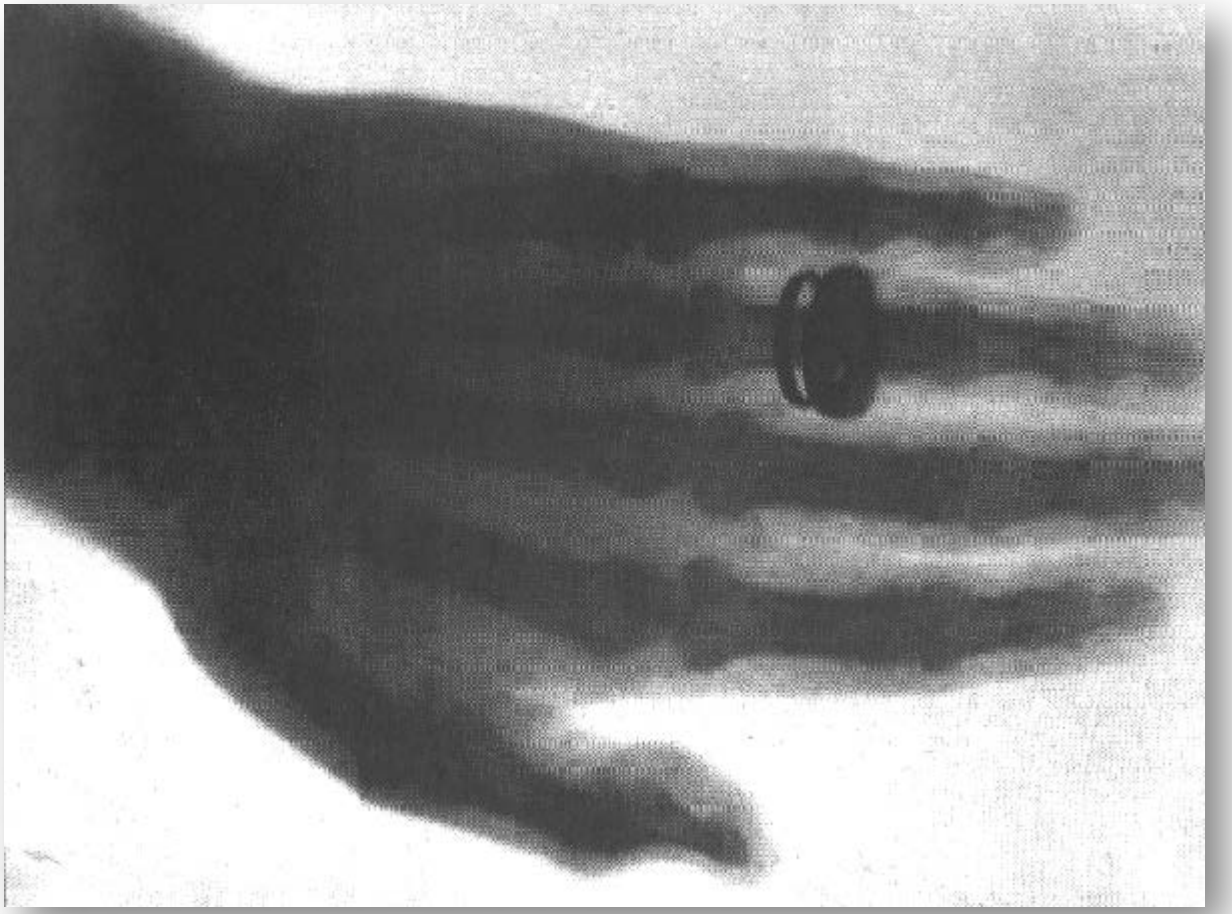
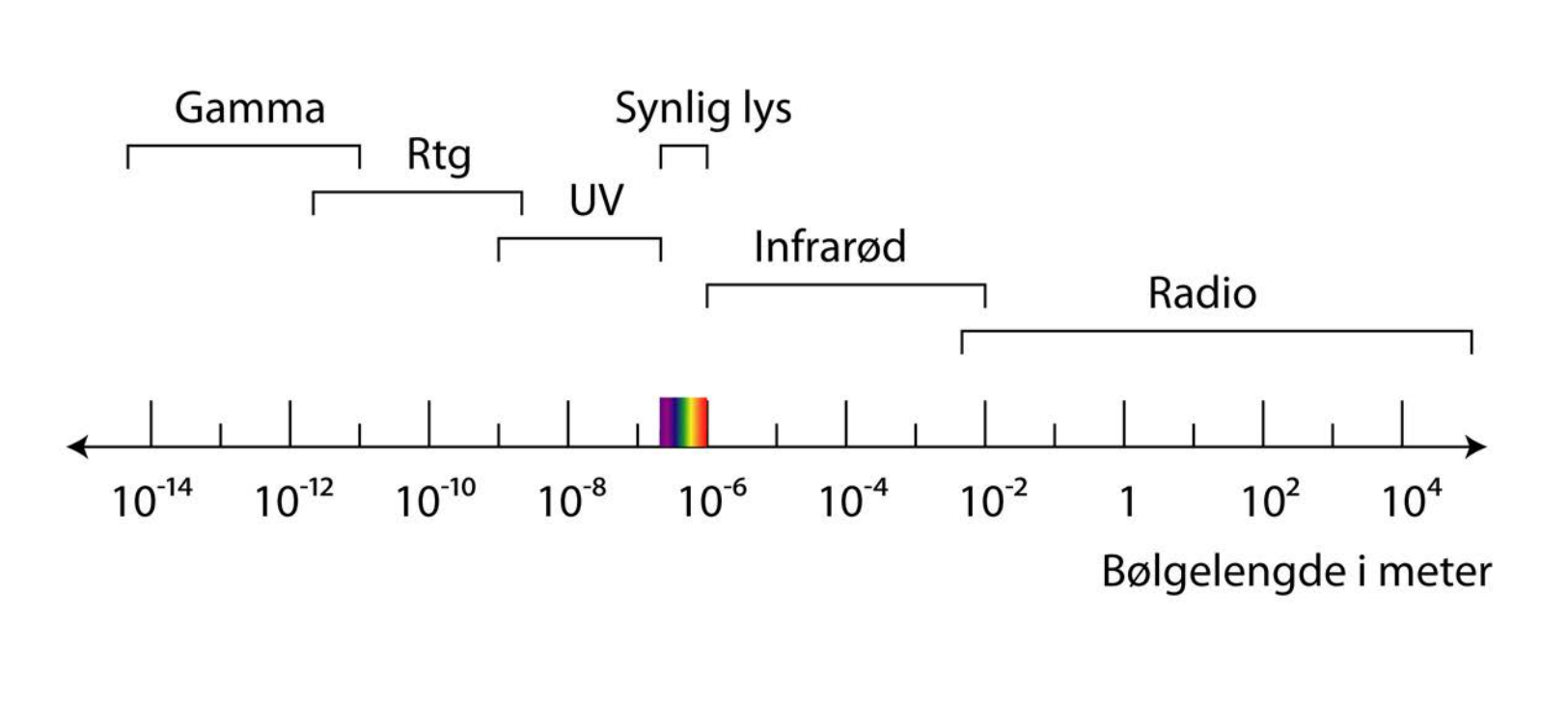
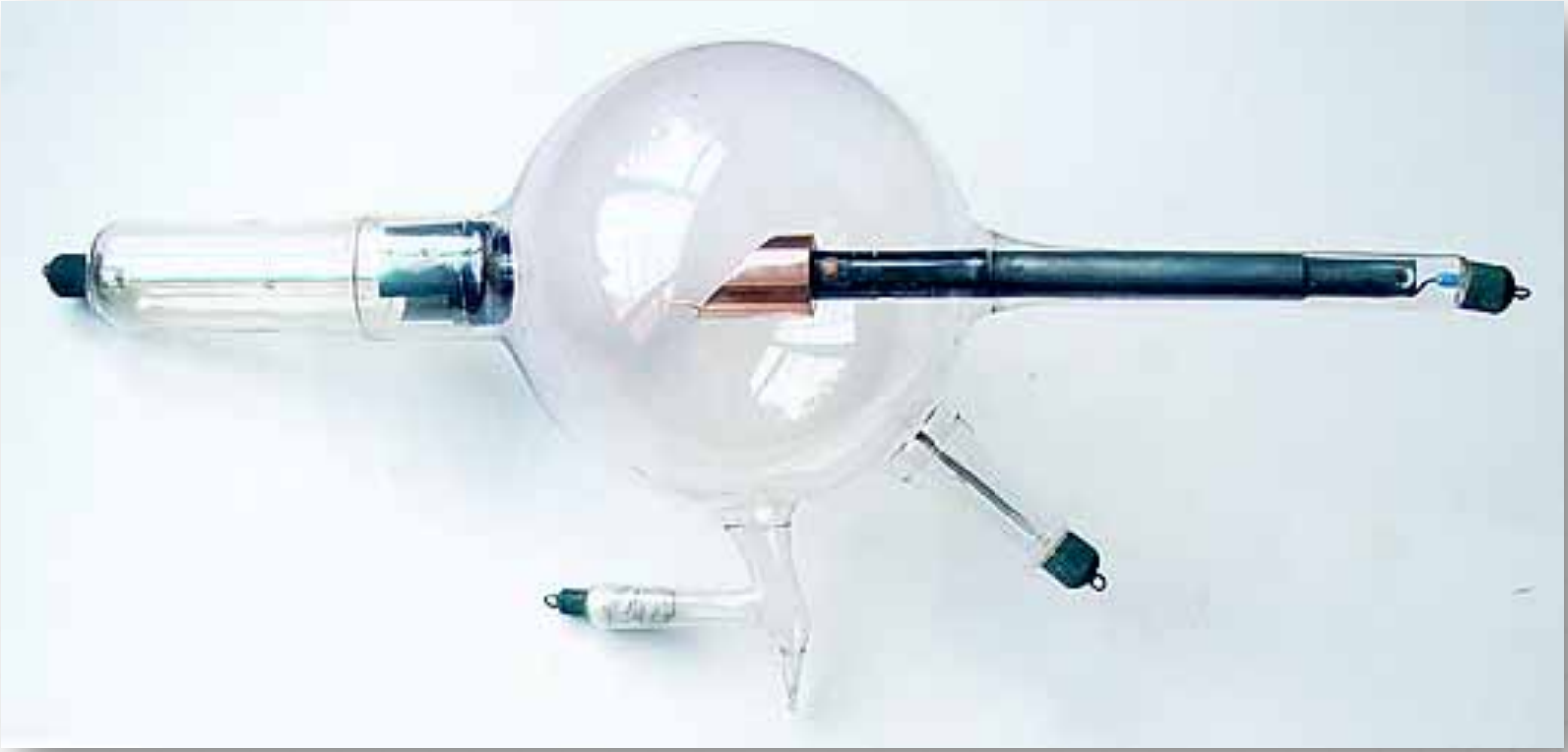
Wilhelm Konrad Röntgen (1845-1923)

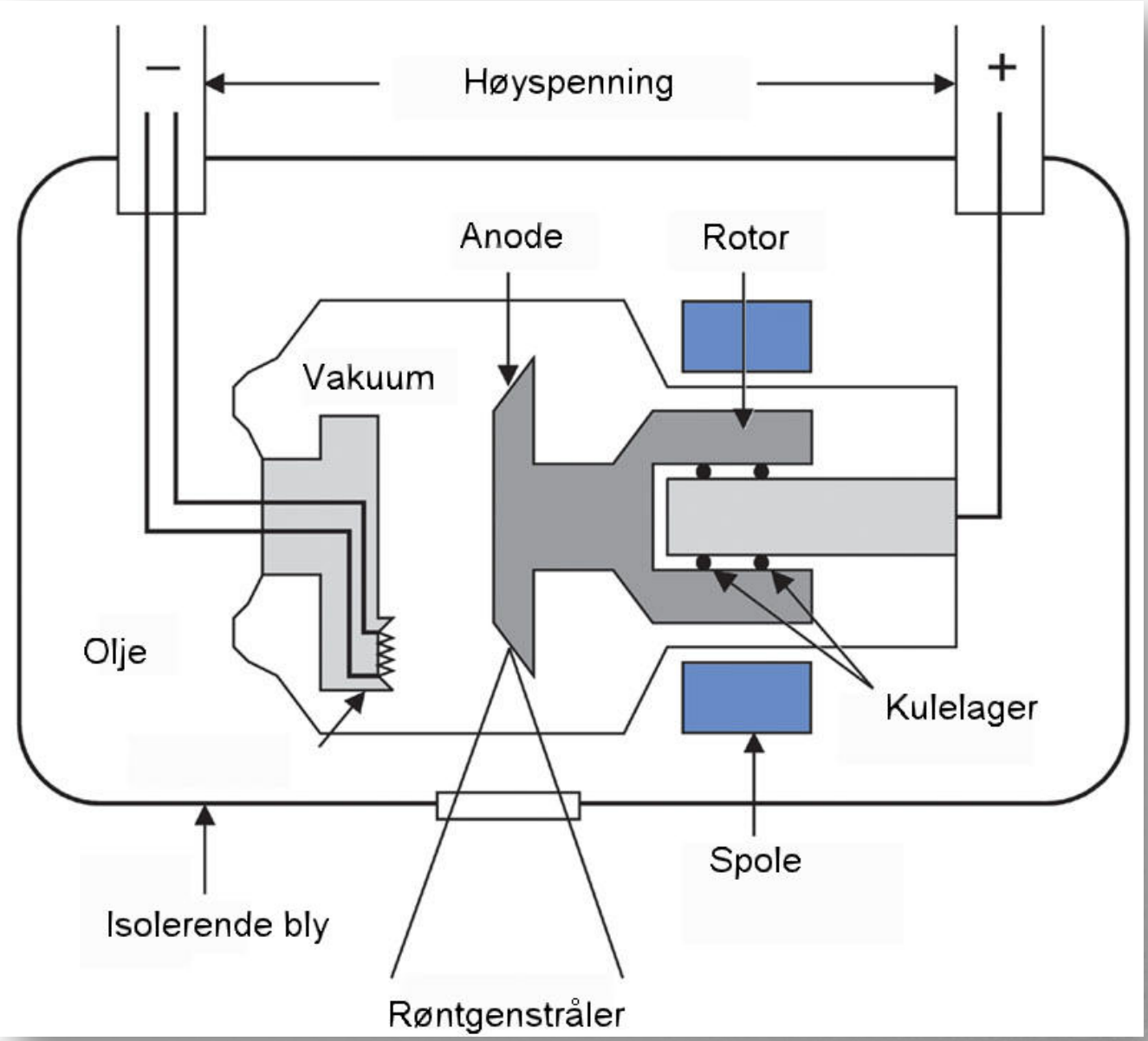
WILHELM RÖNTGEN'S FIRST ATTEMPT AT X-RAYS:
SHINING A BRIGHT LIGHT THROUGH MADAME RÖNTGEN
S. HARRIS

