



NTNU

Det skapende universitet

Ultralyd i lommeformat - Det nye stetoskopet

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NTNU

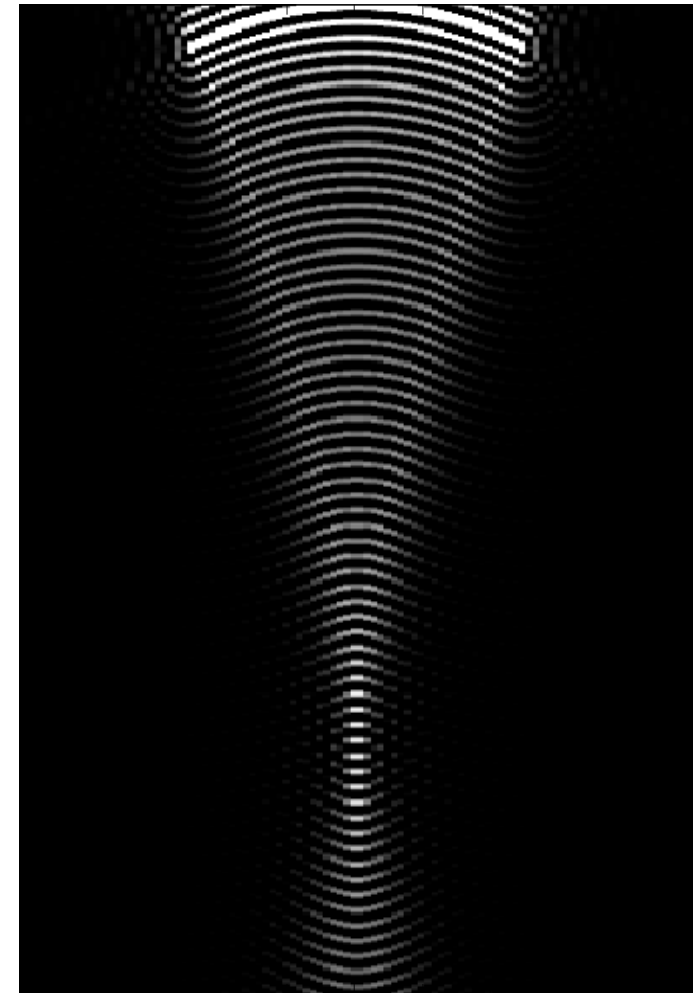
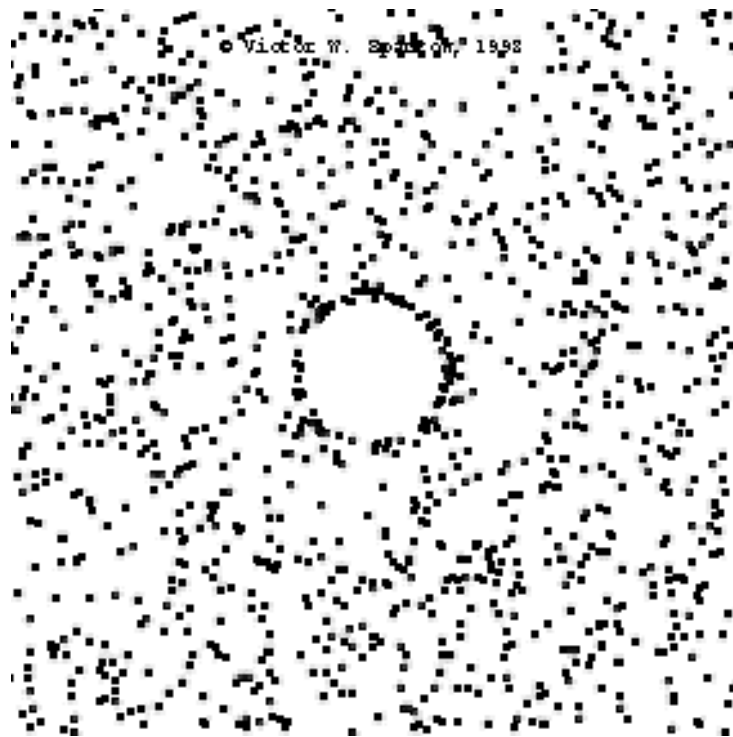
Epost: hans.torp@ntnu.no

