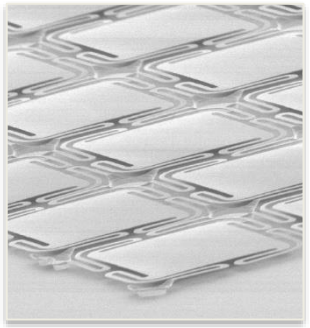
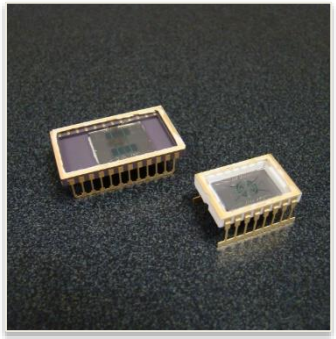

With our MEMS solutions working for you, the sky's the limit.
Company Overview 2024
AMFITZGERALD

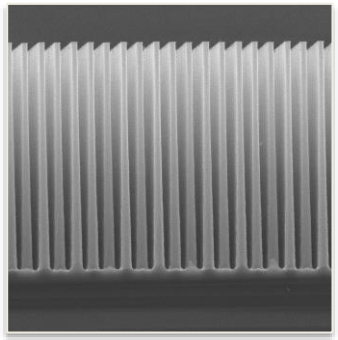
AMFitzgerald: Your partner in specialty MEMS and microtechnology development



AMFitzgerald develops innovative
MEMS and sensor solutions
for specialty applications

We collaborate with our customers
to create high value products
enabled by customized microtechnology





With integrity, expertise, and attention to detail,
we deliver what has never been done before

A global business in MEMS product development

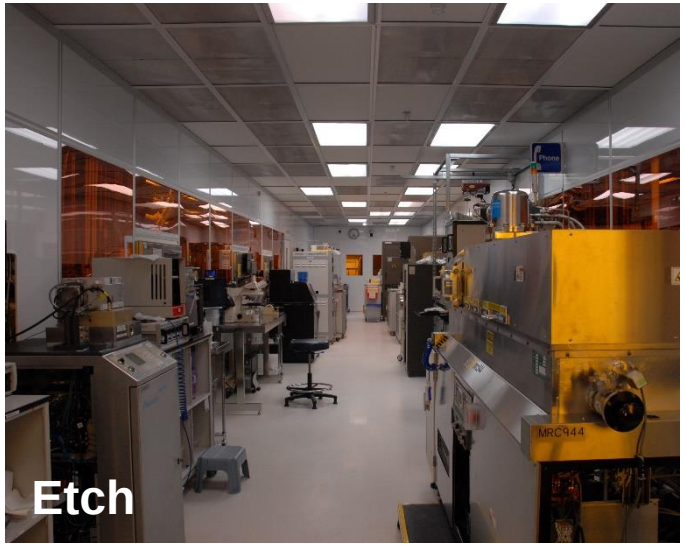
Headquarters in Burlingame, CA
5 minutes from SFO airport

Our Class 100 cleanroom for 200 mm wafer-level test and measurement. Clients may install project-specific equipment.

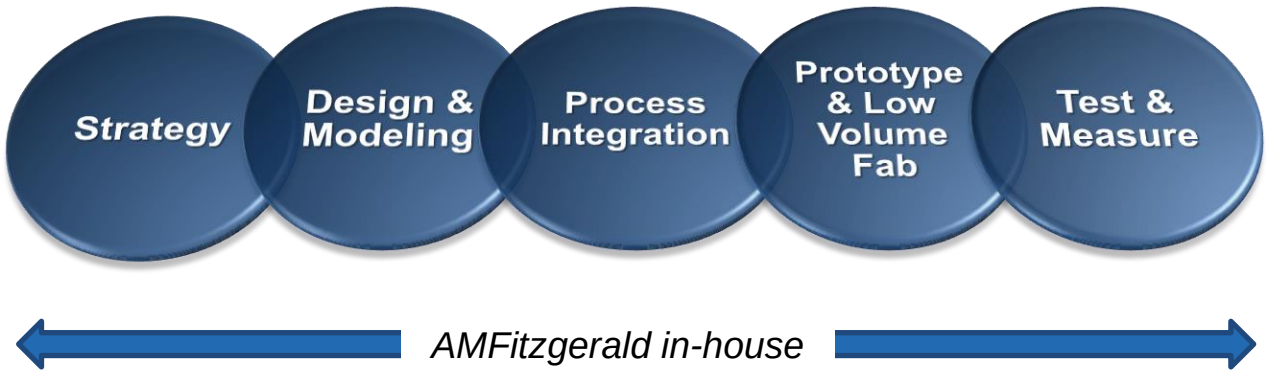
- **Company profile**
  - **Founded 2003, privately held**
  - **California Bay Area, near Silicon Valley**
    - **Burlingame: Headquarters and Class 100 cleanroom for metrology**
    - **Berkeley: 15,000 sq. ft. rented MEMS fab access**
  - **Export control compliant**
  - **Over 400 projects completed to date, from startups to public multi-national enterprises**

AMFitzgerald client locations

Our fab operations at the Marvell Nanolab (100, 150 and 200 mm wafers)