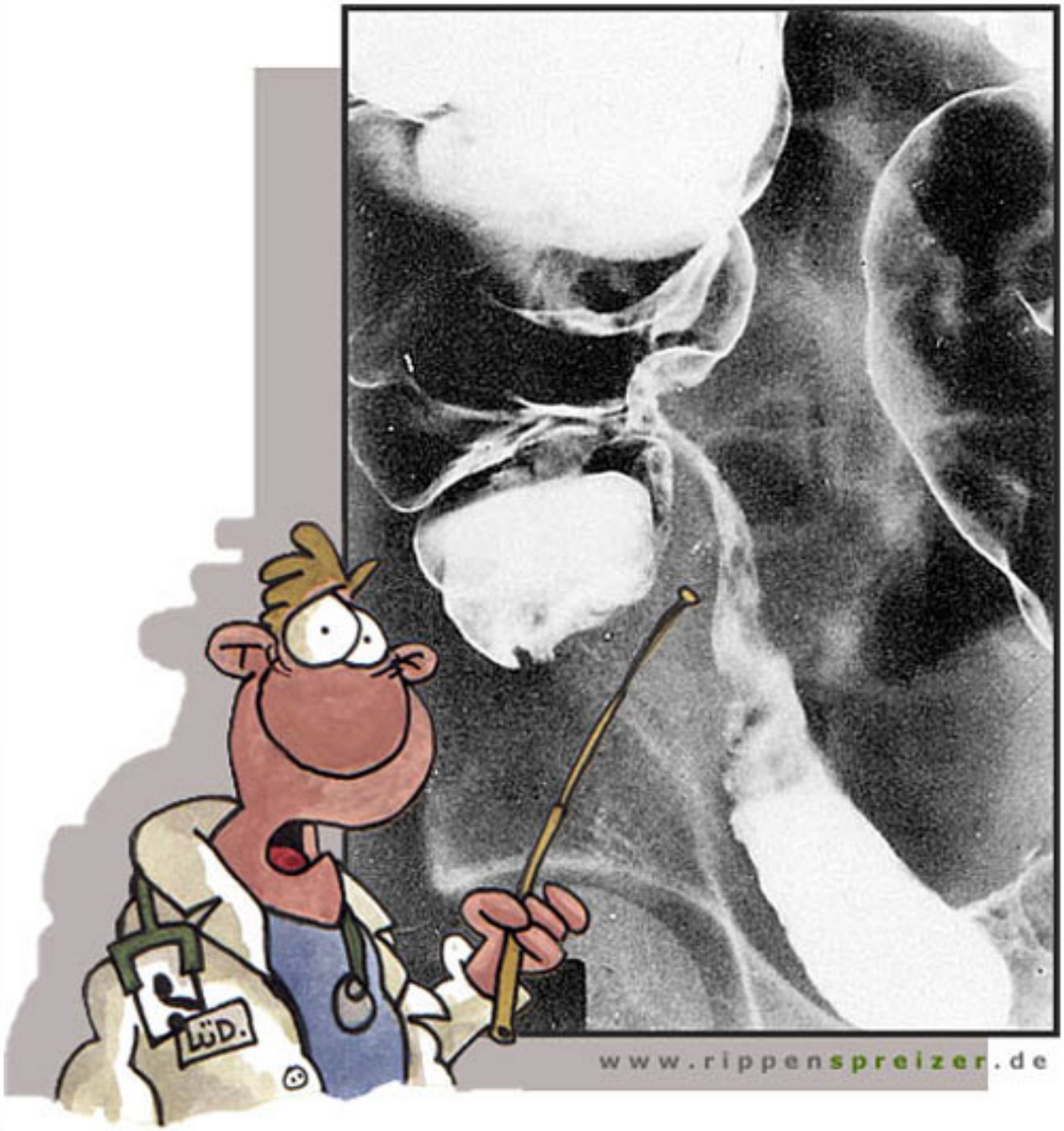




Spektrum av elektromagnetisk stråling

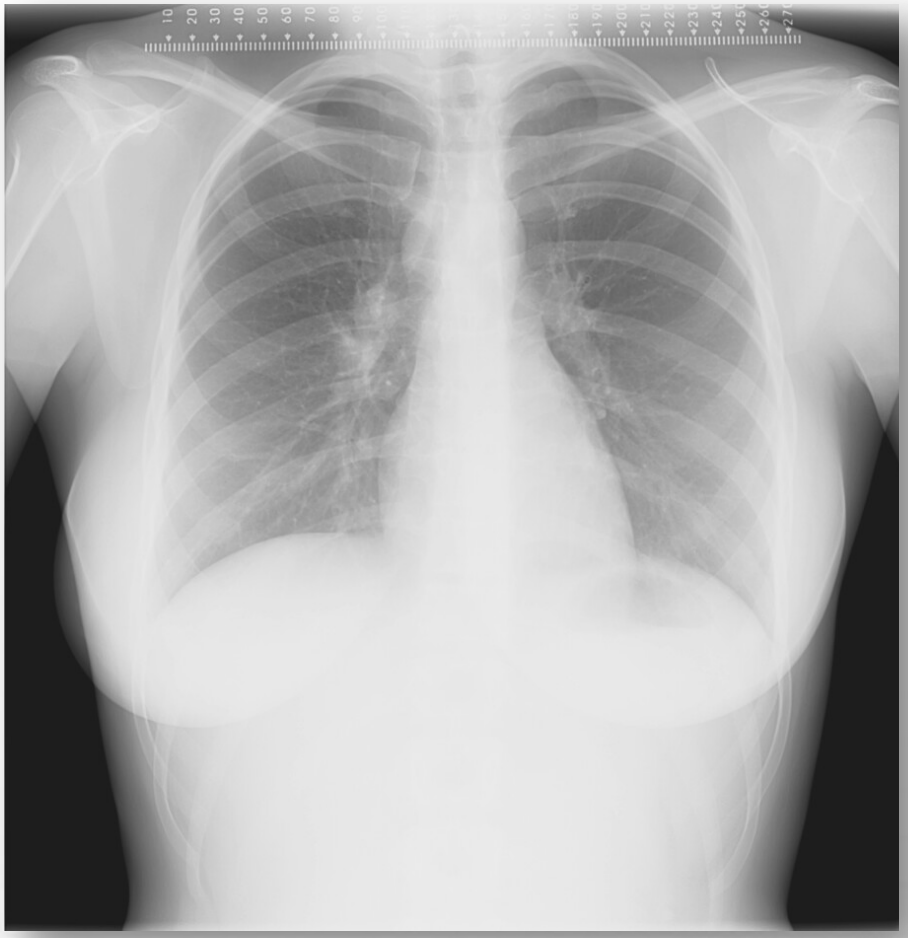



−
Høyspenning
+
Anode
Rotor
Vakuum
Olje
Kulelager
Spole
Isolerende bly
Røntgenstråler


www.rippenspreizer.de

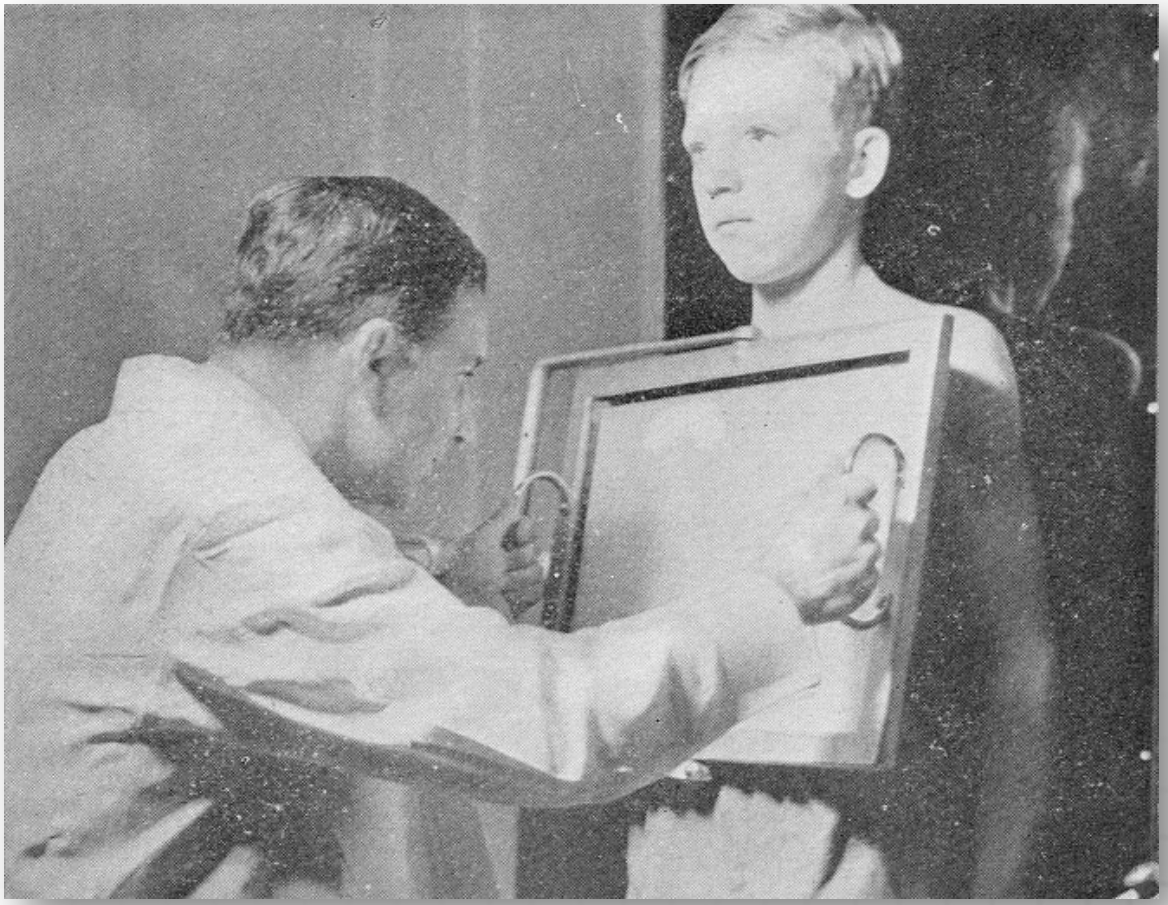
Oversikt abdomen

Røntgen thorax



Røntgen gjennomlysning

Røntgen gjennomlysning



1
W 3200 : L 1800

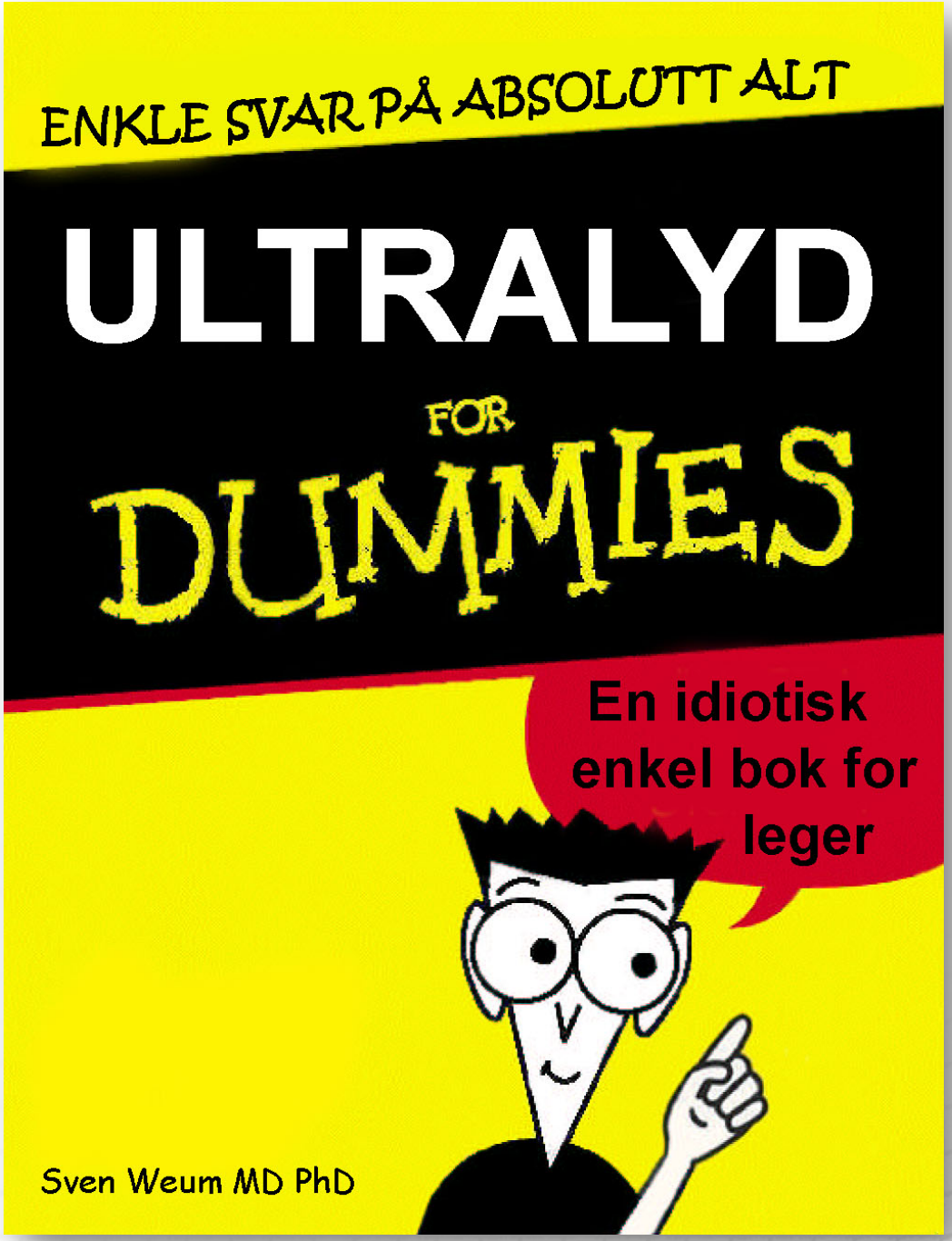
Husk blyfrakk

Stå bak blyglasset om mulig

Barium kontrast

Svelging

Defekografi

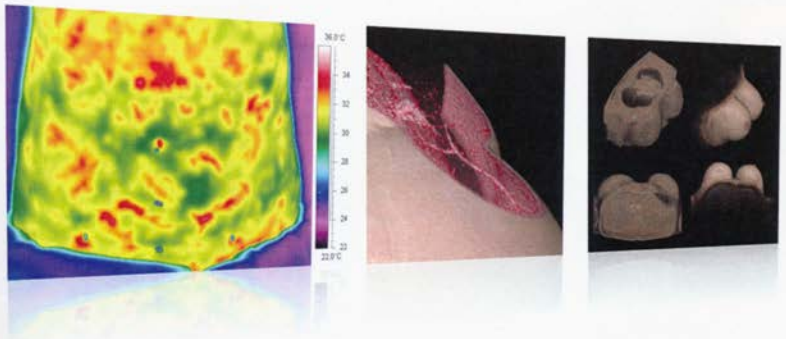

ENKLE SVAR PÅ ABSOLUTT ALT
ULTRALYD
FOR
DUMMIES
En idiotisk enkel bok for leger
Sven Weum MD PhD

UNIVERSITY OF TROMSØ UIT

FACULTY OF HEALTH SCIENCES
INSTITUTE OF MEDICAL BIOLOGY
CARDIOVASCULAR RESEARCH GROUP

Imaging in plastic surgery

A clinical and experimental study with notes on the history of medical imaging



Sven Weum

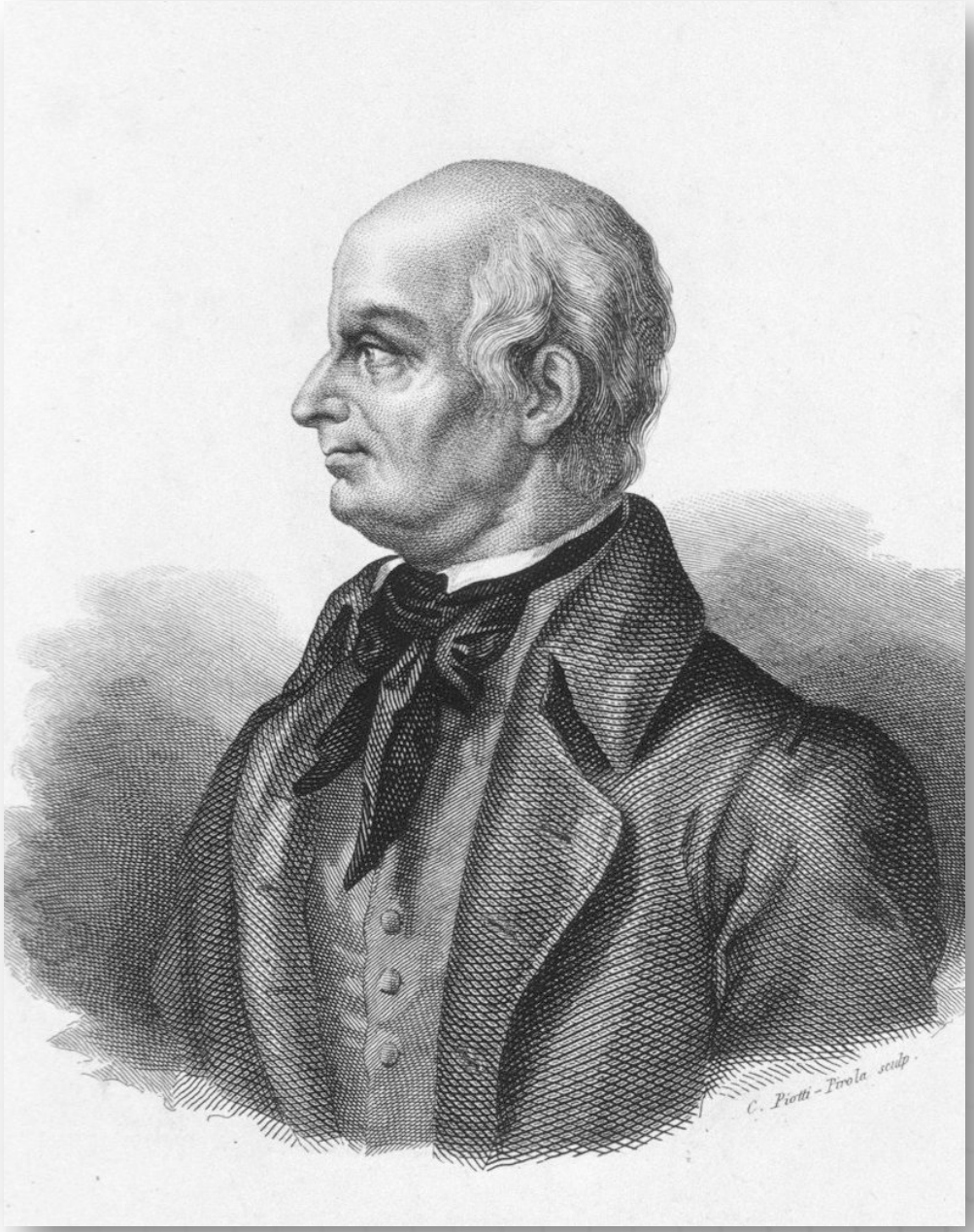
A dissertation for the degree of Doctor Philosophiae

2013

www.radiolog.no

Photo: Sven Weum

Photo: Colourbox.com



Lazzaro Spallanzani 1729-99

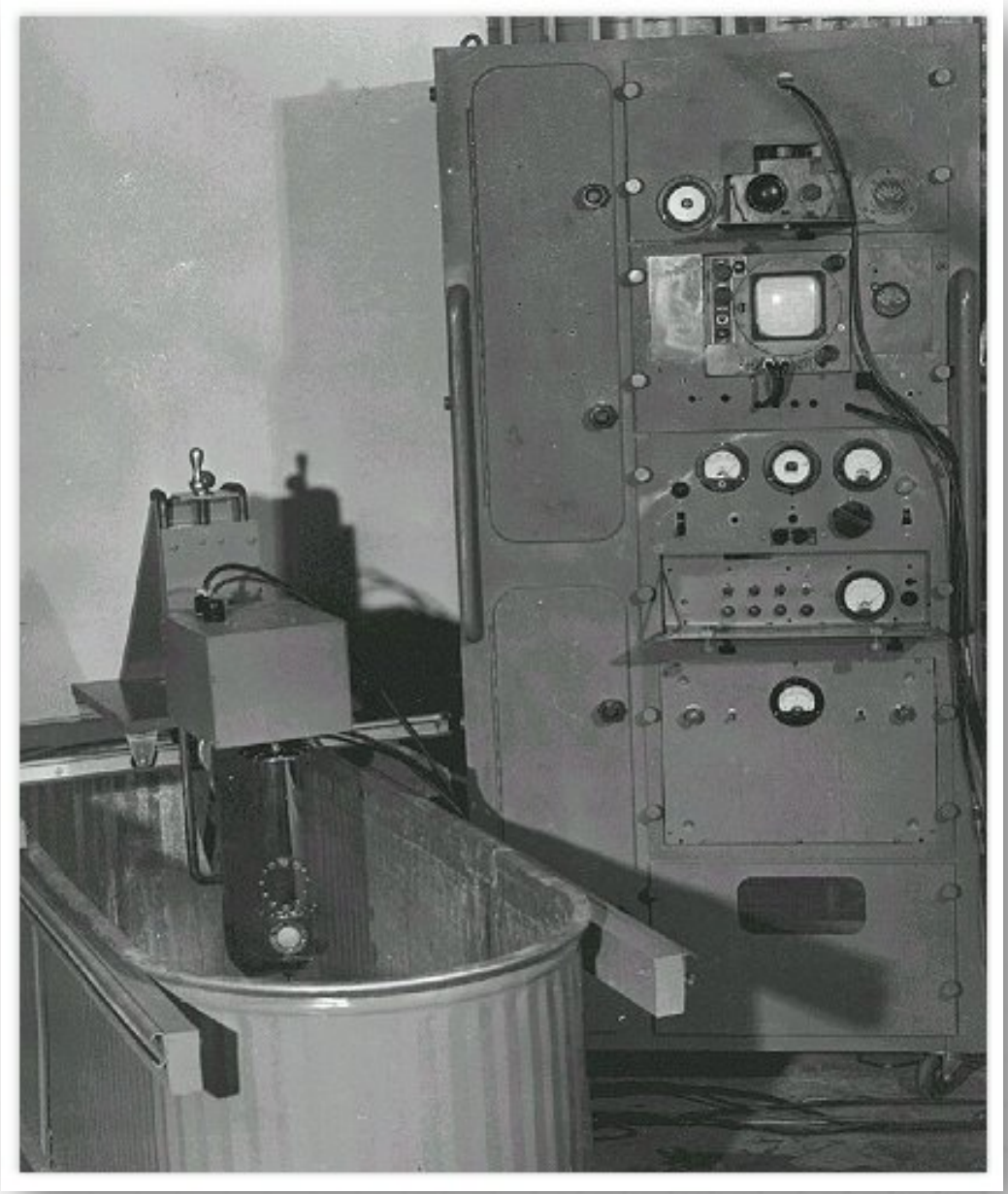
SONIC AMPLIFIER

John J Wild c. 1953

SONARCOPE SUBJECT SITS ON STOOL IN TUB AS SOUND WAVES, STREAMING INTO HIM FROM BEHIND, RECORD HIS BACK'S INNER TISSUES ON SCOPE (TOP)

