

Electro-Chemical Discharge Machining

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INSET

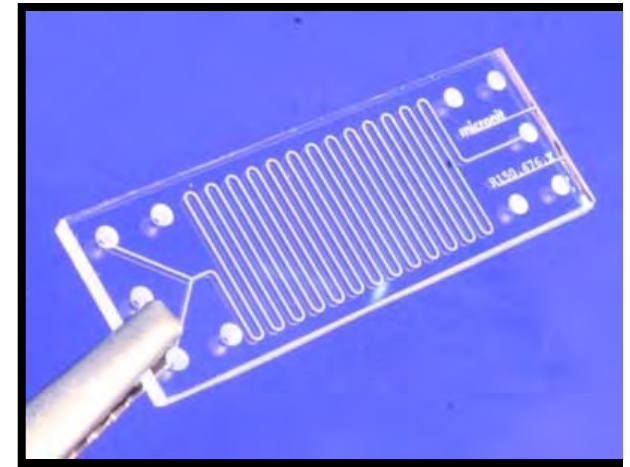
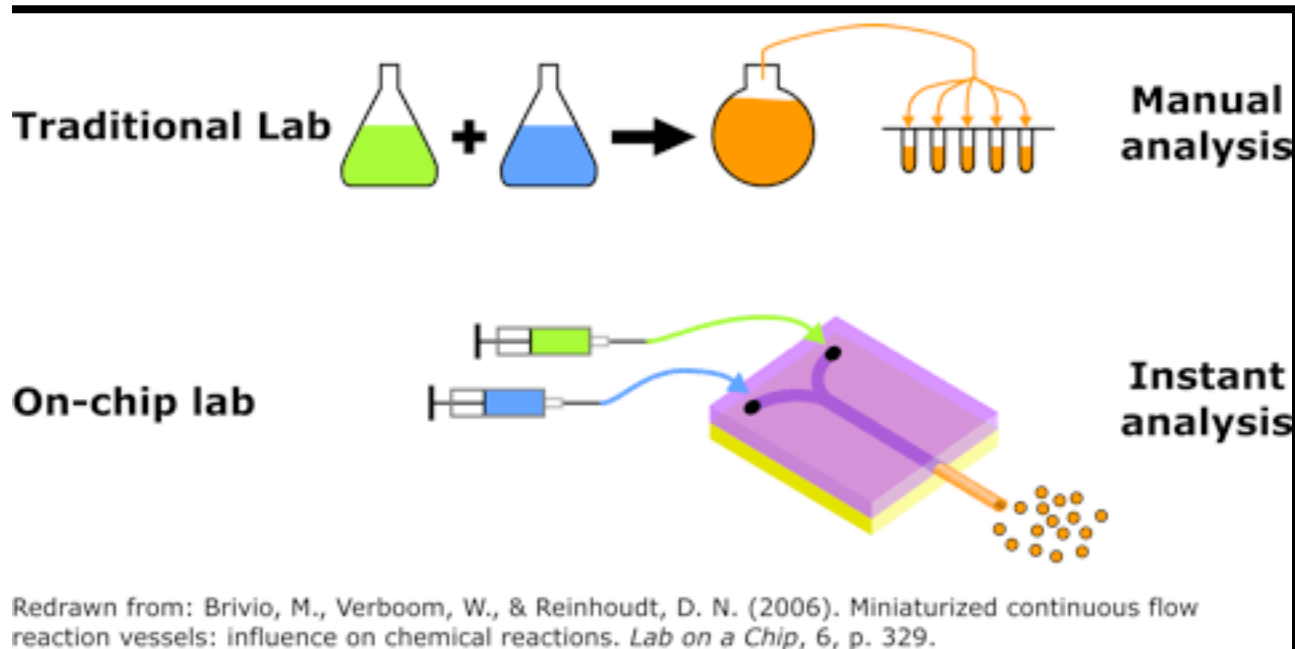
*Internships in Nanosystems,
Science, Engineering and Technology*