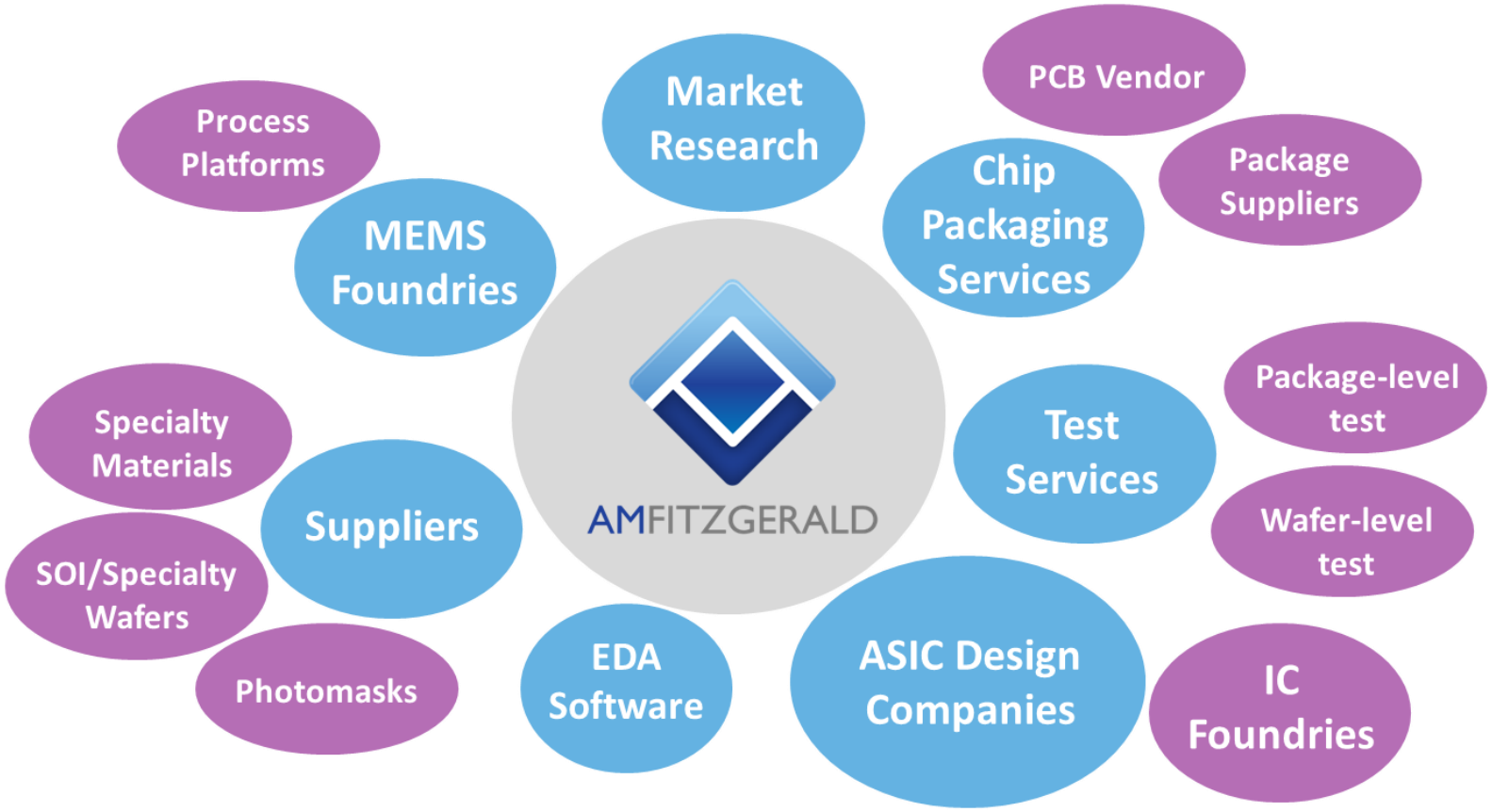


AMFitzgerald's unique value: in-house prototyping of our designs



- **Prototyping by our expert staff enables discovery of key IP, rapid cycles of learning and manufacturable design that facilitates production scale-up**
- **Our multi-disciplinary, expert engineering team has years of hands-on experience**
- **Clients own all the design and process IP that we create**
- **Our mature, de-risked prototype will get you to production faster and cost less**

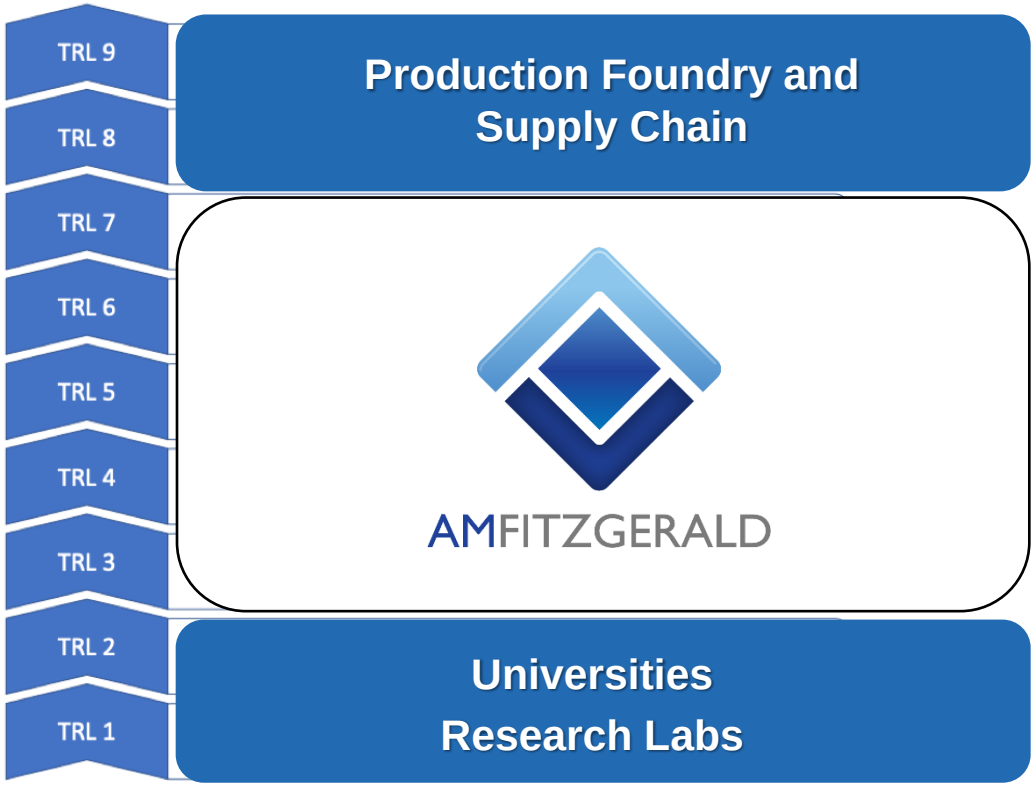
Our global ecosystem of trusted partners provide specialty services



We are as capable as a vertically integrated company, with the agility of a small team

Our product development services get clients to production and to market

NASA Technology Readiness Level (TRL)



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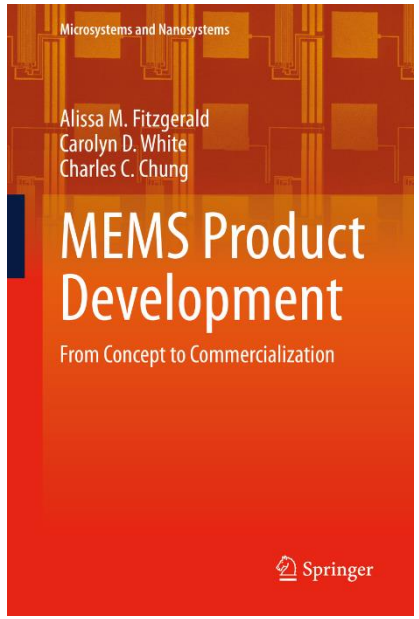
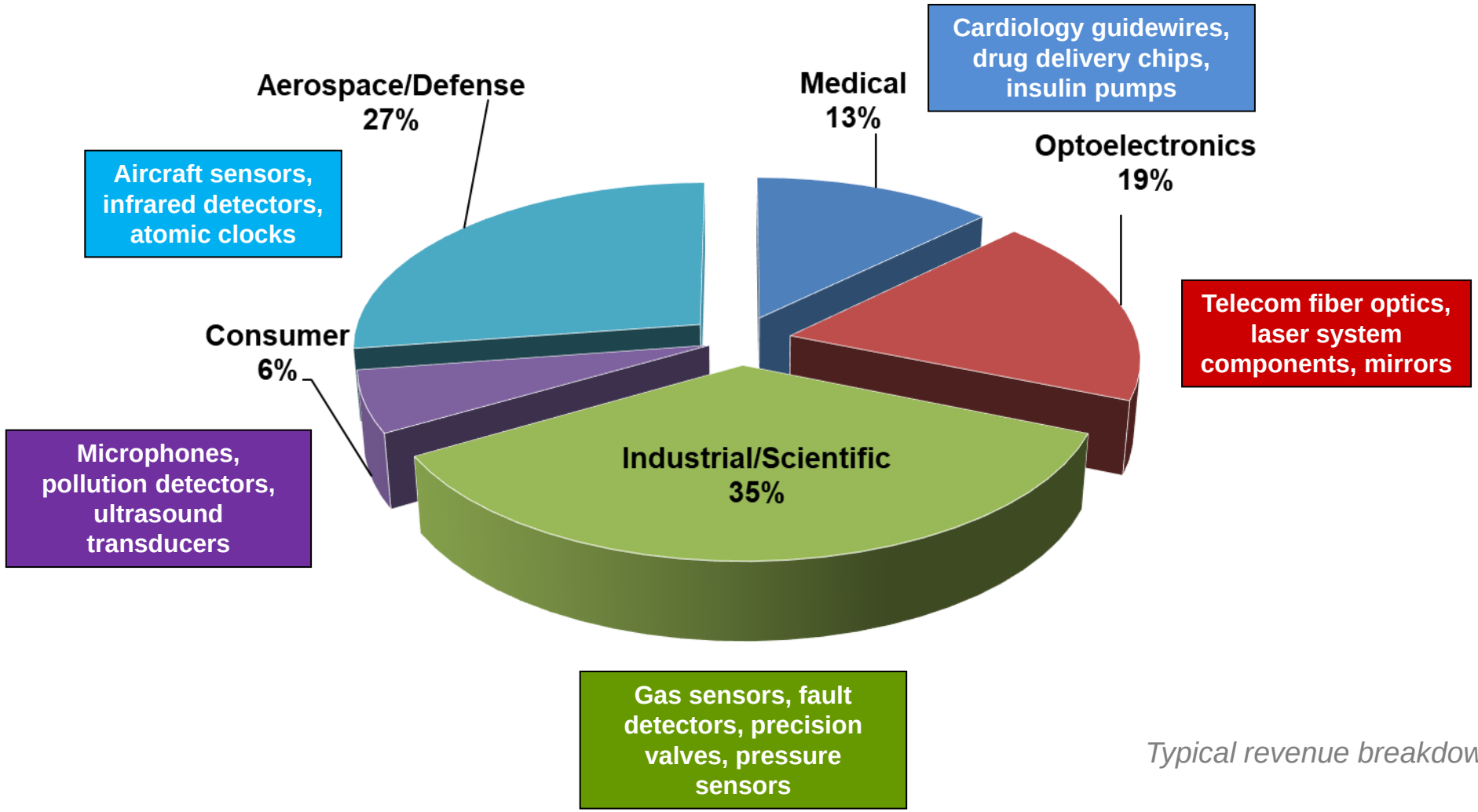
AMFitzgerald bridges the development gap (TRL 3-7)