SOUND-WAVE PORTRAIT IN THE FLESH

A sonarlike device produces pictures of the human body's soft tissues which are invisible to X-rays



LIFE

BEGINNING A NEW SERIES ON THE

Profound and Astonishing Biological Revolution

Control of Life

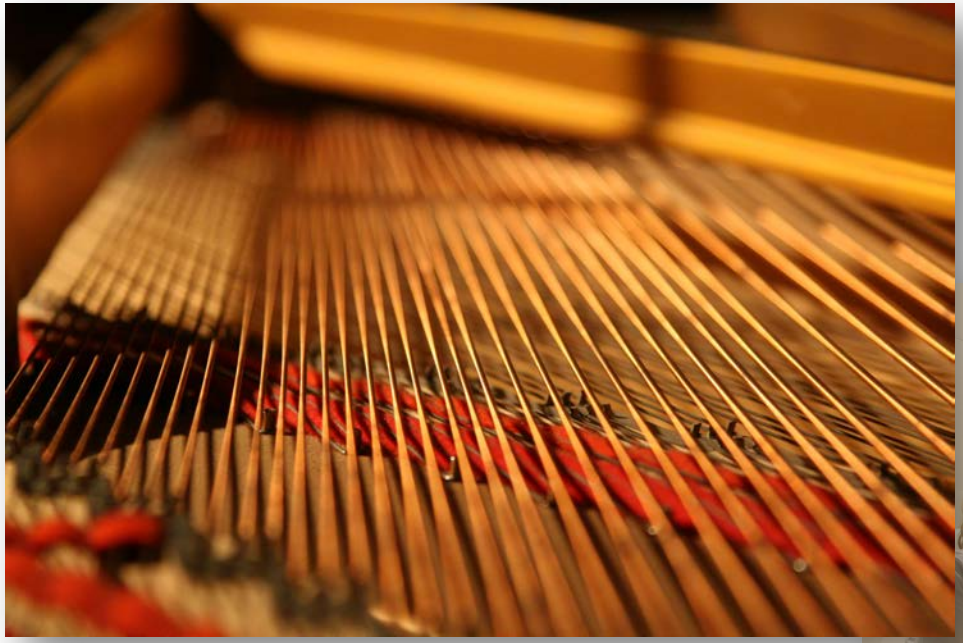
Image of baby's head in womb is projected onto screen by ultrasonic waves transmitted through water-filled bag

Audacious experiments promise decades of added life, superbabies with improved minds and bodies, and even a kind of immortality

NOV66 UDE SN021C9-L56 31 26
CLIFFORD B UNDERWOOD
1021 SANDERS DR
ST LOUIS MO 63129

SEPTEMBER 10 · 1965 · 35¢

www.radiolog.no



20-20.000 Hz

2-20 MHz

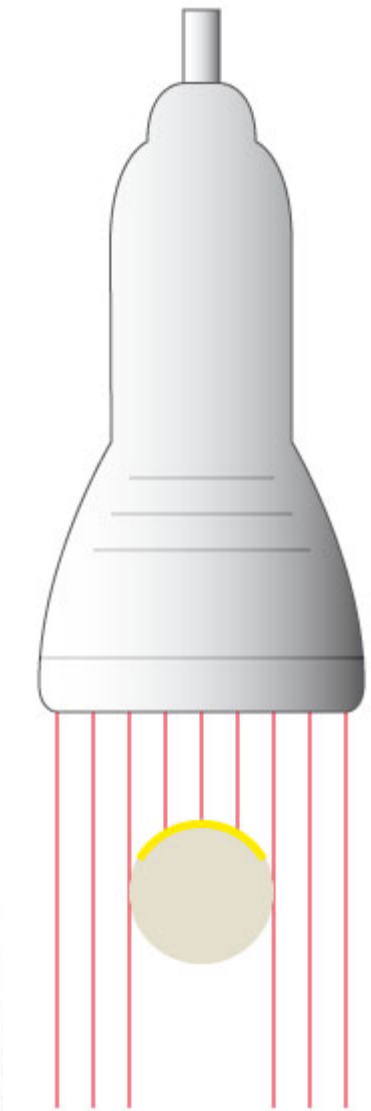
Photo: Sven Weum

Ekko

- Overgang mellom ulike materialer
- Ulike fysiske egenskaper gir ekko

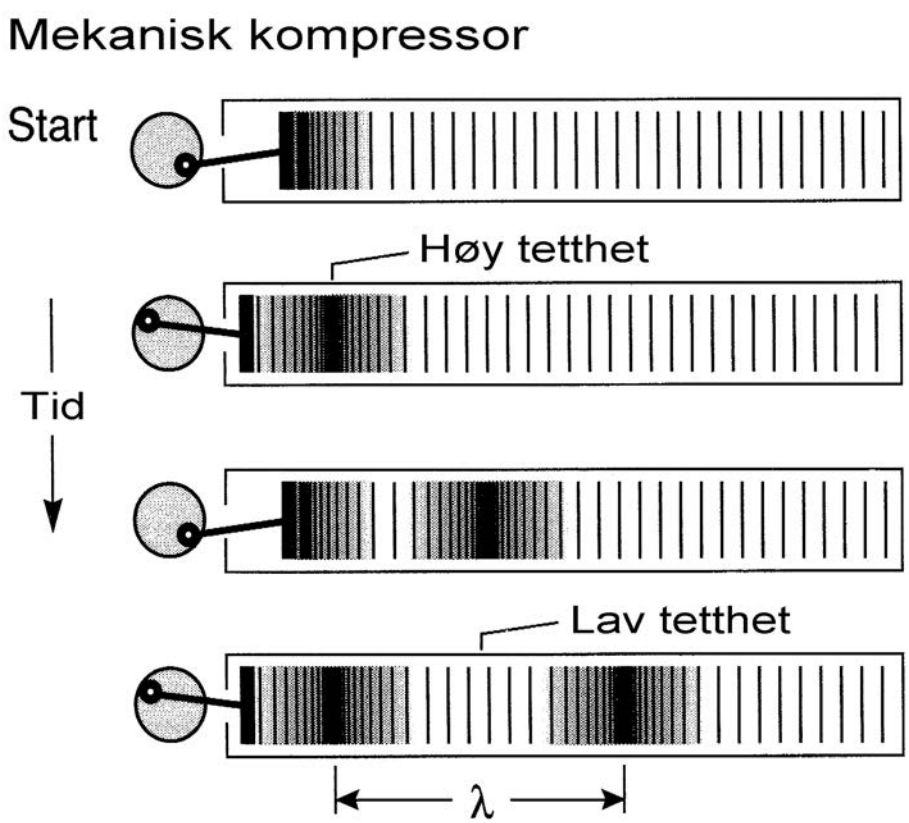
Photo: Sven Weum

Refleksjon av ultralydbølger



Ekkoets styrke avhenger av ulik akustisk impedans ($Z = \rho \times c$)

Ultralyd



Transduceren omdanner elektriske signaler til mekaniske vibrasjoner

Bølgelengden λ er den fysiske avstanden mellom to bølger

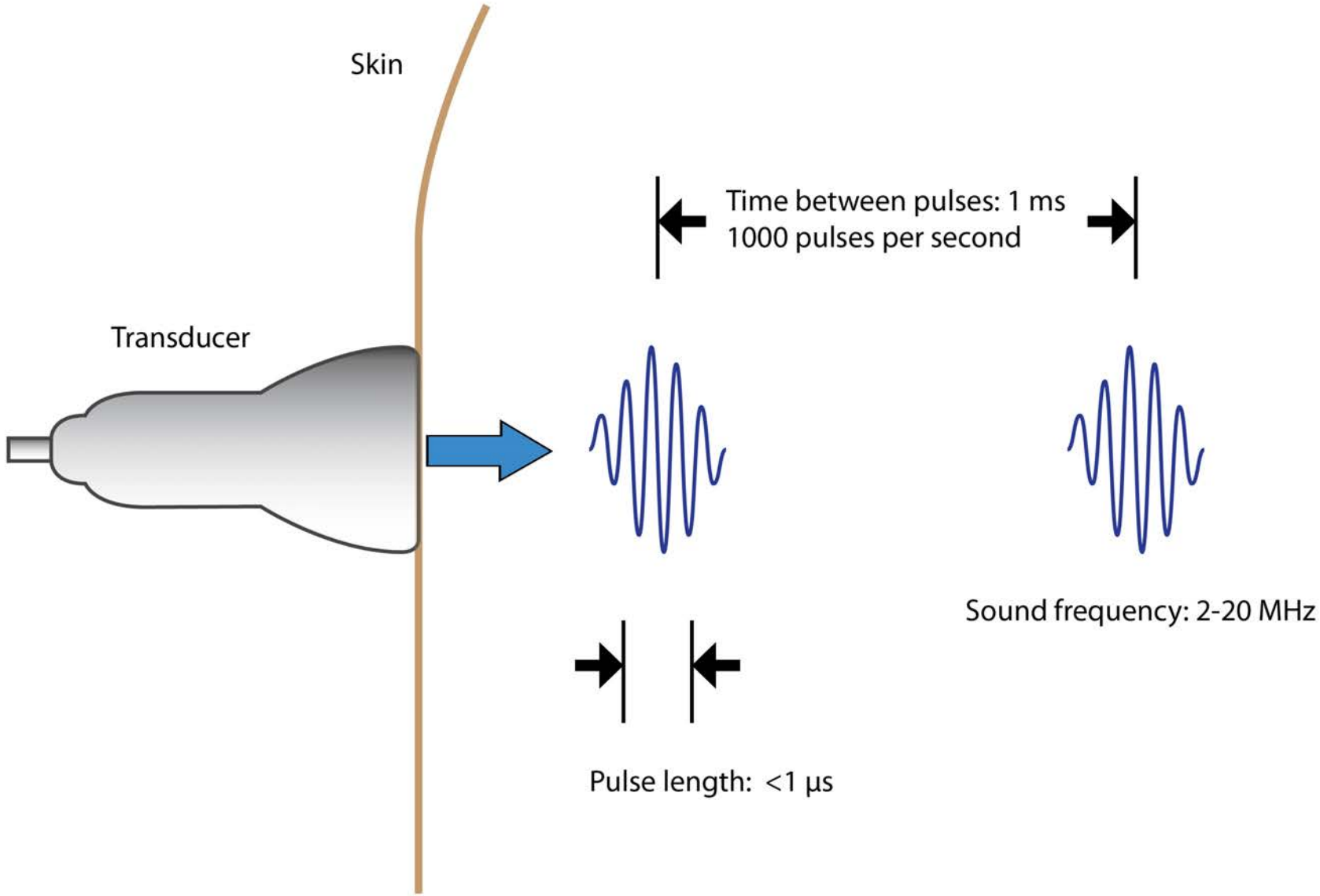
Frekvensen f er antall svingninger per sekund

