



UNIVERSITY OF ÓBUDA

DONÁT BÁNKI FACULTY OF MECHANICAL AND SAFETY ENGINEERING

INTRODUCTION TO THE MECHATRONICS

PROJECT WORK

Producer's personal information

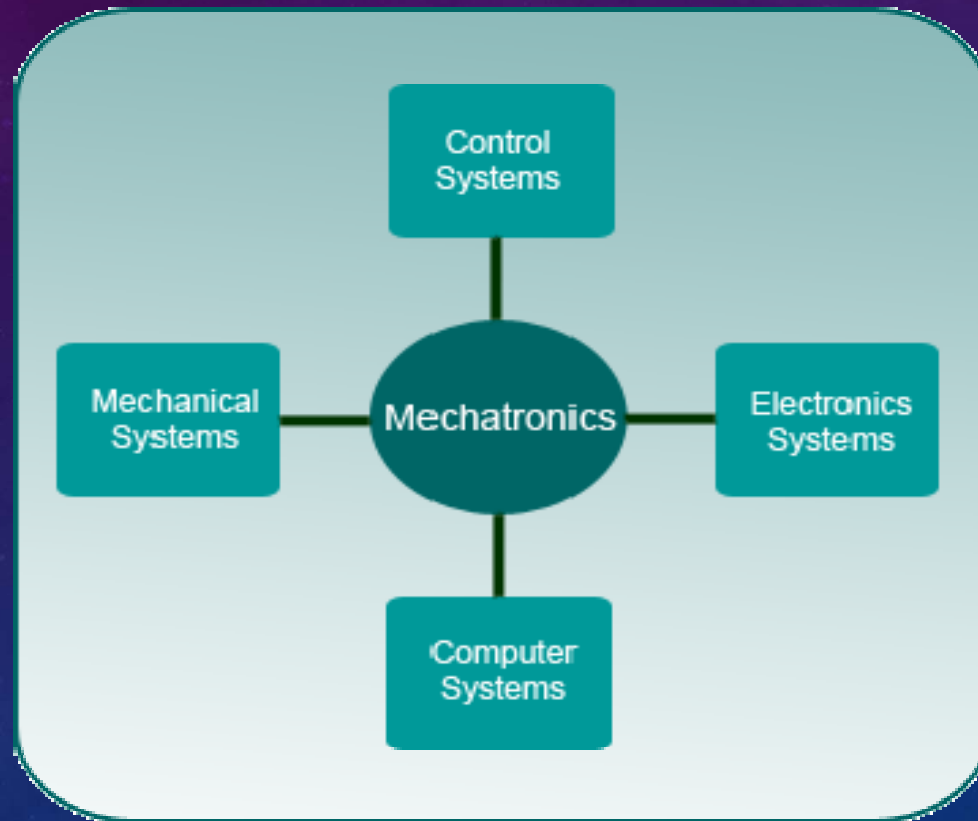
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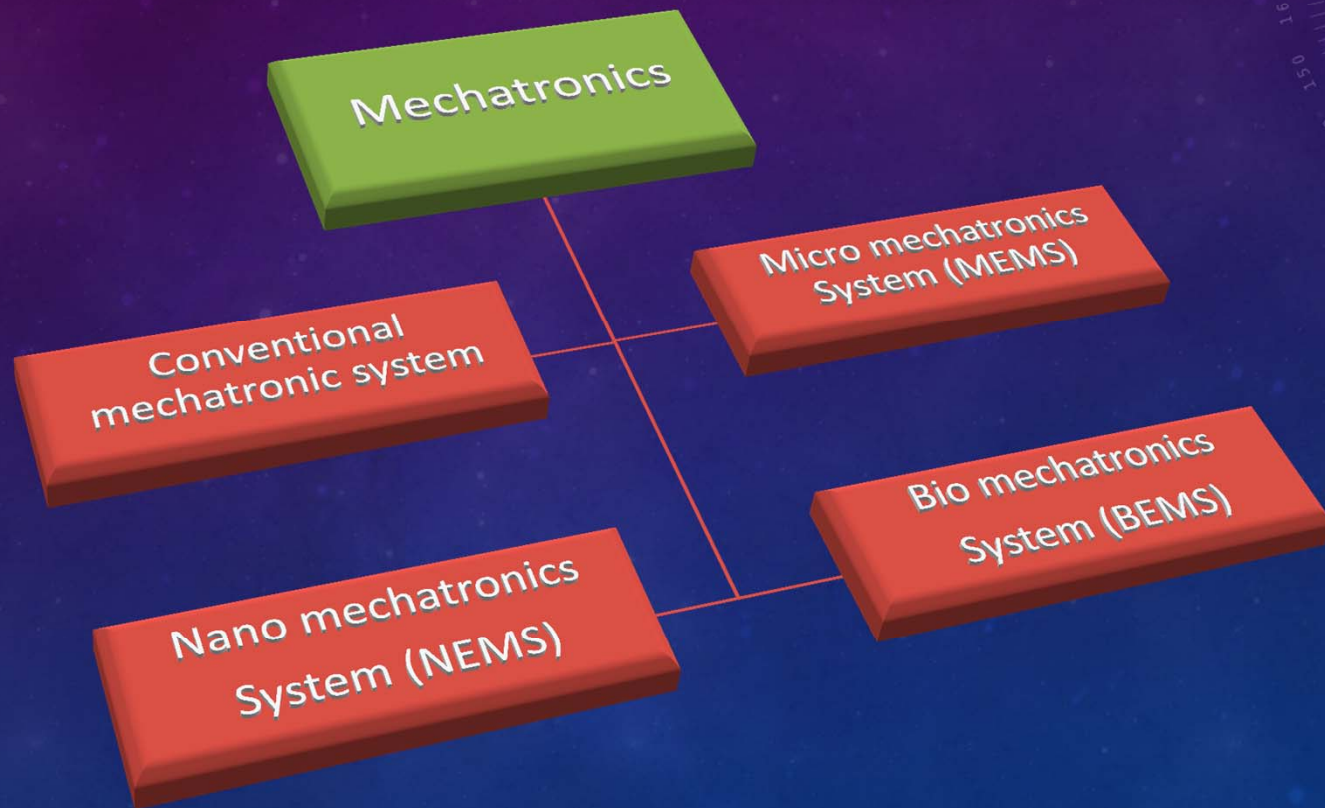