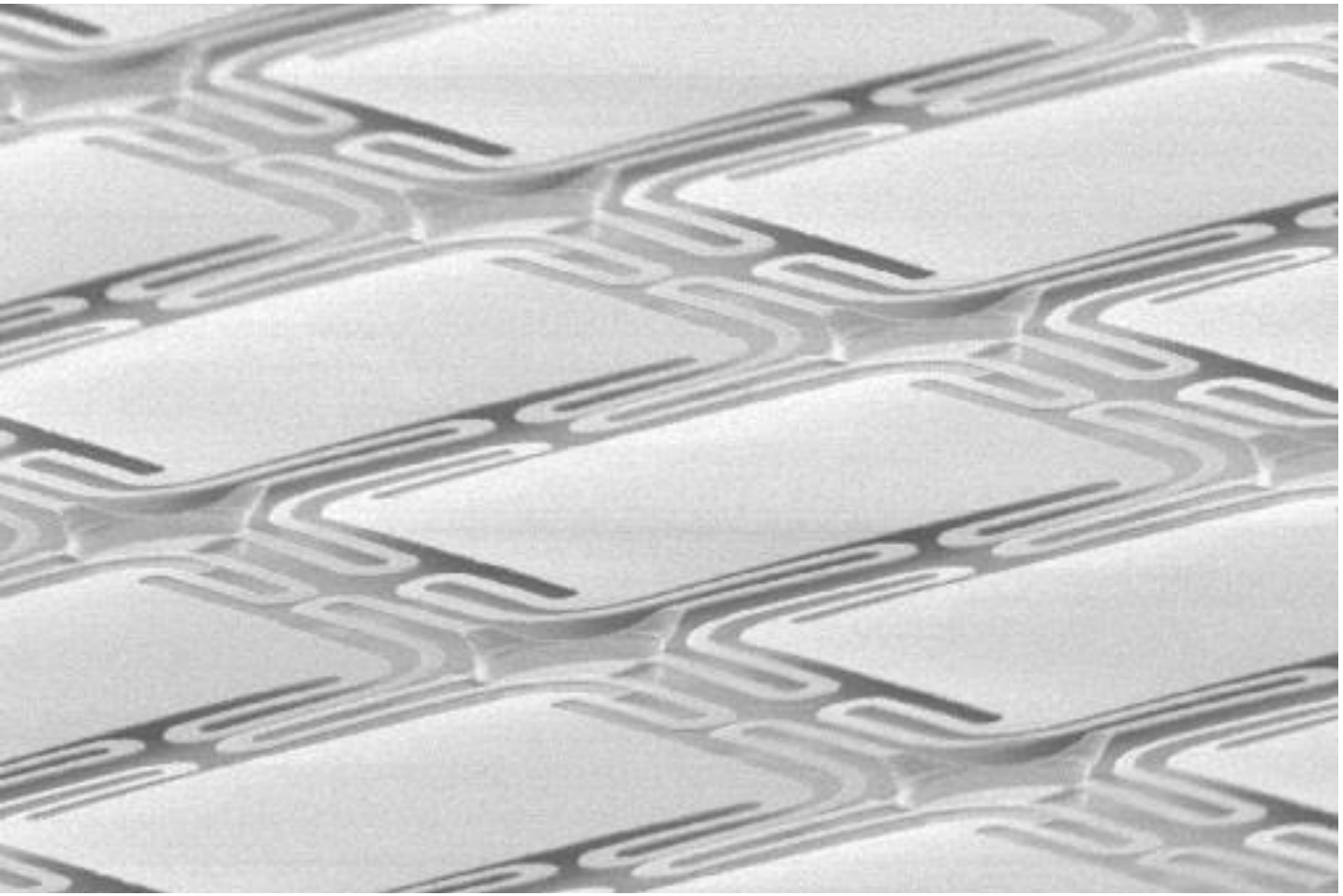


Read our book to learn more about our methods

AMFitzgerald custom MEMS enable products in high value markets



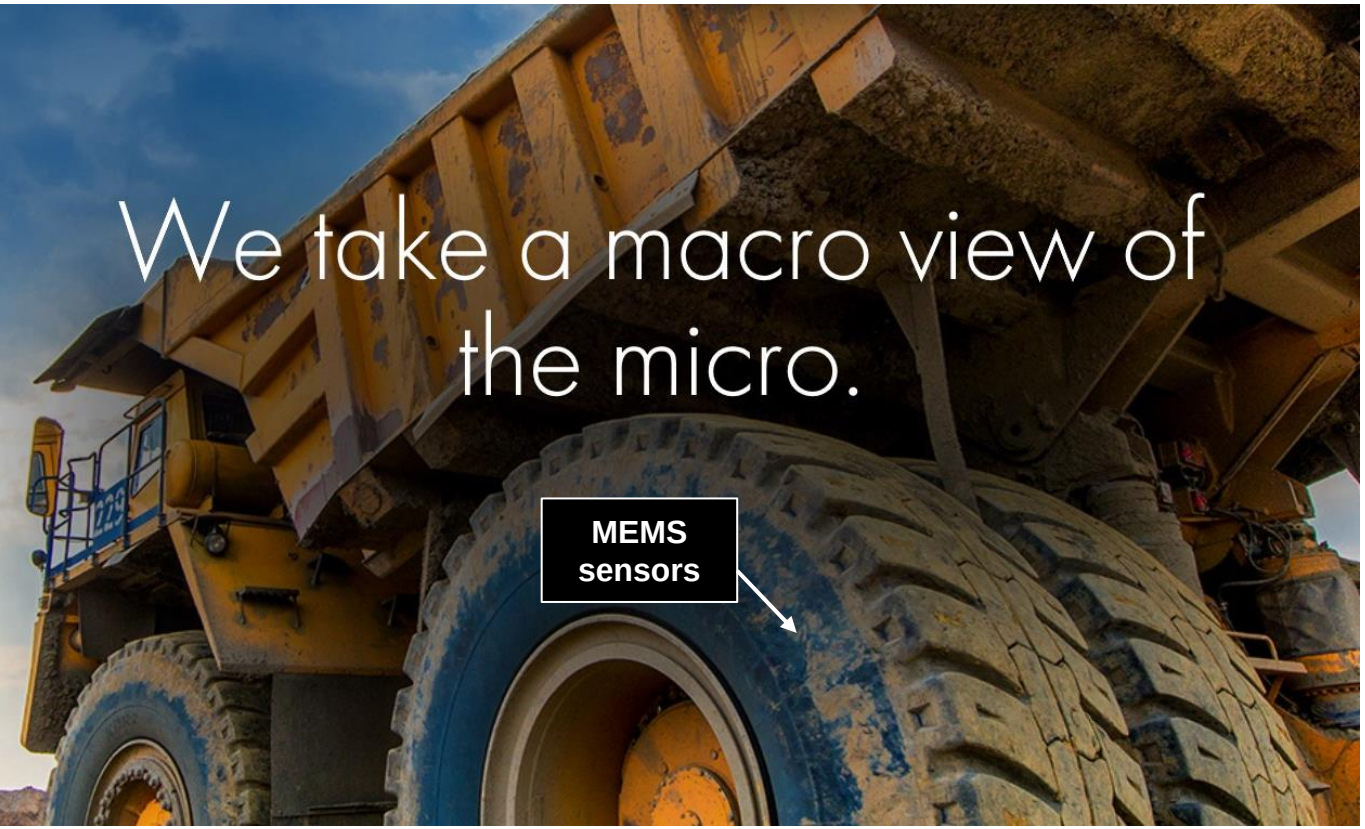
Typical revenue breakdown, by market



LWIR bolometer fabricated over CMOS photodiodes

Innovation and Product Development Services

Our development approach: begin with the end use in mind

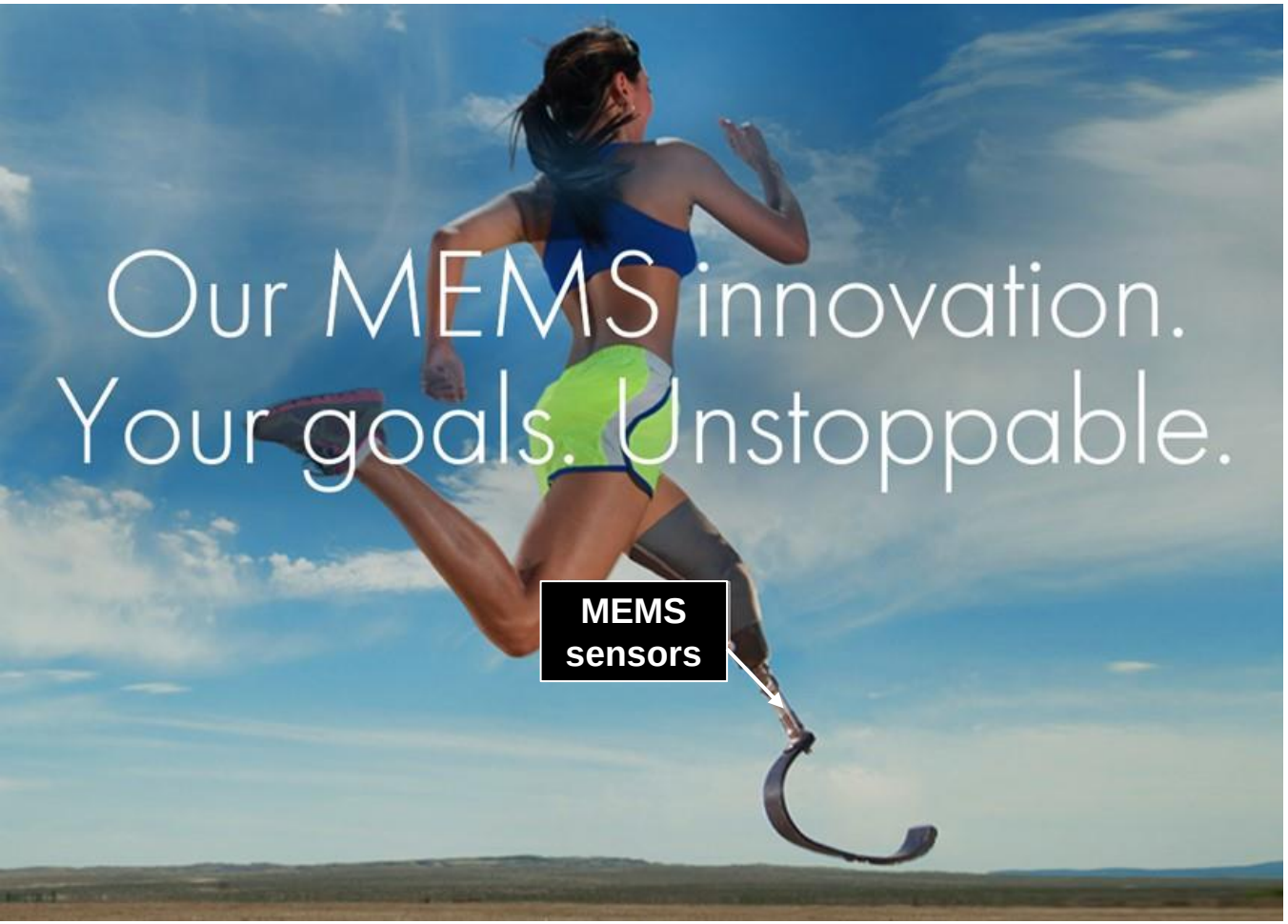


The customer's product integration requirements and end use inform our MEMS designs

We develop MEMS to be ready for manufacturing at scale

Longer development plans are divided into phases, with go/no-go gates, to control cost, time and risk

Complete start-to-finish MEMS development services



- **Custom chip design:**
  - Sensors: motion, pressure, acoustic, infrared, magnetic, radiation, resonators, chemical, gas, particles
  - Actuators: motors, mirrors, switches, valves, pumps
  - Passive microstructures and microfluidics
- **Design services:**
  - Modeling and ANSYS simulation
  - Mask layout and tape-out
  - Design for manufacture
- **MEMS fabrication services:**
  - Prototyping and design validation
  - Process integration
  - Foundry transfer and supply chain creation
