

## 7.1.4 Summary to: 7.1 MEMS - Products and Developments

**MEMS** are "Micro Electro Mechanical Systems" including also micro optics, micro fluidics and generally meaning micro systems.

**MEMS** uses **Si** substrates and technologies because "it is there and cheap" for the non-electronic part *and* because electronic components can be integrated on the same chip.

Examples of high-volume **MEMS** products are

- (Pressure) sensors.
- Accelerometers.
- Gyros
- "Beamer" chips (**DLP**)

More products are to come; **MEMS** is an *emerging* and often an *enabling* technology

**Gyros** are particular complex **MEMS** sensor products with a huge range of applications.

- There must be a physical principle behind the sensor design; different approaches can be used.
- One approach uses the **Coriolis force** causing detectable additional vibrations in an oscillator with two degrees of freedom if some rotation is experienced.

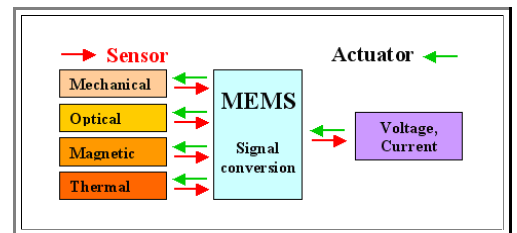
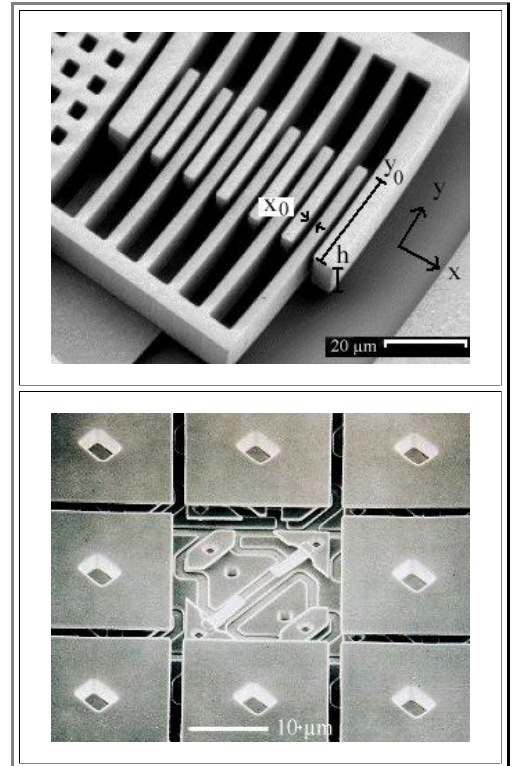
Many **MEMS** devices are either sensors or actuators.

Looking only at mechanical **MEMS**, there is a need to couple mechanical movements to electrical signals and vice versa.

Ways to do this include.

- Capacitive coupling
- Piezoelectric and piezoresistive coupling.
- Thermal coupling (expansion, resistivity changes).
- Magnetic coupling.
- Optical coupling.

There is no "ideal" coupling; all methods suffer from certain problems.



### Exercise 7.1-1

All Questions to 7.1