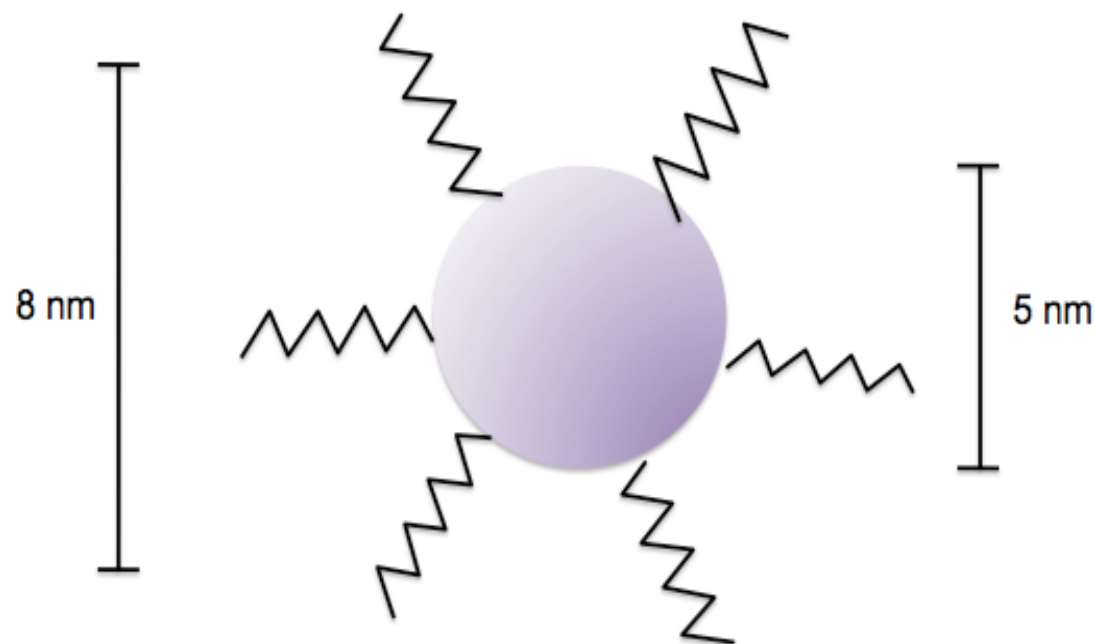


Gold Nanoparticle Solutions in Uniform Electric Fields



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Mentor: Dr. Sorensen

What are gold nanoparticles?



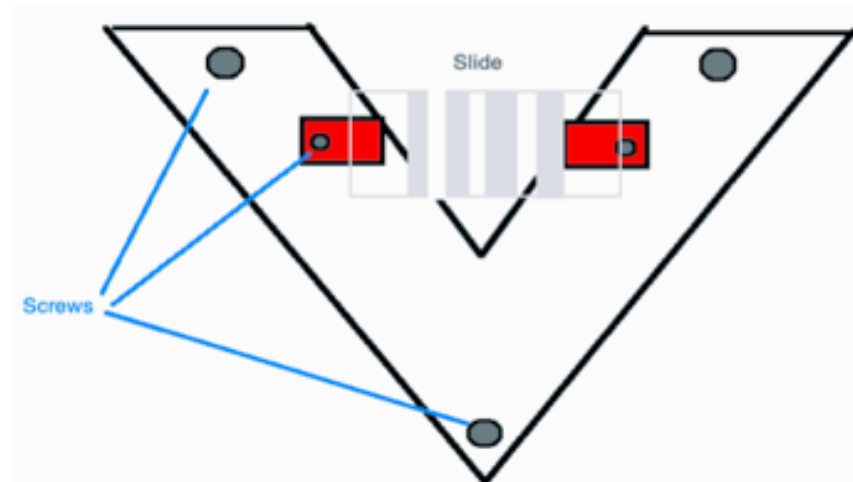
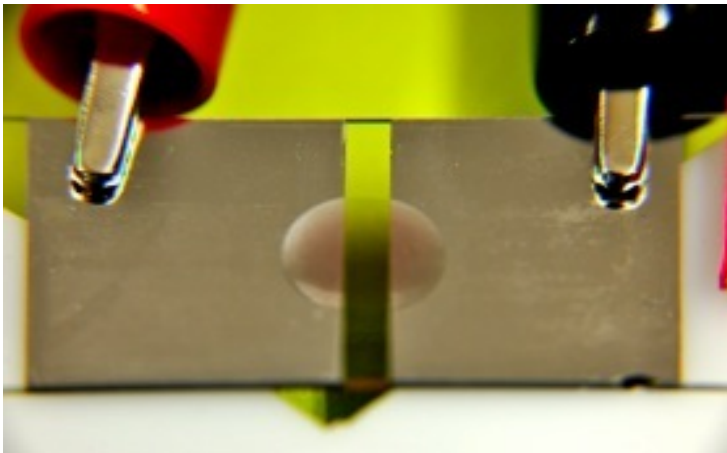
- Metallically bonded together
- Each NP bonded to DDT ligands, $\text{CH}_3(\text{CH}_2)_{10}\text{CH}_2\text{S}$
- I worked with Au NP's suspended in toluene