- **System integration**
  - Packaging
  - Readout and control electronics
  - Assembly

Our phased development method reduces risk, manages cost and saves time

1. Strategy, Feasibility

"What to Build"

- First, we study the competitor and patent landscapes to create a strategy for innovating your product. Then we develop concept designs and check their feasibility using basic calculations.

2. Design, Analyze, Plan

"How to Build"

- We always begin design work with a plan for manufacturing in mind. Using 3D multiphysics simulation and fab short loops, we test and validate our designs before attempting a full prototype.

3. Prototyping and Iteration

"Build"

- Our expert MEMS engineers fabricate advanced prototypes efficiently, while harvesting valuable process and design data in order to build your IP portfolio and inform future designs.

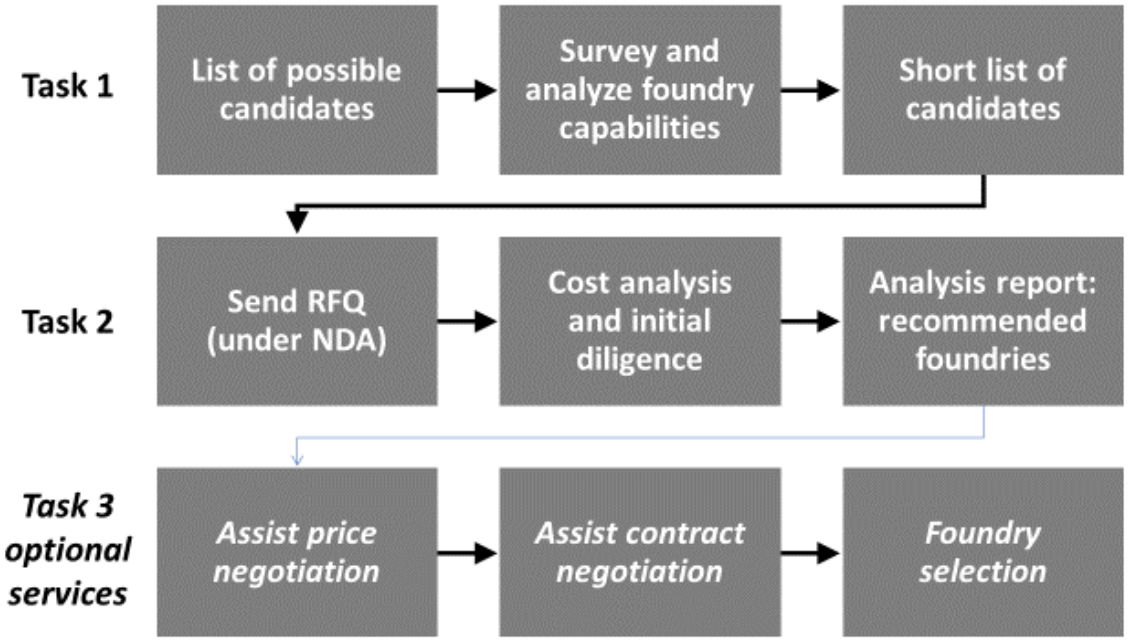
4. Transfer to Manufacturing

"Build in Volume"

- With an advanced, debugged prototype, whose IP you own, you'll get the best offers from foundries. We'll tailor a supply chain for your specific business and technical needs and shepherd your product through manufacturing ramp-up.

