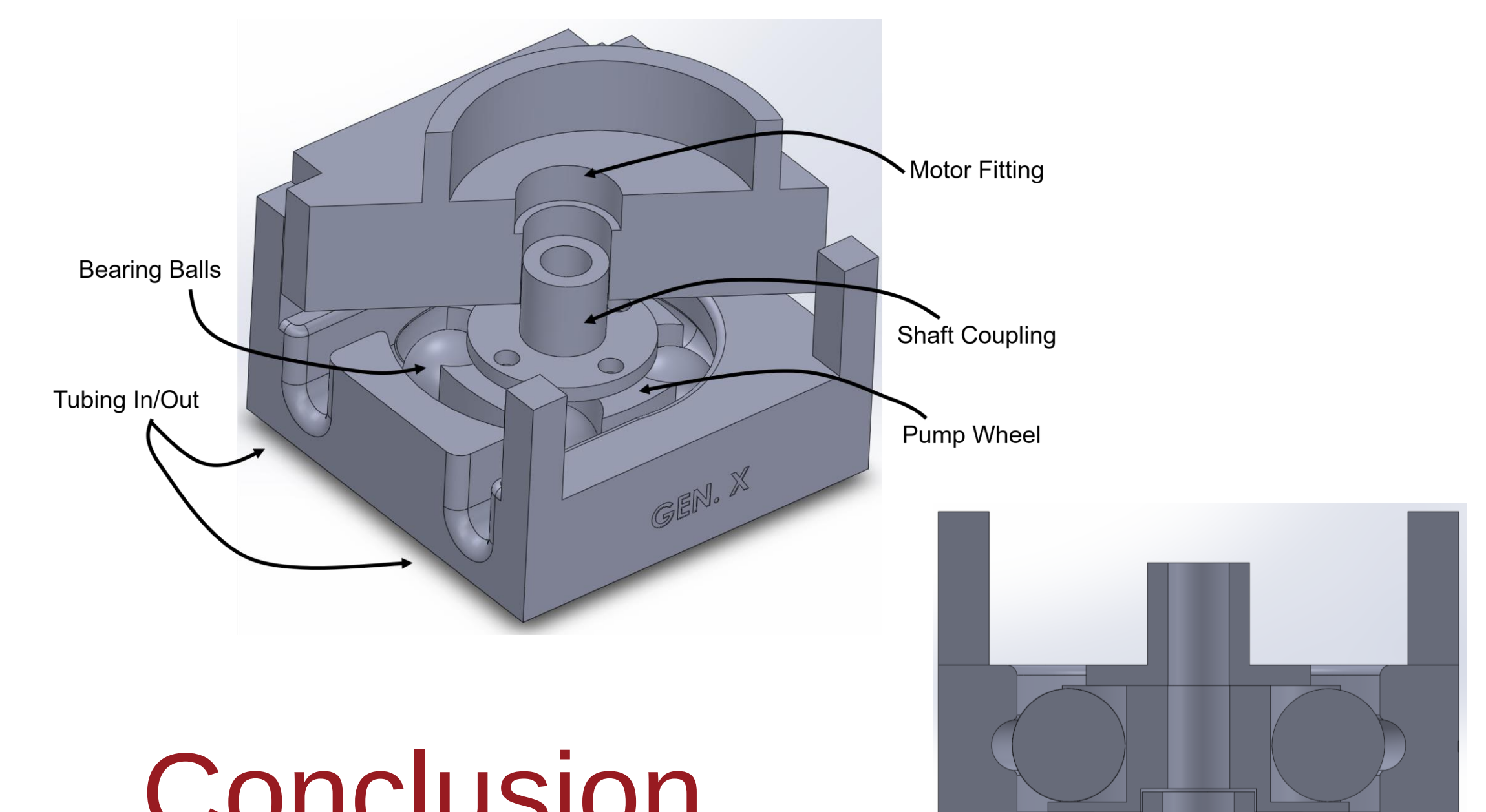
By applying specific voltages, we can reduce a chosen set of metals onto the gold wire. When the surface of the gold wire has been covered, we can then reoxidize the metals for safe disposal.

My Precious Failures



To increase the durability of the pump we decided to incorporate the concept of a peristaltic pump.

Current Device



Conclusion

Producing a durable and working removal system has been an ongoing learning experience. Each device has been optimized through a series of generations and is now close to being fully functioning.

Future work

- Finish Assembling the Removal System
- Build a Solar-Powered Field Power Supply
- Perform lab and field tests

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