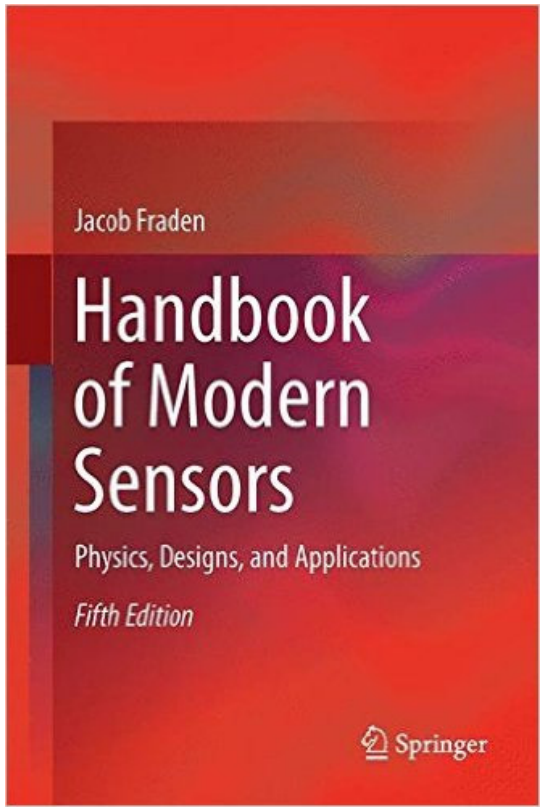
Introduksjon til FYS 3231 / 4231

- Presentasjon av kurspersoner
- Hvem er studentene?
- Lærebok og forelesninger
- Websider
- Forskjell 3231 / 4231
- Sensorama 2018
- Litt om målesystemer og sensorer