Ultralyd i lommeformat

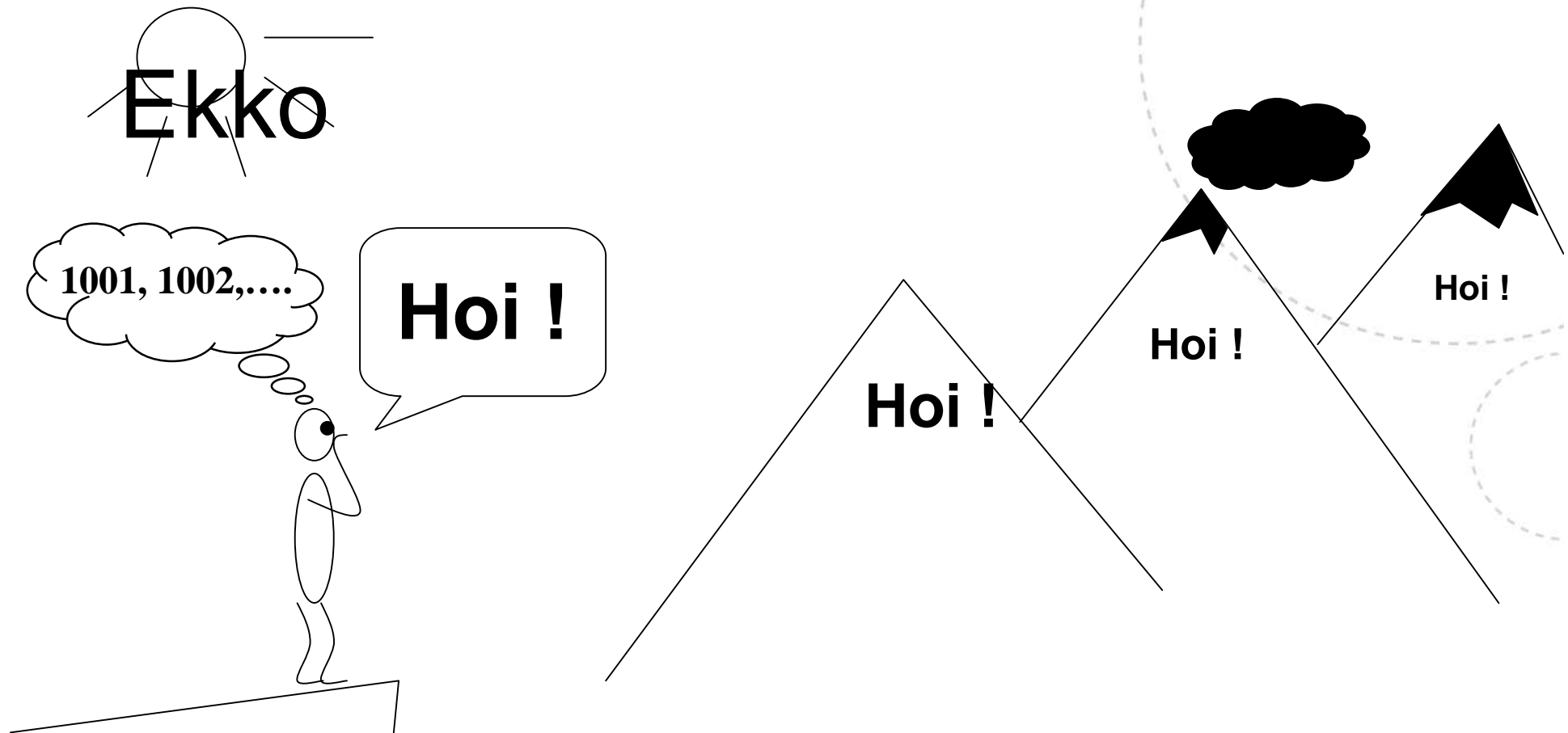
- Det nye stetoskopet

- Å se inn i kroppen med ultralyd
 - Hvordan, og hva ser vi?
- Kan en ultralyd-scanner få plass i lomma?
- Kan vi lage 3-dimensjonale ultralyd-bilder?

Hva er ultralyd?



- Hørbar lyd $f = 20 - 20.000 \text{ Hz}$
- Ultralyd $f > 20.000 \text{ Hz}$
- Diagnostisk ultralyd $f > 2.000.000 \text{ Hz}$