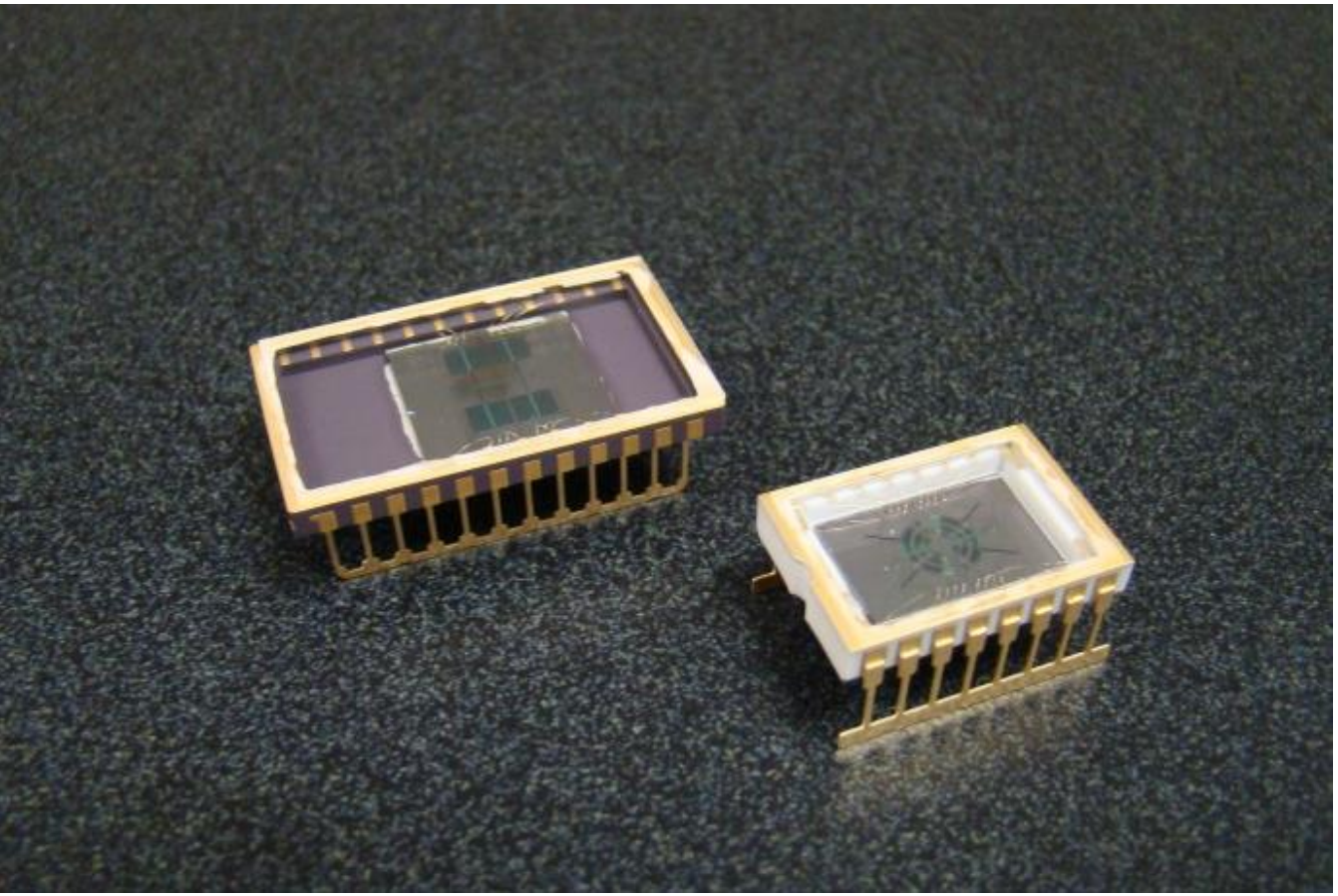
Client commits one phase at a time

Transfer to foundry: a critical step in MEMS commercialization



AMFitzgerald foundry selection method

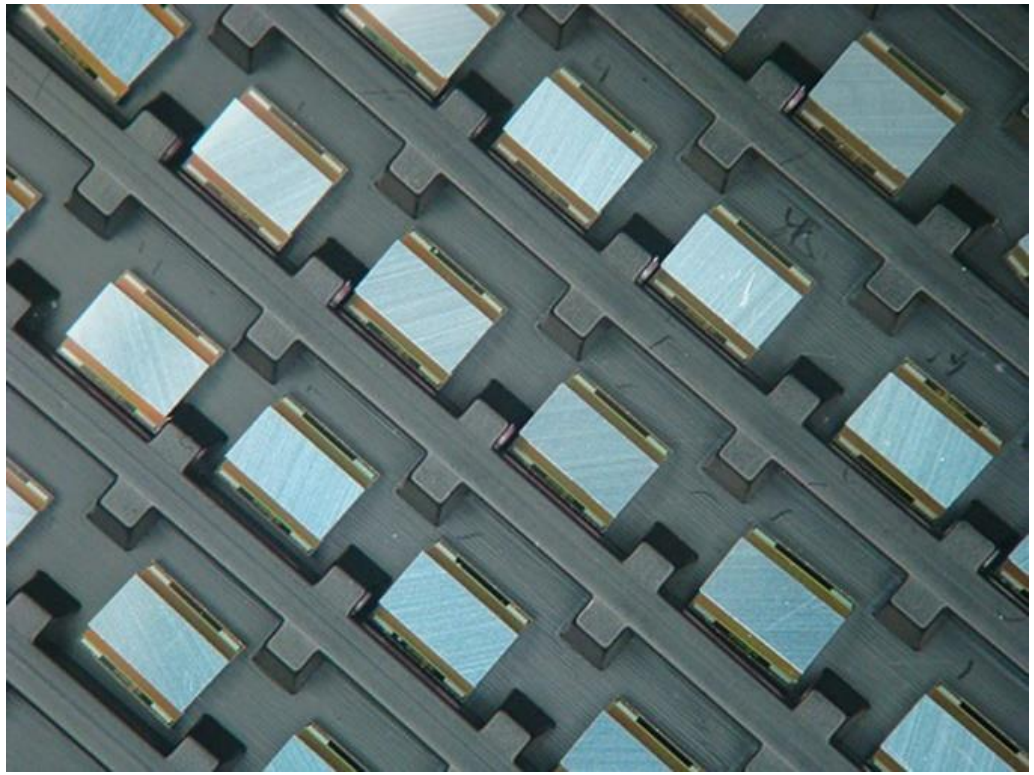
- **We have developed our own method to help clients select and work with an ideal manufacturing partner**
- **Transfer to any foundry, any wafer size**
- **More than 20 foundry selections and technology transfers successfully executed**
- **Additional supply chain services: selection of and transfer to back-end vendors**