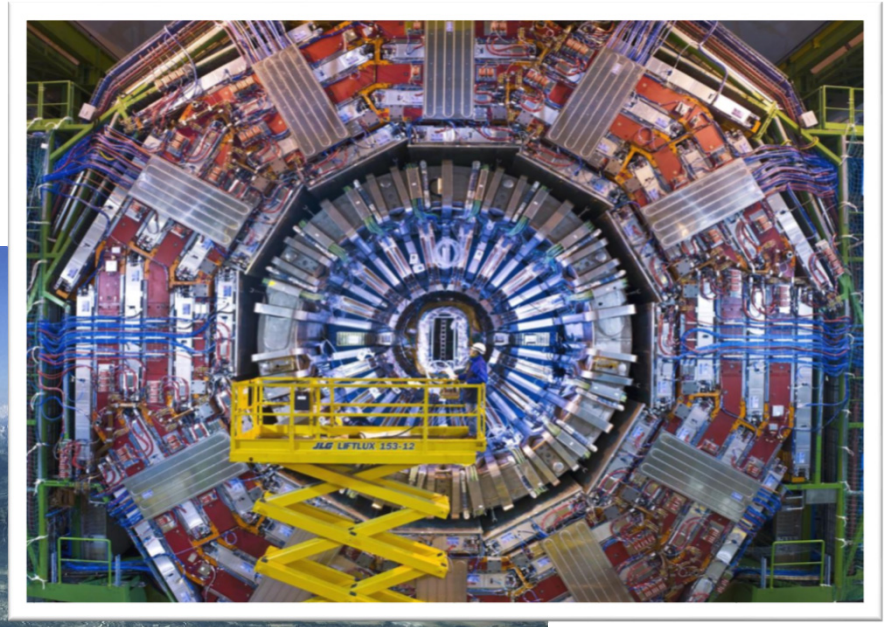
Tentativ forelesningsplan

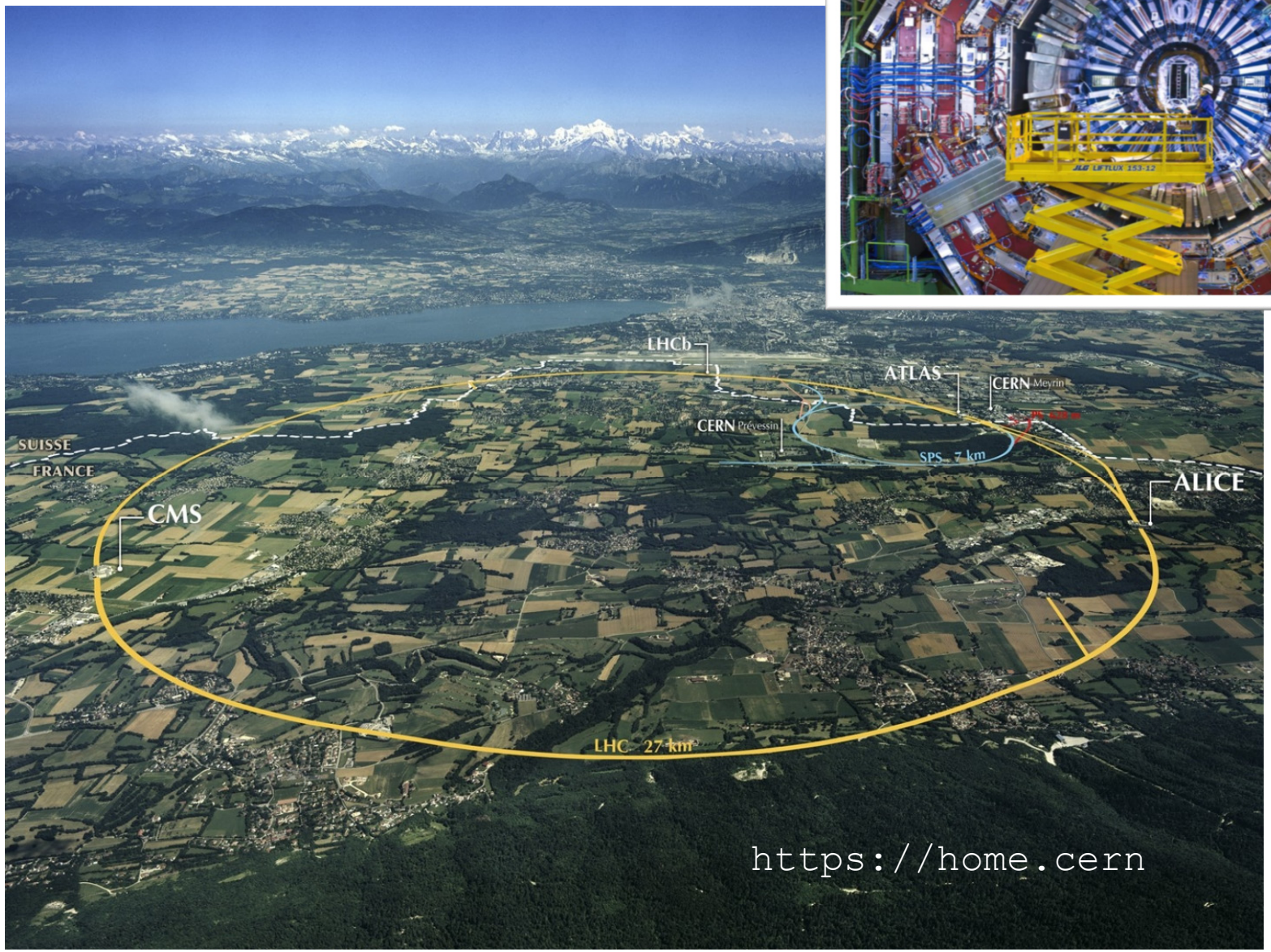


Gratis som PDF på nett (fra UiO-IP) eller kjøpes på Akademika

22-Aug	Innledning, begreper og Sensorama 2017 (kap. 1)
23-Aug	Bioimpedans og instrumentering (kap. 6)
29-Aug	Transferfunksjoner (kap. 2)
30-Aug	Sensorspesifikasjoner (kap. 3)
5-Sep	Fysiske prinsipper (kap. 4)
6-Sep	Ingen forelesning
12-Sep	Sensorama 2018
13-Sep	Optikk og tilstedeværelsessensorer (kap. 5 og 7)
19-Sep	Vitenskapelig publisering
20-Sep	Ingen forelesning
26-Sep	Ingen forelesning
27-Sep	Gjesteforelesning?
3-Oct	Ingen forelesning
4-Oct	Posisjons- og hastighetssensorer (kap. 8 og 9)
10-Oct	Ingen forelesning (midtveisuke)
11-Oct	Ingen forelesning (midtveisuke)
17-Oct	Sensorama 2018
18-Oct	Kraft-, trykk og strømningssensorer (kap. 10-12)
24-Oct	Akustiske sensorer og fuktighetssensorer (kap. 13 og 14) + opamkretser
25-Oct	Ingen forelesning
31-Oct	Sensorama 2018
1-Nov	Lys- og strålingssensorer (kap. 15 og 16)
7-Nov	Temperatur- og kjemiske sensorer (kap. 17 og 18)
8-Nov	Eksamenslesning + Sensorama 2018
14-Nov	
15-Nov	
21-Nov	
22-Nov	
28-Nov	**Digital eksamen**

Akademisk måle-system og sensor





Industrielt målesystem og sensor

Contents lists available at SciVerse ScienceDirect

Food Chemistry

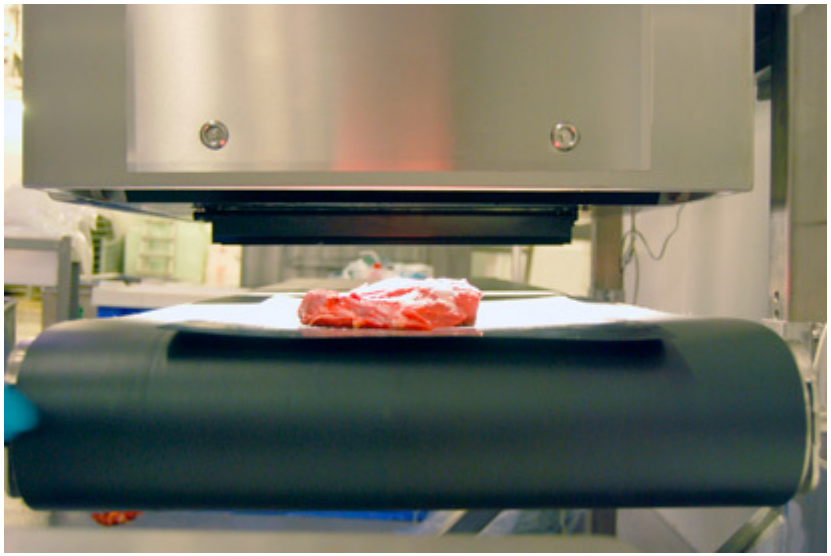
journal homepage: www.elsevier.com/locate/foodchem

Analytical Methods

Non-destructive assessment of instrumental and sensory tenderness of lamb meat using NIR hyperspectral imaging

Mohammed Kamruzzaman [a], Gamal ElMasry [a], Da-Wen Sun [a,*], Paul Allen [b]

[a] Food Refrigeration and Computerised Food Technology (FRCFT), School of Biosystems Engineering, University College Dublin, National University of Ireland, Agriculture & Food Science Centre, Belfield, Dublin 4, Ireland
[b] Ashtown Food Research Centre (AFRC), Teagasc, Dublin 15, Ireland



