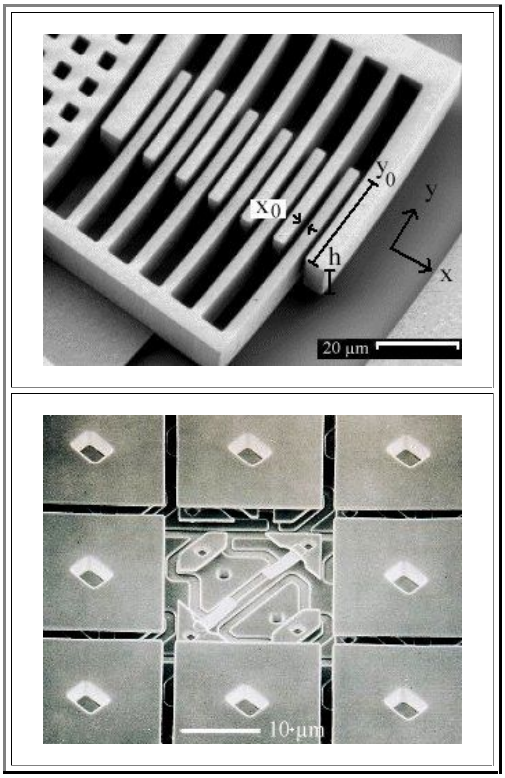
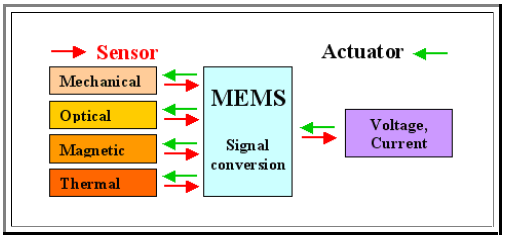
7.1.4 Summary to: 7.1 MEMS - Products and Developments



- **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 verse.
  - Ways to do this include.
    - Capacitive coupling
    - Piezoelectric and piezoresisitive 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