

AMFitzgerald Company Overview

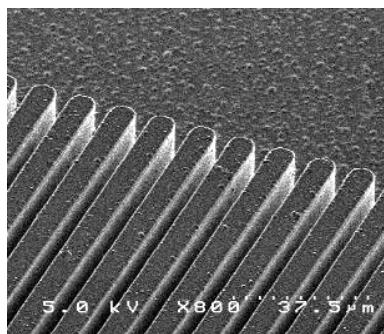
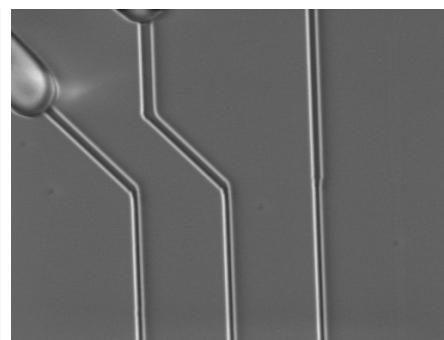
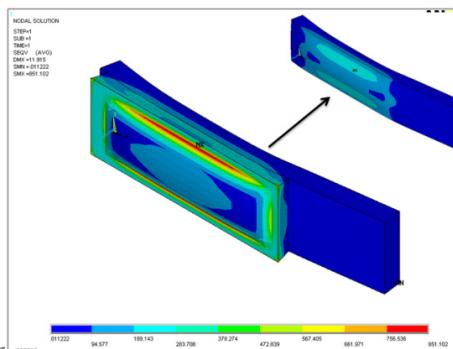
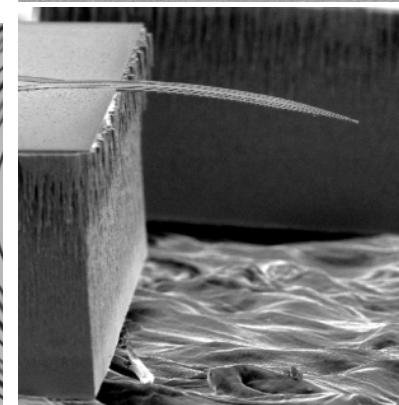
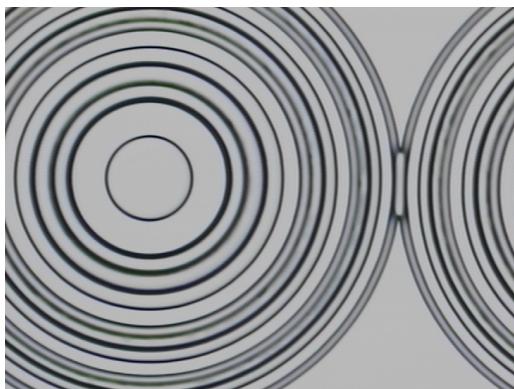