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What is mechatronics?

Mechatronics is the hybrid or synergistic combination of mechanical engineering with electronics and intelligent computer control or we can define it as a methodology used for the optimal design of electromechanical products.





Micro mechatronics:

Micro mechatronics are also integration of *mechanical and electronic systems but they are based on scaling effects in the micro world*

Micro mechatronics requires the organic combination of micro devices such as micro processor, micro sensor, and micro actuator

Among the micro devices, the micro processor and micro sensor have been widely employed in advanced mechatronics products, but not much micro actuator its believed that micro actuators are still under development for further application on modern mechatronic system

Sensing unit usually works on converting physical phenomena to electrical signal, contains elements like filters, amplifiers, vision systems

Sensors
(Micro)



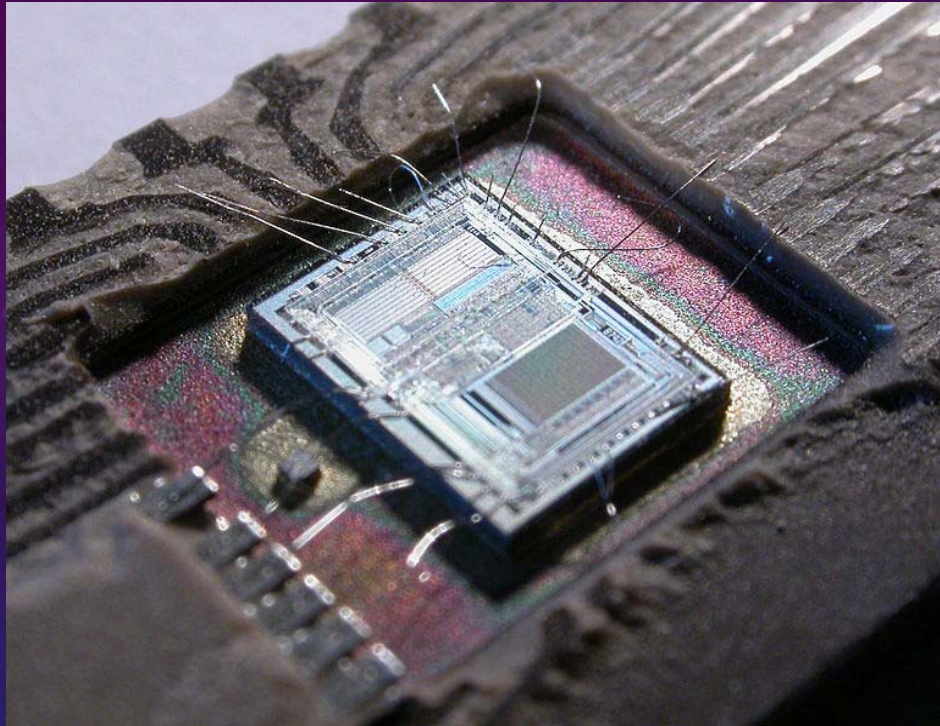
Control
(Micro)