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Nanolab Research Goals

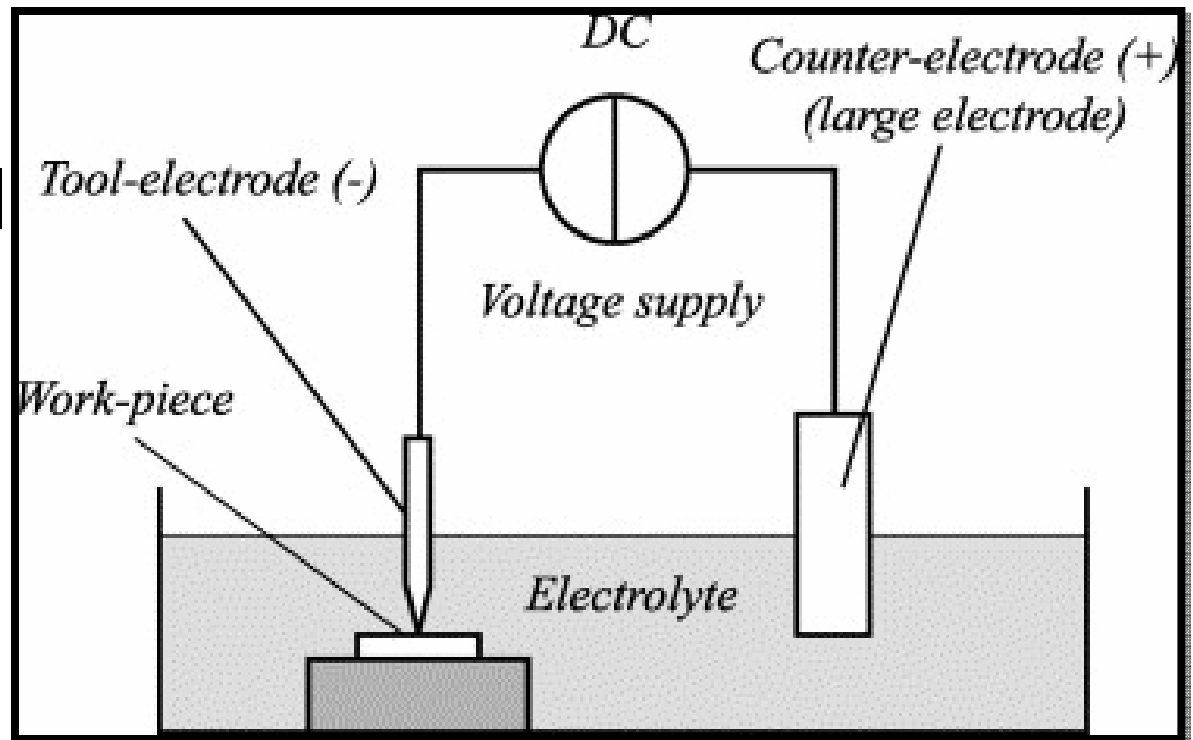
- To be able to carry out a laboratory tests on a lab on a chip device
- Researching ways that allow for DNA separation and energy conversion



Research Goals

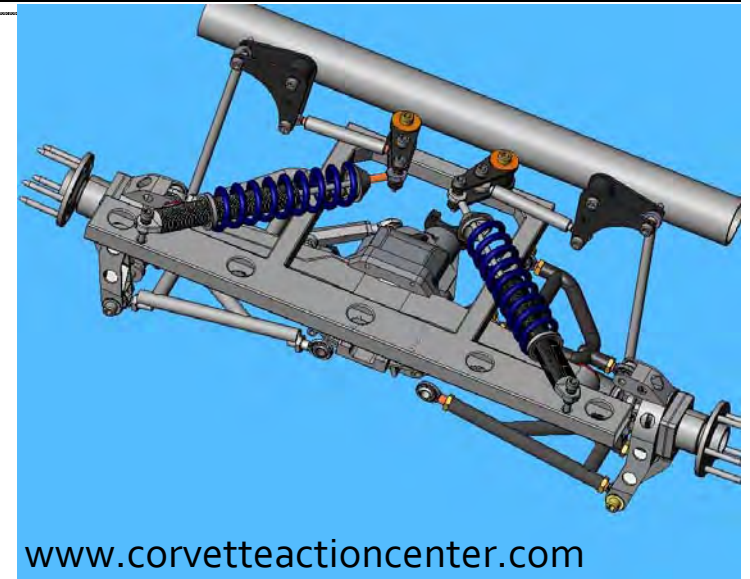
- Work on a less expensive form of glass micro fabrication