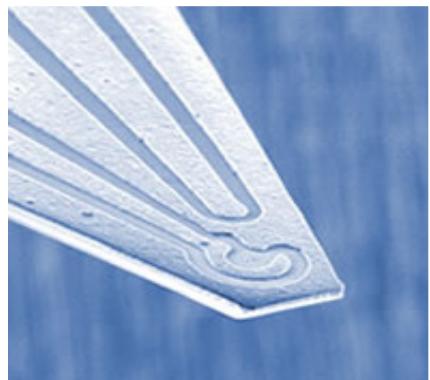
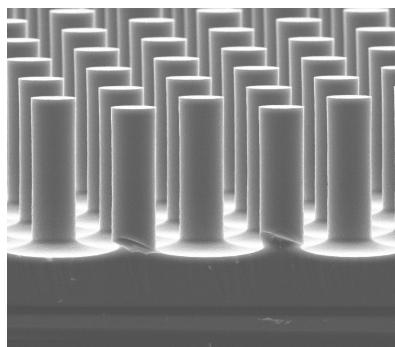
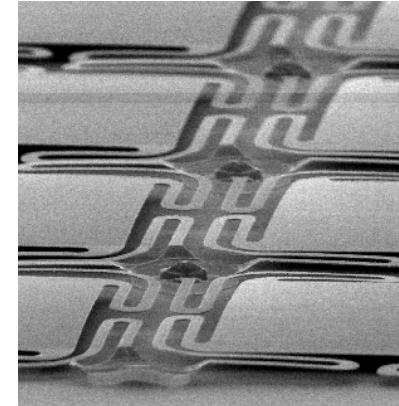
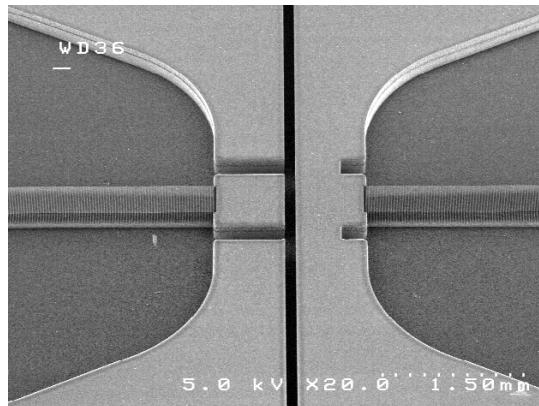
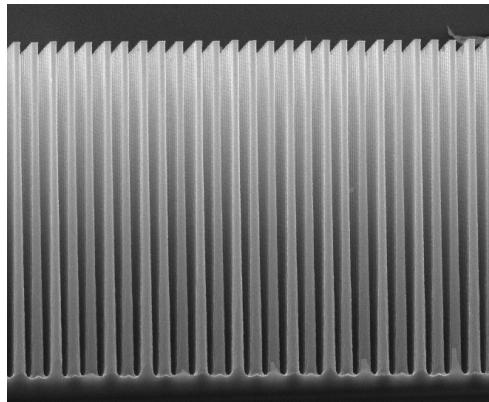
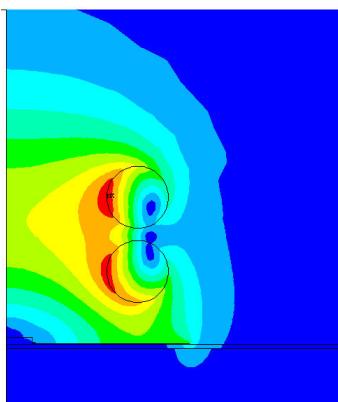
January 2013