Lydhastighet = f x λ

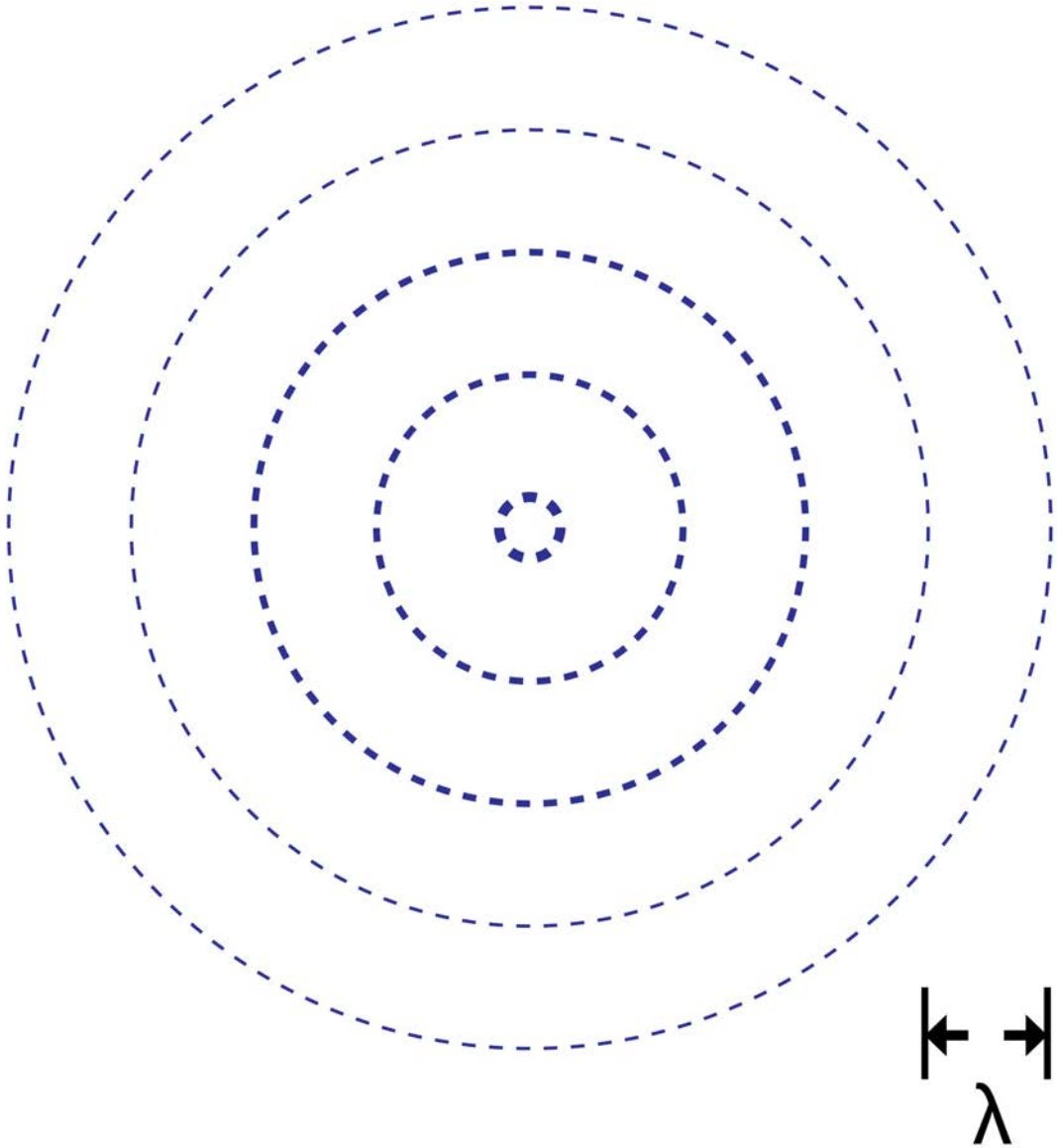
Lydhastighet i vev er ca 1540 m/s

Photo: Beate Alexandersen

Photo: Sven Weum



Graphics: Sven Weum



Wavelength (λ)
Distance between waves

Frequency (f)
Waves per second

Speed (c)
Meters per second

$$c = f \times \lambda$$

Graphics: Sven Weum

Sopranino

Photo: Sven Woum

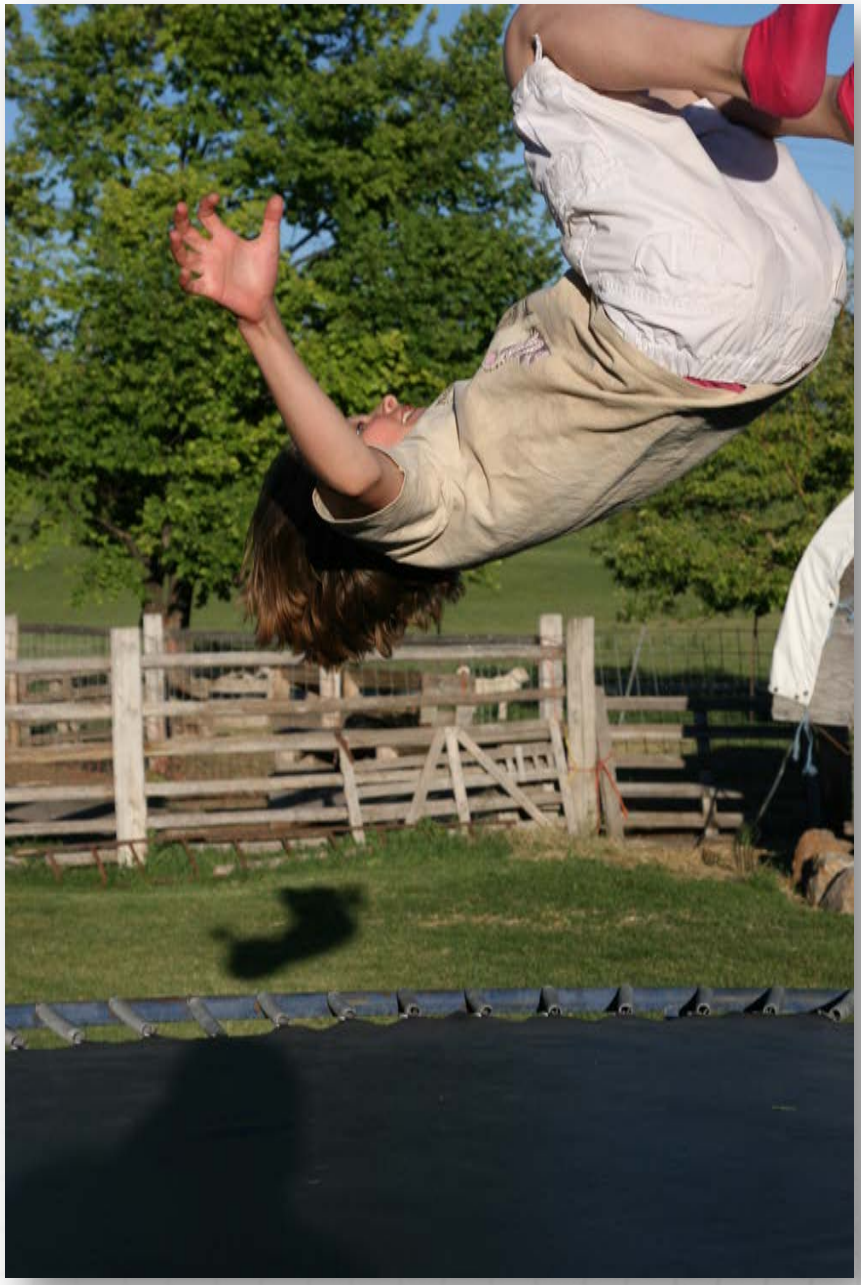
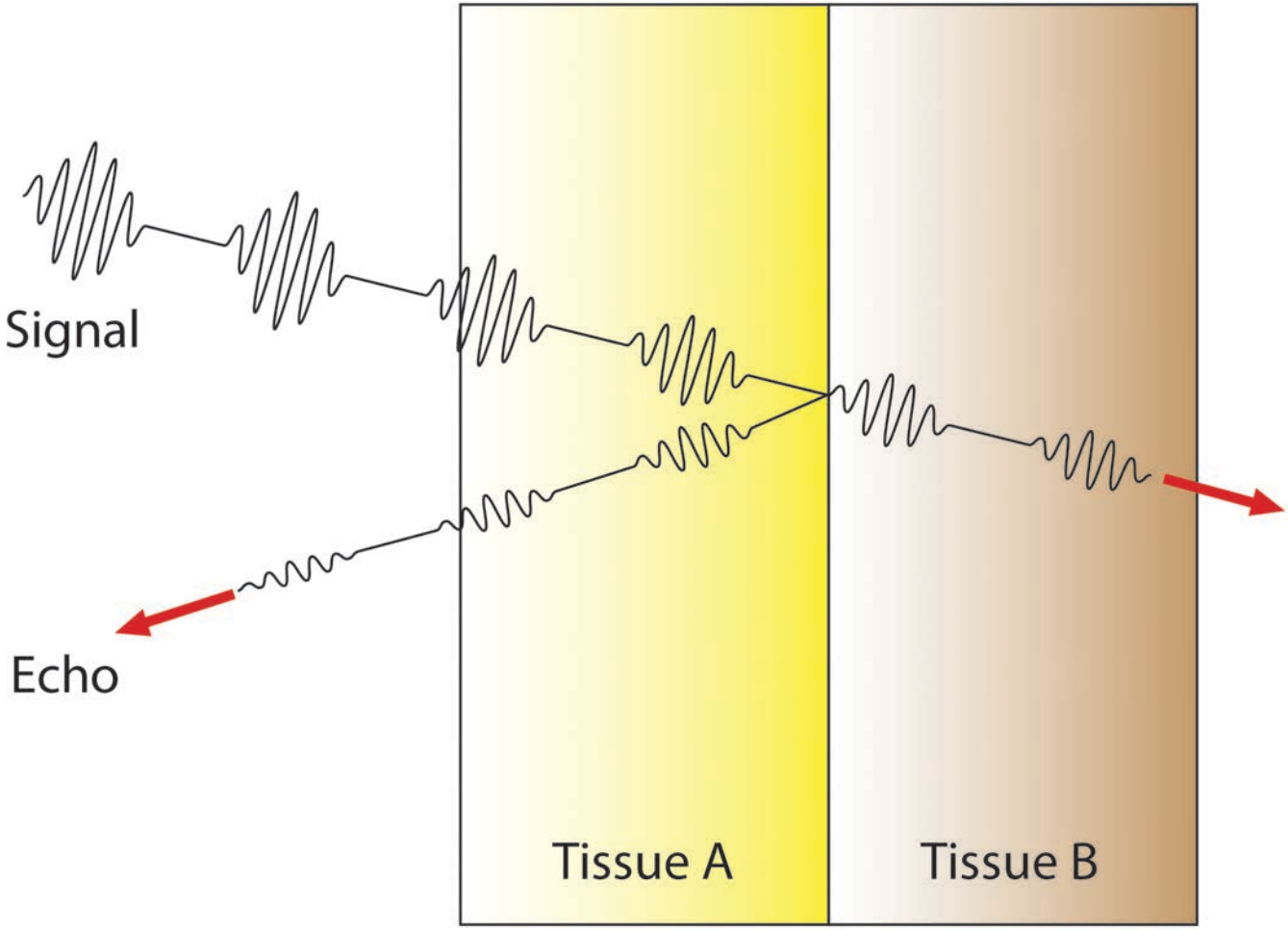


Photo: Sven Weum



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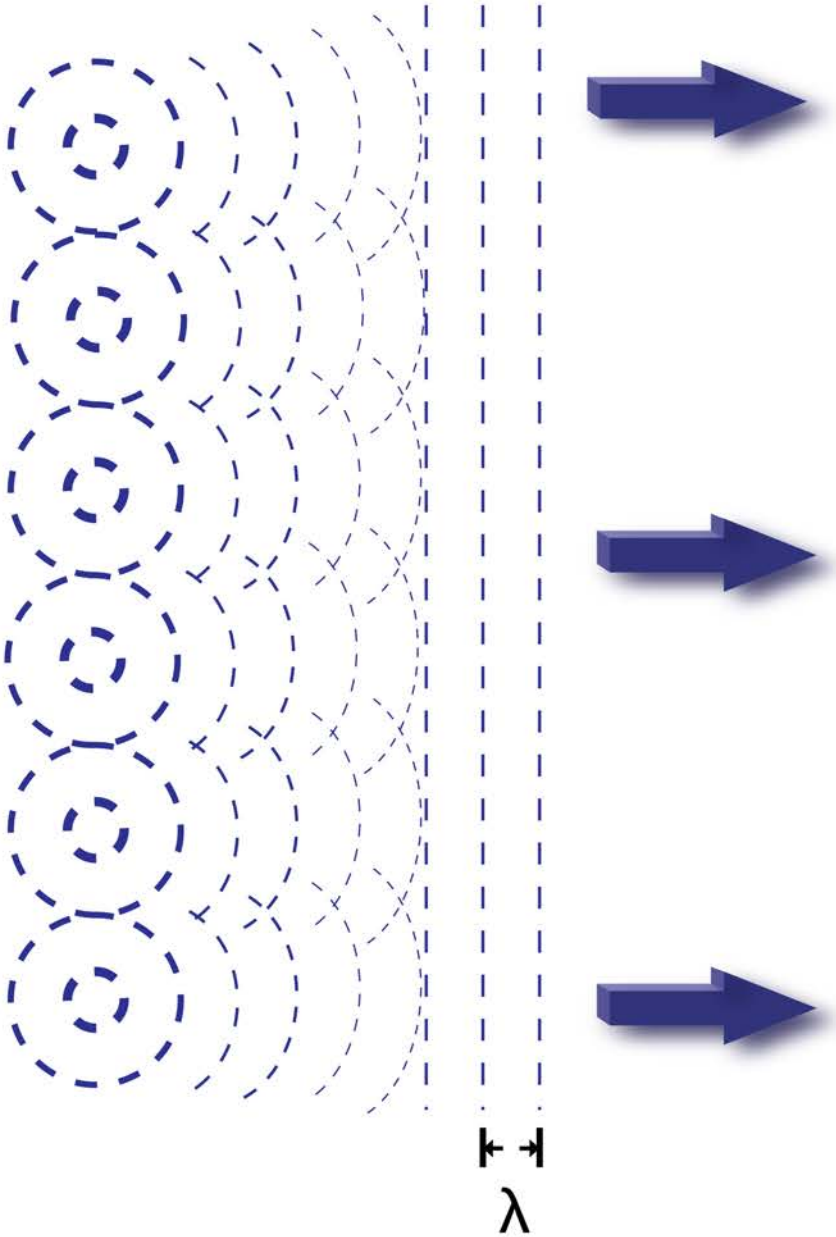

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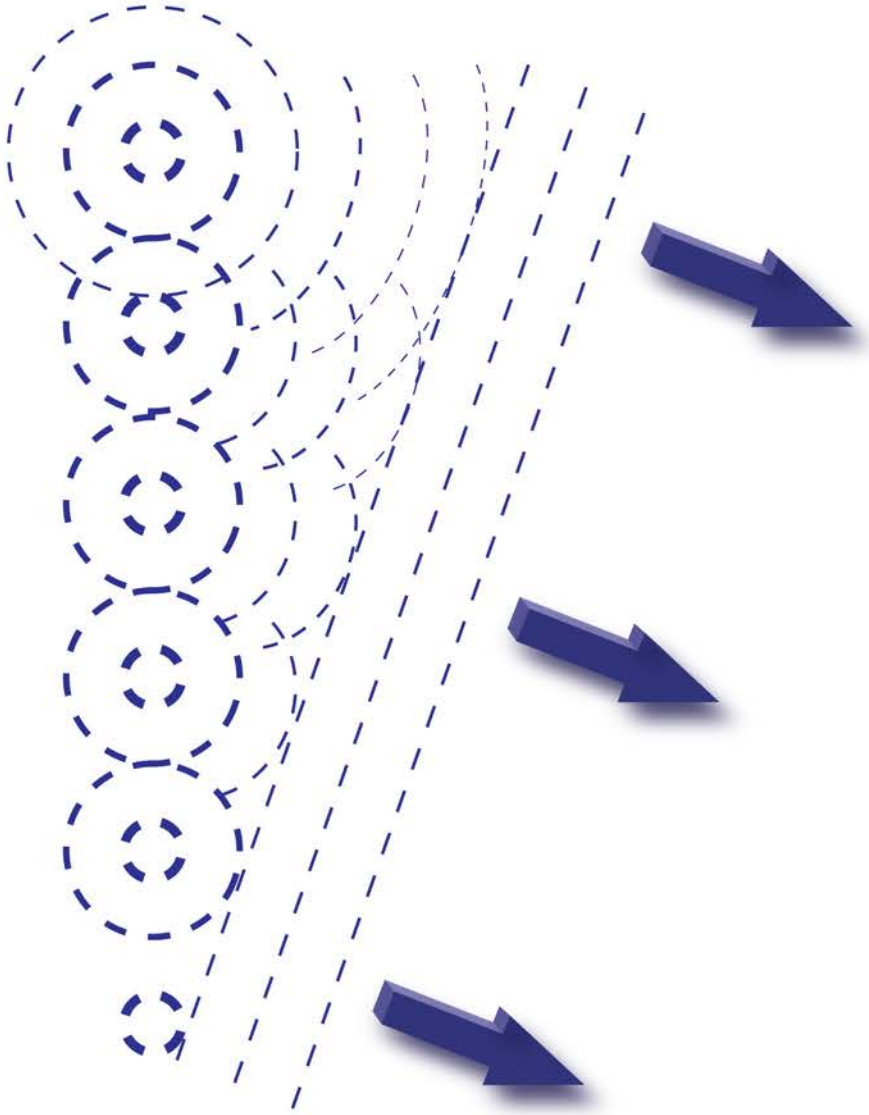
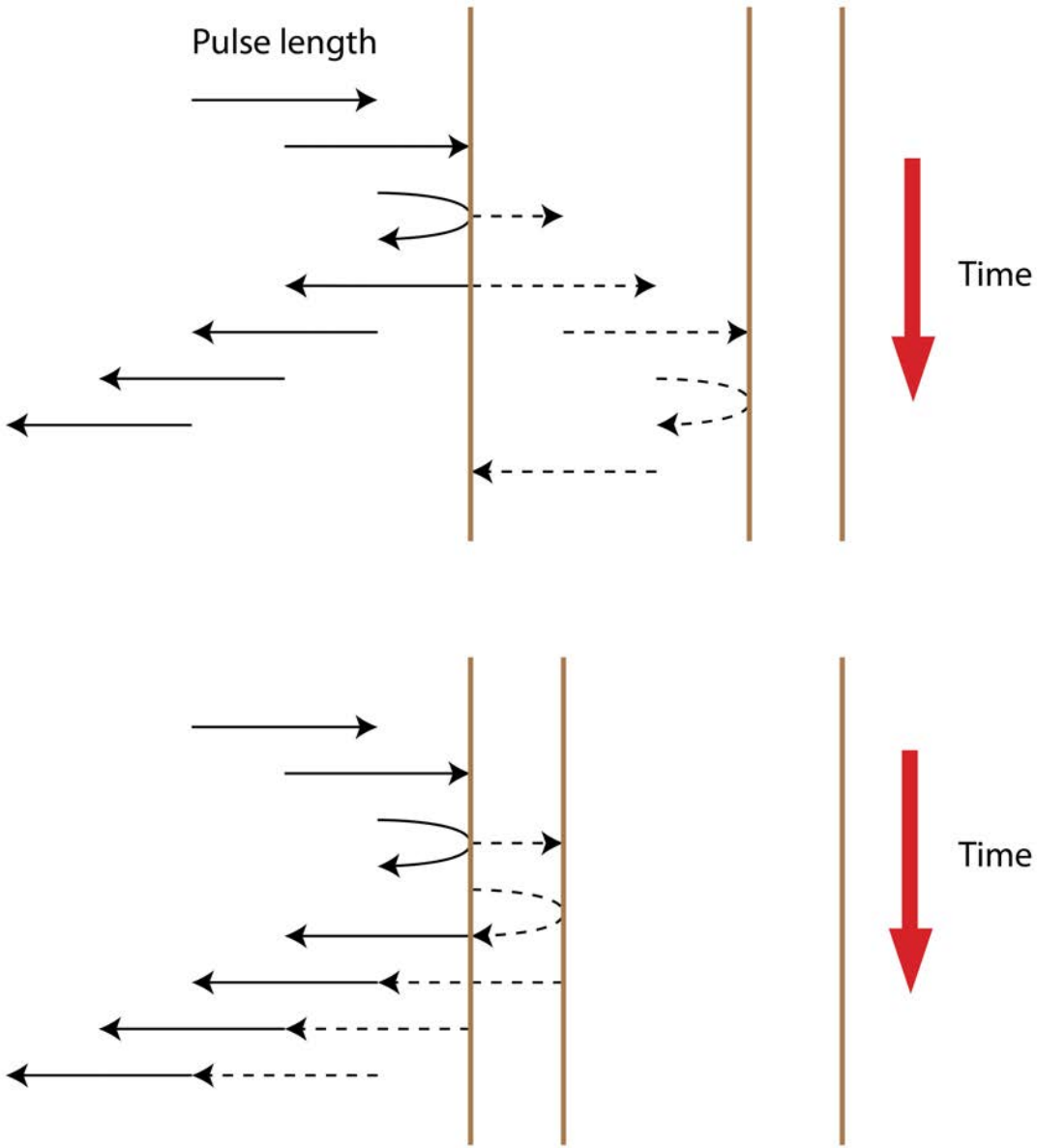
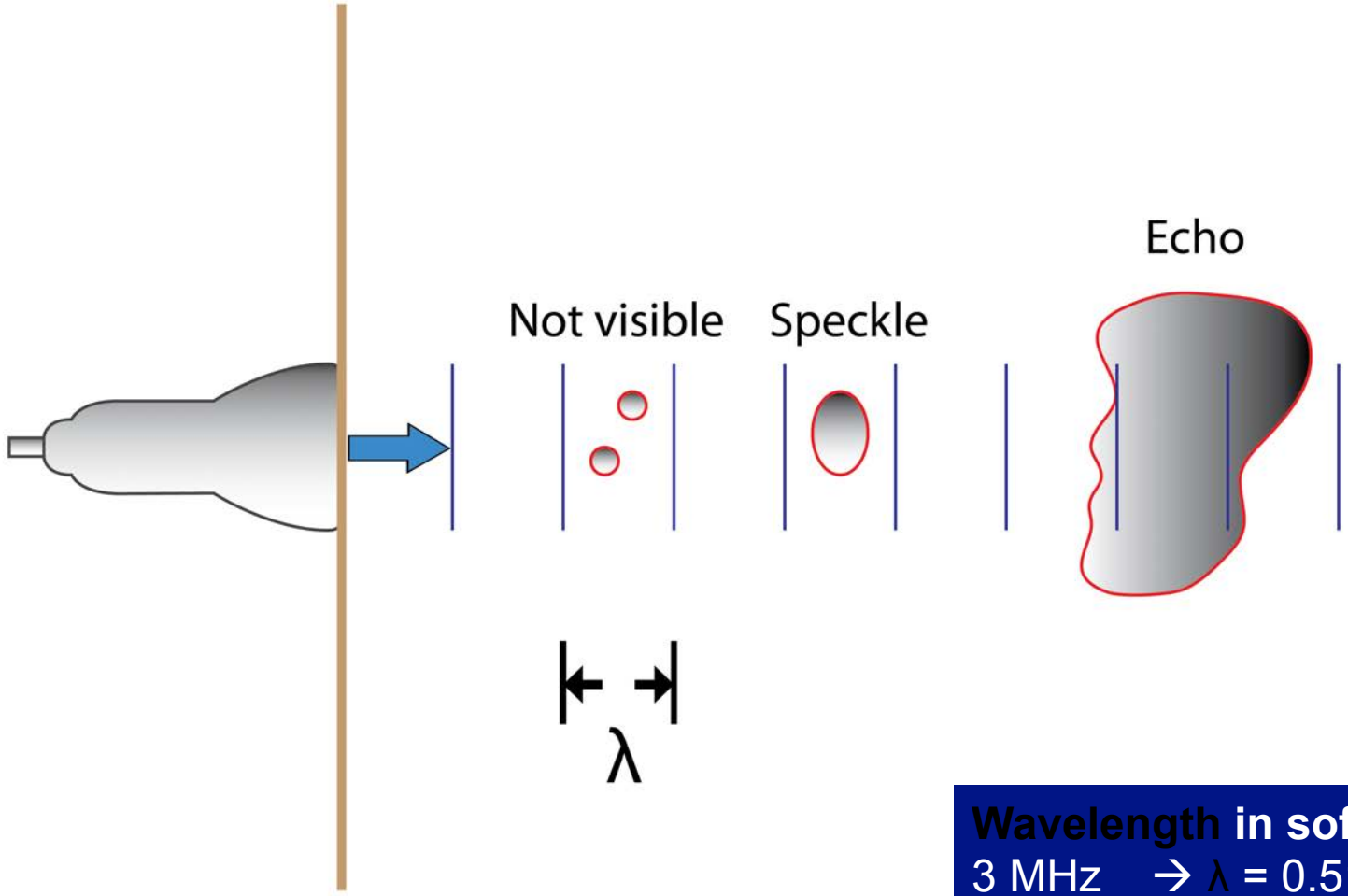