- Electro-Chemical Discharge Machining (ECDM)

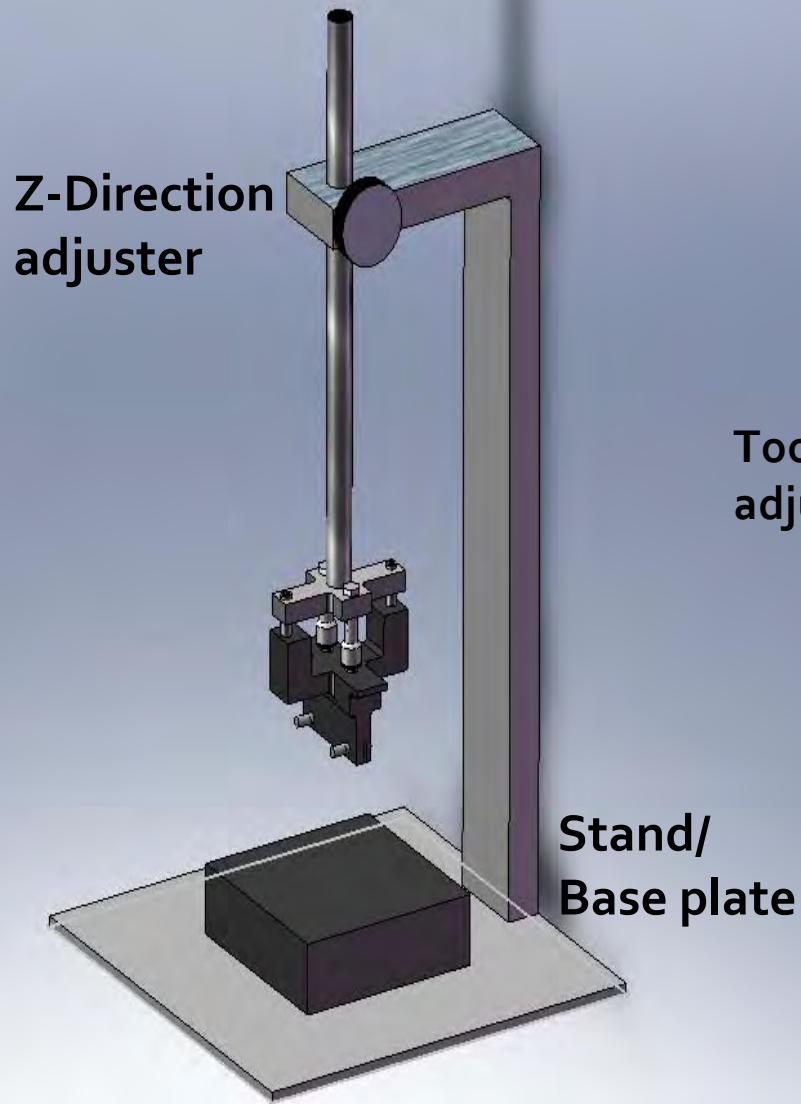


Research Methods

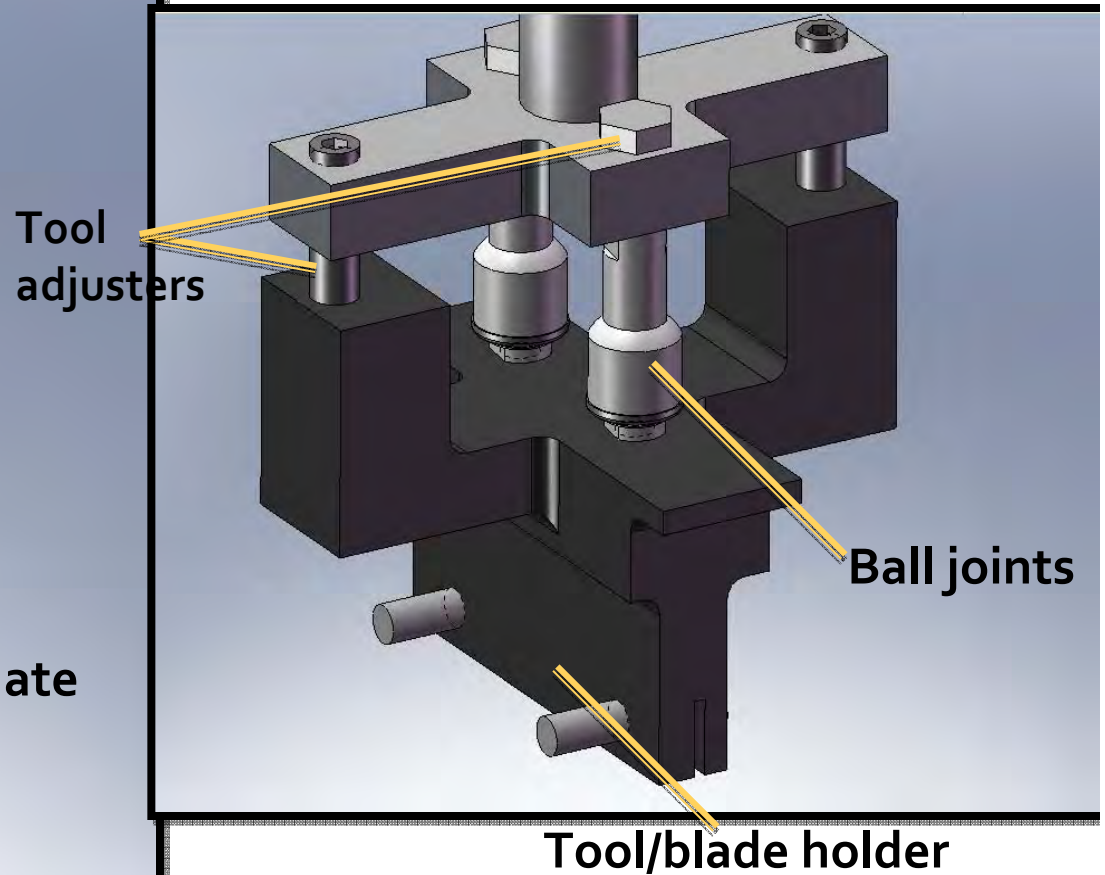
- Computer Aided Design Program
Solid Works
 - Learning how to use it!
 - Figuring out a design to build on Solid Works
 - Actually making the design buildable
 - Getting all the parts together to build the machine