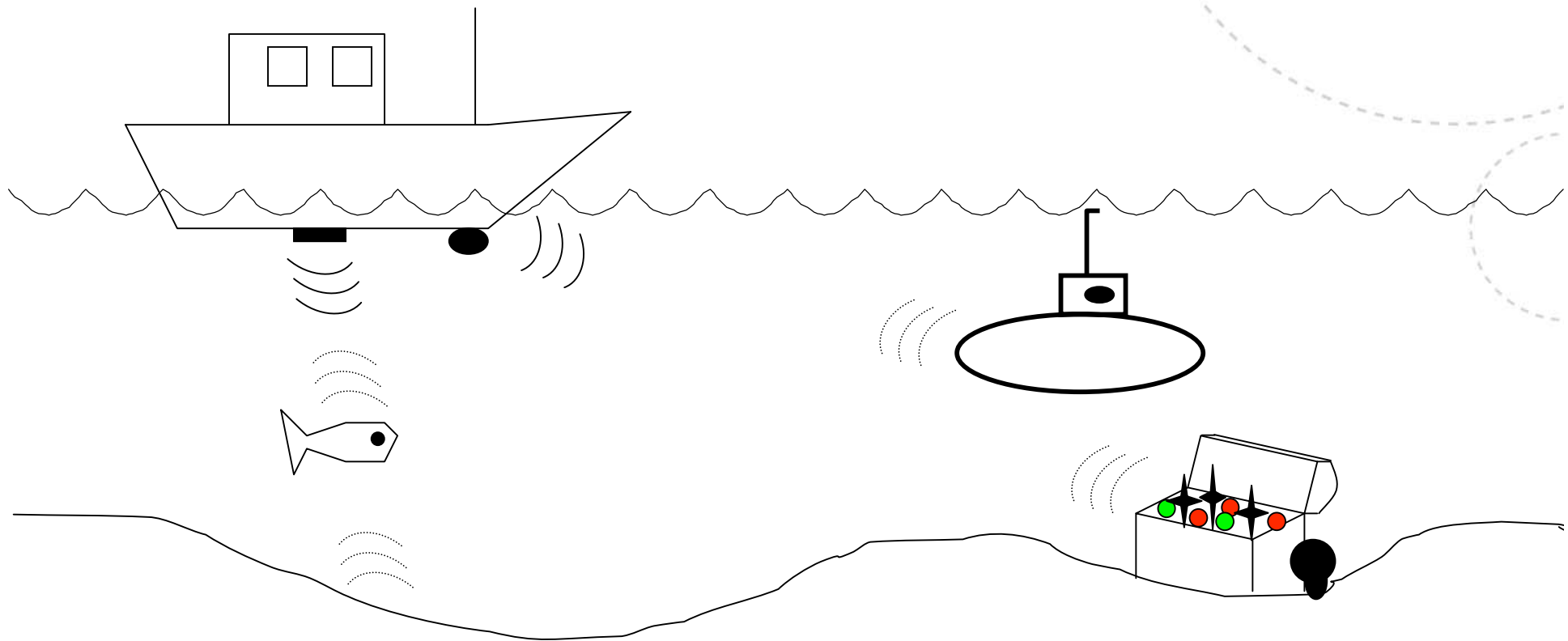


Ekko er reflekterte lydbølger

Vi kan regne ut avstanden til fjellet ved å måle tidsforsinkelsen

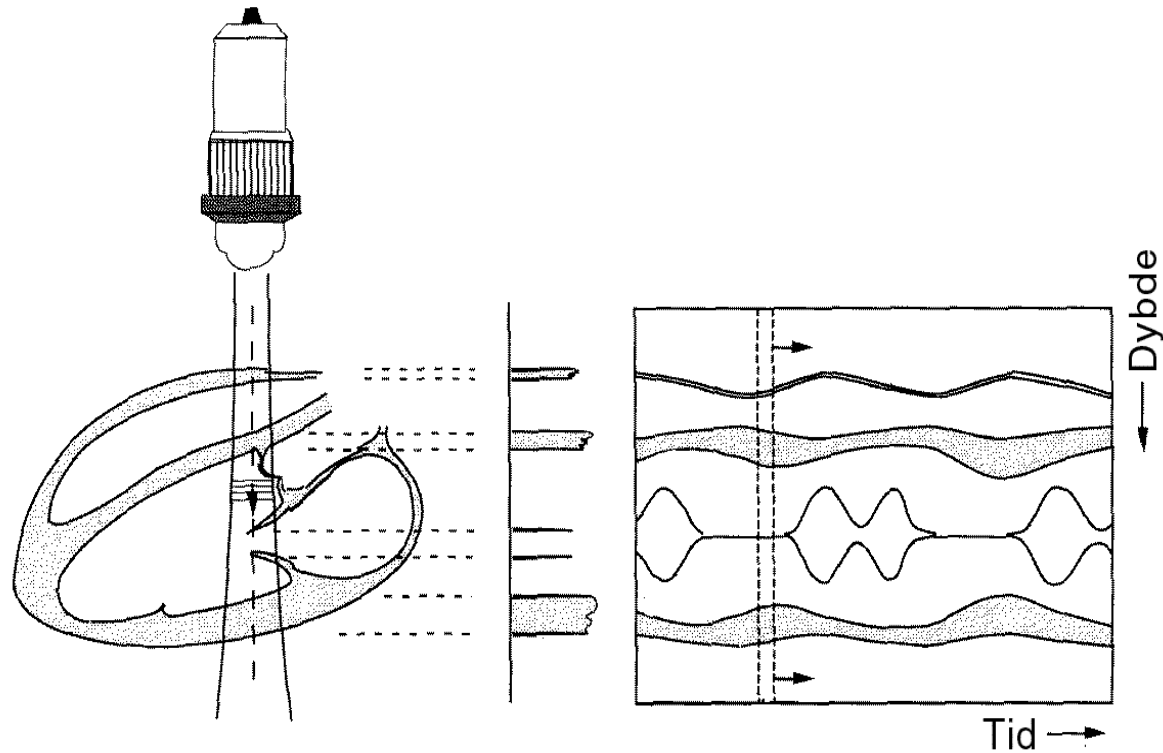
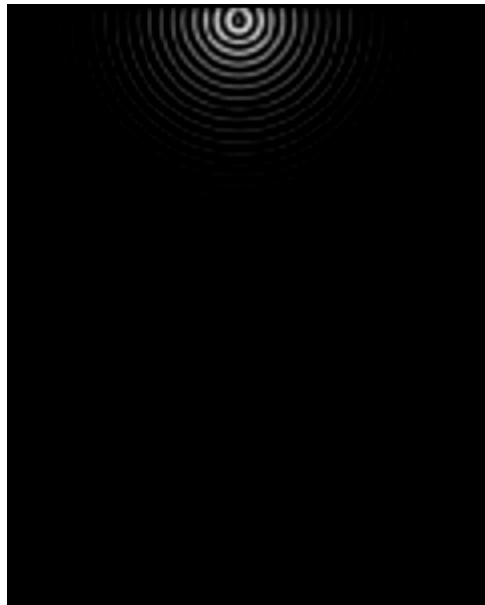
Ekkolodd / Sonar

- Frekvens:
10-150 kHz



Ultralyd M-Mode

Ekkolodd ar



Fokusert ultralydstråle

Ekko fra vevs-strukturer avtegnes på skjermen

 Hans Torp
NTNU, Norway

Det startet i Lund, Sverige i 1953:

 NTNU
Det Norske universitet



Ultralyd probe

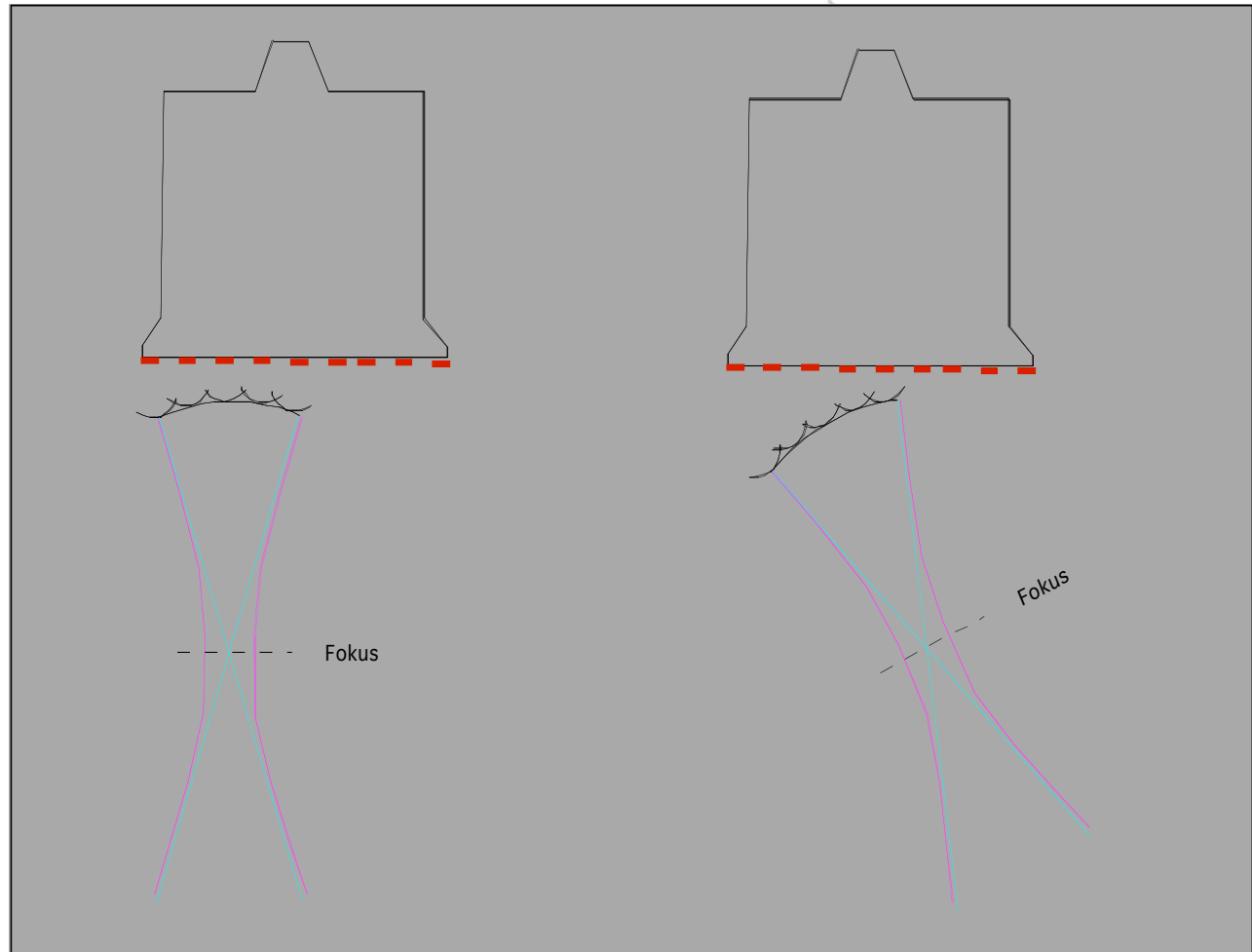


50-200 elementer

Høytaler/mikrofon

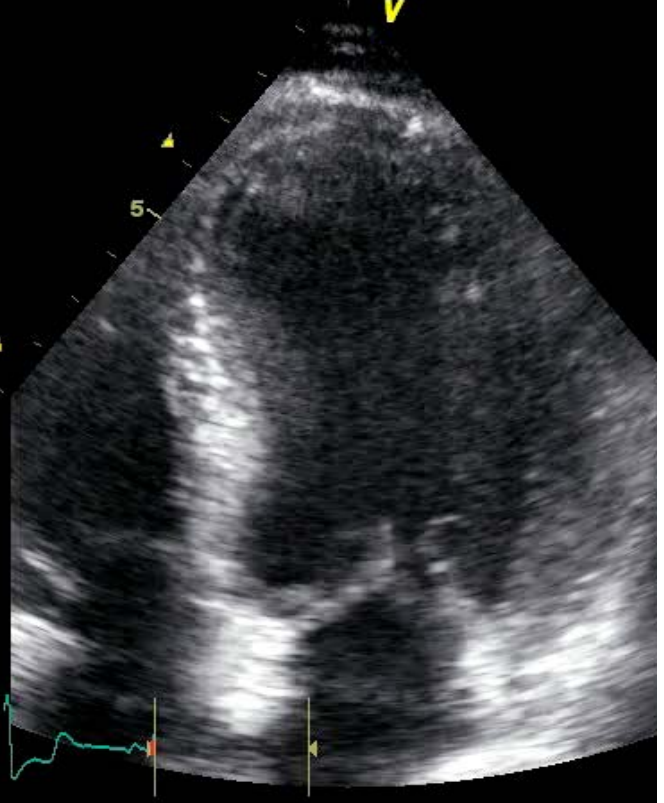
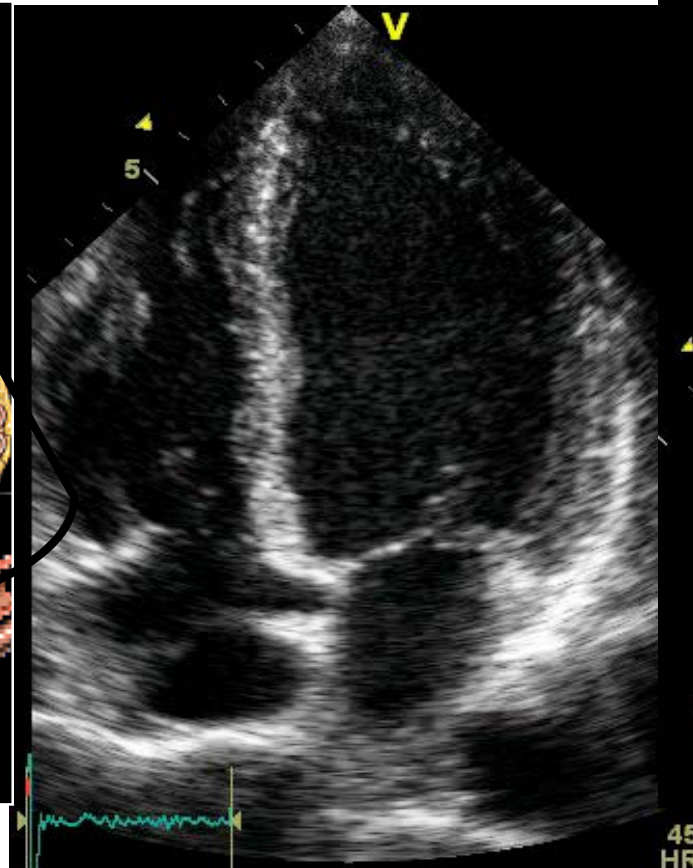
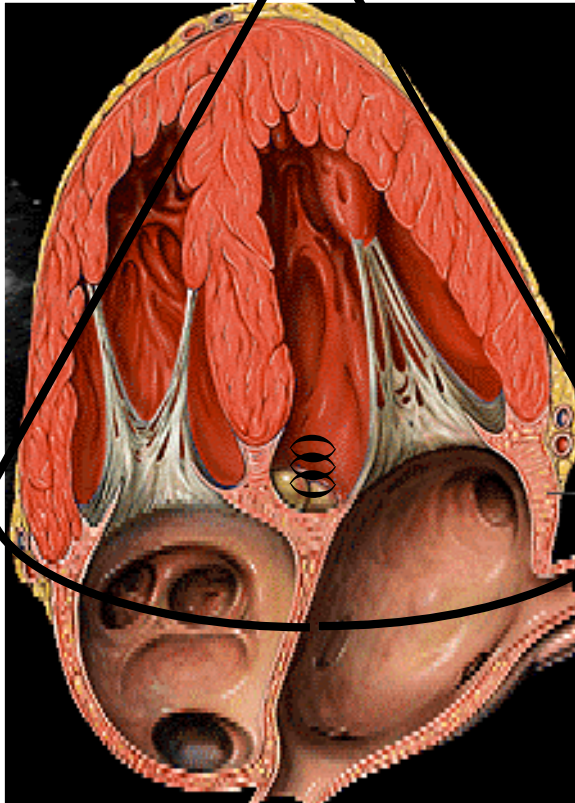
Fokusering