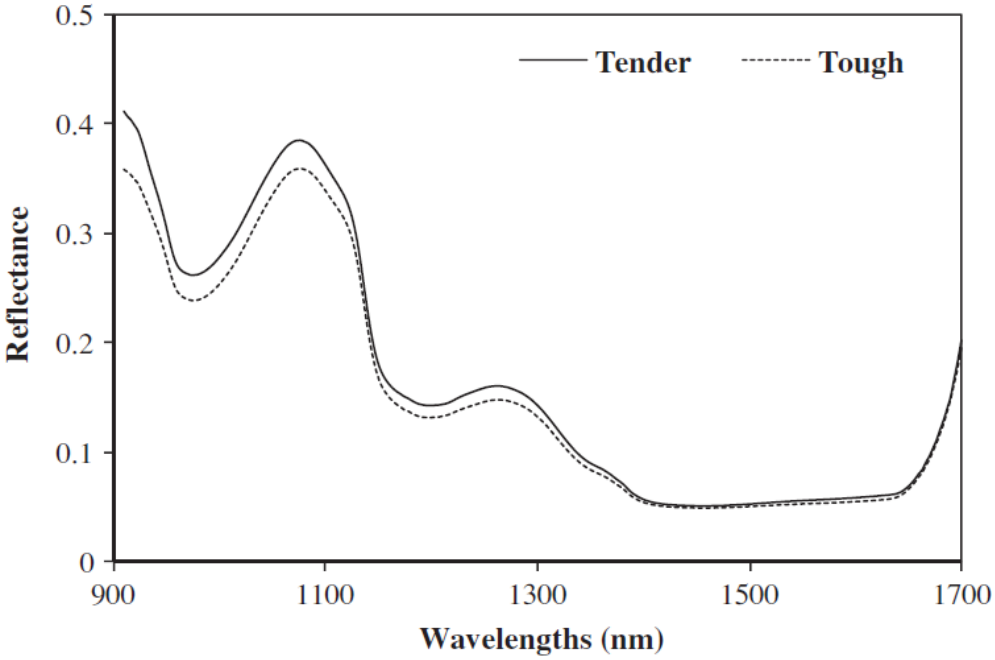
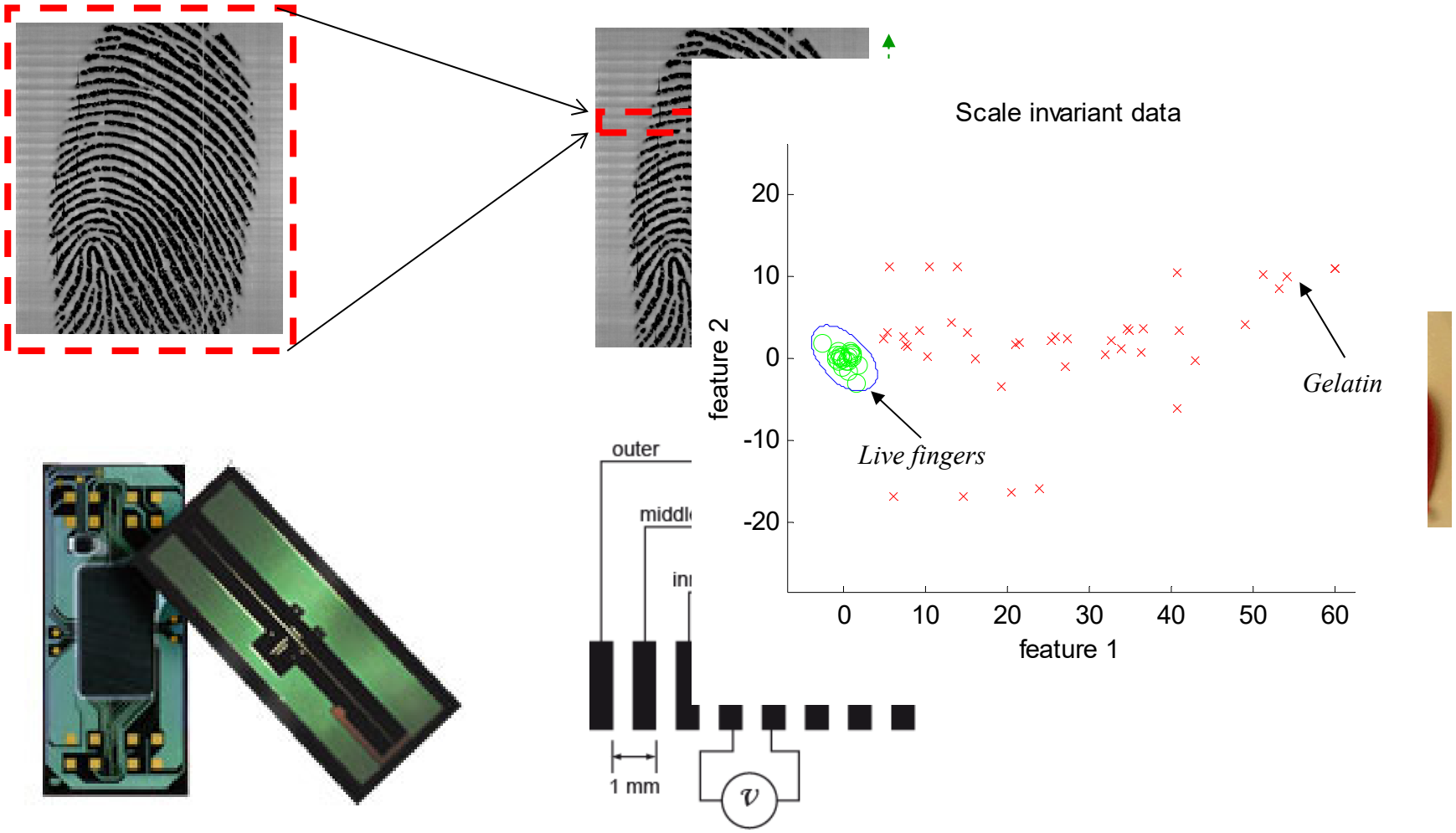