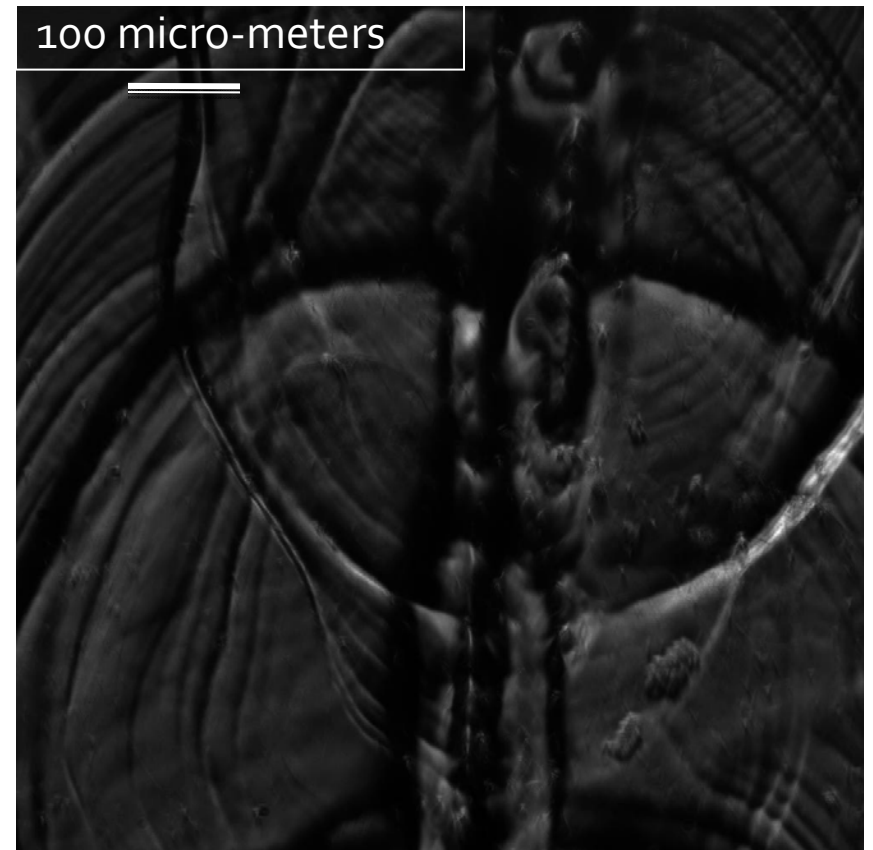
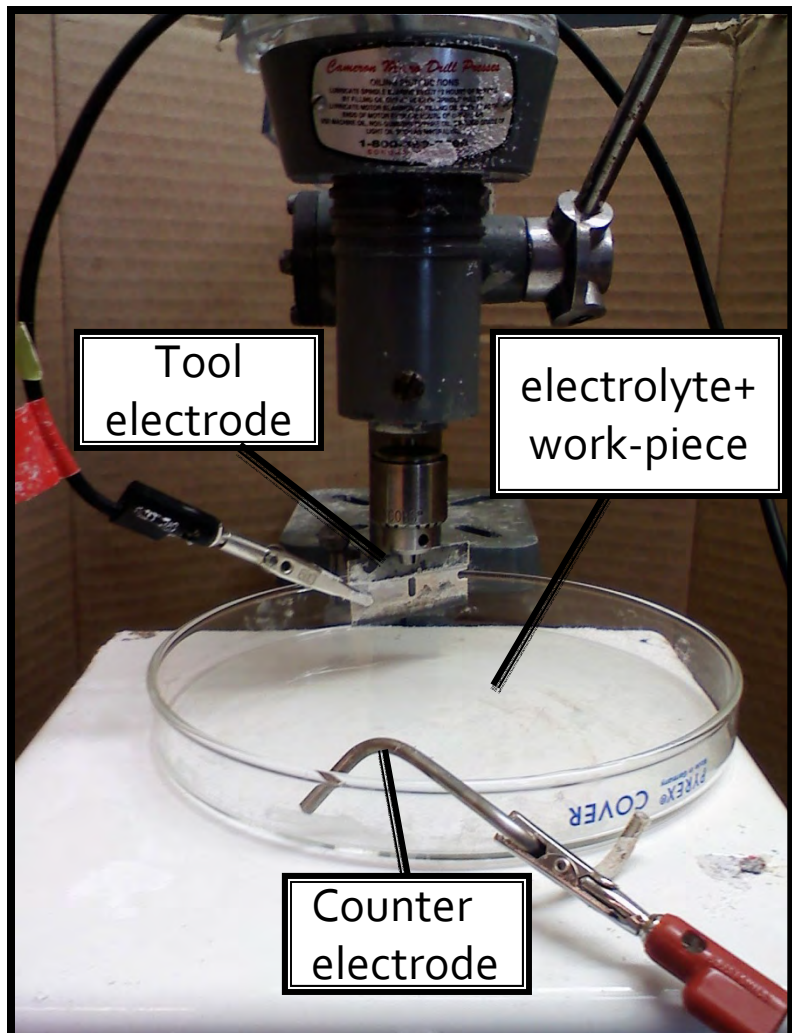
ECDM Design