What is the “Jump?”

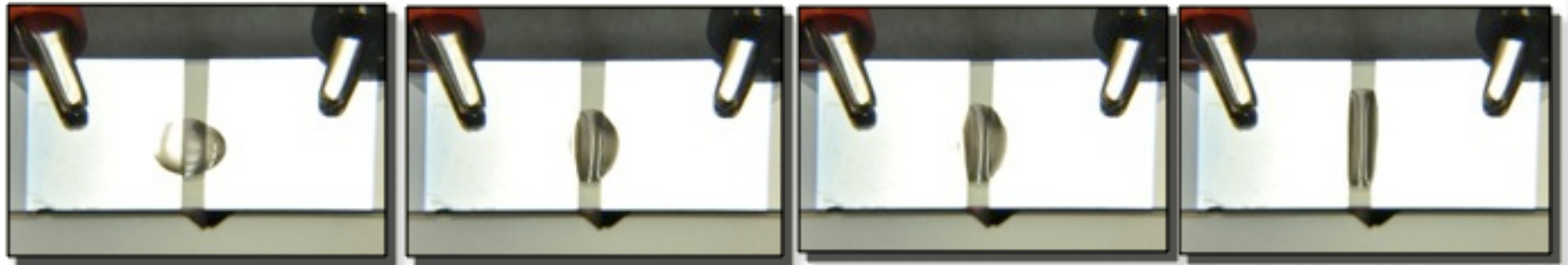
- Last summer a KSU physics undergrad observed Au NP-toluene solutions jump quickly when placed in uniform electric fields.
- This “jump” is supposedly independent of dielectric constant.
- First goal of the summer: reproduce the “jump”