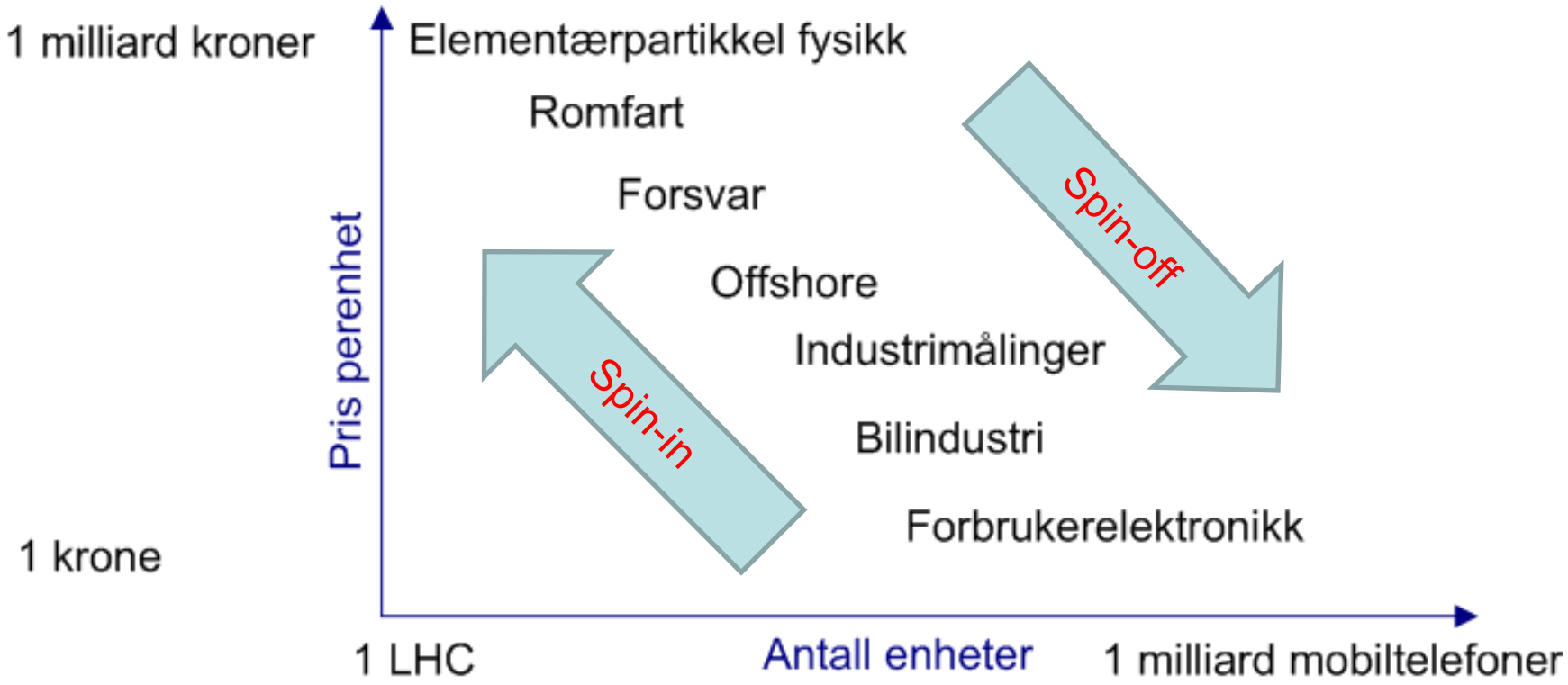
Fig. 1. Average NIR reflectance spectra of tender and tough lamb samples.