Styring og fokusering

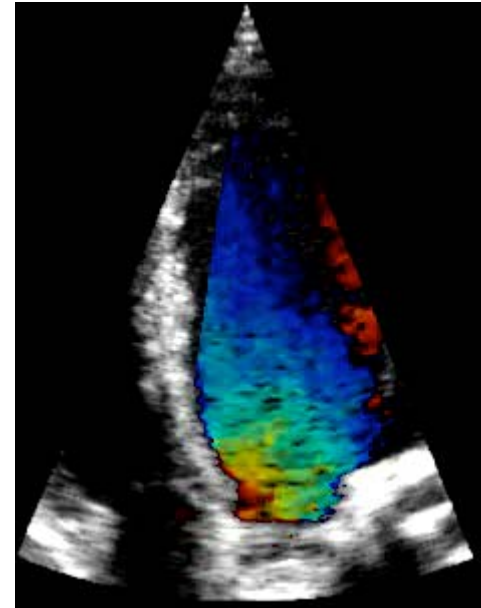
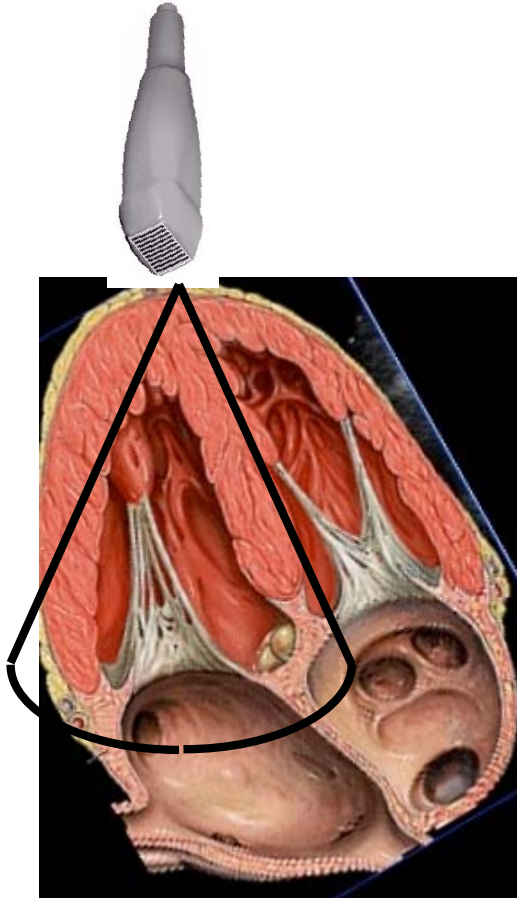