Linear and rotary micro fiber optic switch prototypes

Product Integration and Go-to-Market Solutions

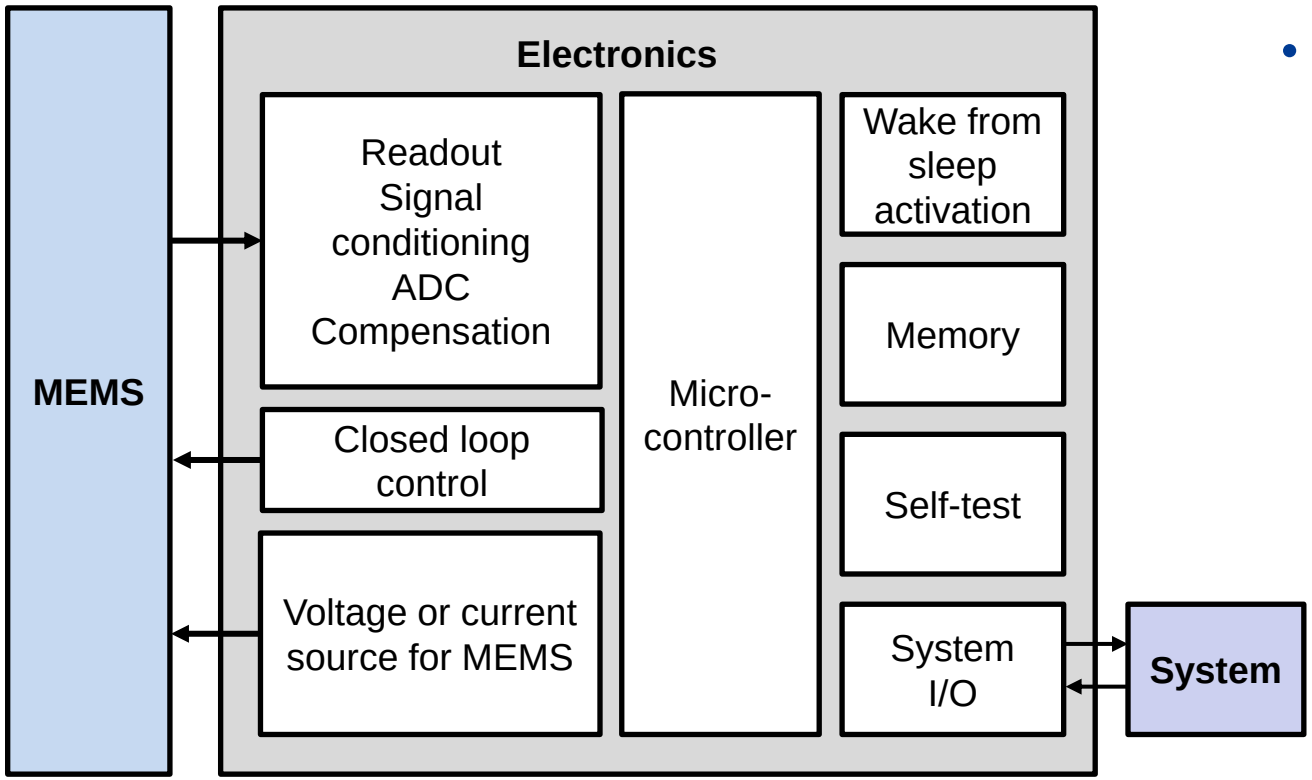
Custom solutions leveraging foundry process platforms



Accelerometer designed and fabricated using 200mm foundry platform

- **Existing standard foundry processes offer fast time to market**
- **We have successfully designed both MEMS and ASIC using foundry process platforms**
- **MEMS platforms**
  - **X-FAB**
  - **Silex**
  - **MEMS Infinity**
- **CMOS platforms**
  - **X-FAB**

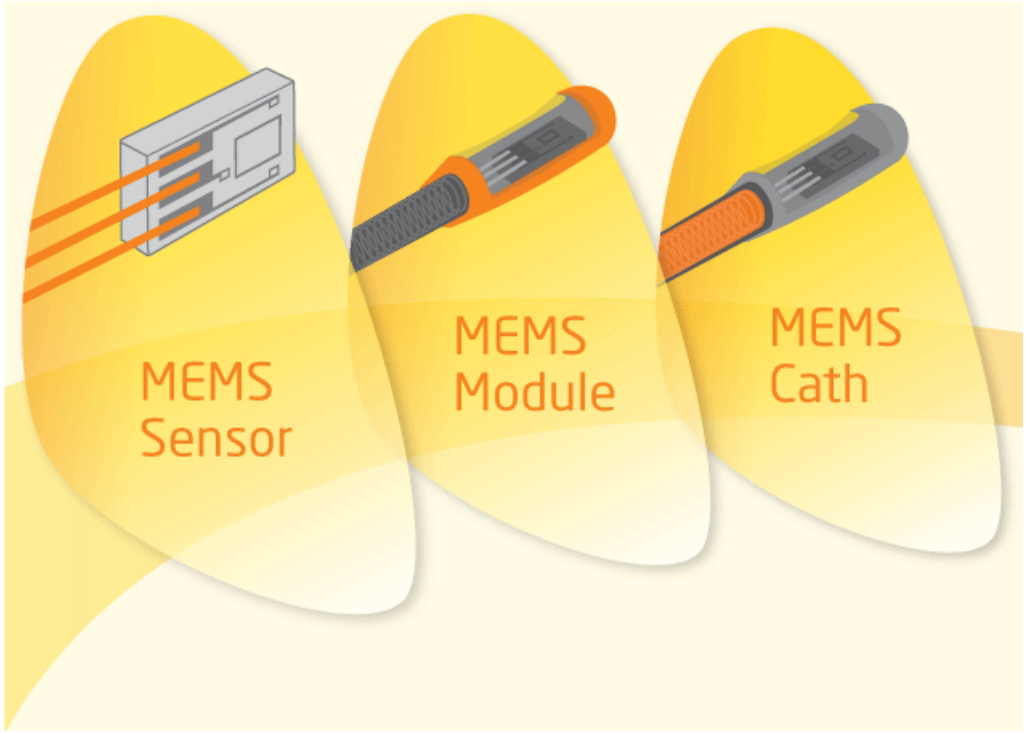
Integrated MEMS sensor solutions to deliver data



Schematic of an integrated sensor solution

- **We can develop the rest of the system to deliver the data you seek**
  - **Custom ASIC or PCB**
  - **Component selection**
  - **System interface**
  - **Assembly and test**