Sensorer i forbrukerelektronikk

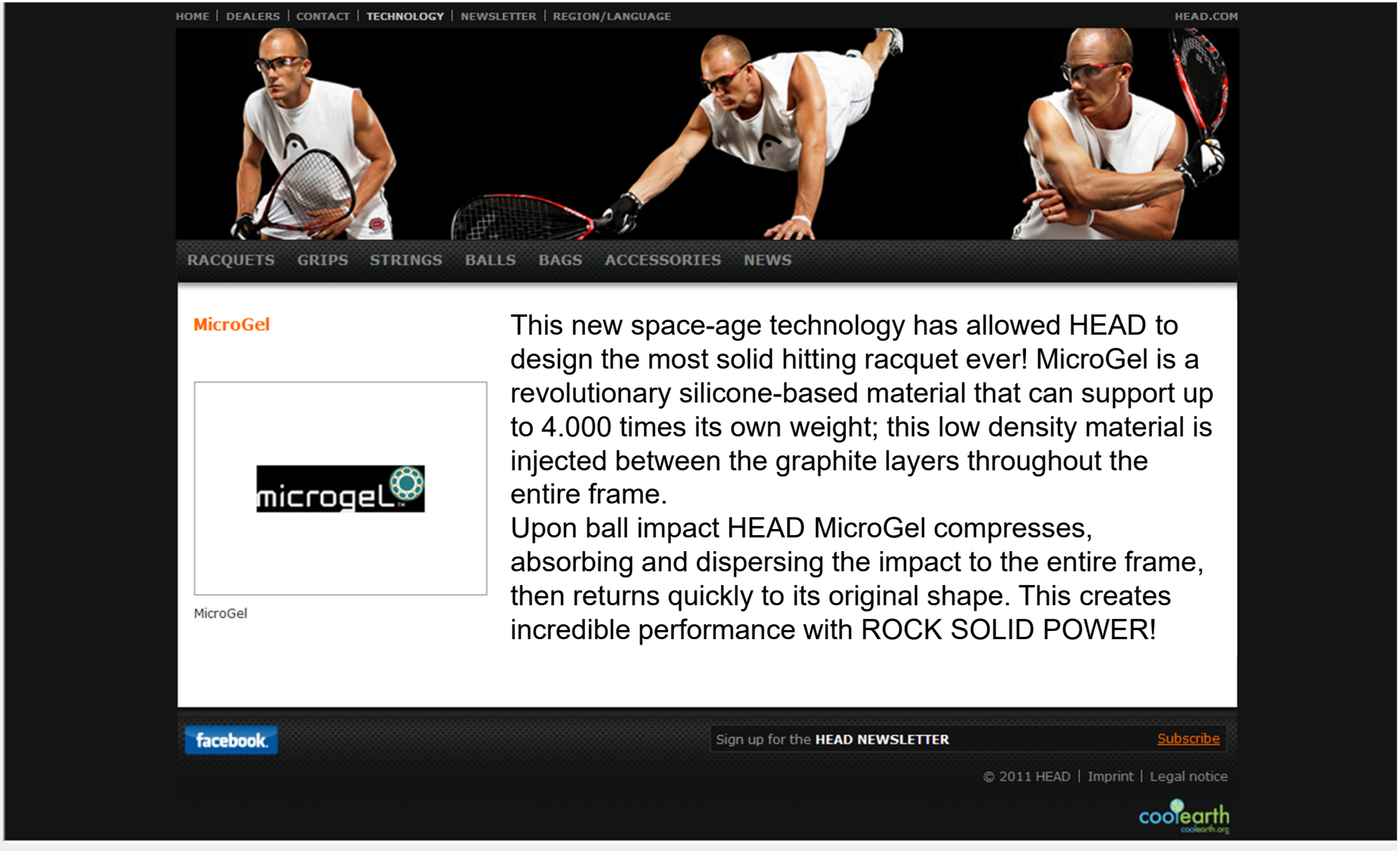
Nye forbrukersensorer



Sensormarkeder



Spin-off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- International collaboration
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Resources

News

ESA highlights online games as key future technology

23 March 2010

Video gaming has become one of the globe's most popular pastimes. Fans say games are often educational, their detractors answer they are anything but. Might ESA have something to learn from gaming? A new Agency study says the answer is yes.

Related links
- Education with ESA
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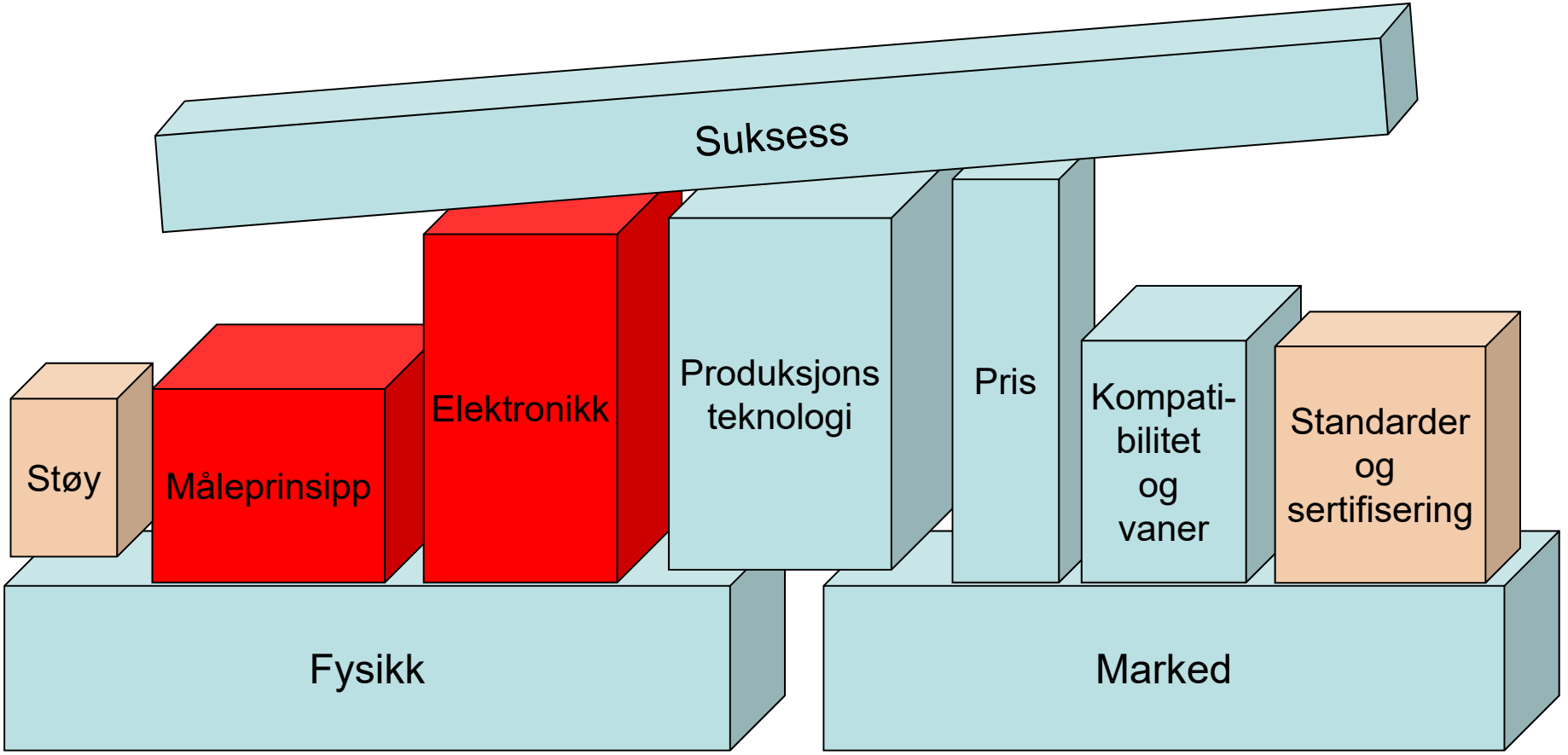
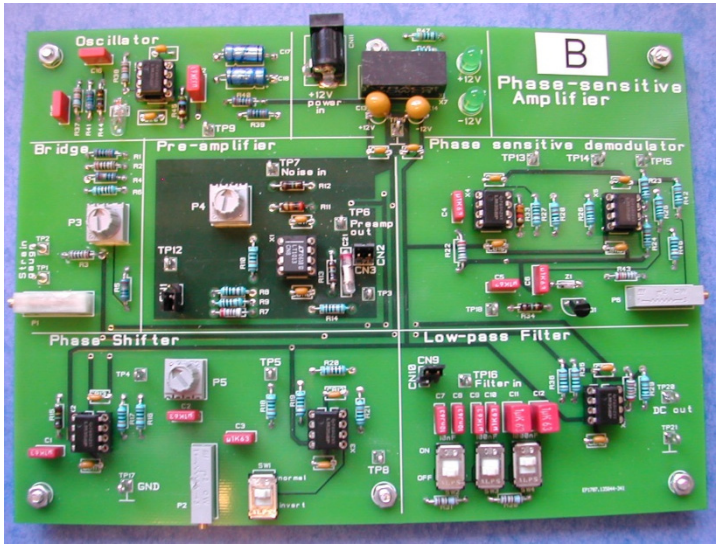
ESA on Youtube

