Archiving Symposia related to Washington and Berlin (Exhibition)

****

History of Ultrasound in Medicine

German
Ultrasound
Museum

Part I — Pioneers (< 1940)

1793 Spalanzini Spalanzini postulates a sixth sense in bats, later assumed to be an "ultrasound-sense" (1920), proven not before 1939 (*Griffin* and *Galambos*).

1842 Doppler detects the relative frequency shift of moving sources (redshift of double stars) – the *Doppler-effect*

1877 Strutt describes the physical principles of sound, "The Theory of Sound"

1880 The **Curie**-brothers detect the piezoelectric effect

1912 Behm and – independently – **Richardson** invent the sonar

1916 Langevin and **Chilkowsky** construct the first ultrasound generator and the equipment for underwater detecting of submarines

1929 Sokolov develops the nondestructive ultrasound test of different media

1929 Wood, Loomis and **Johnson** start first studies of ultrasound bioeffects

1936 Gohr and **Wedekind** discuss ultrasound examination of inner organs

1939 von Pohlmann introduces ultrasound in therapy

1912 **Behm** and – independently – **Richardson** invent the sonar

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1936 **Gohr** and **Wedekind** discuss ultrasound examination of inner organs

1939 **von Pohlmann** introduces ultrasound in therapy

Part II First Attempts (< 1952)

1942 **Dussik:** First attempts to use ultrasound transmission in medical diagnostics ("hyperphonography" of the cerebral ventricels)

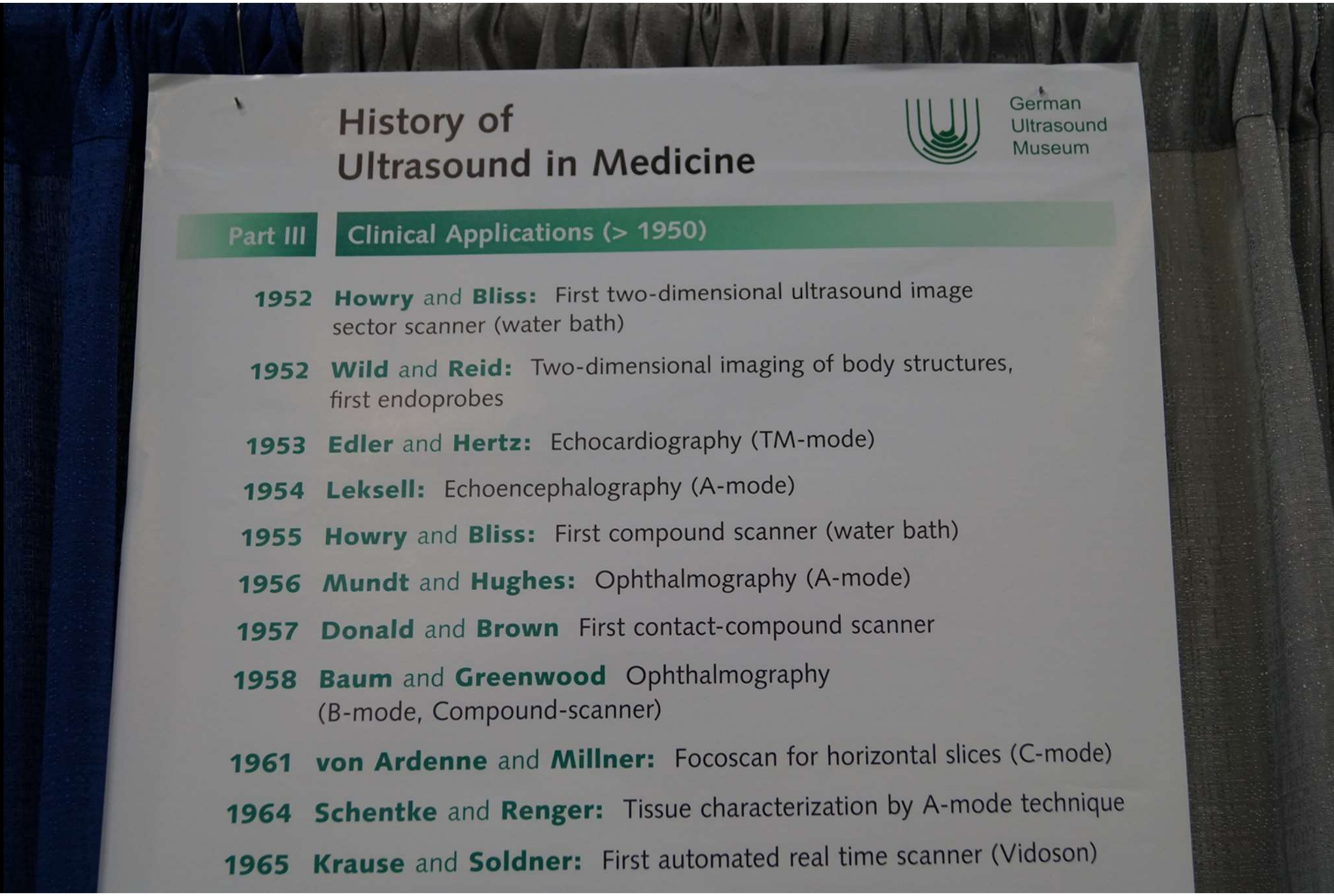
1949 **Keidel:** Volume measurement of the heart (transmission-technique)