Graphics: Sven Weum

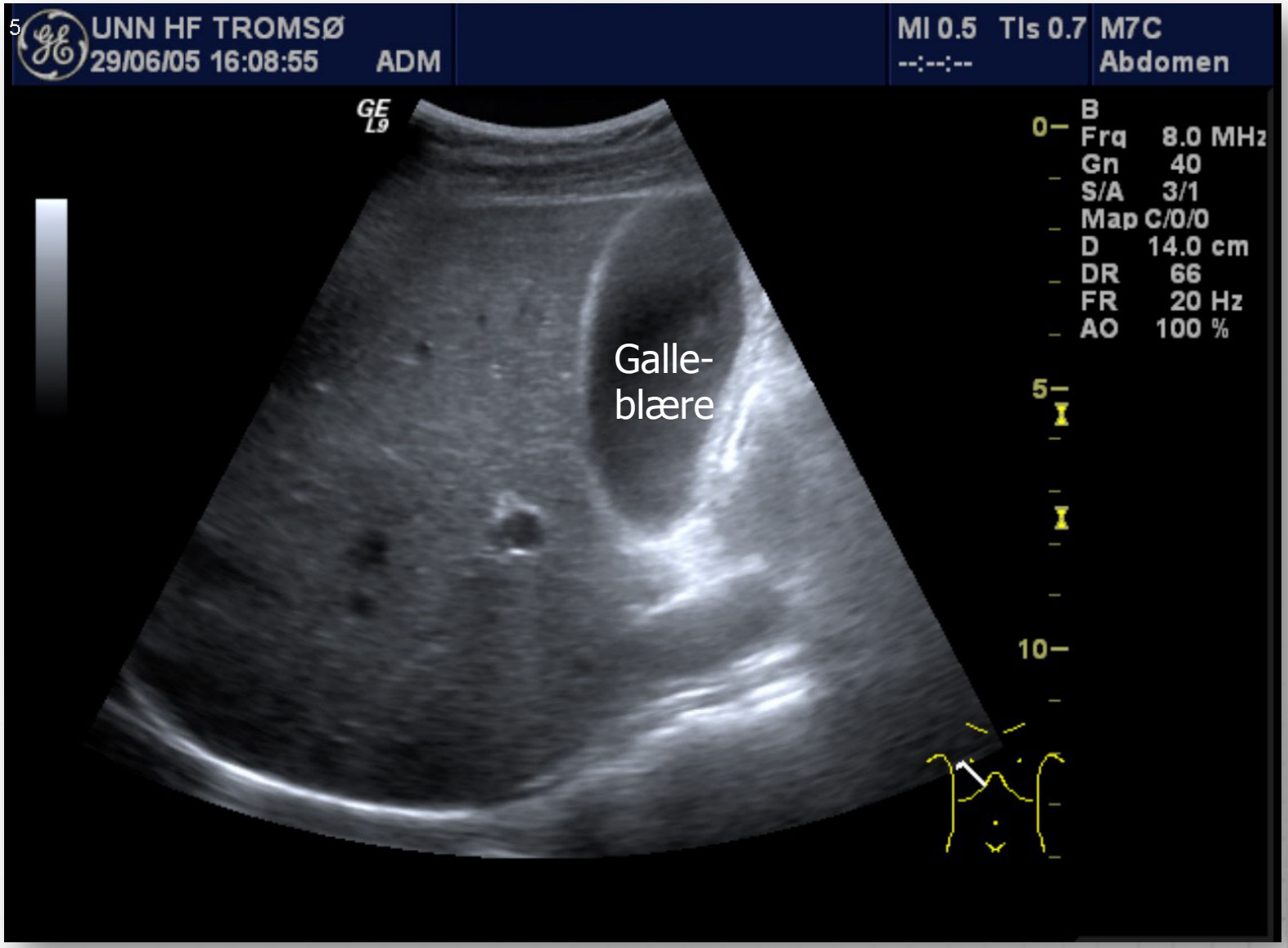


Graphics: Sven Weum

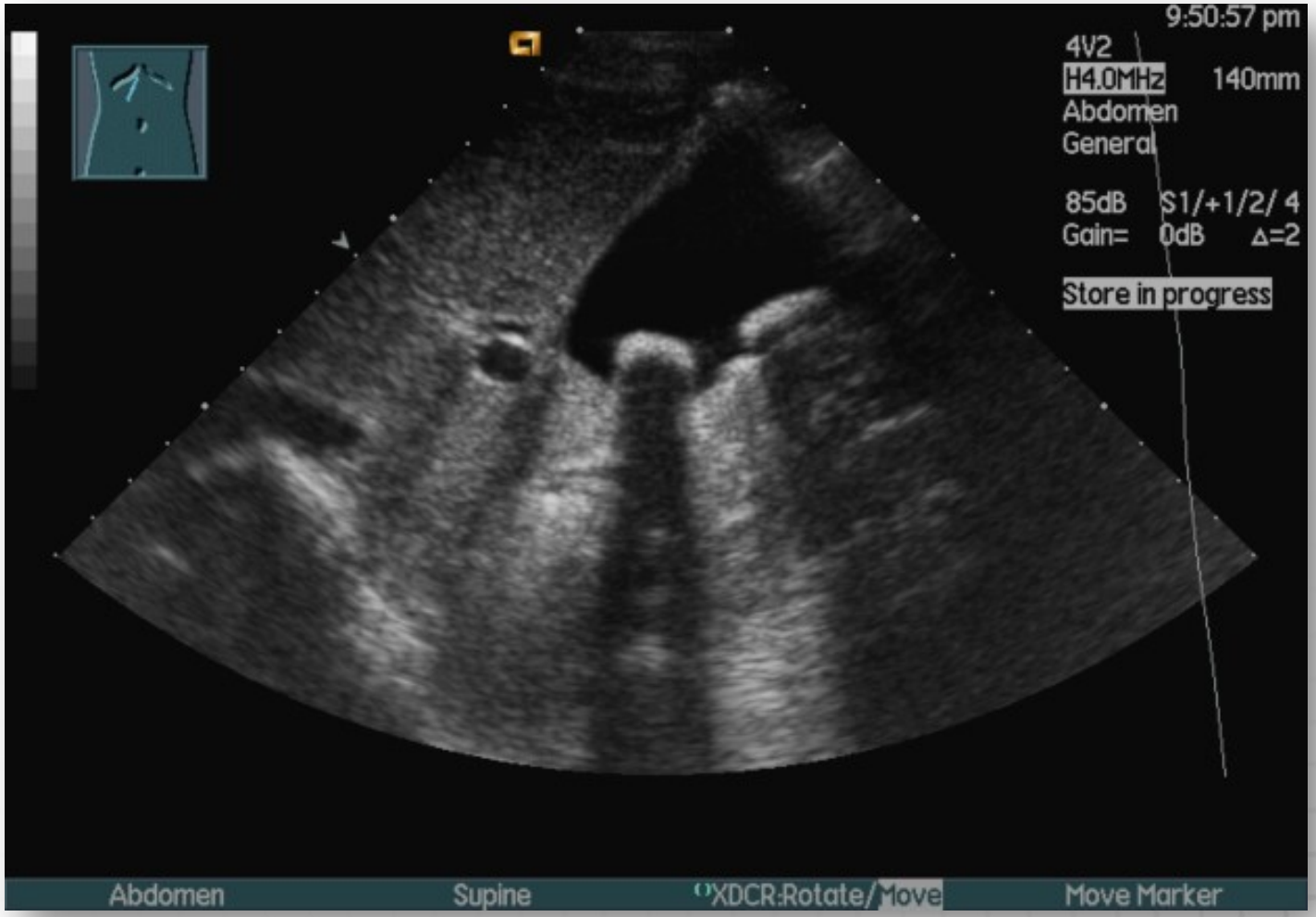


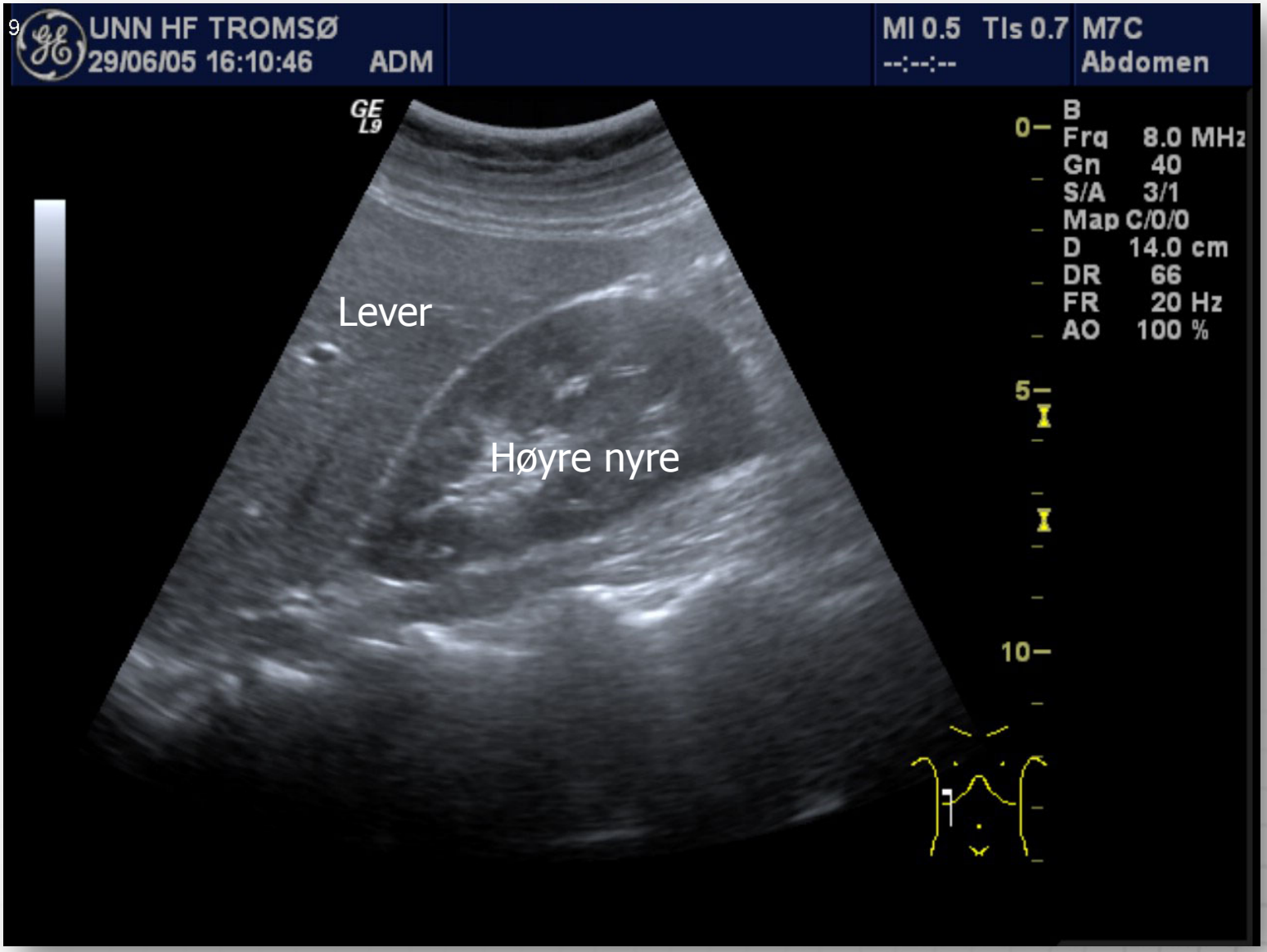
Wavelength in soft tissue:
3 MHz → λ = 0.51 mm
10 MHz → λ = 0.15 mm
15 MHz → λ = 0.10 mm

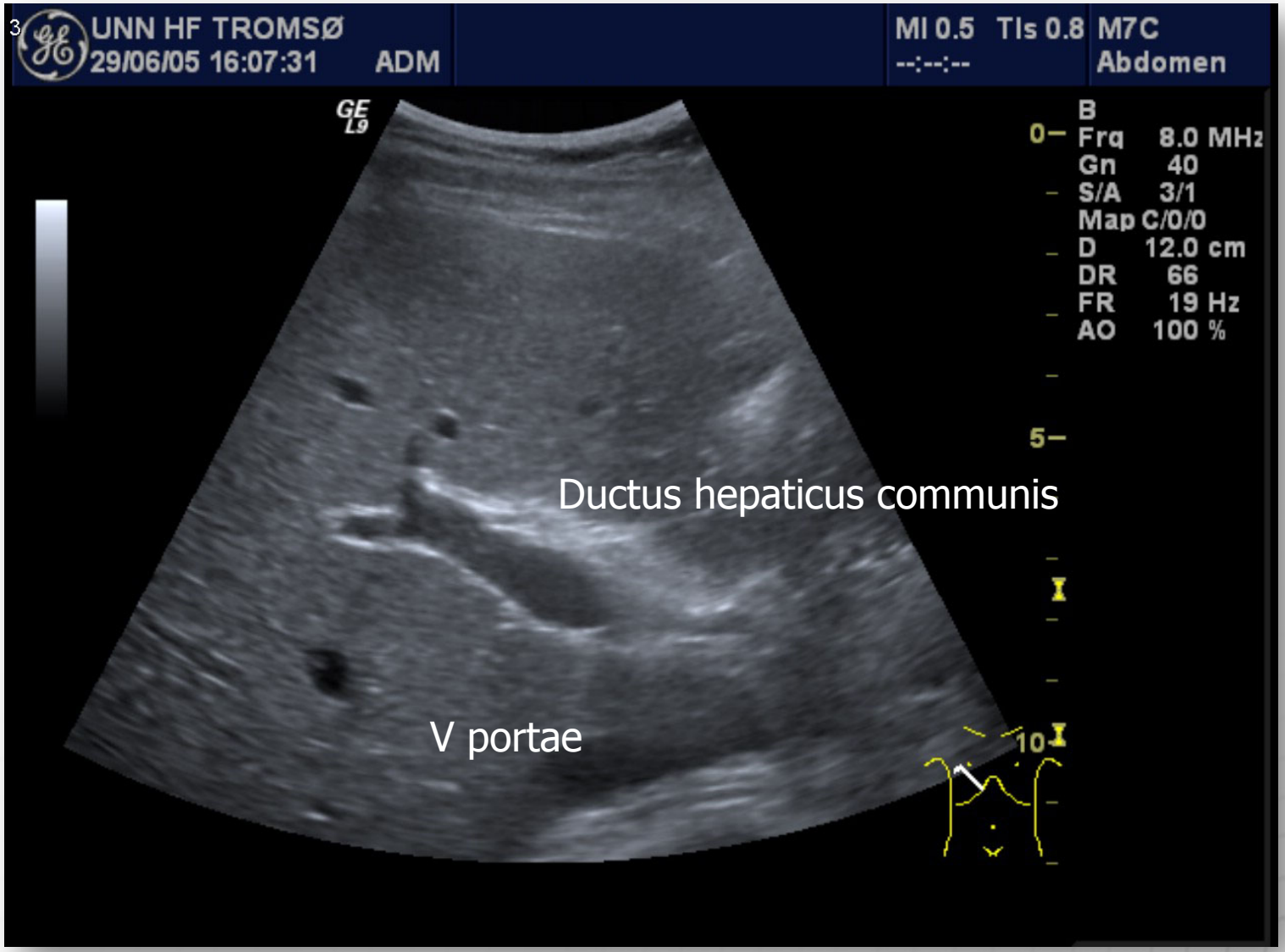
Graphics: Sven Weum

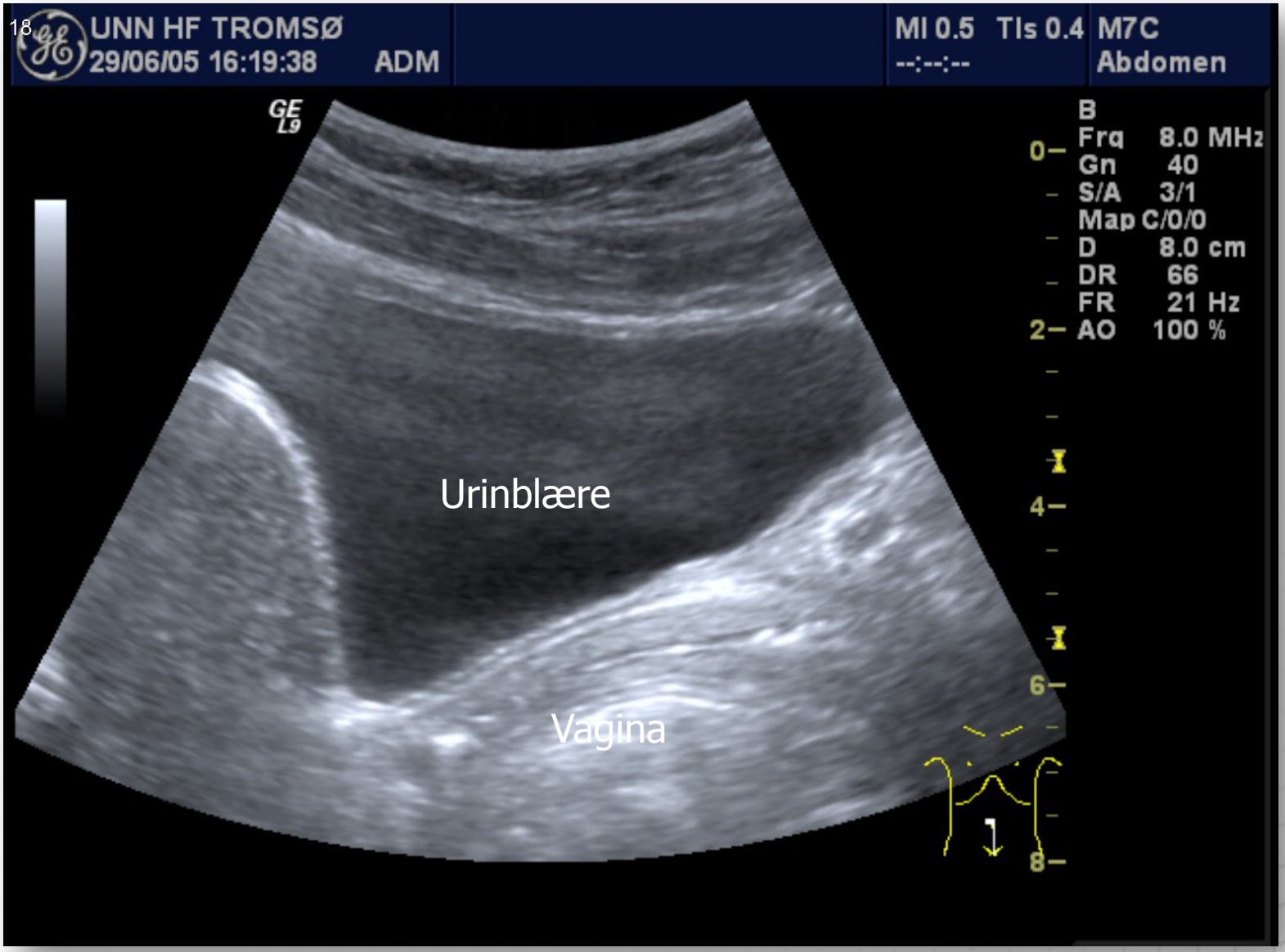

UNN HF TROMSØ
29/06/05 16:08:55
ADM
MI 0.5 TIs 0.7
--:--:--
M7C
Abdomen
GE
L9
B
Frq 8.0 MHz
Gn 40
S/A 3/1
Map C/0/0
D 14.0 cm
DR 66
FR 20 Hz
AO 100 %
0
5
10
Galle-
blære