YouTube

Suksessfaktorer for sensorer



Instrumenteringsløsninger



Noen konsepter

- **Transduser:** Enhet som konverterer fra en energiform til en annen
- **Sensor:** Enhet som konverterer et stimulus til et elektrisk signal
- **Aktuator:** Motsatt av sensor; konverterer et elektrisk signal til en ikke-elektrisk energiform
- **Direkte sensor:** Gir elektrisk signal i ett trinn (motsatt: indirekte sensor)
- **Aktiv sensor:** Tilfører energi for å måle (motsatt: passiv sensor)

Målesystem – Sensor - Transducer

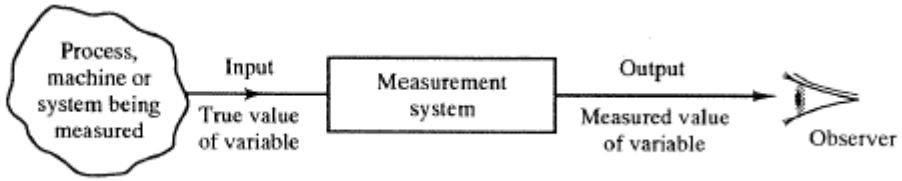


Fig. 1.1 Purpose of measurement system

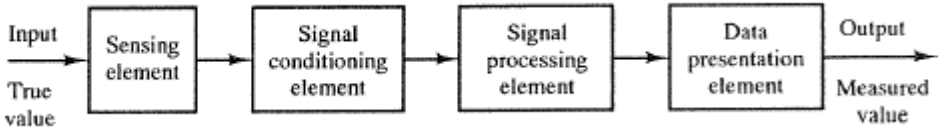


Fig. 1.2 General structure of measurement system

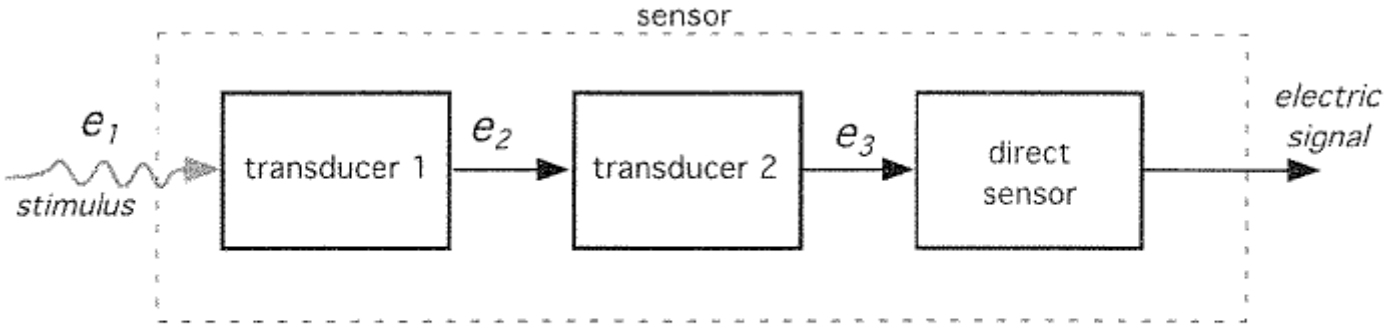


Fig. 1.2. A sensor may incorporate several transducers. e_1, e_2, and so on are various types of energy. Note that the last part is a direct sensor.

Direkte og indirekte sensorer

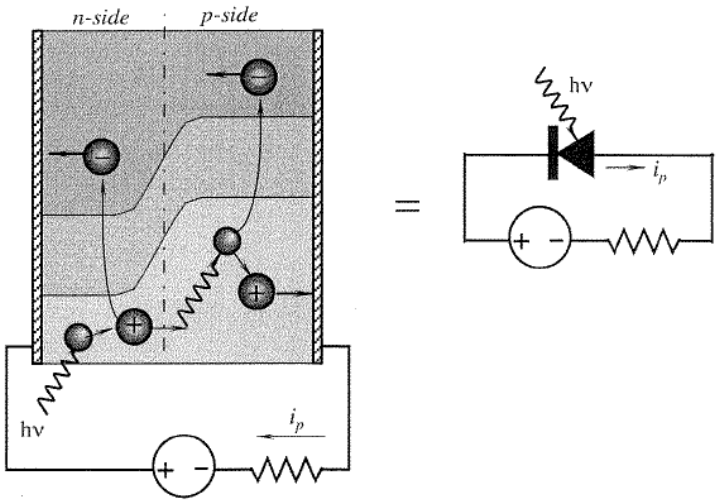


Fig. 14.3. Structure of a photodiode.