1949 **Ludwig** and **Struthers** use a pulse-echo-device (material testing device)

1950 **Wild** and **Reid:** Tissue characterization with ultrasound

1951 **Wagai:** Diagnosis of gall stones and cancer via water bath-scanner

1959 **Satomura:** Transcutaneous Doppler sonography of cervical and peripheral vessels



History of Ultrasound in Medicine

German Ultrasound Museum

Part III — Clinical Applications (> 1950)

1952 **Howry** and **Bliss:** First two-dimensional ultrasound image sector scanner (water bath)

1952 **Wild** and **Reid:** Two-dimensional imaging of body structures, first endoprobes

1953 **Edler** and **Hertz:** Echocardiography (TM-mode)

1954 **Leksell:** Echoencephalography (A-mode)

1955 **Howry** and **Bliss:** First compound scanner (water bath)

1956 **Mundt** and **Hughes:** Ophthalmography (A-mode)

1957 **Donald** and **Brown** First contact-compound scanner

1958 **Baum** and **Greenwood** Ophthalmography (B-mode, Compound-scanner)

1961 **von Ardenne** and **Millner:** Focoscan for horizontal slices (C-mode)

1964 **Schentke** and **Renger:** Tissue characterization by A-mode technique

1965 **Krause** and **Soldner:** First automated real time scanner (Vidoson)

1953 Edler and **Hertz:** Echocardiography (TM-mode)

1954 Leksell: Echoencephalography (A-mode)

1955 Howry and **Bliss:** First compound scanner (water bath)

1956 Mundt and **Hughes:** Ophthalmography (A-mode)

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1965 Holländer: Real time in Obstetrics and Gynecology

1966 Strandness jr.: First commercially available CW-Doppler equipment in the Western hemisphere

1967 Watanabe: Transrectal scanning of the prostate

1969 Rettenmaier: Real time scanning of the abdomen

1969 Kratochwil: First biopsy transducer for a compound scanner

1972 Greene: high performance ultrasonic camera (acoustical holography)

1972 Holm: First biopsy transducer for real time scanner

(B-mode, Compound-scanner)

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1972 Greene: high performance ultrasonic camera (acoustical holography)

1972 Holm: First biopsy transducer for real time scanner

1973 Carlsen and **Garrett:** Gray scale technique

1974 Baker and **Strandness:** First prototype of duplex system

1974 ADR 2130: First commercially available linear array scanner

1986 Aloka Quantum: First color coded duplex-sonography


WFUMB/aium
1980s
LIFE INSTRUMENTS WATER BATH BREAST SCANNER
This system features large dual monitors with single step, freeze frame or synchronized sequencing modes, and could generate videotaped images. The image replay system was able to show both breasts simultaneously.
CAMERA
BRIGHTNESS
CONTRAST
RESET
DISC
dual image sequencing console
life instruments corporation
LIBS™