AMFITZGERALD
& ASSOCIATES



Mission: Your Partner in MEMS Product Development



Company background

- **Founded 2003 by Alissa M. Fitzgerald, self-funded**
- **Burlingame, CA: near SFO and Silicon Valley**
- **Goal: become the premier MEMS product development firm**
- **Consistent growth**
 - Over 120 clients served to date
- **Active member of the MEMS Industry Group**



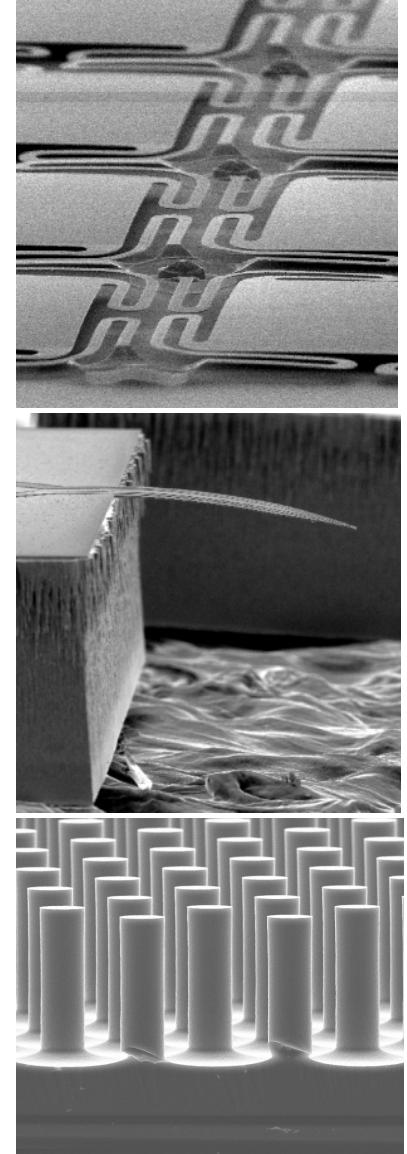
Headquarters in Burlingame, CA



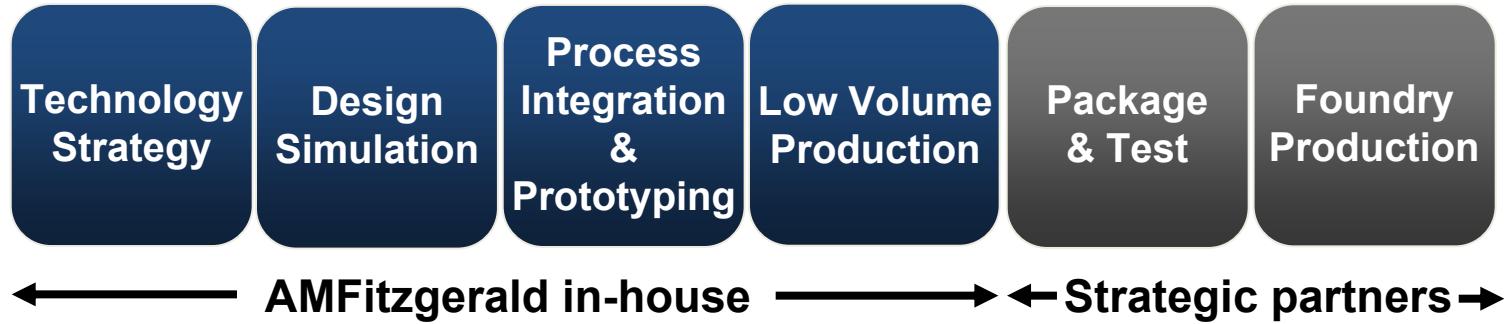
Fab operations at UC Berkeley
Marvell Nanolab

Our value

- **First time developing MEMS?**
 - We can provide the complete solution
- **Improving your MEMS product?**
 - Let us optimize your design
- **Investing in MEMS?**
 - Valuable insight from expert practitioners
- **Our competitive advantage**
 - A complete MEMS solution
 - Expert design and process engineers



A complete solution from concept to production



- **Make vs. buy decisions; technology roadmaps**
- **R&D management, multi-disciplinary engineering team**
- **Design and process integration for volume production**
- **In-house prototype fabrication (150 mm wafers) by our engineers, not operators**
- **Smooth transition to production partners**

