Abstract
Nanotechnology’s potential is restricted by its difficult and expensive fabrication methods. The electrostatic nanoprinter assembled by the team creates useful nanostructures using less expensive techniques without significant performance compromise.

Project Description
The main objective is to develop a printer capable of producing nanostructures on conductive surfaces. The client supplied a detailed article that features methods to assemble a nanoprinter with promising results. Other promising usage of this technology is to print on non-conductive substrates such as live tissues. This project is a step towards the client’s goal of printing structures using organic material. This technology can advance fields such as medicine, electronics, and biophysics.

Setup

Methods
Preparation of Components
- Pulling Pipette
- Coating Pipette
- Mixing Ink
- Wiring

Glass capillaries are heated and pulled to form nozzle diameter of 1µm.

Coated with 10 nm of Ti followed by 100 nm of gold.

Nano-ink mixed with a hydrocarbon solvent to create a ~0.1% volume concentration ink.

Thin wires are glued to substrate and pipette using epoxy conductive glue.

Nanoprinter Component Assembly
- Align coated pipette vertically on printing surface.
- Connect the pipette and printing surface to the amplifier via pre-connected wires.
- Calibrate the distance between the pipette and surface to achieve 1-5 µm separation.
- Apply voltage up to 400V to eject ink and move pipette to shape the nanostructures.

Results
Printed structures of different sizes by varying parameters such as voltage and distance.

Conclusion
The team found solutions that the supporting article did not address such as calibrating the vertical distance. The finalized product is capable of printing down to the nano scale by producing <1 µm droplets satisfying the objective of this project. The printer can be used to create nano circuit lines or further enhanced to print organic compounds on different substrates.

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References