Actuators
(Micro)

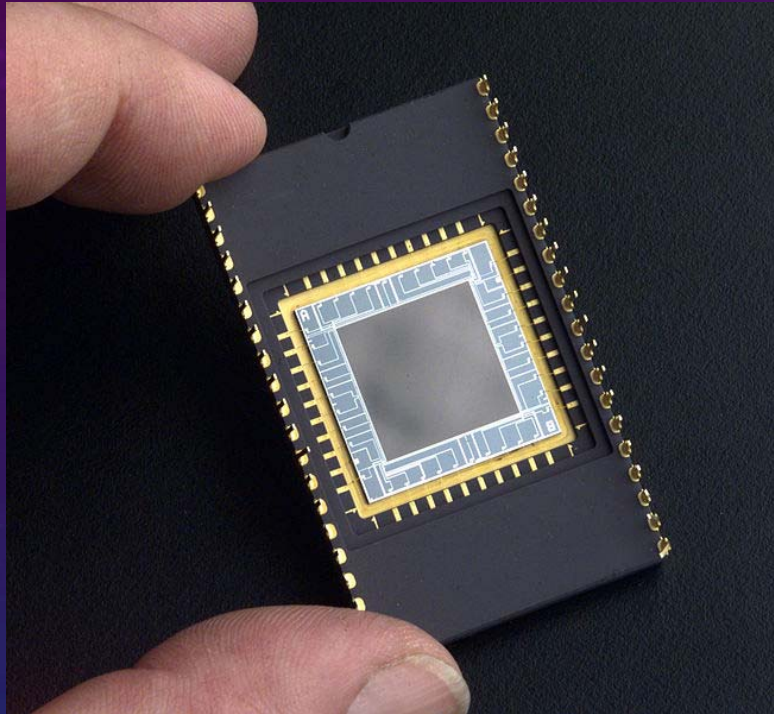
A small computer on integrated circuit containing a processor

Actuating unit is usually involved in power supply and coupling unit and its job is to convert electrical, hydraulic or pneumatic energy to mechanical

