



MEMS Application to Bio and Medical Devices

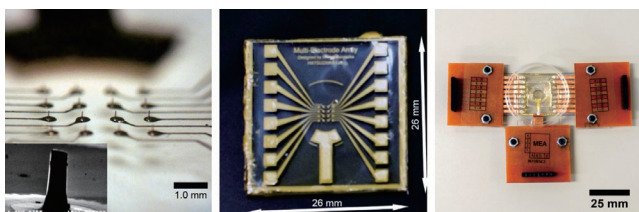
FIRST, Industrial Mechano-System Research Core

<http://www.hat.first.iir.titech.ac.jp>

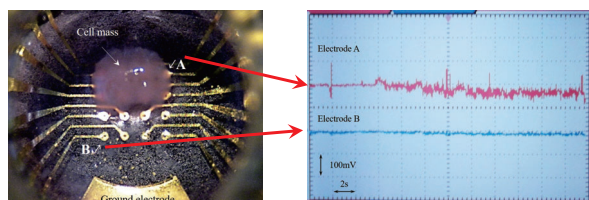
- Cell Activity Monitoring Device
- Cell Culture Device with Differentiation Induction Function
- Endoscope for Tumor Detection
- Bio-Power Driven Micro Mechanisms

Cell Activity Monitoring Device

A device fabrication method that allows easy setting of pitch and height of electrodes and easy replication is developed for exploring electric communication among cell sheet or cell masses. The device is fabricated by backside exposure of thick film resist, replication by epoxy resin, and finally wiring by gold film lift off.



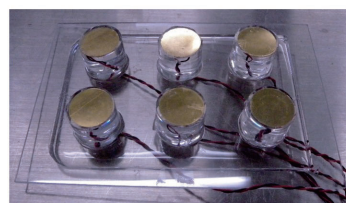
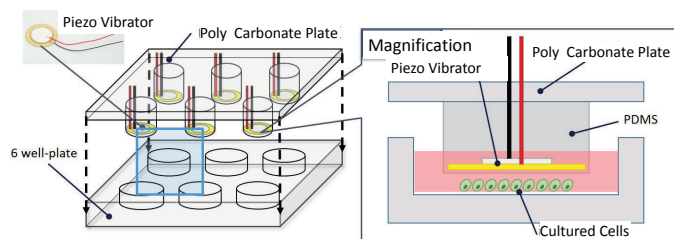
Epoxy replicated 4x4 electrode array (height 200 μ m, pitch 1mm) .



An example of monitoring on tumor cell mass.

Cell Culture Device with Differentiation Induction Function

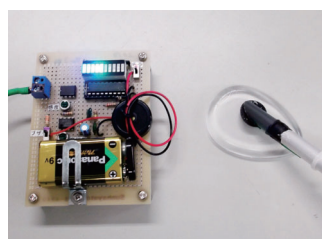
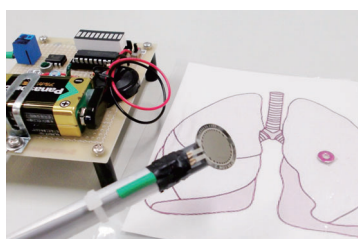
For the cultivation of differentiated cells in response to mechanical stimuli such as bone cells, a device with cell stimuli is developed. For the exploration of stimuli conditions on differentiation, piezo vibrators are installed on the bottom of culture plate.



Piezo vibrator for cell stimuli is installed in the 6-hole culture plate.

Endoscope for Tumor Detection

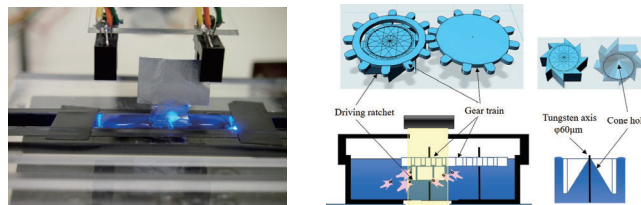
With the spread of endoscopic surgery, access from the skin aperture to the organ is restricted, confirmation of lesion area of the surgeon is becoming difficult. Various sensors are attached to the end of the endoscope, which acts as doctor's finger feelings.



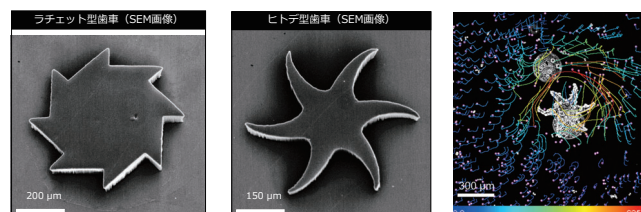
各種臓器モックアップによるセンサ感度調整とLEDバースケール/スピーカーによる表示例

Bio-Power Driven Micromechanisms

Driving the mechanism directly by the kinetic energy of living organisms are developed for the power source of battery-less systems. With oceanic zooplankton and migratory phytoplankton reciprocating and gear type mechanisms are successfully driven..



Reciprocation by the phototaxis of Artemia and ratchet gears driven by Volvox



フォトレジスト製ラチェット歯車と遊走藻ボルボックスによる駆動解析の様子