Scanner strålen 50 ganger pr. sekund

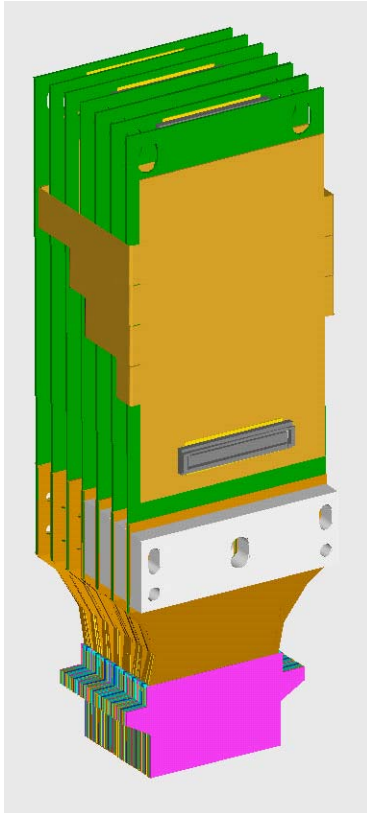


Color Doppler velocity imaging



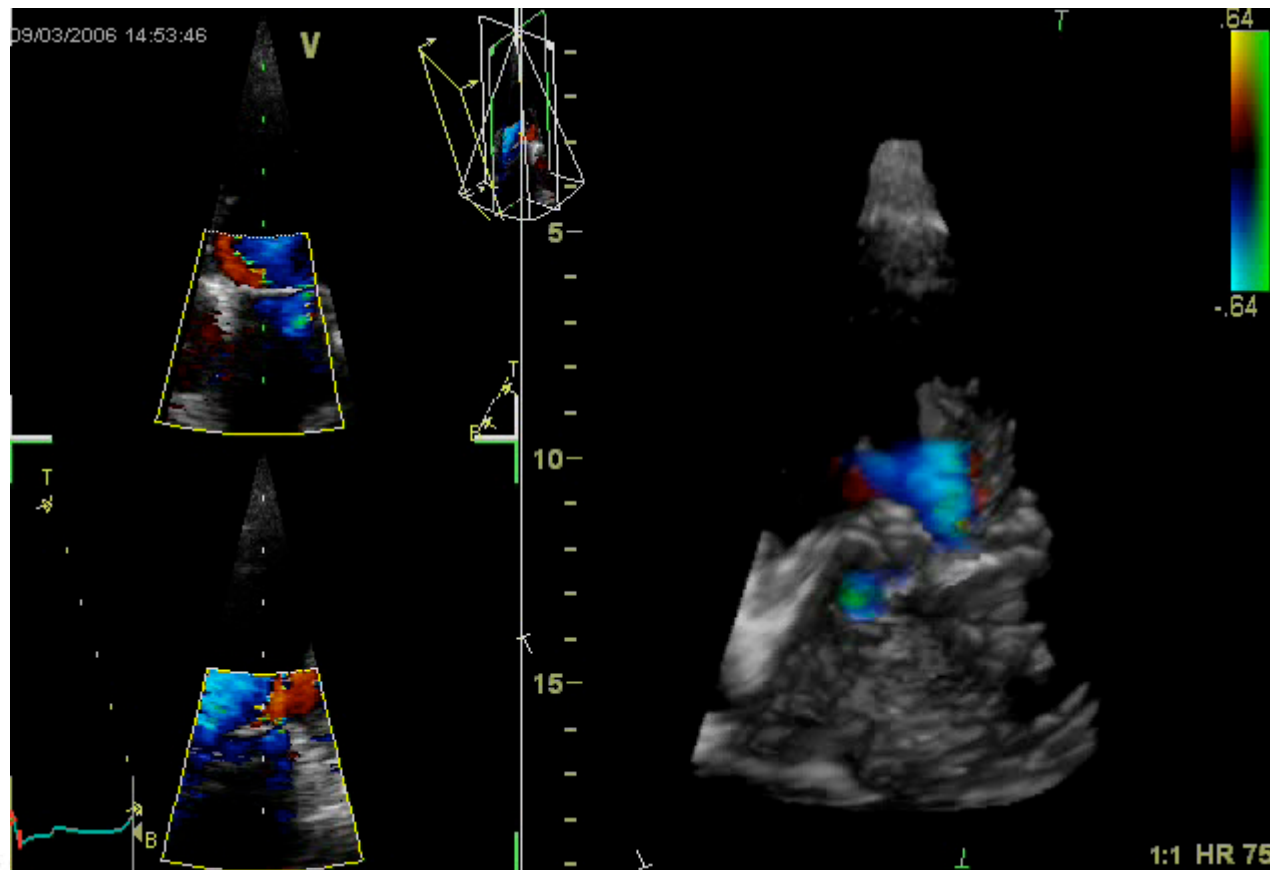
Color flow imaging:
Velocities in the whole image

3D Ultralydprobe – high tech



1860 Transducer Elements → 7 Boards, 35 ASICs → 256 System Channels

Sanntid 3D ultralyd - hjerte

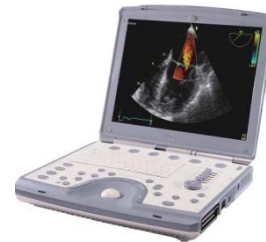


The Challenge of Miniaturization



Stationary:
Fully featured
200 kg
~1000 W

40x kg red.
10x pow. red.



Portable:
High performance
5 kg
~100 W

10x kg & pow.
reduction



Pocket-size:
Everywhere &
anytime
Good image quality
< 0.5 kg
~10 W

Stethoscope of the Future



*Why only **listen** to the heart ...*

- Pocket-sized
- Easy to use
- Designed for Primary Care physicians
 - Document results



Det skapende universitet

In the ER/ Ambulance



- Internal Bleeding
- Cardiac Condition
- Rapid, Accurate Diagnosis and Treatment
- Tele-Medical Expert Consulting

In the Doctor's Office

- Cardiac Monitoring
- Foetal Monitoring
- Rapid Decision support
- Tele-Medical Expert Consulting



