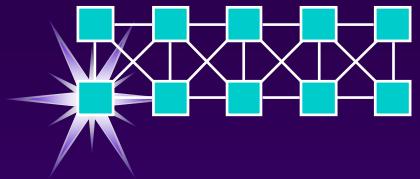
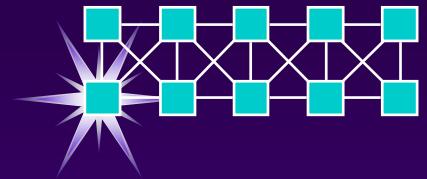


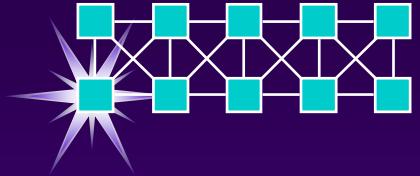
Medical Imaging Systems



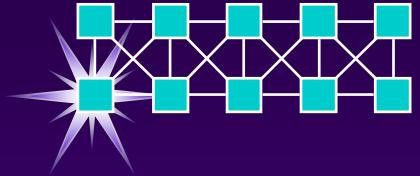
- ◆ Radiography
- ◆ Tomography
- ◆ Magnetic Resonance Imaging (MRI)
- ◆ Nuclear Medicine
- ◆ Ultrasound
- ◆ **Electrical Impedance Tomography**
- ◆ Breast Thermography
- ◆ Others (Elastography, Spectroscopy, Ophthalmology)



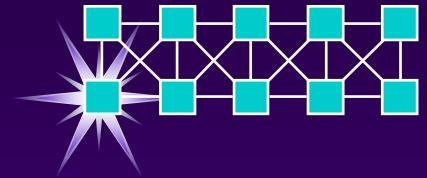
Electrical impedance tomography (EIT)



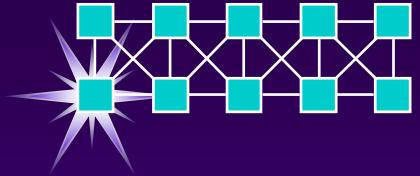
- ◆ A medical imaging technique in which an image of the **conductivity** or **permittivity** of part of the body is measured from surface.
- ◆ Invention of EIT: John G. Webster, 1978



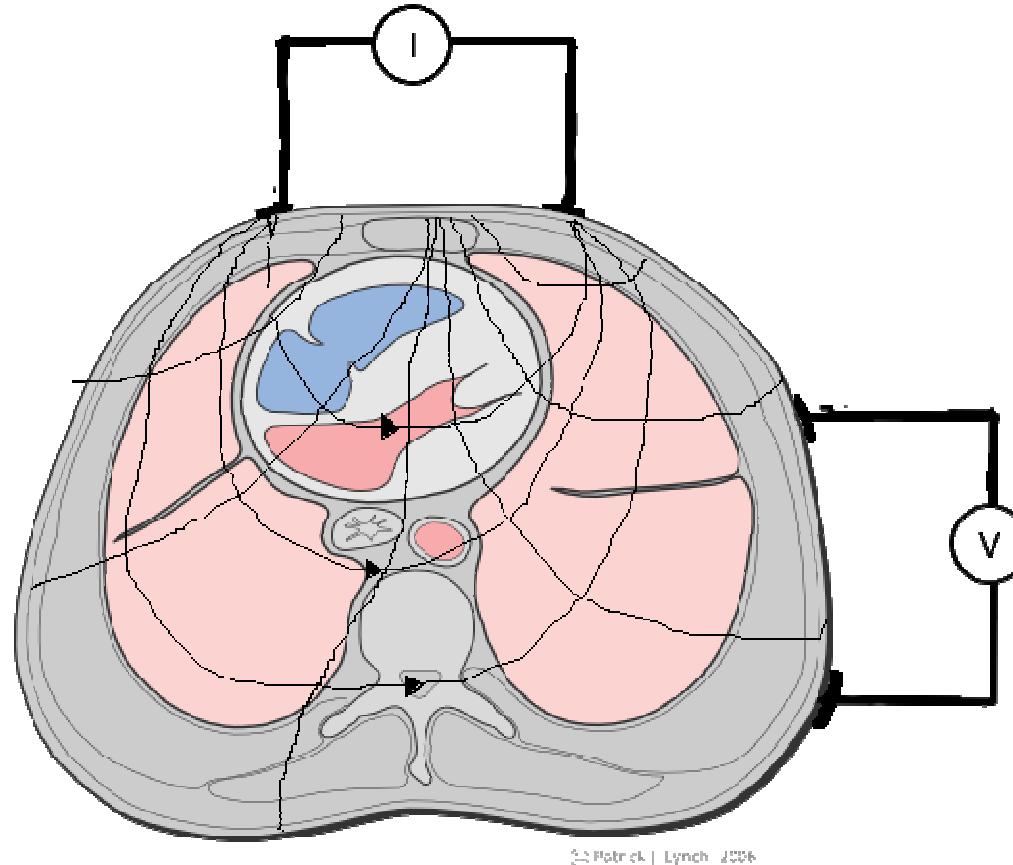
- ◆ Conducting electrodes are attached to the skin of the subject and small alternating currents are applied to some or all of the electrodes.
- ◆ The resulting electrical potentials are measured



- ◆ Proposed applications include
 - monitoring of lung function,
 - detection of cancer in the skin and breast and
 - location of epileptic foci.