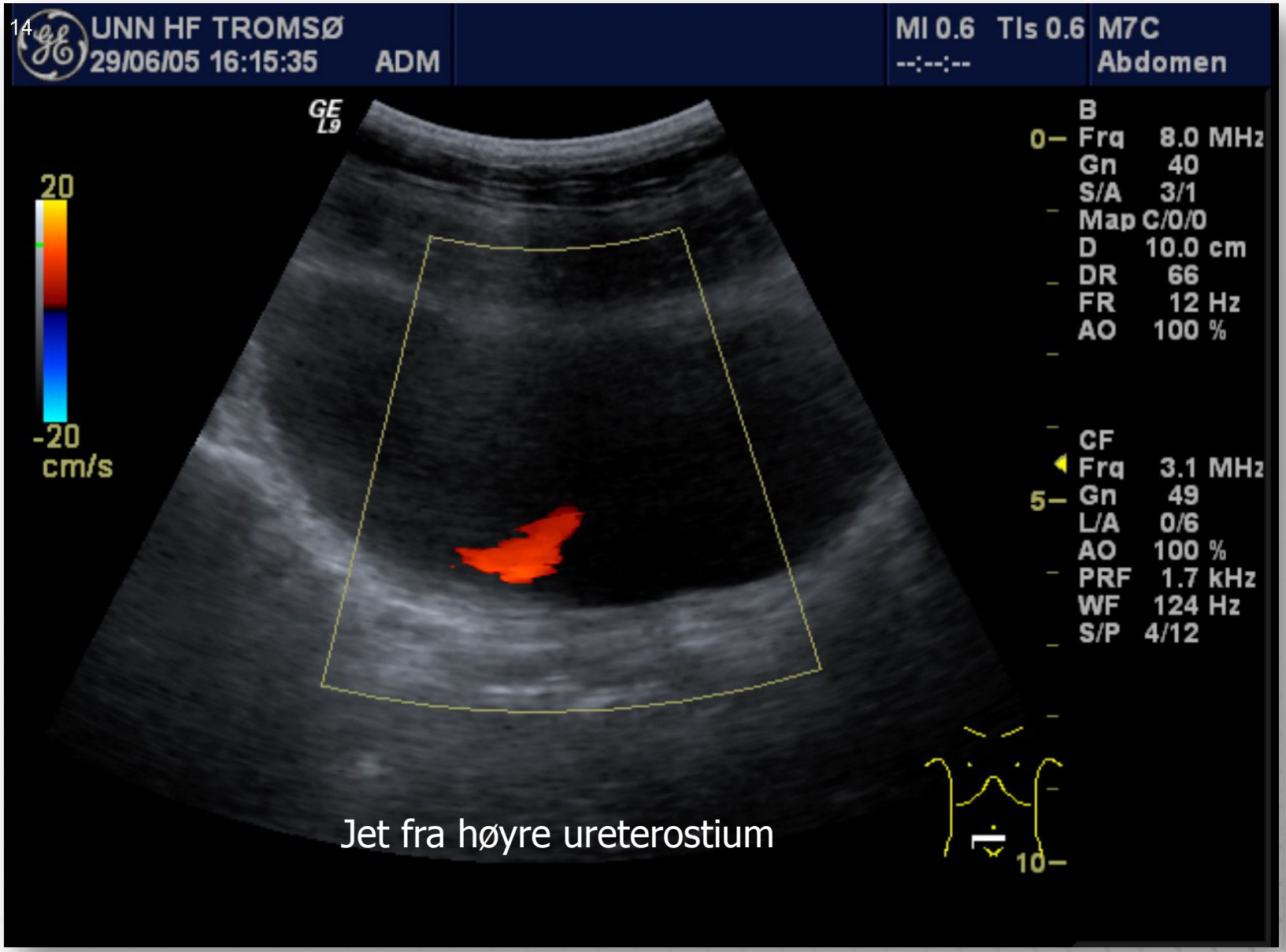
Stein i galleblæren




UNN HF TROMSØ
29/06/05 16:10:46
ADM
MI 0.5 TIs 0.7
--:--:--
M7C
Abdomen
GE
L9
B
Frq 8.0 MHz
Gn 40
S/A 3/1
Map C/0/0
D 14.0 cm
DR 66
FR 20 Hz
AO 100 %
0
5
10
Lever
Høyre nyre

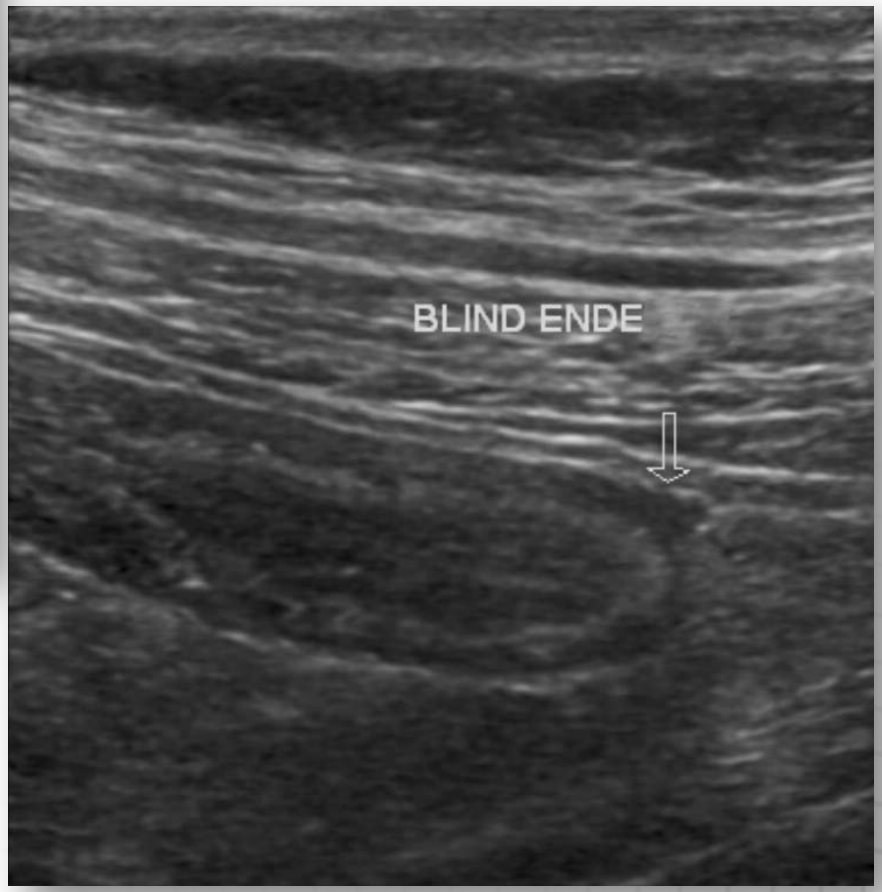

UNN HF TROMSØ
29/06/05 16:07:31
ADM
MI 0.5
TIs 0.8
--:--:--
M7C
Abdomen
GE
L9
B
Frq 8.0 MHz
Gn 40
S/A 3/1
Map C/0/0
D 12.0 cm
DR 66
FR 19 Hz
AO 100 %
0
5
10
Ductus hepaticus communis
V portae


UNN HF TROMSØ
29/06/05 16:19:38
ADM
MI 0.5
TIs 0.4
--:--:--
M7C
Abdomen
GE
L9
B
Frq 8.0 MHz
Gn 40
S/A 3/1
Map C/0/0
D 8.0 cm
DR 66
FR 21 Hz
AO 100 %
Urinblære
Vagina



Jet fra høyre ureterostium

Blindtarmbetennelse kan ofte bekreftes med ultralyd men ikke utelukkes.

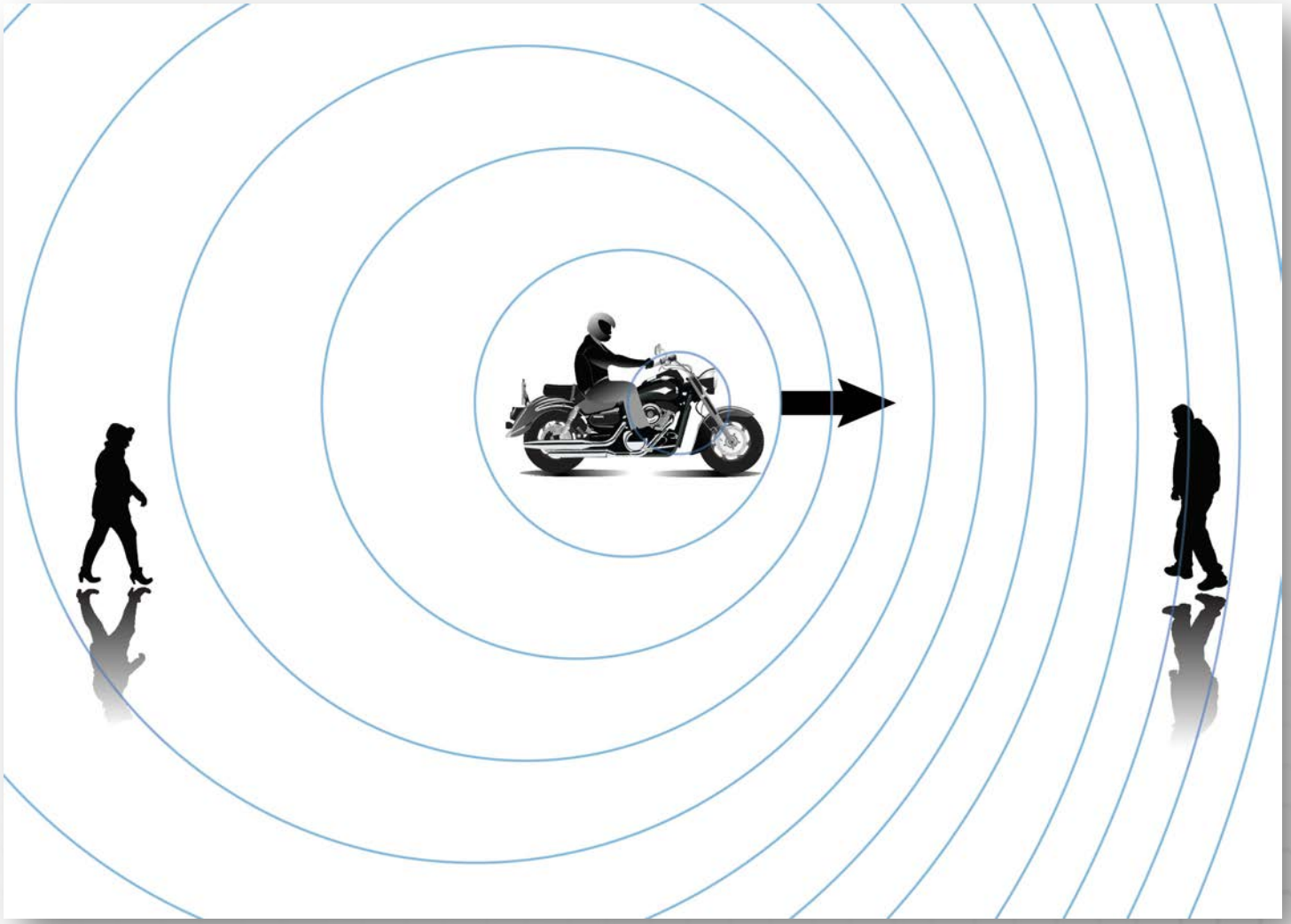


Appendicitt

Christian Doppler
Austrian physicist
1803-1853

Photo: Wikimedia Commons

Photo: Sven Weum



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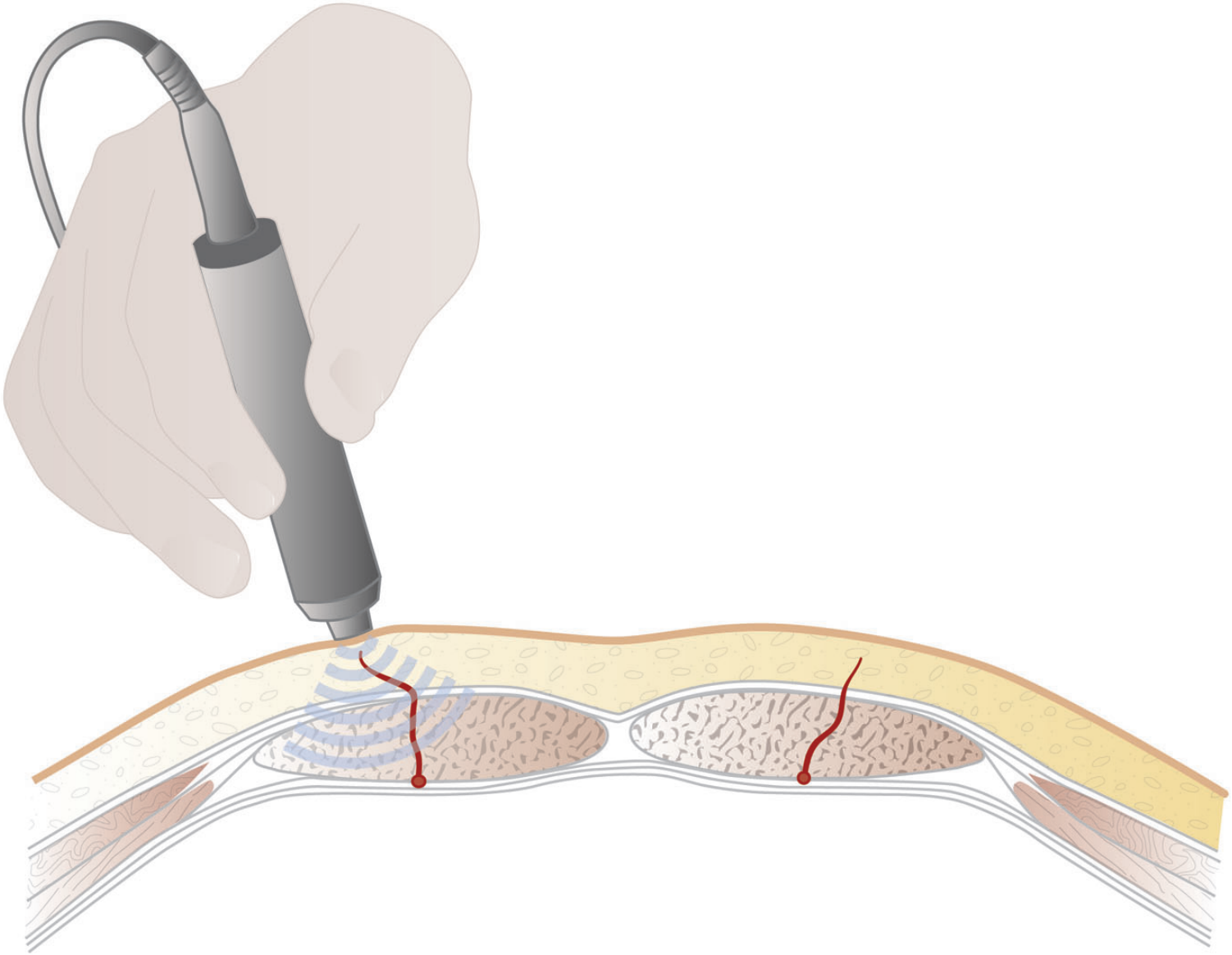

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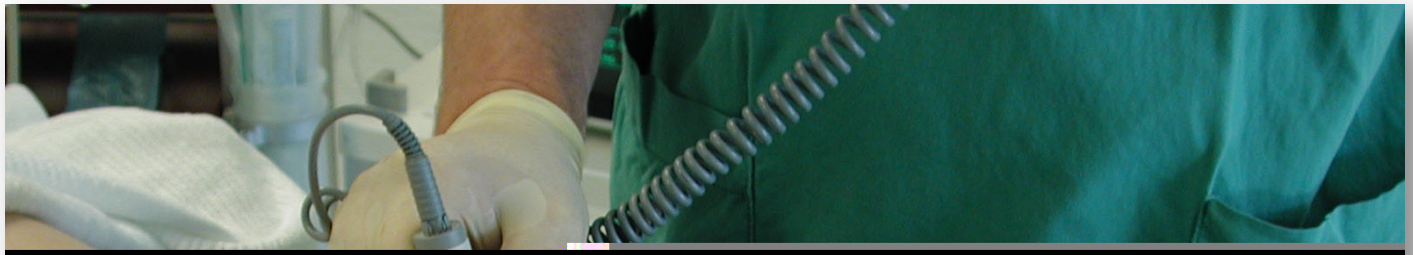