Patient Visits

- Low Cost, Portable, Full Functionality
- Wireless Tele-Medical Consulting



Applications

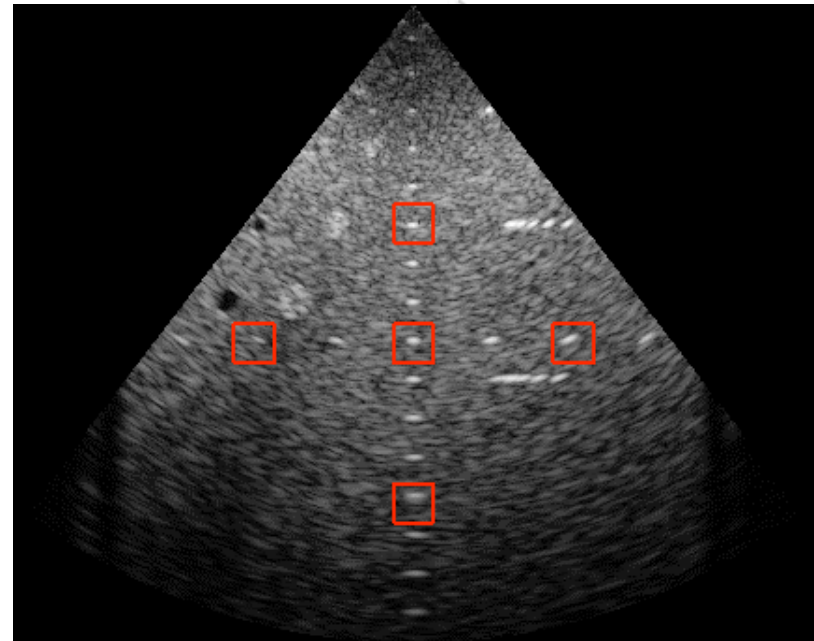
In the Local Hospital



- Patient Screening
- Intermediate level
- Rapid, Accurate Diagnosis

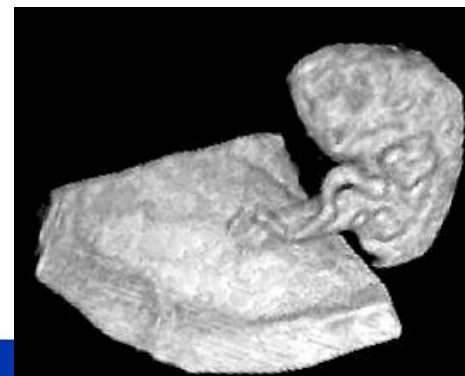
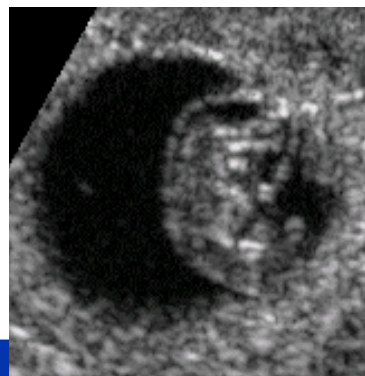
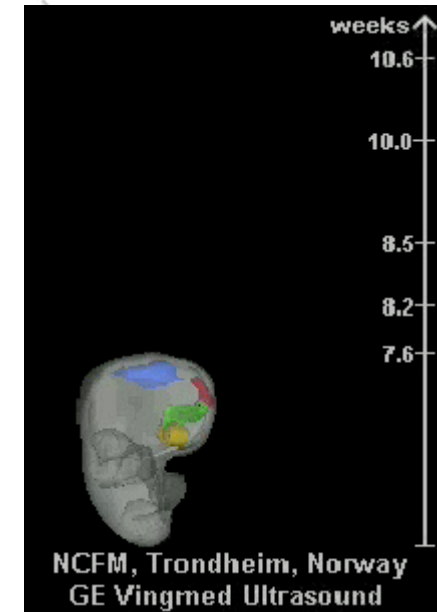
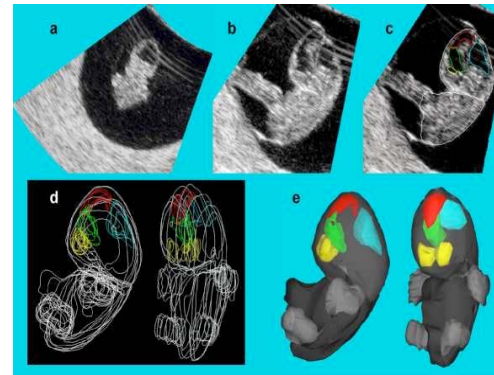
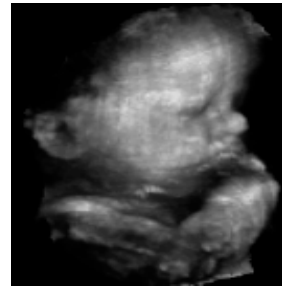
Objektiv måling av bildekvaliteten i ultralydbilder

- Cecilie Øinæs Simpson
- 5. Elektronikk
- Studieretning:
Signalbehandling i medisinske anvendelser
- Master, objektiv måling av bildekvalitet