Solutions beyond R&D

A menu of production options for different customer needs

Full custom
low volume



*Open search
for foundry
partner*

Full custom
high volume

*Open search
for foundry
partner*

Fast time to
market with
foundry-specific
design

micralyne

silex
MICROSYSTEMS

Faster time to
market with
semi-custom
sensors



Fastest time to
market with
standardized
200mm process

InvenSense
Innovation in MEMS

Process flexibility

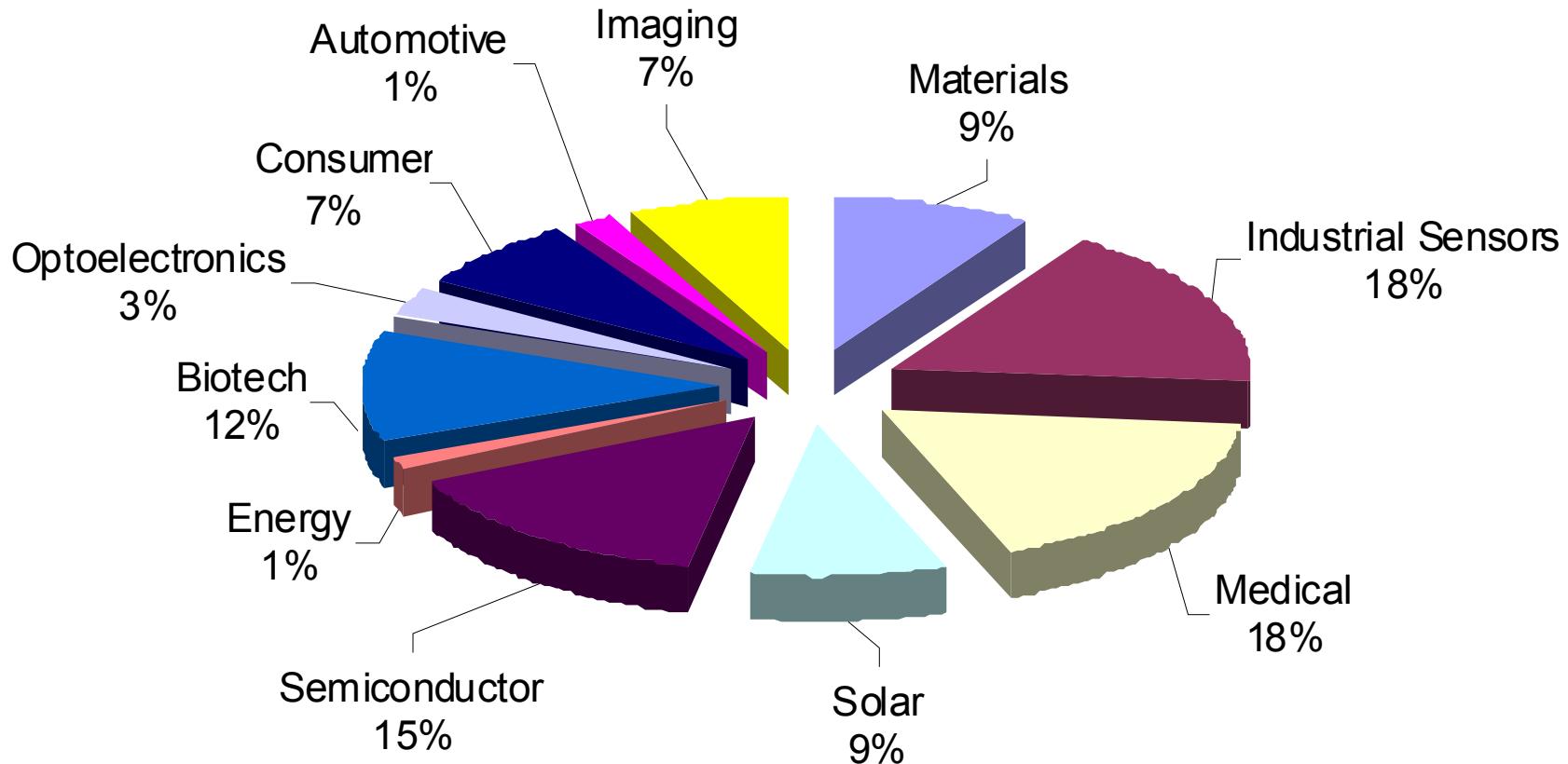
Time to market

A new era in MEMS development



- **MEMS solutions for OEMs and system integrators**
 - ISO-certified foundries
 - Cost-effective multi project wafer runs
- **Customer supplies sensor spec, AMFitzgerald delivers customized chips run on established foundry process**
- **First run: pressure sensors, Q2 2013, at Silex Microsystems**
- **More sensors and more foundries in the future...**

Our diverse customer base



MEMS type core competencies

- **Sensor types**
 - Motion, pressure, acoustic, infrared, magnetic, radiation, resonators, chemical
- **Transduction principles**
 - Piezoresistive, piezoelectric, electrostatic, capacitive
- **Actuators**
 - Electrostatic, piezoelectric
- **Microfluidics**
- **Micromolds and surface texturing**