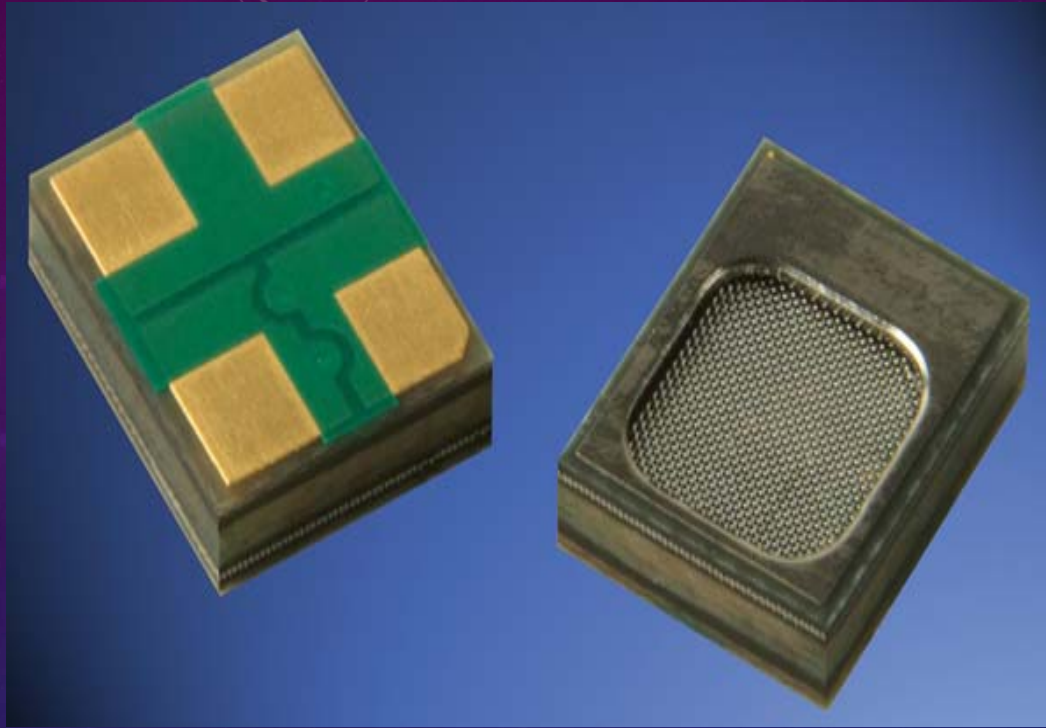


Intel 8742, an 8-bit microcontroller that includes a CPU running at 12 MHz, 128 bytes of RAM, 2048 bytes of EPROM, and I/O in the same chip.

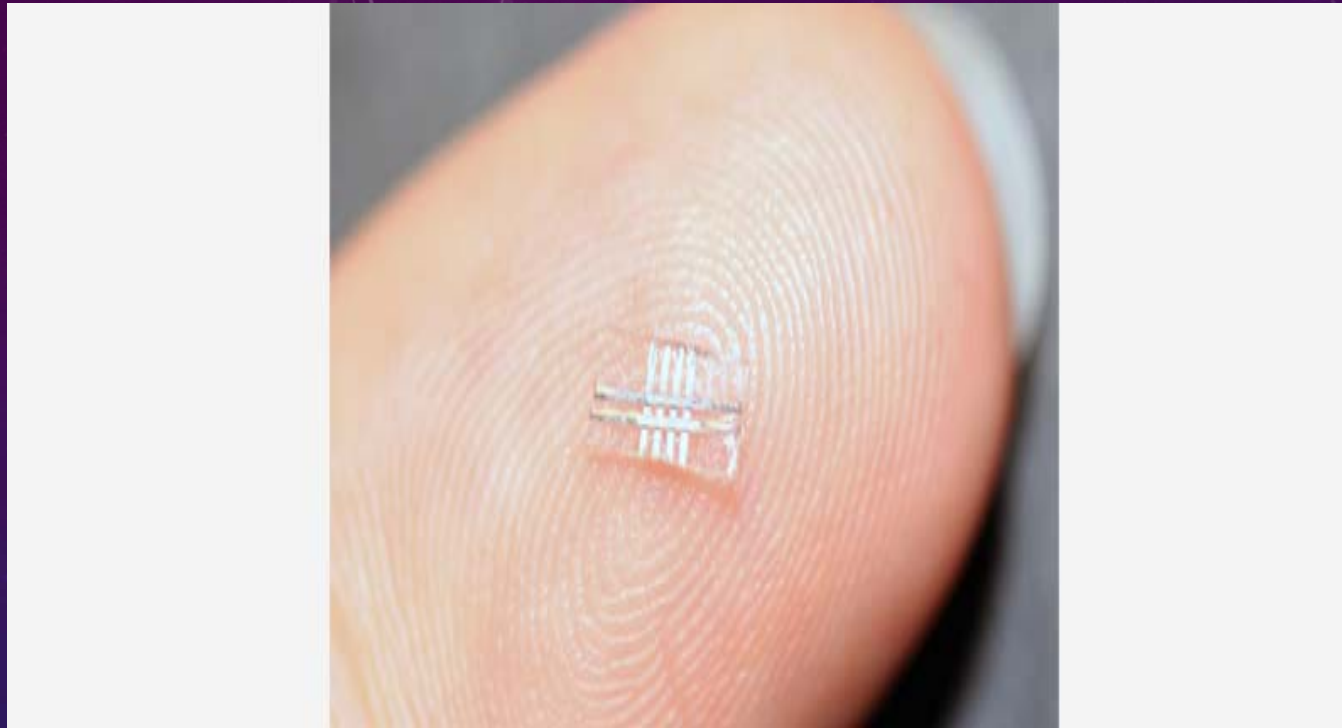
Some Sensors used in Micro mechatronical systems:



Micro CCD Image sensor: A type of solid-state image sensing device for digital imaging, used in digital video cameras of all types. It has higher sensitivity and lower noise than other sensing devices.