Creating a Uniform Electric Field

- Microscope Slide
- Vacuum Evaporator
- Power supply
- Slide holder



Qualitative Analysis



0 V, t = 0 sec

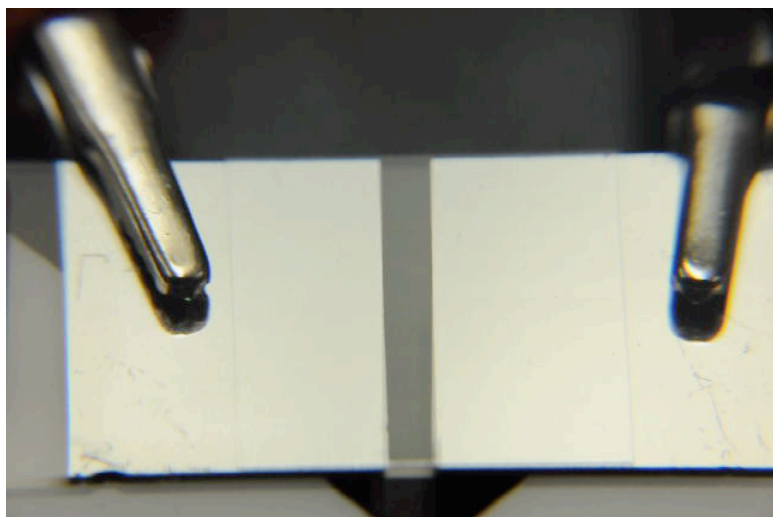
1000 V, t = 2 sec

1000 V, t = 4 sec

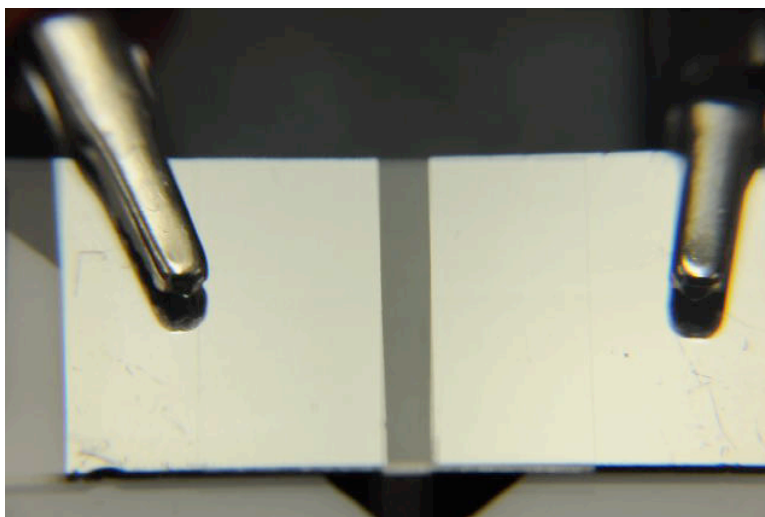
1500 V, t = 6 sec

- Al coated microscope slide with:
 - 3 mm glass strip
 - 8 microliter Au NP solution drop
- Issue: Possible conduction of electricity?

Qualitative Analysis with Cover Slip



Au NP Toluene Solution at 2500 V

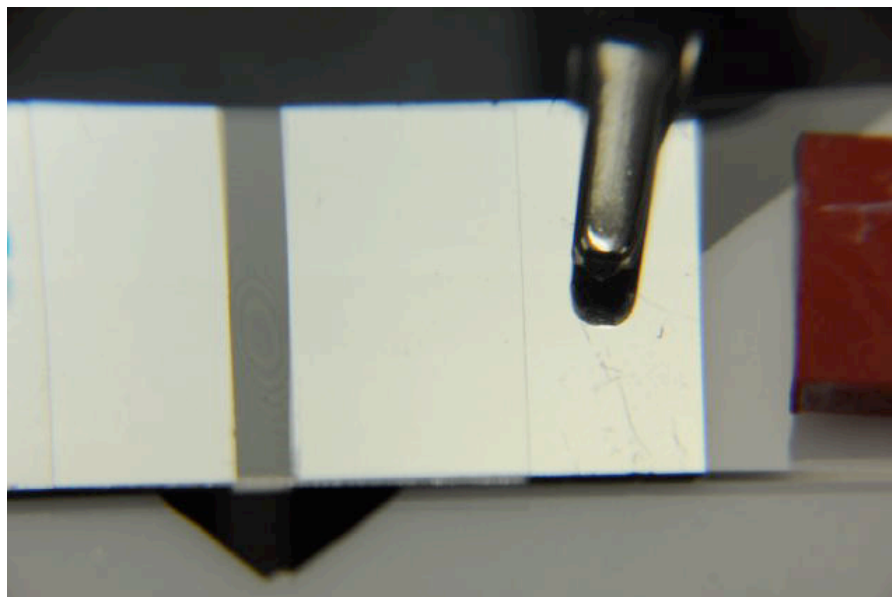


Pure Toluene at 2500 V

What is the “jump?”

- The “jump” appears to be made up of 3 different events:
 1. Surge inwards
 2. Flatten out
 3. Movement to positive plate
- Now we have a new question: What should we try to measure?

A second glance:



Quantitative Analysis

- New direction: focus on the “flattening”
- Method: Measure contact angles



- Next question: How do we obtain good contact angle measurements on a cover slip?

Preparing Coverslips

- Silane coating procedure with Sean McBride from:

Appendix C of: "Improved in situ spring constant calibration for colloidal probe atomic force microscopy" by Sean McBride and Bruce Law.