En direkte sensor gir en elektrisk respons i ett trinn

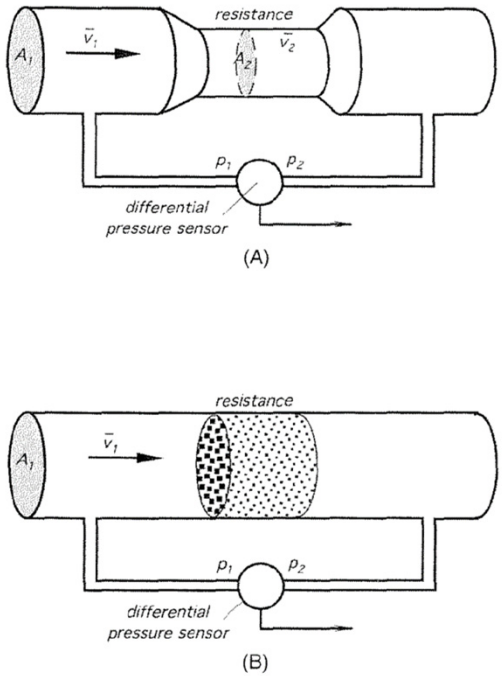


Fig. 11.3. Two types of flow resistor: a narrow channel (A) and a porous plug (B).

En indirekte sensor overfører først energi fra en form til en annen. Ofte via en transducer.

Aktive og passive sensorer

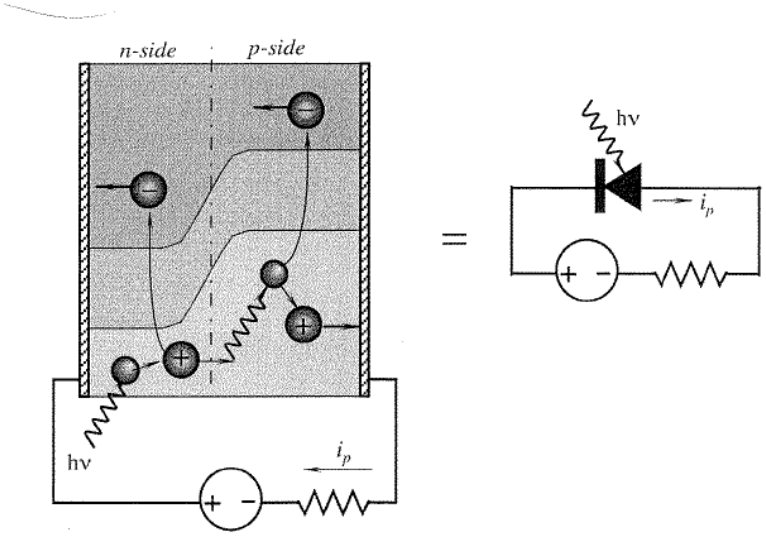
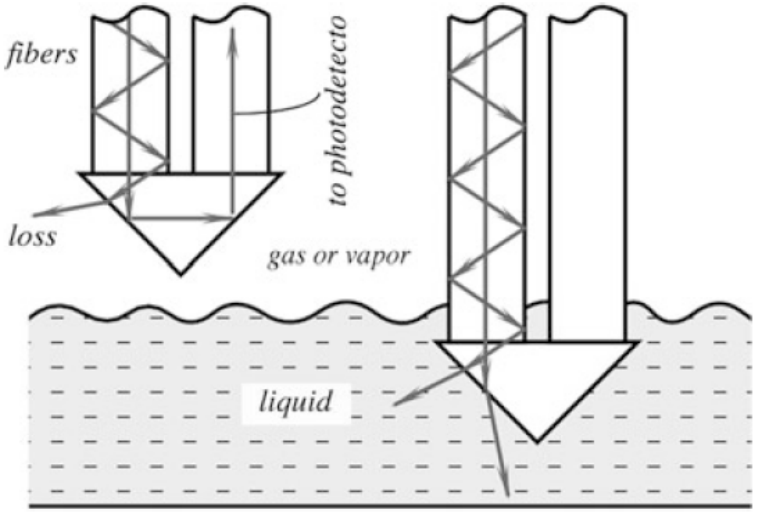


Fig. 14.3. Structure of a photodiode.

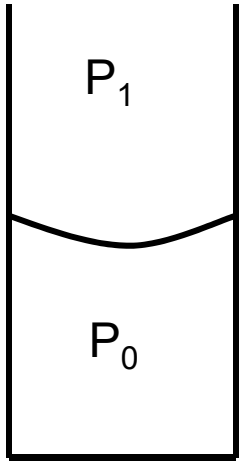
En passiv sensor henter energien fra det den måler

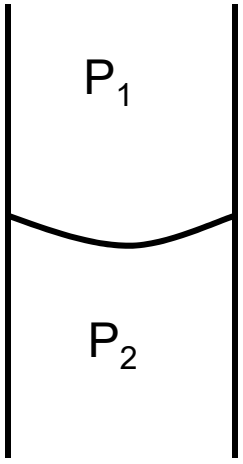
Fig. 7.31 Optical liquid level detector utilizing a change in the refractive index