Micro ultrasonic sensors: used in microphones for detection of sound either to be recorded or amplified can be used for inputting sound to a required system



Micro tactile sensor: a micro scale biomimetic tactile sensor with epidermal ridges is proposed to enhance the sensitivity of force detection and also there is a proposed idea of using these sensors to create medical system which enables the sensor to detect hidden anatomical features such as embedded lumps or arteries

Micro actuators:



The micro actuator MA-35 was designed for applications with limited space conditions or where high-precision actuators must be positioned decoupled of the drive



Linear actuators: These linear actuators are designed to save product designers the difficulties of engineering a linear stage from large and awkward motors, servos, gears and rods. Linear Servos are a plug and play replacement for standard R/C servos



MP-20: The New micro pusher MP-20 is designed to motorize manual drives or mirror mounts and it is an ideal component for limited space conditions

Aims of Micro mechatronical systems and where are they today?

The main aim of production of micromechatronics is to ensure a coherent overall design at the device and system levels integrating both conventional and “micro” solutions and technologies or integrating advanced electromechanical motion devices, actuators, sensors, power electronics, integrated circuits, microprocessors, digital signal processors, and other components

We can also use the denotation (M3) instead of the term micro mechatronics, which are also the main category of micro mechatronics which are in use these days

M3 motion modules are spurring development of smaller, next-generation instruments for medical diagnostics including IVD; DNA identification; pathogen detection; electrophysiology research and many other applications. Their small size, high resolution and low power use cannot be matched by traditional stepper motor systems

They are applicable in Aerospace & Defense Applications

Eg: 1

Targeting systems: Compact linear motion modules provide precision control for extremely accurate laser targeting

2.

Missile and munitions controls. Custom rotary actuators offer high torque, high speed and high precision in extremely thin packages

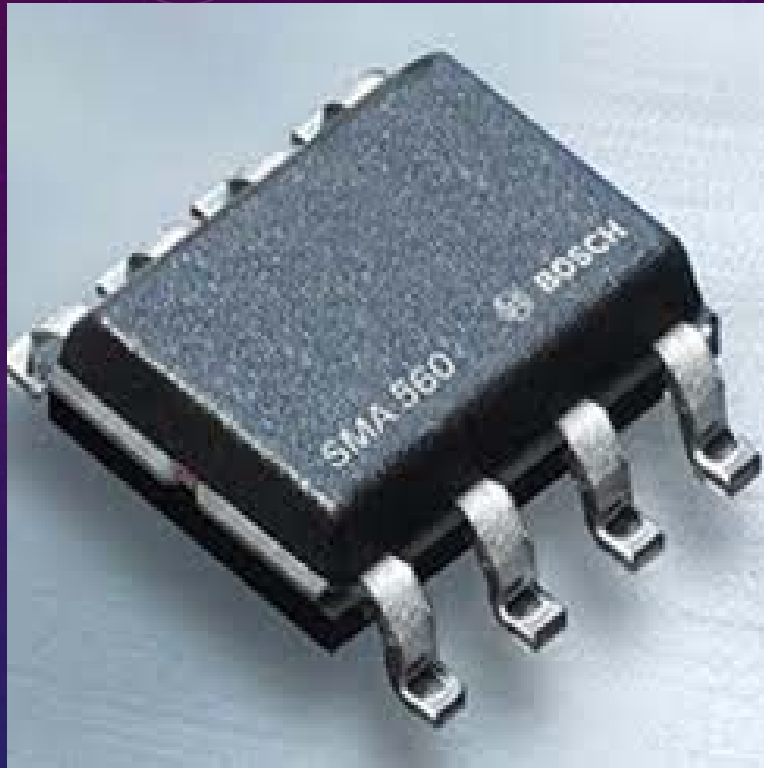
Medical application:

Medical imaging. Small, precise modules for lens control and laser tuning enable systems for point-of care-diagnostics, home monitoring and telemedicine, real-time automated data collection and augmented vision eyewear.

