

MICROELECTROMECHANICAL SYSTEMS (MEMS)

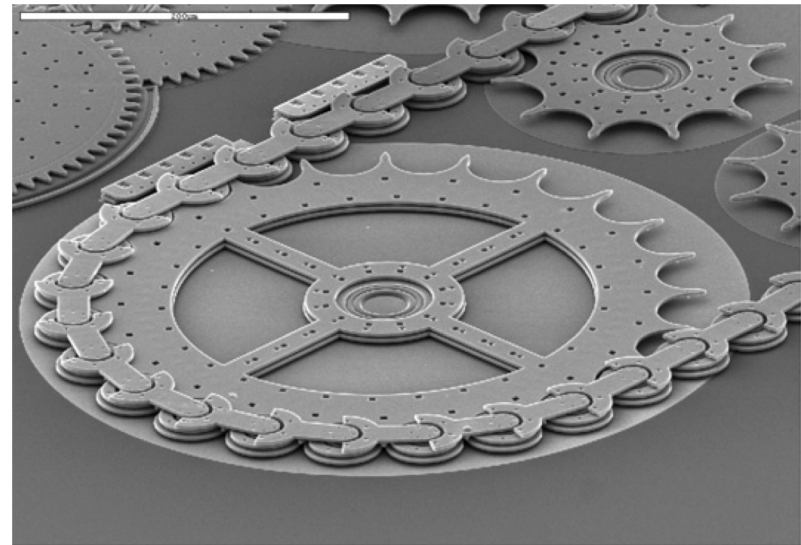
ENGR 325 - Instrumentation

Gus Rocha

Ariana Salmon

INTRODUCTION

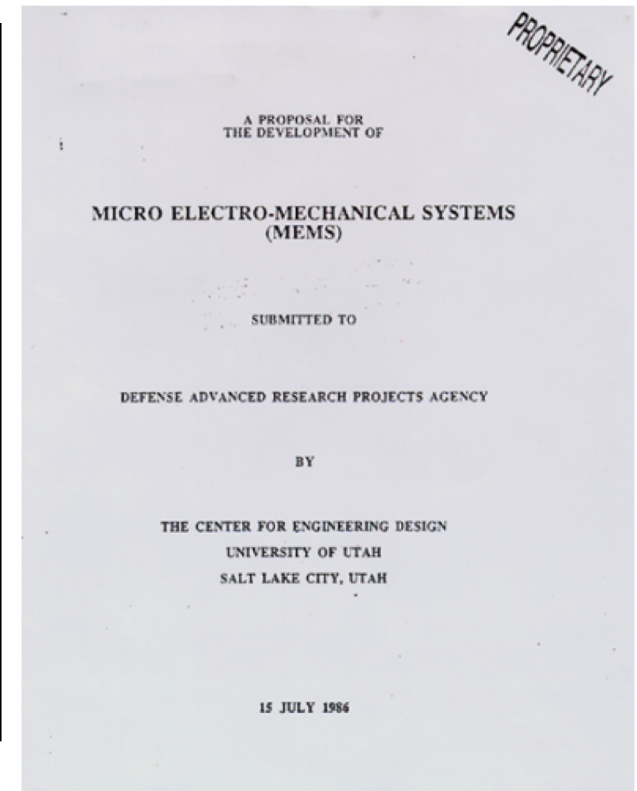
Microelectromechanical systems (MEMS): is a process technology used to create tiny integrated devices or systems that combine mechanical and electrical components



This is a physical gear and chain. The links in the chain are about 50 μm long—i.e., less than the diameter of a human hair. Image courtesy of [Sandia National Laboratories](#).

HISTORY

The idea of creating MEMS started in the 1980's; however, the means to produce MEMS (the designing and manufacturing infrastructure) was not available enough until the 1990's. One of the first few types of MEMS produced were for air-bag controllers and inkjet printheads.



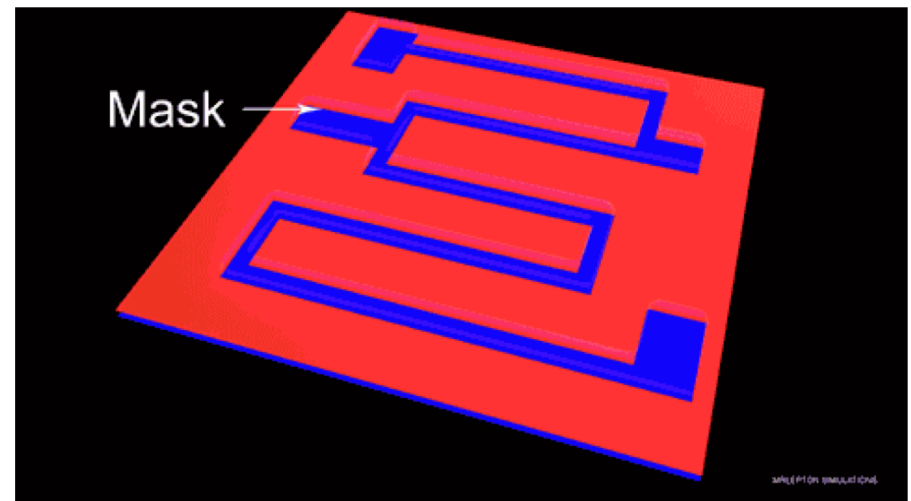
MATERIALS

- Silicon
 - Most common
 - Long life cycle
- Polymers
 - Easily Produced
 - Wide range of material characteristics
- Metals
 - Very reliable
- Ceramics
 - High elastic modulus (TiN)



BASIC PROCESSES

- Deposition
- Patterning
- Lithography
- Remove Photoresist



MANUFACTURING TECHNOLOGIES

- Bulk micromachining
- Surface micromachining
- Thermal oxidation
- High aspect ratio (HAR) silicon micromachining



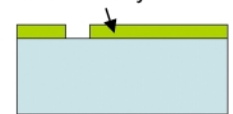
isotropic etching



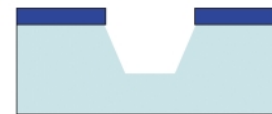
substrate (Si)



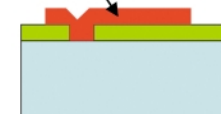
sacrificial layer



anisotropic etching



structural layer



microstructure



APPLICATIONS

- Inkjet printer – Piezoelectric to deposit ink
- Accelerometers – Airbag deployment, electronic stability control, and personal devices
- Silicon pressure sensor – TPMS and blood pressure
- Microphones – personal devices



REFERENCES


<https://www.eetimes.com/theres-more-to-mems-than-meets-the-iphone/>

<https://www.eenewsanalog.com/news/smart-mems-microphones-market-emerges>

<https://www.eetimes.com/theres-more-to-mems-than-meets-the-iphone/>

https://www.lboro.ac.uk/microsites/mechman/research/ipm-ktn/pdf/Technology_review/an-introduction-to-mems.pdf

QUESTIONS?

 *Gus Rocha*

 *Ariana Salmon*