Photo: Sven Weum

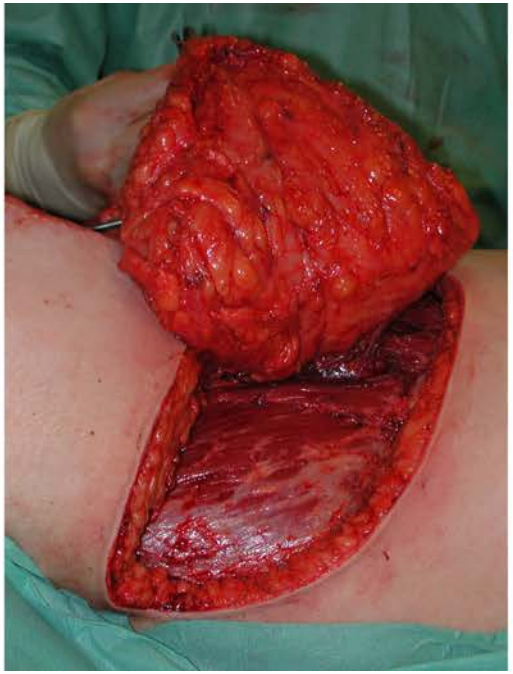
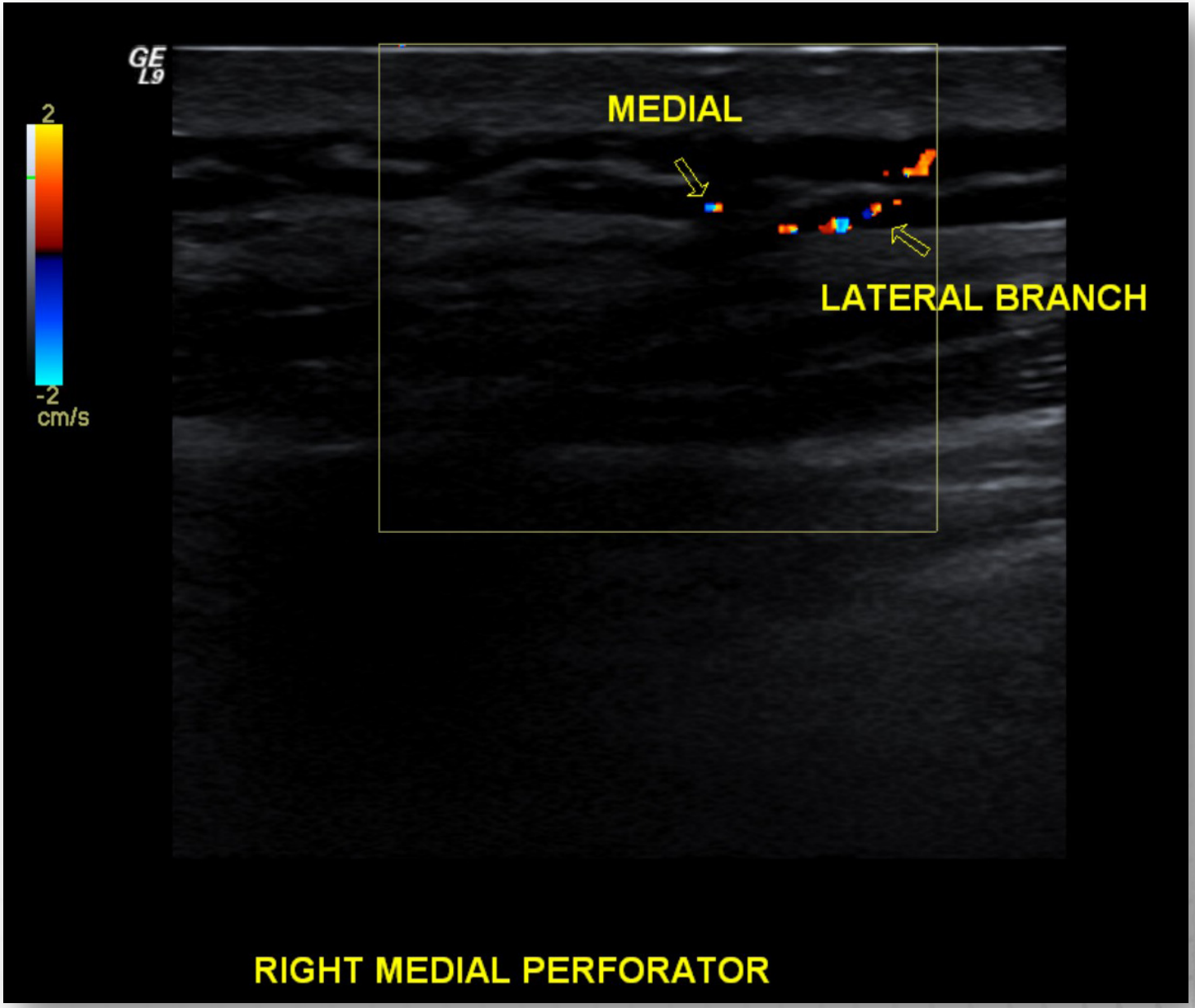


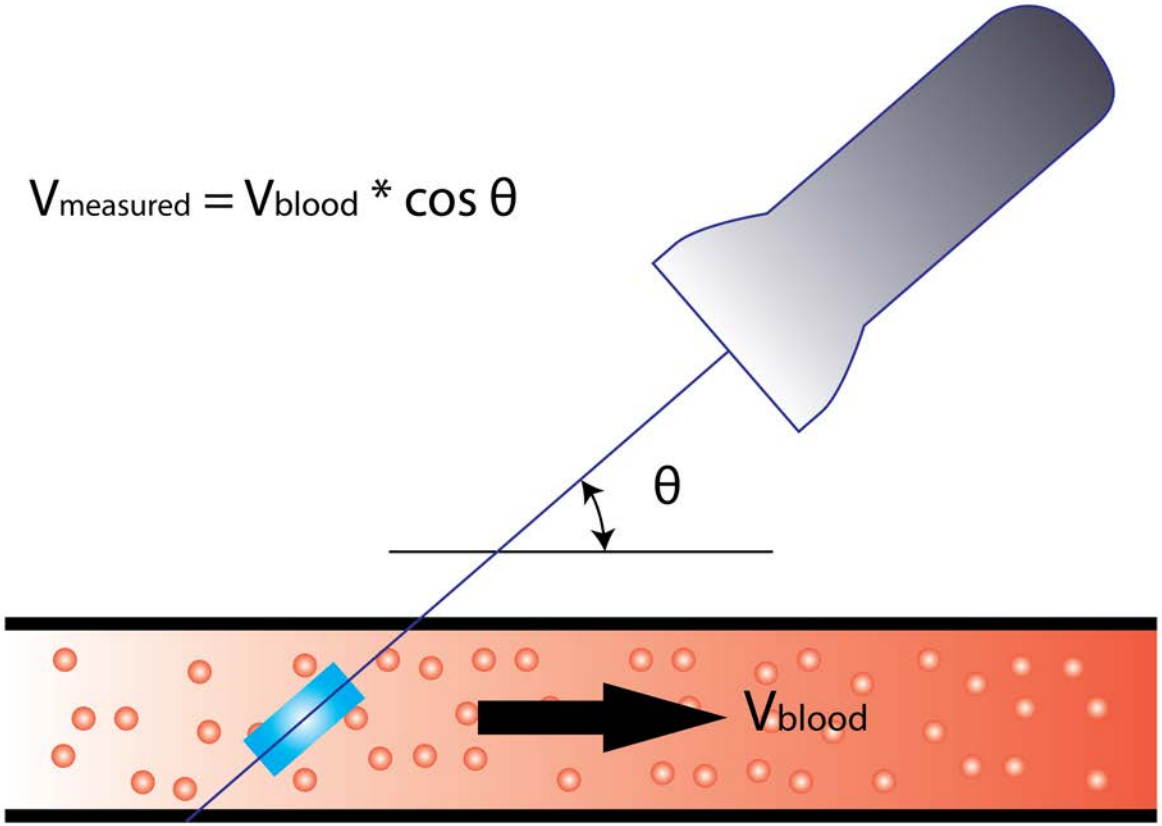
Photo: Sven Weum

Photo: Sven Weum

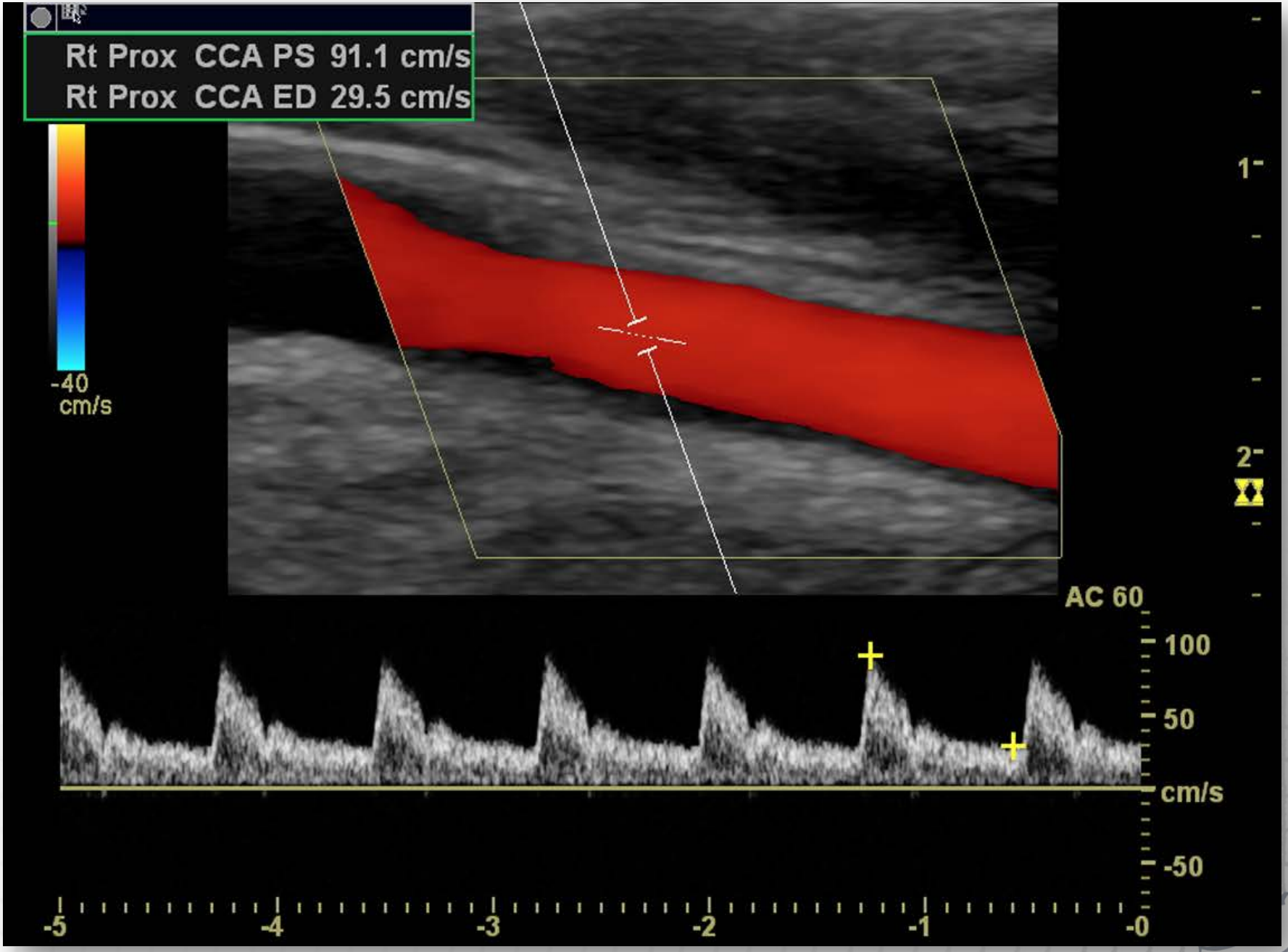

GE
L9
2
-2
cm/s
MEDIAL
LATERAL BRANCH
RIGHT MEDIAL PERFORATOR

Doppler: Sample angle

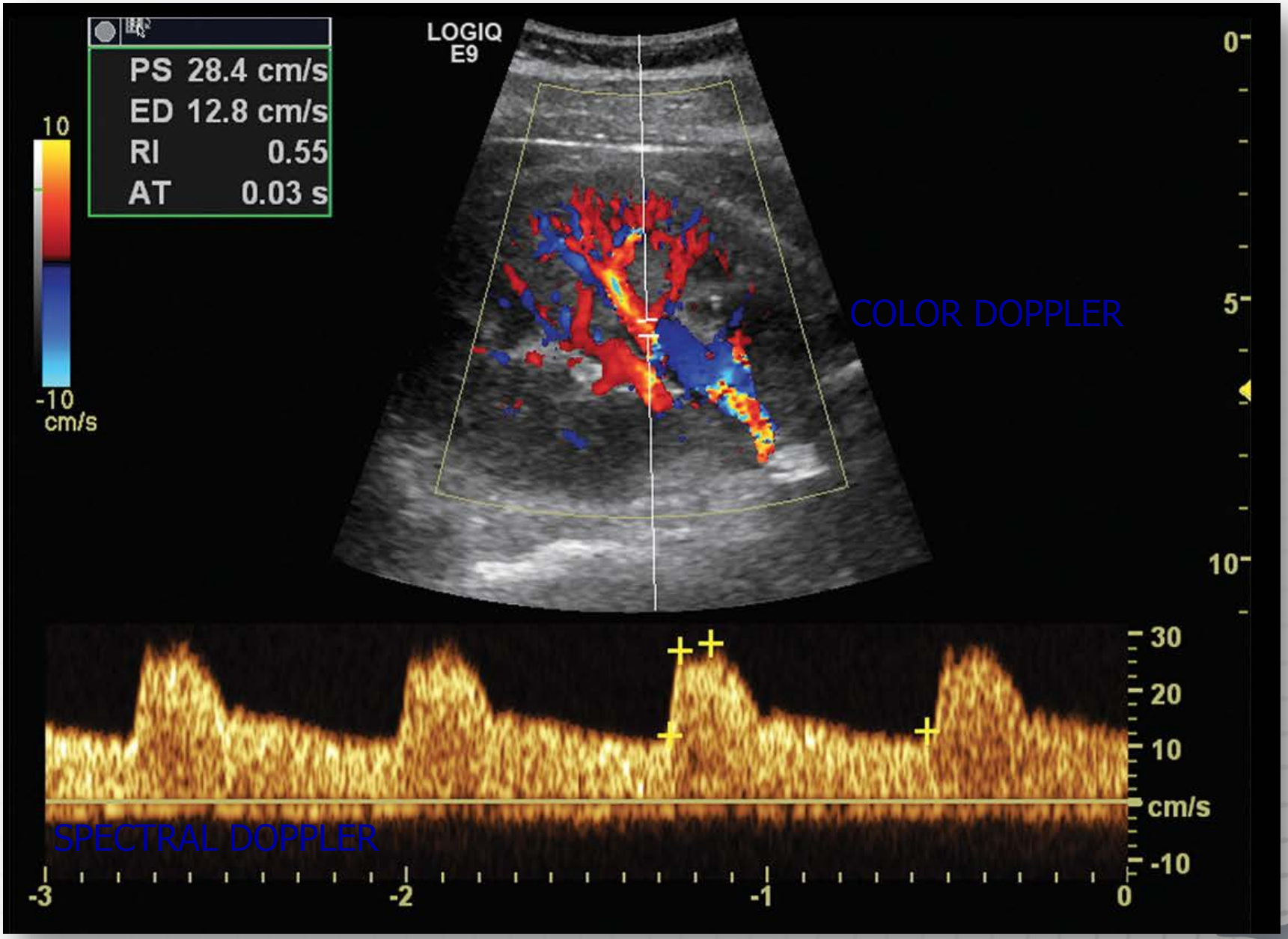
$$V_{measured} = V_{blood} * \cos\theta$$