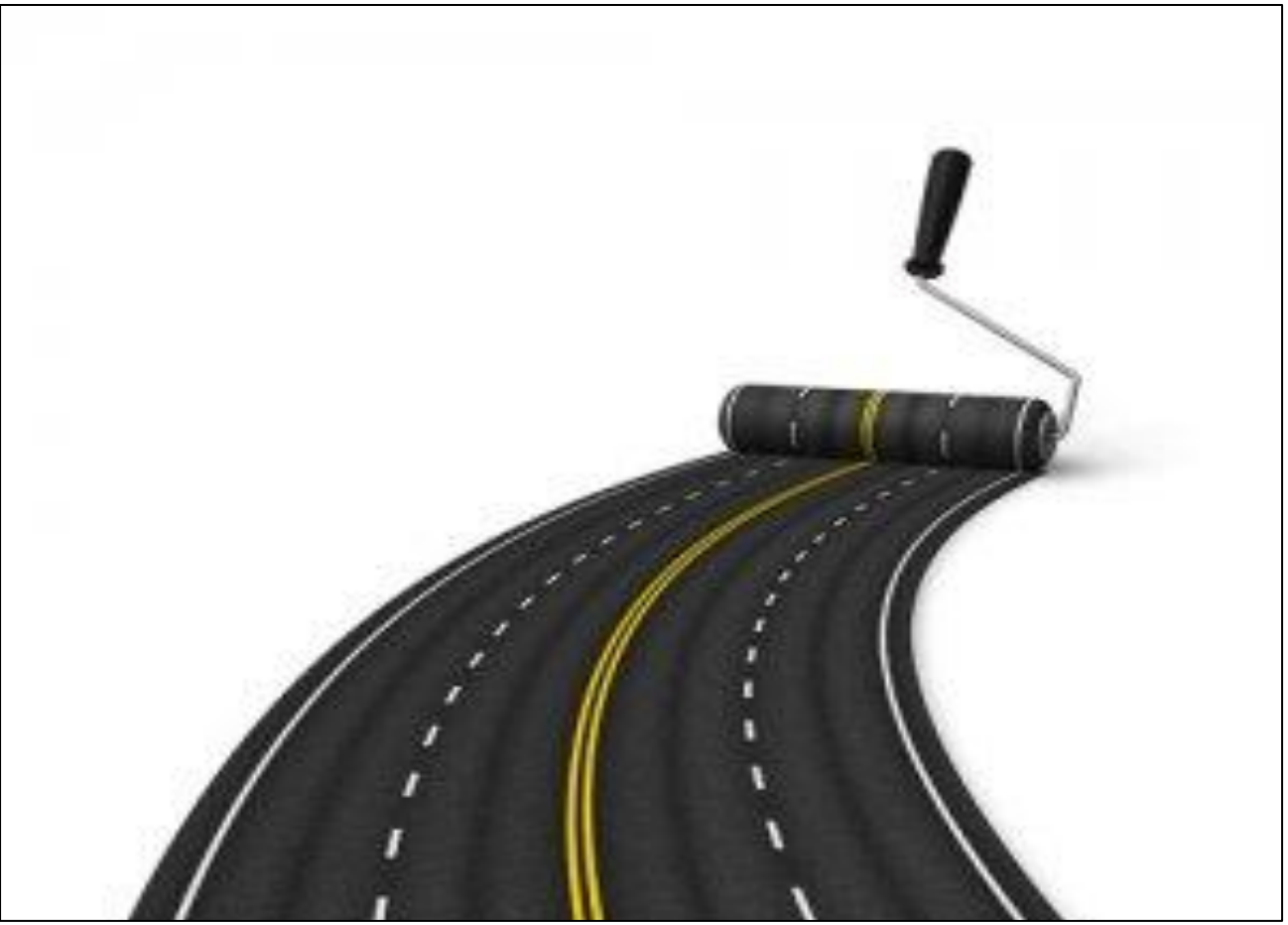
Custom medical solutions



Source: Millar OEM

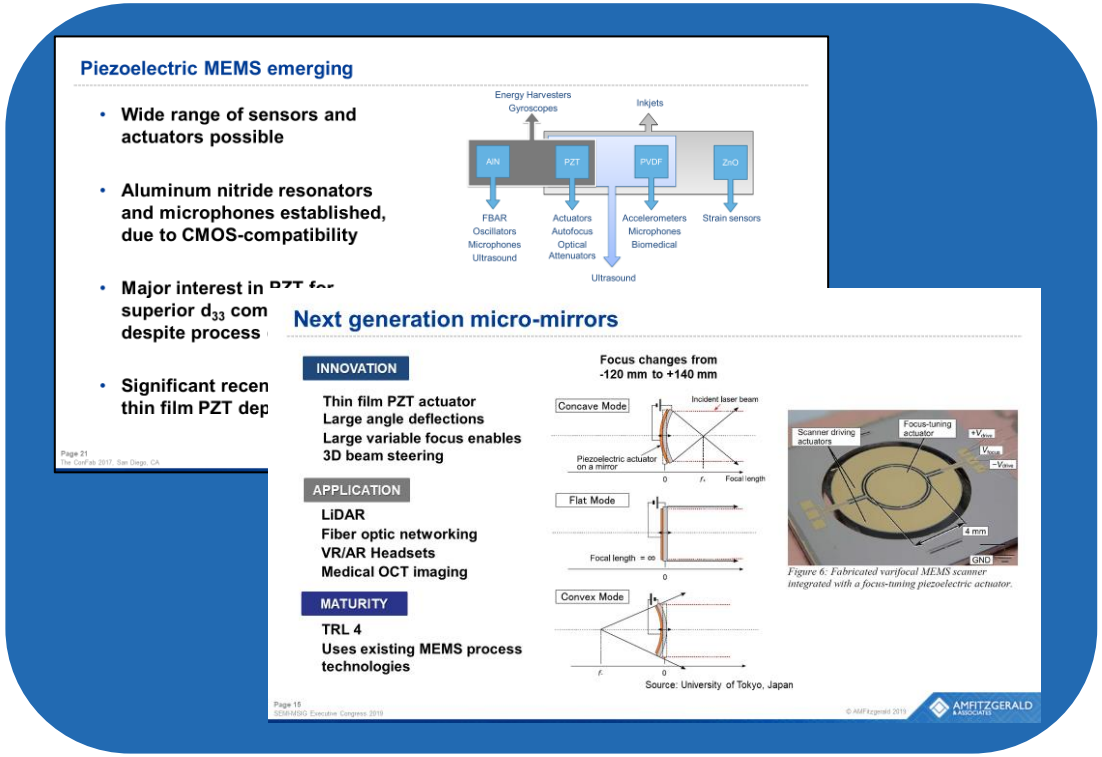
- **Custom pressure sensor design, absolute or gage**
  - **We design custom 1F- and 3F-sized sensors for invasive use and arrange foundry manufacturing**
  - **3 sensors in market for 2 different clients**

- **ISO-13485 contract manufacturing with our partner, Millar**
  - **Lead attachment**
  - **Pressure sensor integration onto catheter or guidewire, encapsulation**
  - **Sensor testing in simulated body environment**



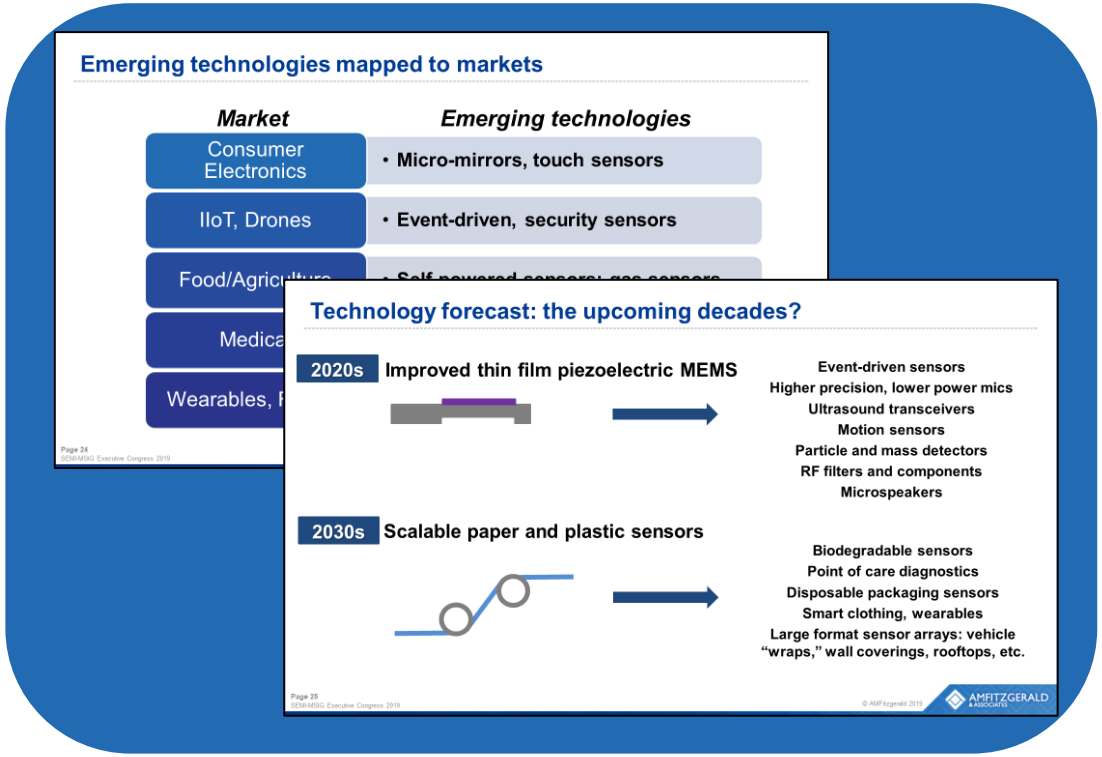
Technology Strategy Consulting

Technology strategy services



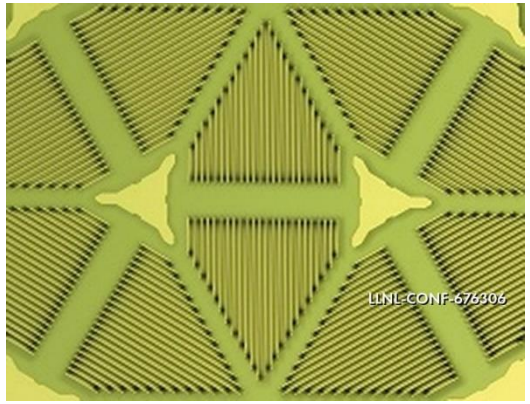
- Emerging trends
- Technology analysis and selection
- Competitive intelligence
- Make vs. buy analysis
- Patent landscaping
- Operations and management consulting

Workshops



- **Half day or one day workshops**
- **Subject presentation: overview or deep dive**
  - **For investors, board directors, C-level executives**
  - **Cross-discipline groups, such as surgeons**
- **"Ask the expert" session**
  - **Brainstorming with technical staff**
  - **Path-finding**

Customer success stories

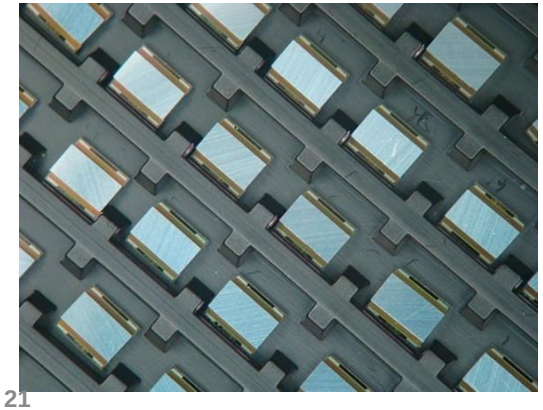


LAWRENCE LIVERMORE NATIONAL LABORATORY

We developed a multi-wafer fabrication process for a 3-axis micro-mirror with high-angle tip, tilt, and piston actuation. The mirror was developed for high-performance adaptive optics applications. We are currently helping a LLNL licensee transfer the process to a 200mm foundry.