En aktiv sensor tilfører energien den trenger for å gjøre målingen

Absolutt eller relativ sensor





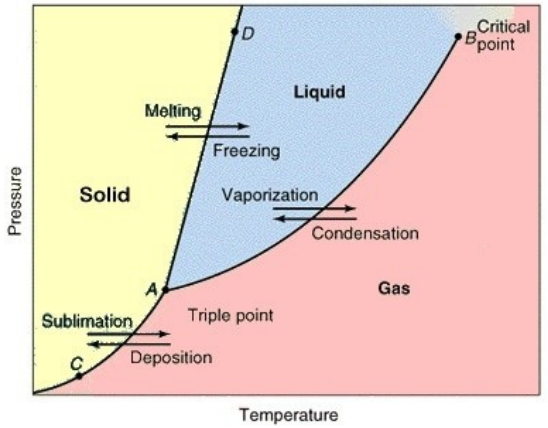
SI-systemet

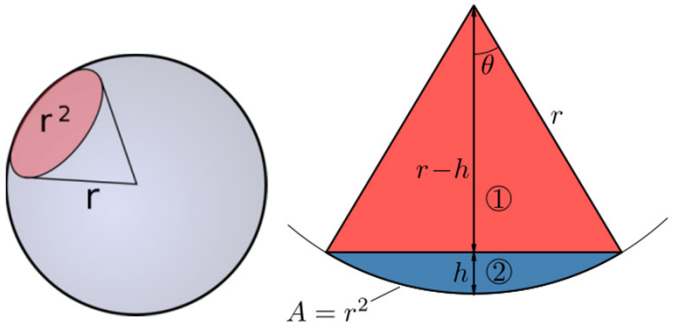
- SI-systemet (Système International)
- 1791: En meter var 1/10.000.000 av avstanden fra Nordpolen til Ekvator gjennom Dunkirk og Barcelona. Bare 0.02% forskjellig fra dagens verdi.
- SI stammer fra slutten av 1800-tallet:
  - Meter: avstanden mellom to merker på en platina-stav
  - Kilogram: massen av vann i en kube 0,1 x 0,1 x 0,1 meter
  - Sekund: 1 / 86.400 av et gjennomsnittsdøgn
  - Disse tre var de første av de syv SI-enhetene

Table 2.1. *SI base units, symbols and definitions*

Quantity	Unit	Symbol	Definition
Mass	kilogram	kg	The kilogram is equal to the mass of the international prototype of the kilogram. (The prototype kilogram is made from an alloy of platinum and iridium and is kept under carefully controlled environmental conditions near Paris.)
Time	second	s	The second is the duration of 9 192 631 770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the cesium-133 atom.
Length	metre	m	The metre is the length of the path travelled by light in a vacuum during a time-interval of 1/299 792 458 of a second.
Thermodynamic temperature	kelvin	K	The kelvin is the fraction 1/273.16 of the thermodynamic temperature of the triple point of water.
Electric current	ampere	A	The ampere is that current which, if maintained in two straight parallel conductors of infinite length, of negligible cross-section and placed one metre apart in a vacuum, would produce between these conductors a force of 2×10^{-7} newton per metre of length.
Luminous intensity	candela	cd	The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540×10^{12} hertz and that has a radiant intensity in that direction of 1/683 watt per steradian.
Amount of substance	mole	mol	The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12.

SNL: **trippelpunkt**, den temperatur hvor et stoff kan eksistere samtidig i både fast, flytende og gassformig tilstand. Dette inntrer ved en bestemt temperatur og et bestemt trykk. Vannets trippelpunkt brukes for å definere temperaturskalaen, og temperaturen er satt lik 273,16 K, dvs. 0,01 °C. Bemerk at andre spesielle punkter, f.eks. frysepunkt, kokepunkt og sublimasjonstemperatur, er trykkavhengige.





Wiki: A graphical representation of 1 steradian. The sphere has radius *r*; the circular patch has an area on the sphere of $A=r^2$. The solid angle is $\theta=A/r^2$ so in this case $\theta=1$. The entire sphere has a solid angle of 4π sr ≈ 12.56637 sr. *Steradian (stereo = solid/romlig) = romvinkel.*

Table 2.2. *Examples of derived units with special names*

Quantity	Derived unit	Symbol	Unit of quantity expressed in base units
Frequency	hertz	Hz	s^{-1}
Force	newton	N	$kg \cdot m \cdot s^{-2}$
Pressure	pascal	Pa	$kg \cdot m^{-1} \cdot s^{-2}$
Energy, work	joule	J	$kg \cdot m^2 \cdot s^{-2}$
Power	watt	W	$kg \cdot m^2 \cdot s^{-3}$
Potential difference, electromotive force (emf)	volt	V	$kg \cdot m^2 \cdot s^{-3} \cdot A^{-1}$
Electrical charge	coulomb	C	$s \cdot A$
Electrical capacitance	farad	F	$kg^{-1} \cdot m^{-2} \cdot s^4 \cdot A^2$
Electrical resistance	ohm	Ω	$kg \cdot m^2 \cdot s^{-3} \cdot A^{-2}$
Electrical conductance	siemens	S	$kg^{-1} \cdot m^{-2} \cdot s^3 \cdot A^2$
Magnetic flux density	tesla	T	$kg \cdot s^{-2} \cdot A^{-1}$
Magnetic flux	weber	Wb	$kg \cdot m^2 \cdot s^{-2} \cdot A^{-1}$
Inductance	henry	H	$kg \cdot m^2 \cdot s^{-2} \cdot A^{-2}$
Absorbed dose	gray	Gy	$m^2 \cdot s^{-2}$
Reaction rate	katal	kat	$mol \cdot s^{-1}$

Table 2.4. *Prefixes used with the SI*

Factor	Prefix	Symbol	Factor	Prefix	Symbol
10^{-24}	yocto	y	10^{1}	deka	da
10^{-21}	zepto	z	$\mathbf{10^{2}}$	**hecto**	**h**
$\mathbf{10^{-18}}$	**atto**	**a**	$\mathbf{10^{3}}$	**kilo**	**k**
$\mathbf{10^{-15}}$	**femto**	**f**	$\mathbf{10^{6}}$	**mega**	**M**
$\mathbf{10^{-12}}$	**pico**	**p**	$\mathbf{10^{9}}$	**giga**	**G**
$\mathbf{10^{-9}}$	**nano**	**n**	$\mathbf{10^{12}}$	**tera**	**T**
$\mathbf{10^{-6}}$	**micro**	**μ**	10^{15}	peta	P
$\mathbf{10^{-3}}$	**milli**	**m**	10^{18}	exa	E
10^{-2}	centi	c	10^{21}	zetta	Z
10^{-1}	deci	d	10^{24}	yotta	Y

15490 Ω

= 15,490 kΩ

= 1,5490 · 10^4 Ω (scientific notation)

= 15,490 · 10^3 Ω (engineering notation)

$$\varepsilon_0 = 8.85 \cdot 10^{-12}\ F/m = 8.85\ pF/m$$