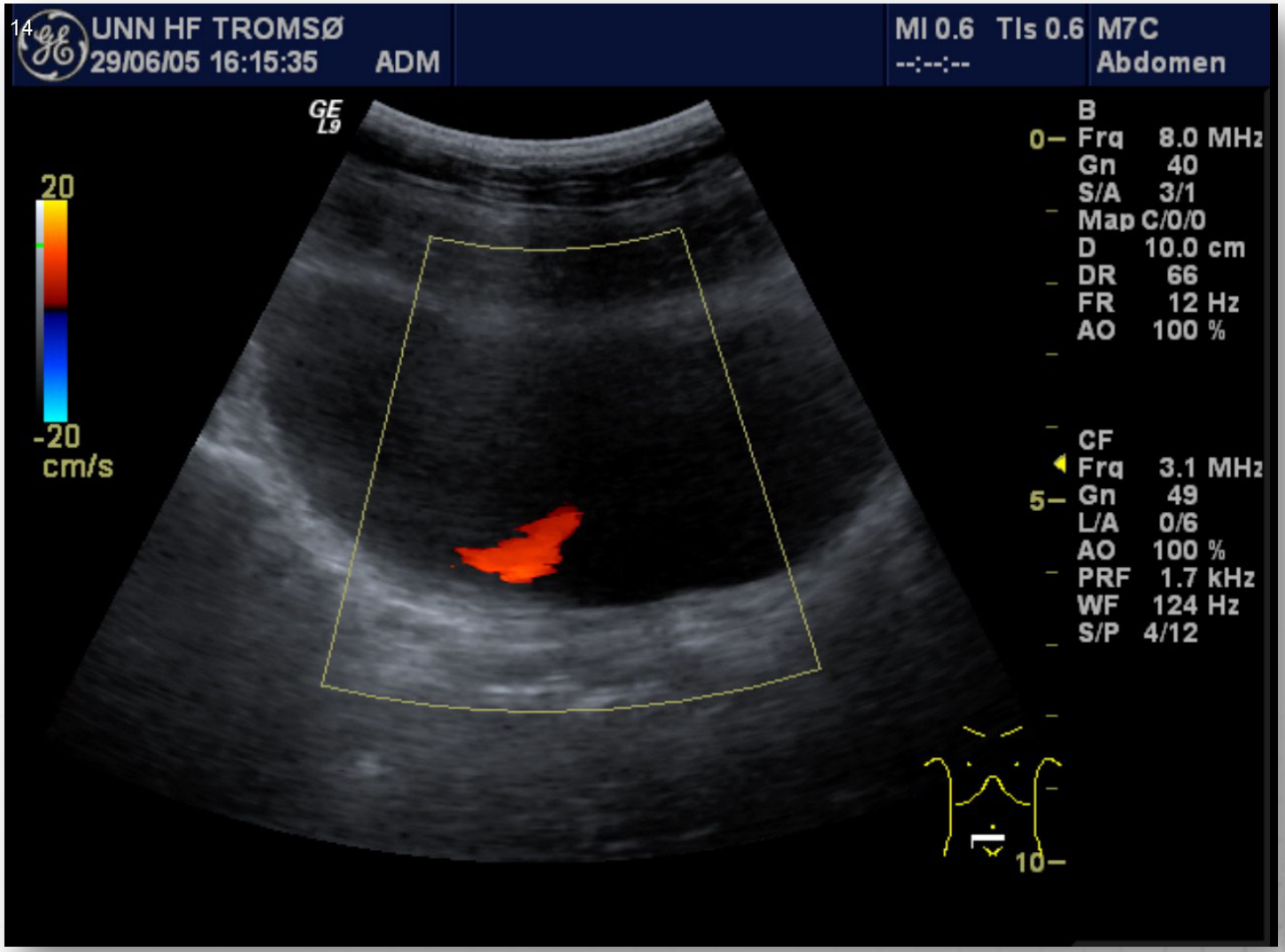
Graphics: Sven Weum

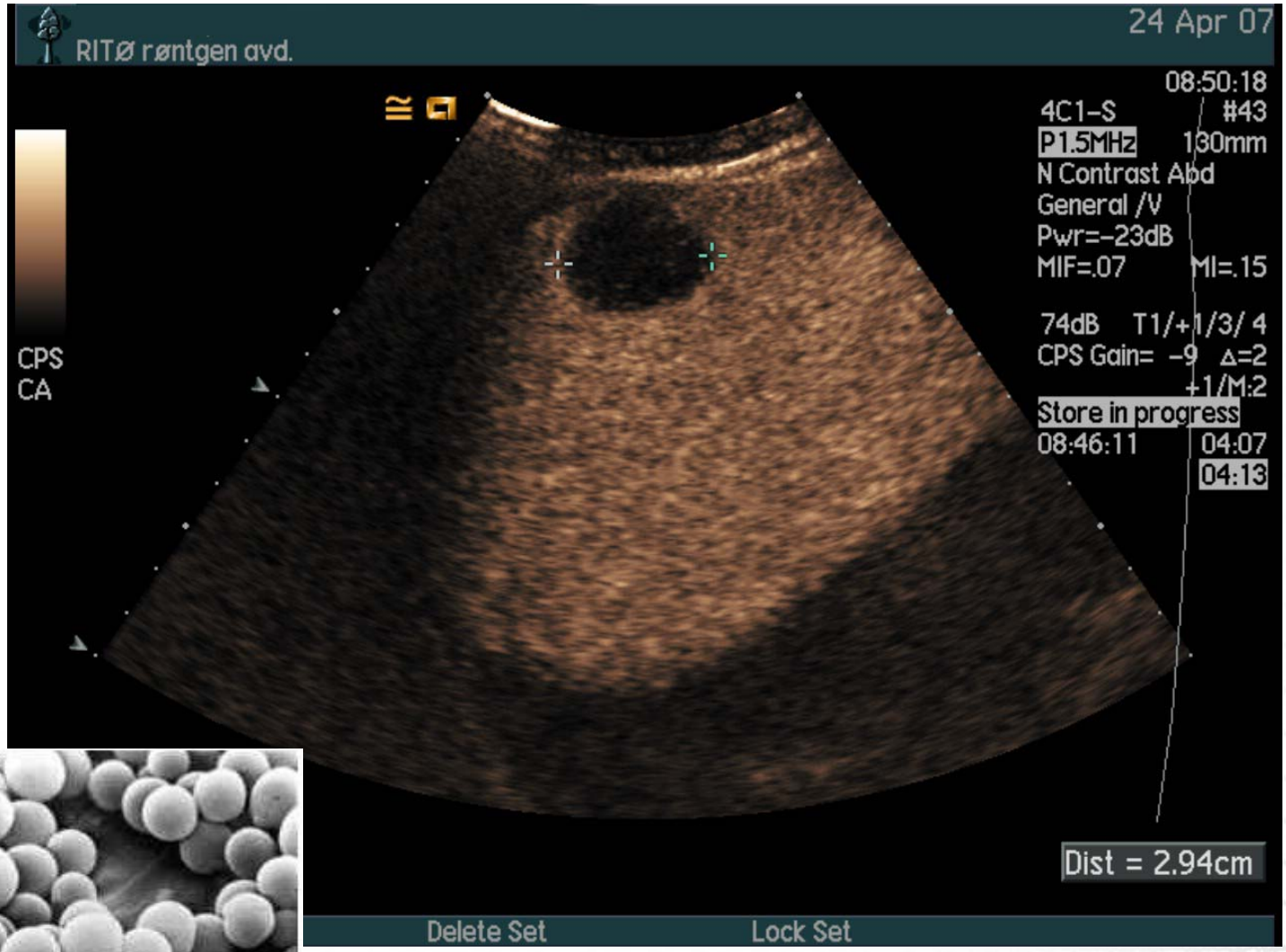


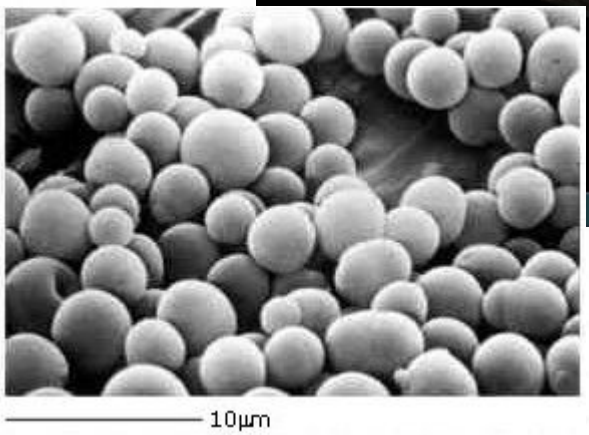
www.radiolog.no



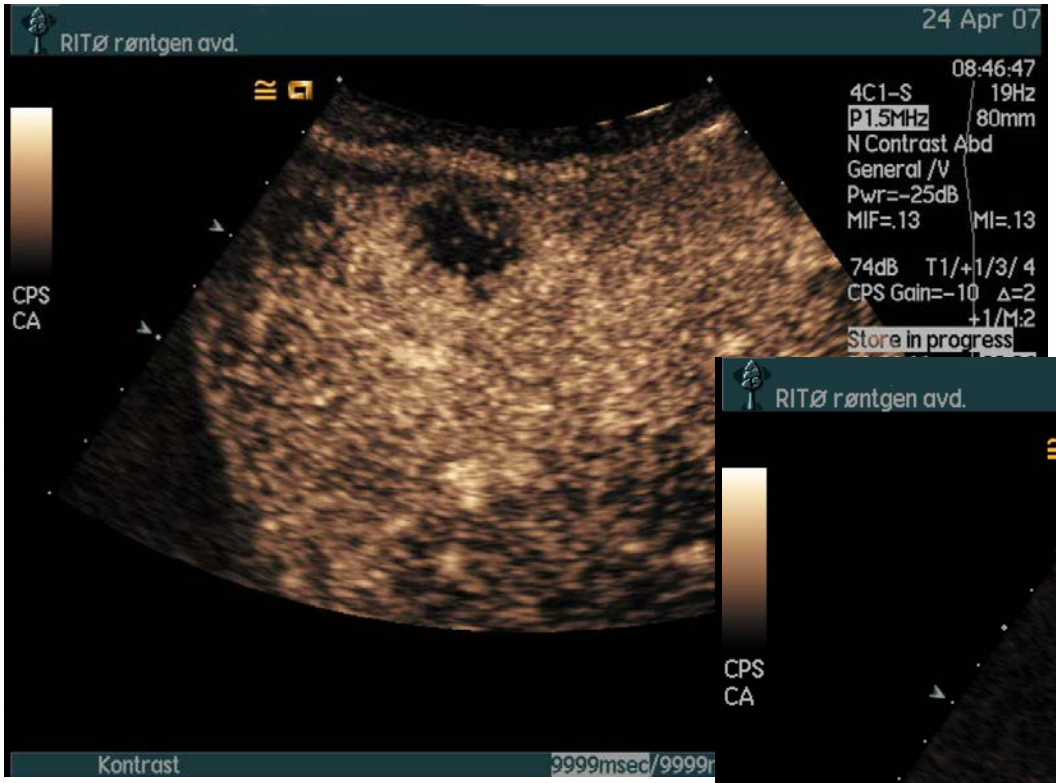
www.radiolog.no


UNN HF TROMSØ
29/06/05 16:15:35
ADM
MI 0.6
TIs 0.6
--:--:--
M7C
Abdomen
GE
L9
20
-20
cm/s
B
Frq 8.0 MHz
Gn 40
S/A 3/1
Map C/0/0
D 10.0 cm
DR 66
FR 12 Hz
AO 100 %
CF
Frq 3.1 MHz
Gn 49
L/A 0/6
AO 100 %
PRF 1.7 kHz
WF 124 Hz
S/P 4/12
0
5
10

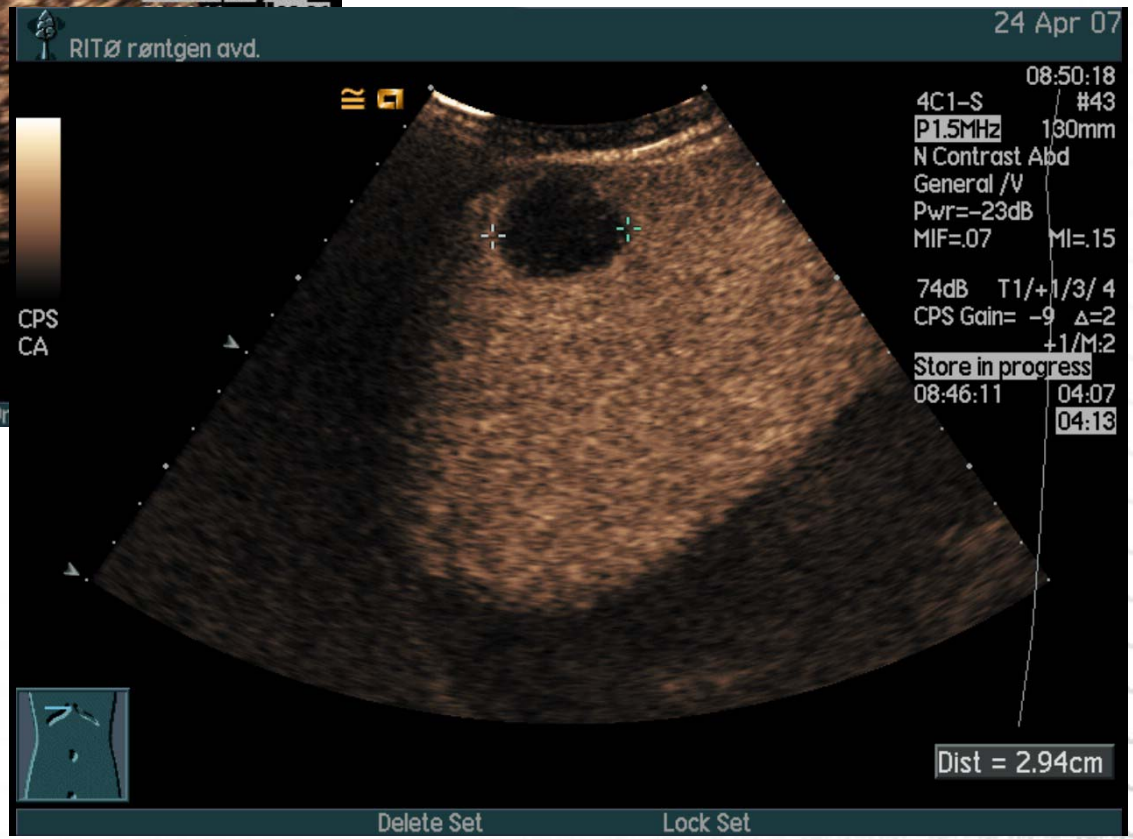




Ultralyd med intravenøs kontrast

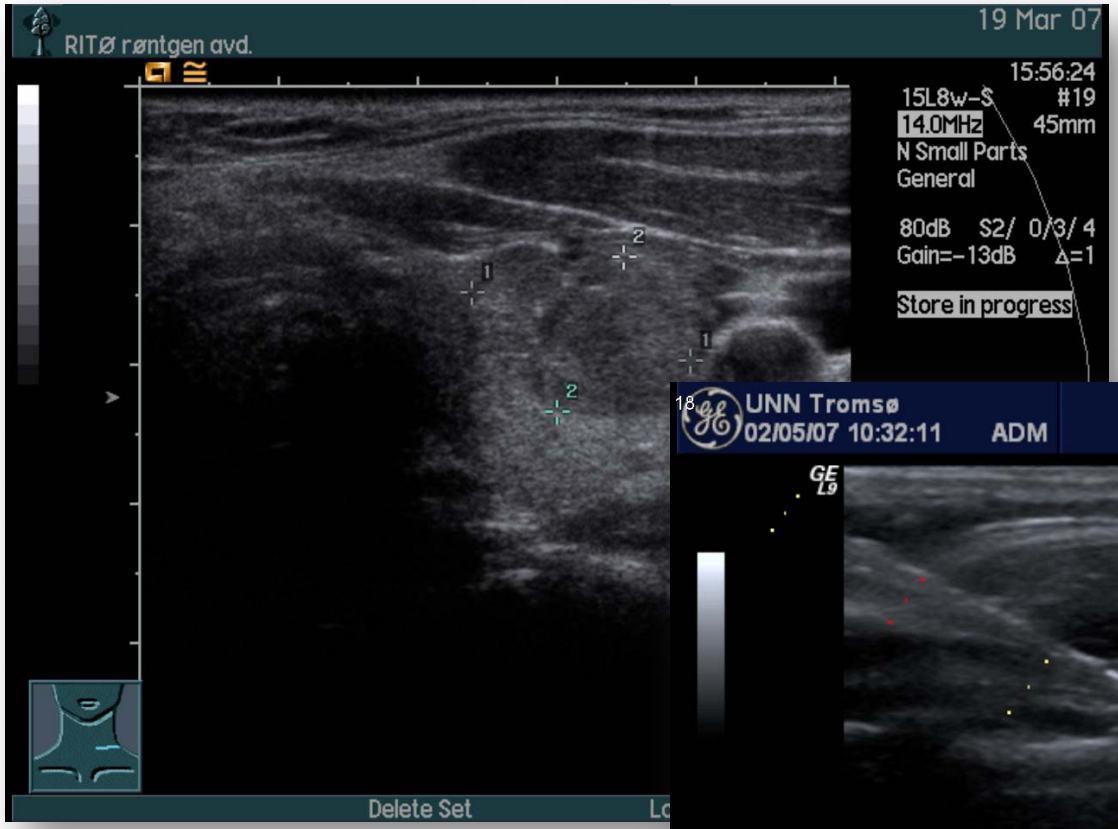


Ved mistanke om levermetastaser gjøres nå ultralyd med intravenøs kontrast

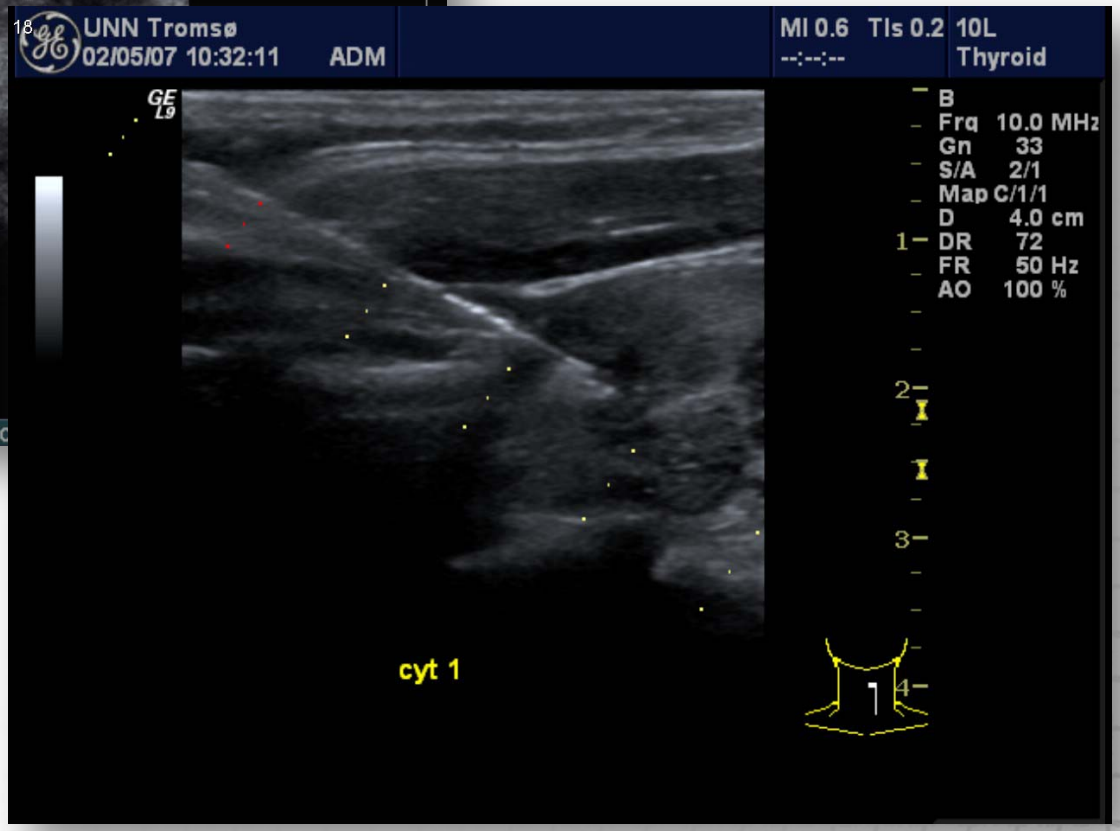


Levermetastase

THERMASONIC



Skjoldbruskkjertelen skal være biokjemisk kartlagt og henvises via kirurgisk poliklinikk



Celleprøve fra skjoldbruskkjertelen

Finn nåla i høystakken

Spesifikk problemstilling