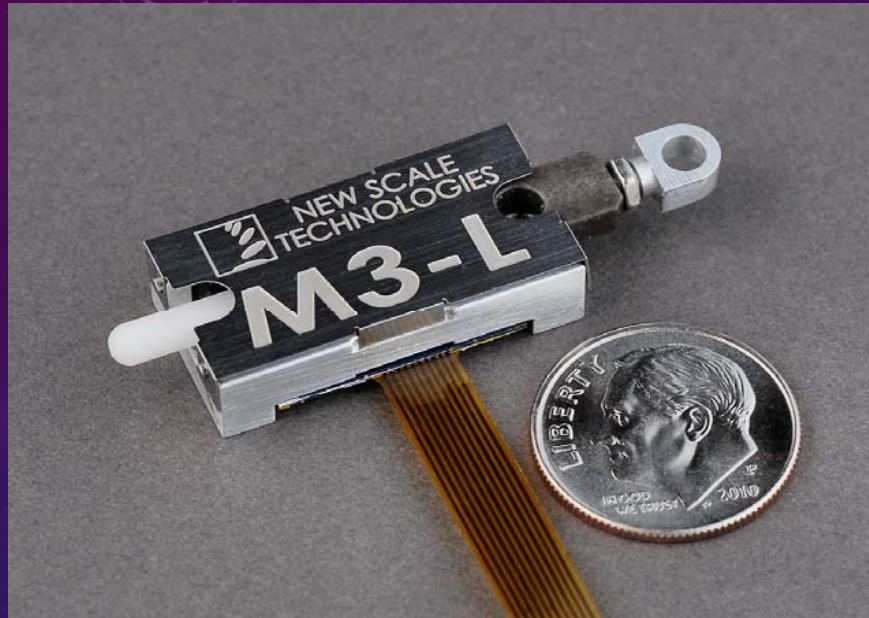
Implantable devices. Adjust implanted devices in situ for drug delivery, orthopedics (bone growth and spine straightening), audiology, neurology, pain management, sleep apnea treatment and more. The implanted devices can be non-magnetic and MRI-safe



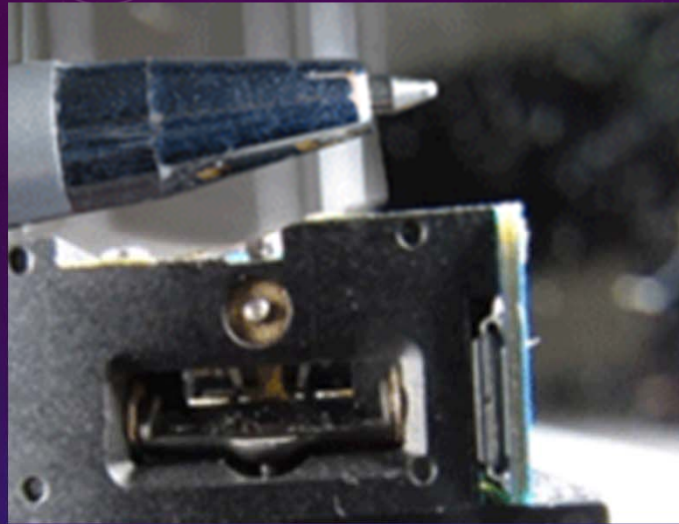
The application note [M3-F focus modules in camera system design](#) describes the use of the M3-F module in camera systems. It includes module details, comparison to other focus techniques, block diagrams and integration information, and discussion of bi-directional vs. uni-directional repeatability and other performance considerations.



Micro mechatronics are expected to be the key component of the mechanical system, such as in electronic automotive technologies



The M3-L is ideal for precision tuning of [photonics](#), microwave and [RF](#) systems. [Defense](#) applications including laser beam steering and targeting, UAV and UGV flight controls, and field-portable systems for biomedical and chemical detection and analysis



M3-R rotary module: rotary piezo motor systems are used for fiber positioning and laser stabilization, in surgical tools and MRI-compatible medical devices, as theta stages in micro assembly or optical inspection, in pan and tilt gimbals for high-performance sensors in UAVs and micro UAVs, as actuators in guided munitions and missile systems, and in instrument testing and calibration.

• **THANK YOU FOR YOUR TIME**

December 18 2013