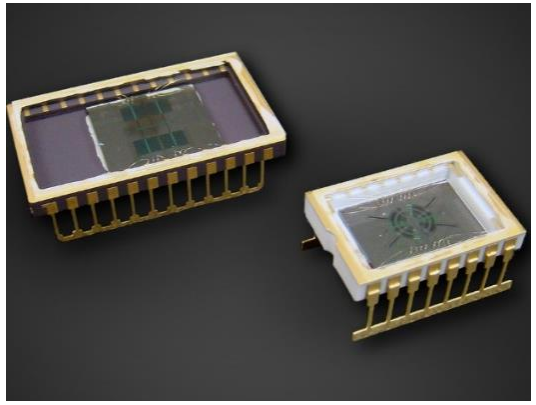
EMERGE

We created a product development strategy to prepare a new PMUT microspeaker design for 200 mm foundry transfer and production scale up. We executed foundry selection, mask tapeout, tech transfer, and wafer test and measurement.



INTERNATIONAL MEDICAL DEVICE COMPANY

We designed a custom MEMS single-axis accelerometer for a cardiac pacemaker application, leveraging a motion sensor platform technology. Sensors were fabricated by a high volume foundry on 200 mm wafers.

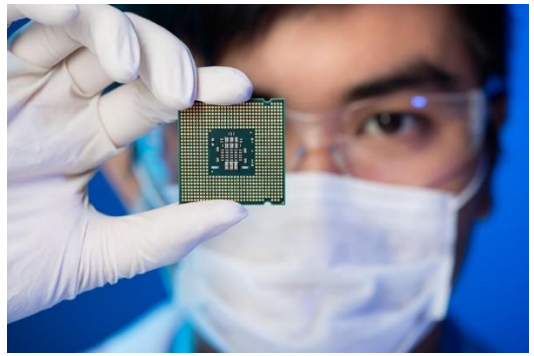


POLYOPTIC TECHNOLOGIES, INC.

We designed two custom in-plane electrostatic switches, one having linear drive and the other rotary drive, for a micro fiber optical switching application. We packaged and tested initial prototypes for the client.

SOFANT TECHNOLOGIES, LTD

We helped Sofant to develop a novel variable capacitance RF MEMS product for 5G applications. We performed electrostatic simulations using ANSYS, developed a full process flow and fabricated prototypes. We later assisted with 200 mm foundry transfer and process improvements.



PUBLIC SEMICONDUCTOR FOUNDRY

We helped a foundry expand its core CMOS foundry business to MEMS, by conducting a gap analysis of their existing tool set and identifying new tools needed to capture strategic MEMS customers.

Client list (public)

Startups and SMEs:

Aclima
Advanced Diamond Technologies
Bay Materials LLC
Edge Embossing LLC
Emerge
Endotronix
Fluxion Biosciences
Ascendance Bio (fka Hepregen)
Microfabrica
Micralyne
NovaSpectra
Rigetti Computing
SemQuest
Silicon Light Machines
Silicon Microstructures
Sofant Technologies
Tactus Technologies
Unispectral
Wave 80 Biosciences
Yole Développment

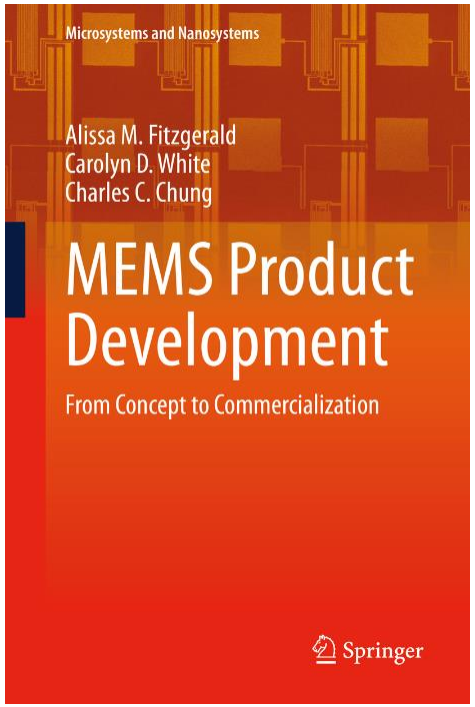
Public Companies:

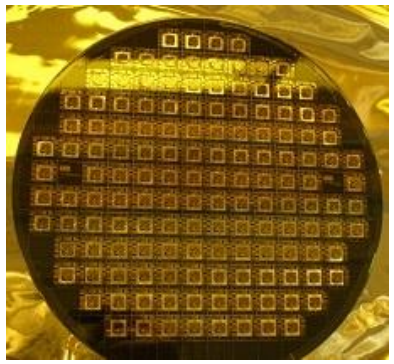
Agilent Technologies
Applied Materials
Caliper LifeSciences
Cypress Semiconductor
Finisar
Lam Research
Maxim Integrated
Measurement Specialties (now part of TE)
Micrel (now part of Micron)
Mirion
Panasonic
Livanova (fka Sorin Biomedica)
Symmetricom (now part of Microchip)
Ricoh Innovations

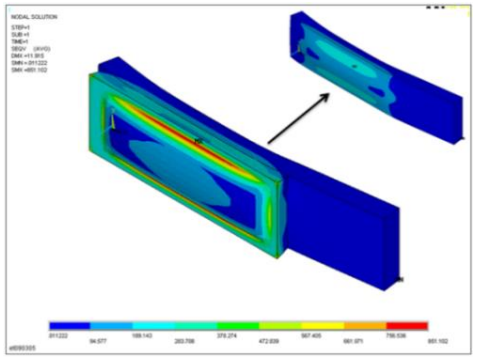
Research Institutions:

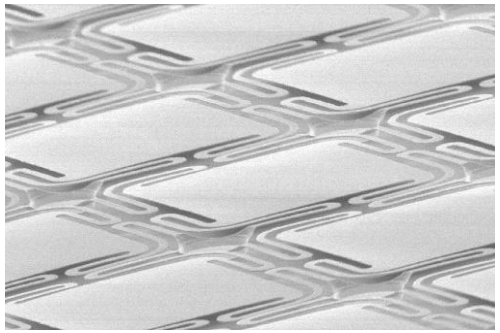
Alfred E. Mann Foundation
DARPA
Lawrence Berkeley National Laboratory
Lawrence Livermore National Laboratory
MIT
Stanford University
Stowers Institute
UCSF, Ophthalmology
Weill Medical College of Cornell Univ.

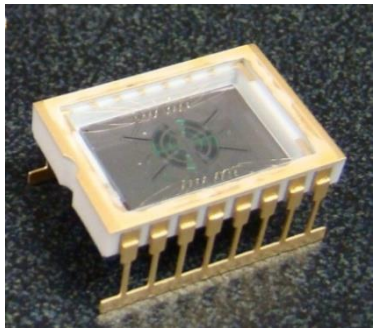
Company contact information











Designed and fabricated by AMFitzgerald

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