Close up

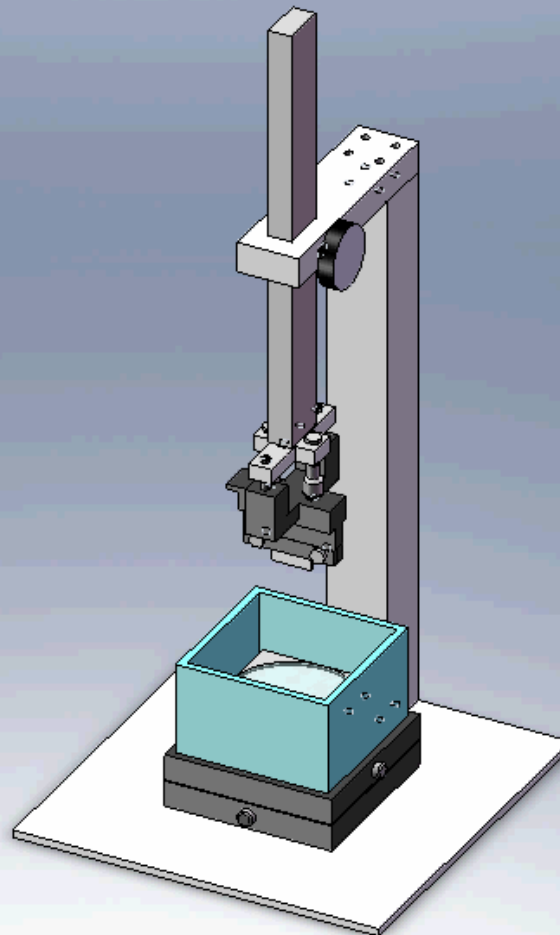


Preliminary Data



- ◆ 20x magnification
- ◆ Etched features

Research Data



Design Goals

- Stability in machining process
- Isolate control of the tool
- Repeatability of the machining results
- Safety



Summary of Achievements

- Learned how to use Solid Works and how to go through all the steps in designing something
- Learned about different forms of micro fabrication
- Learned how the Lab on chips can be used to perform lab tasks

Future Plans

- Finish up any fabrication issues
- Perform experiments to see if usable micro channels can be achieved
- Perform thru hole experiments

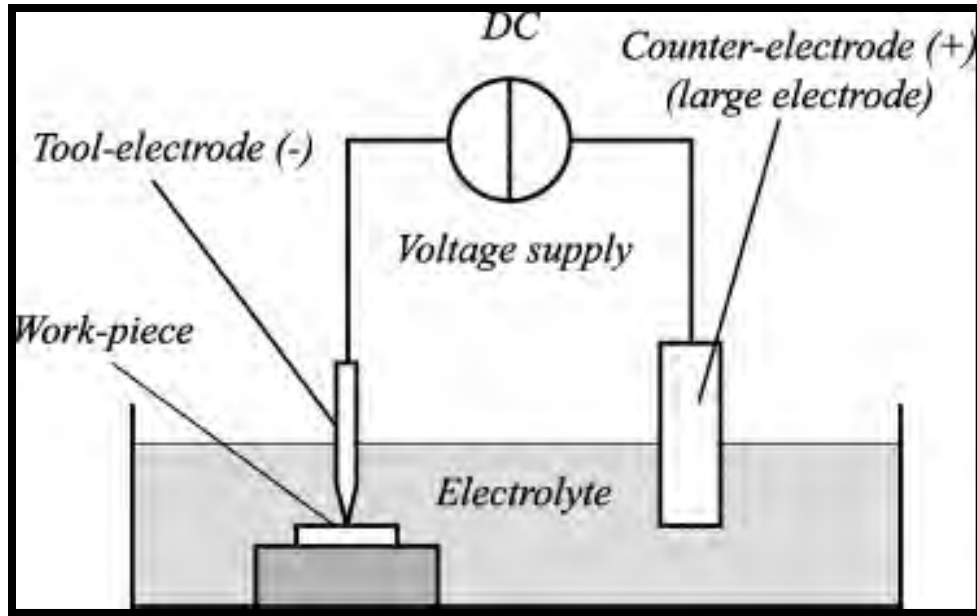
Acknowledgments

- Jens, Dr. Nick, INSET
- Tom Wynne, Jess Sustarich-mentors
- Sumita Pennathur-Faculty Advisor
- Nanolab

THANK YOU!!!!!!

ECDM

ETCHING MECHANISM



- High localized electric fields
- Chemical reactions
- High temperature (1190 K)
 - softens the substrate
 - Increase chemical reaction rate

Fabrication Methods

Traditional microchannel method

- Photolithography
 - Requires clean room
- Etching

Proposed ECDM methods

- Does not require clean room