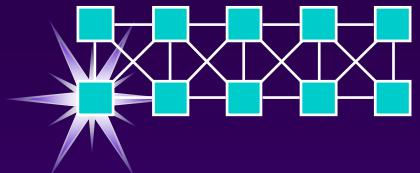
- ◆ Mathematically, it is a non-linear inverse problem and is severely ill-posed.



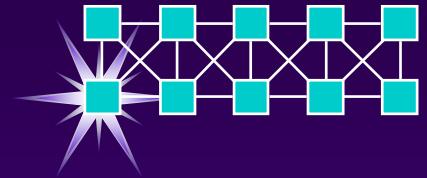
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A cross section of a chest showing a current being applied across two electrodes resulting in current stream lines and equi-potential lines

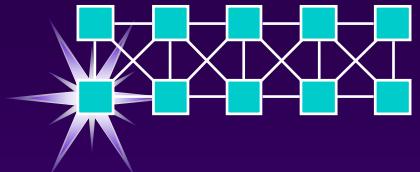
Condition of Electrical Impedance Imaging



- ◆ The currents used are relatively small, not to cause stimulation of nerves.
- ◆ The frequency of the alternating current is sufficiently high not to give rise to electrolytic effects in the body



The Ohmic power dissipated is sufficiently small and diffused over the body to be easily handled by the body's thermoregulatory system.



Lung imaging

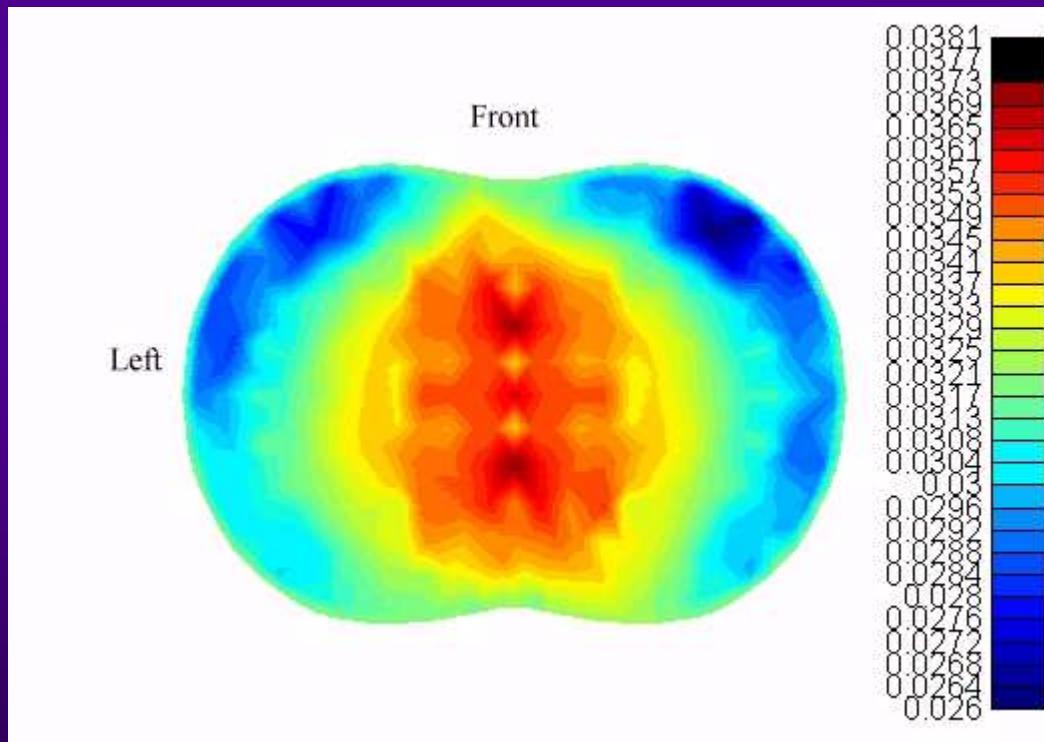
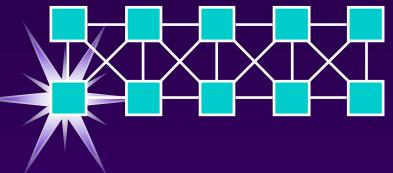
- ◆ EIT is useful for monitoring patient lungs because the air has a large conductivity contrast to the other tissues in the thorax.



Electrodes on chest



Wires attached



Resulting image