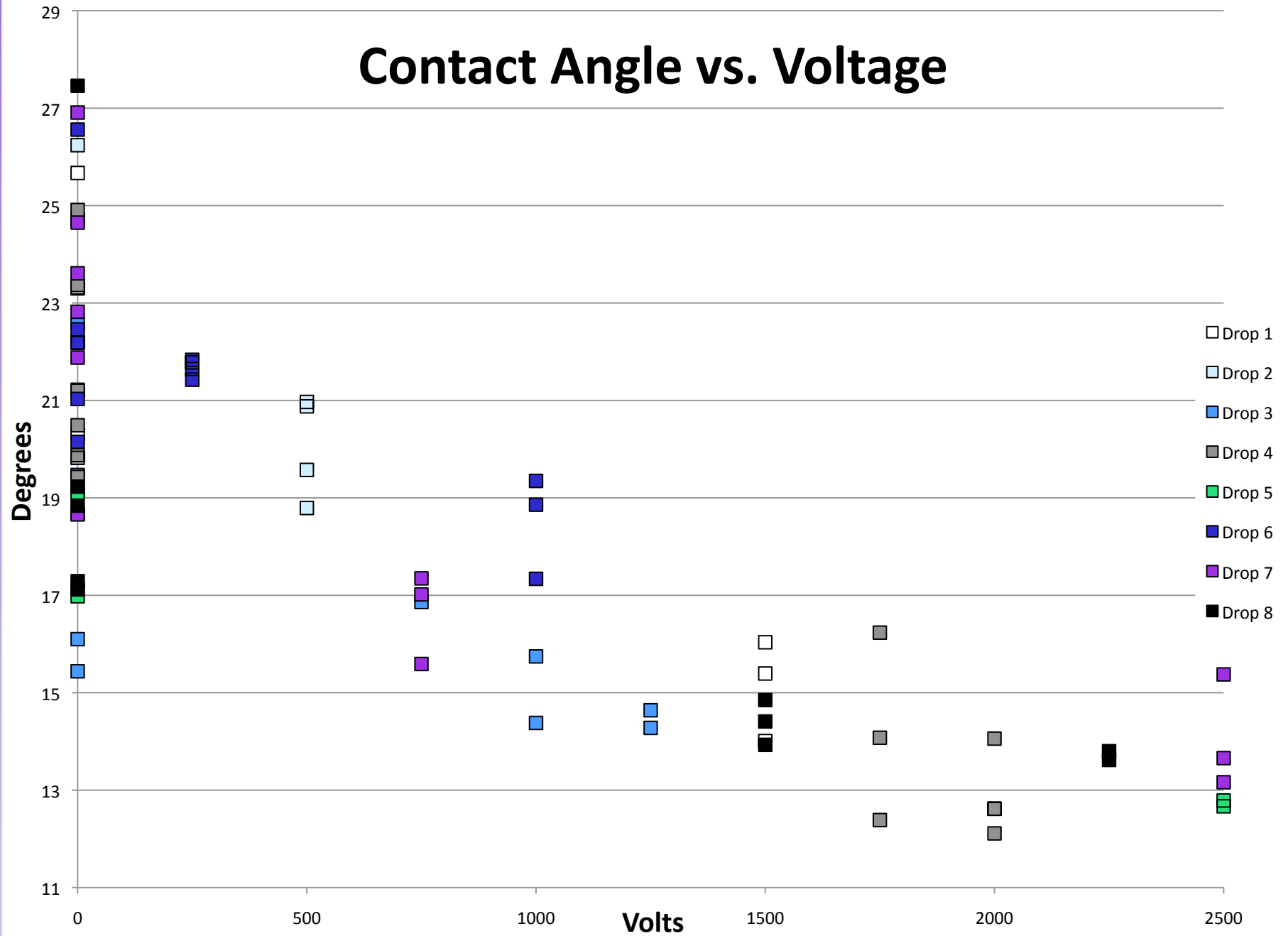
- Over the next week and a half, we completed two separate coating procedures: first ten .1 mm coverslips, and then ten .5 coverslips.

Example Contact Angle Video



2500 V

Contact Angle vs. Voltage



Thank You



And an extra thank you to Dr. Sorensen and Sean McBride. Also, thank you to Dr. Flanders and to Dr. Law for allowing me to work with their equipment.