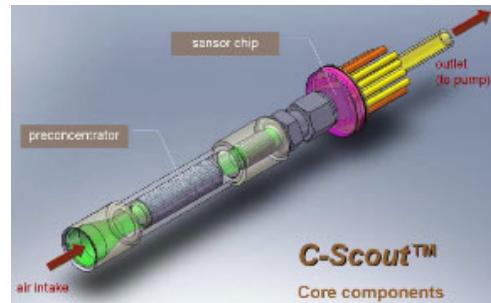
AMFitzgerald Client Products



Cantimer OSMO Dehydration Sensor



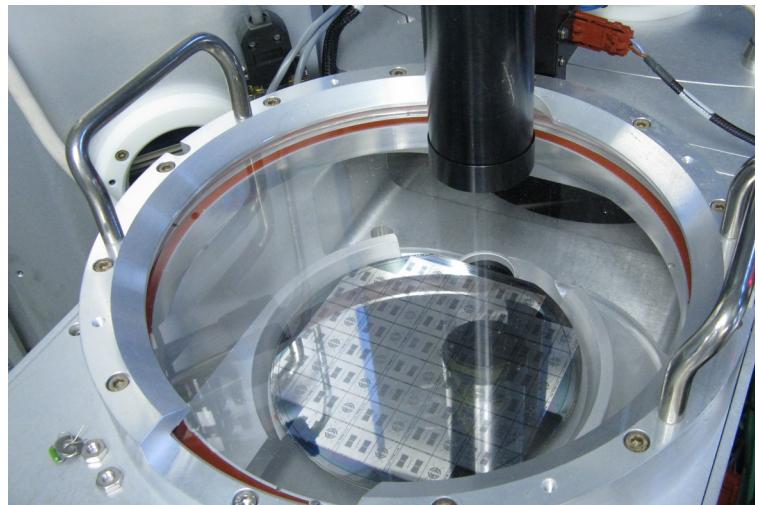
Fluxion Biosciences BioFlux product



NNTS C-Scout product

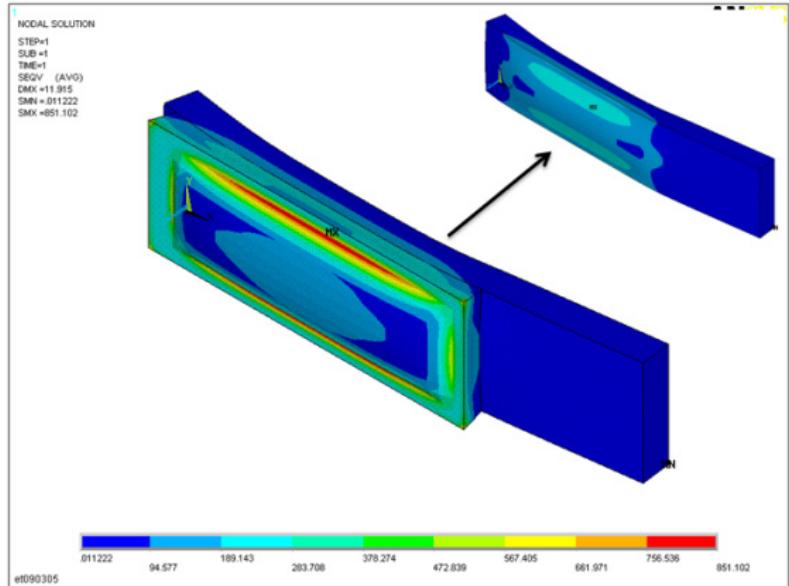
MEMS process core competencies

- All MEMS process techniques
- Process specialties:
 - Thick lithography
 - High aspect ratio silicon etch
 - Sacrificial release by vapor HF or XeF₂
 - Aluminum nitride and other new materials
 - Silex Sil-Via TSV
 - Laser and abrasive drilling
 - Stealth dicing
- Managing risk and uncertainty of MEMS R&D

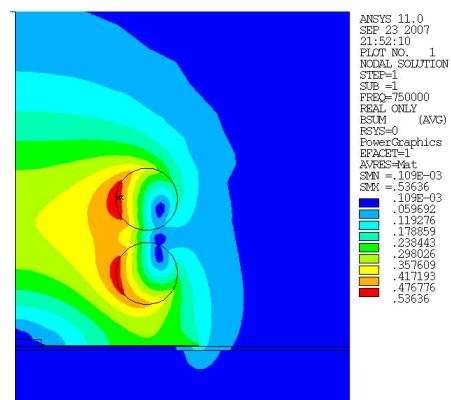


MEMS design core competencies

- ANSYS Multiphysics R13
- Tanner EDA L-Edit
- Matlab
- Proprietary fracture prediction
- Intelligent use of simulation to minimize risk and reduce fab cycles
 - Management of uncertainty in MEMS material properties



Package-induced stresses



Magnetic field of inductor coils

Business process

- Initial meeting: fit and scope of work
- Detailed cost proposal provided
- Project performed in discrete Phases to minimize risk
 - Phase 1: Design exploration
 - Phase 2: Prototype fabrication 1
 - Phase 3: Test and design iteration
 - Phase 4: Prototype fabrication 2
 - Etc.
- Collaborative interactions
- ***Client owns all work product and intellectual property***
 - Including masks and runsheets, which will be transferred to foundries

The secrets to MEMS development success

- Have adequate funds and timeline for multiple prototype iterations
- Robust designs do not push process tolerances
- Bring only mature prototypes to foundry

Public client list (partial)

Startups and Small-Medium Businesses:

Advanced Diamond Technologies
Bay Materials LLC
Cantimer, Inc.
Edge Embossing LLC
Endotronix
Fluxion Biosciences
Hepregen
Microfabrica
Micralyne
NeuroPro Technologies
Nevada Nanotech Systems
NovaSpectra
SemQuest
Silicon Light Machines
Silicon Microstructures
SVTC Technologies
Tactus Technologies
Wave 80 Biosciences
Yole Développment

Public Companies:

Agilent Technologies
Applied Materials
Caliper LifeSciences
Cypress Semiconductor
Measurement Specialties
Panasonic ACOM-TC
Ricoh Innovations

Research Institutions:

DARPA
MIT
Stanford University
Stowers Institute
UCSF, Ophthalmology
University of Nevada, Reno
Weill Medical College of Cornell Univ.

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