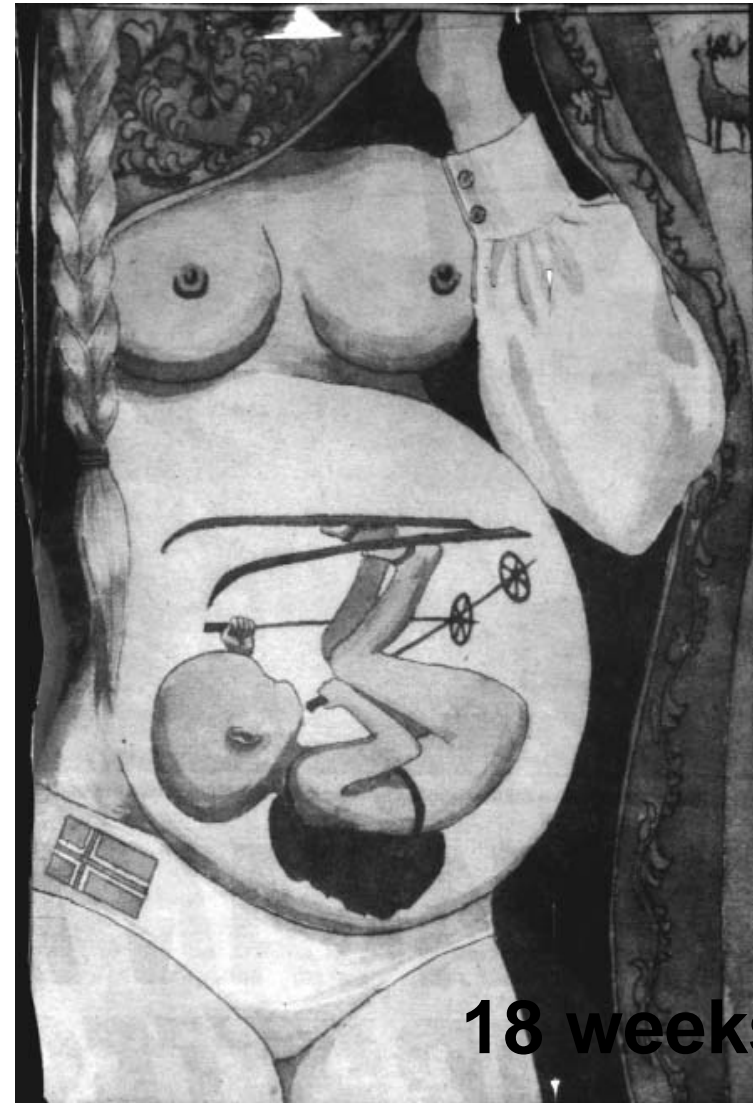
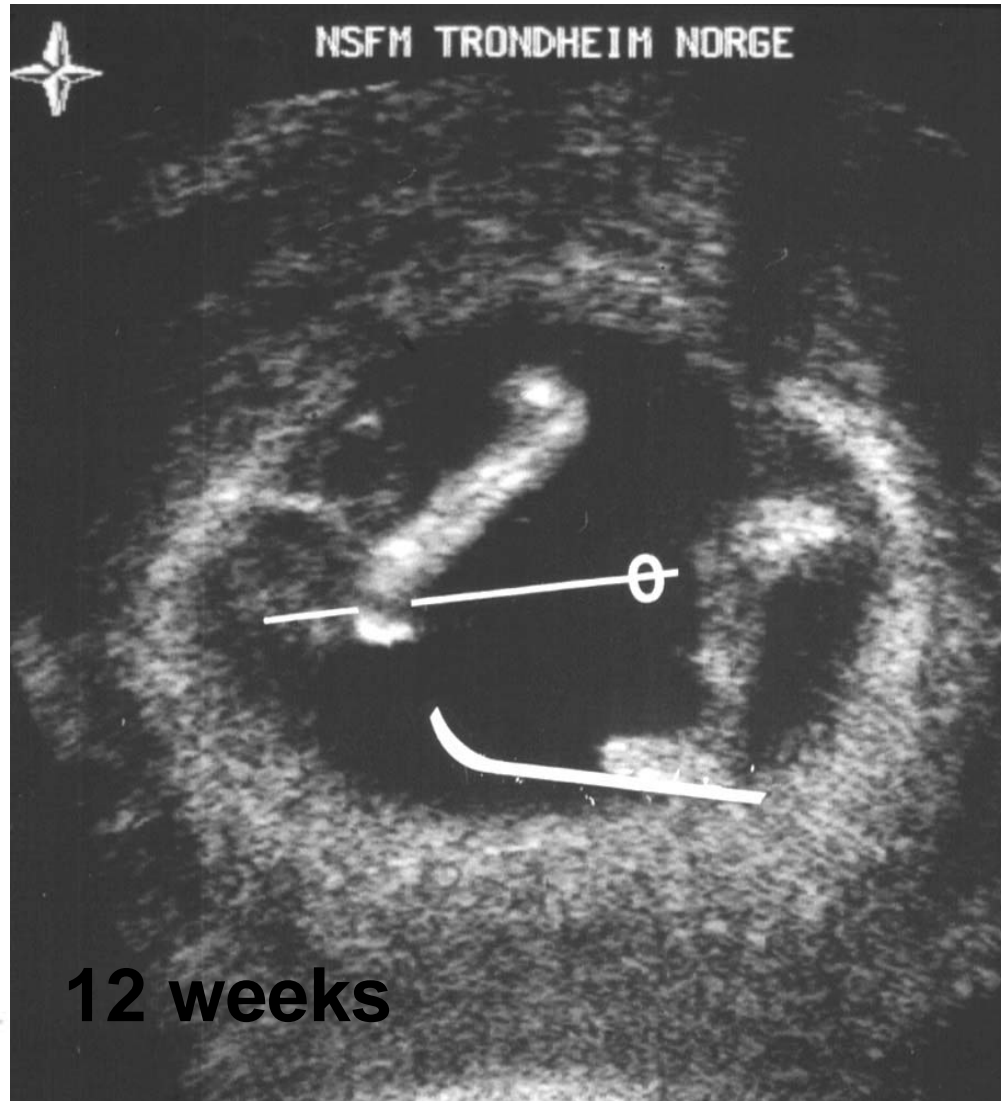
Ultralydavbildning av foster 2D/3D

- Hvem ligner barnet på?
- Tidlig diagnose av sykdom redder liv



Tradisjonelt svangerskap I Norge

Harm-Gerd Blaas, Nasj. Senter fostermedisin



Teknologisk utvikling forenkler fødselen