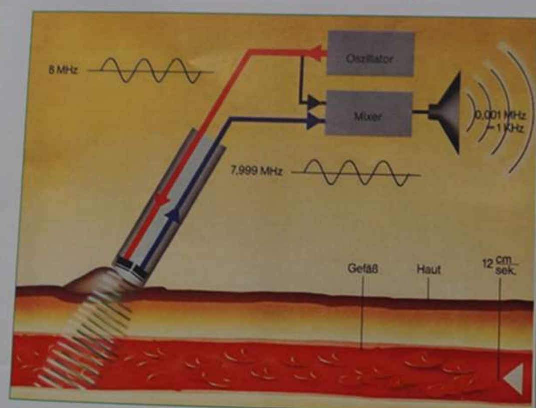

WFUMB/aium
1940s
U. S. NAVY LOCATOR
Dr. G. D. Ludwig's first ultrasonic scanning equipment. During his service at the Naval Medical Research Institute in Bethesda, Maryland, Dr. Ludwig concentrated on the use of ultrasound to detect gallstones and other foreign bodies embedded in tissues, an approach similar to the detection of flaws in metal.
George D. Ludwig, about 1947-49, during his service at the Naval Medical Research Institute in Bethesda, Maryland. Ludwig's early work at the institute concentrated on the use of ultrasound to detect gallstones and other foreign bodies embedded in tissues, an approach similar to the detection of flaws in metals.
ULTRASONIC LOCATOR POWER SUPPLY UNIT
GENERAL PRECISION LABORATORY, INC. PLEASANTVILLE, N.Y.
ON
OFF
INTENSITY
FOCUS
VERT.
ULTRASONIC LOCATOR
GENERAL PRECISION LABORATORY, INC. PLEASANTVILLE, N.Y.
SWEEP DELAY
GAIN
2.5 MC.
PULSE
PROBE
RECEIVER
WFUMB/aium
1950s


Z-2
BIOENGINEERING
Cromemco
WFUMB/aium
1970s
WFUMB/aium
1970s
ADR - MODEL 2130

Doppler-Sonography

German
Ultrasound
Museum

Christian Doppler



Principle of Doppler-sonography

Diagnostic ultrasound gained new perspectives from the use of "Doppler-Sonography", named after the Austrian physicist **Christian Doppler (1803 – 1853)**. He discovered that the frequency of waves – including sound waves – will shift, when the origin of the waves and the observer will move relative to one another.

For example, if a source of sound of a constant pitch is moving towards an observer, the sound seems higher in pitch, whereas if the source is moving away, it seems lower.

Correspondingly, the frequency of diagnostic ultrasound (about 1 – 20 MHz) will change to a higher or lower pitch when reflected or scattered at moving corpuscular elements within a living body, especially blood cells.

Examining blood vessels with 2 – 8 MHz ultrasound, the shift between emitted and reflected sound waves is approximately in an audible range of 50 Hz – 20 kHz. Knowing the frequency shift and the angle of insonation, one can calculate the velocity of the blood flow.

Variations between systolic and diastolic blood flow patterns are specific for certain blood vessels.

Christian Doppler

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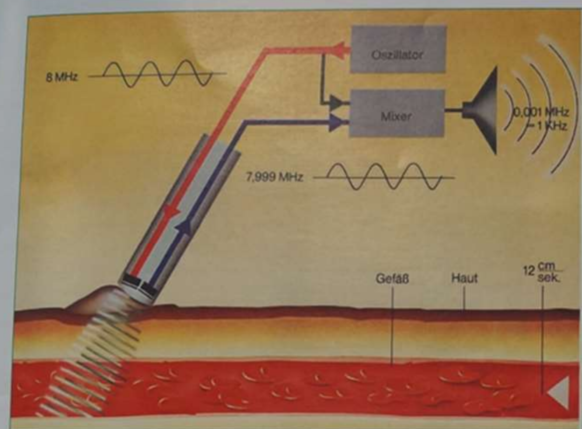


Principle of Doppler-sonography

Continuous-wave Doppler-sonography (about 1978)

Variations between systolic and diastolic blood flow patterns are specific for certain blood vessels. A change of these proportions or a very high or very turbulent flow indicate a vessel stenosis. A missing ultrasound Doppler shift would be typical for an occlusion. In veins not only the spontaneous but also the augmented flow patterns are relevant – for instance after compression of more distant veins.

Experienced sonographers make their diagnoses by listening to the ultrasound Doppler-flow signals. Documentation either as a graphical curve or, after


Dr. J. S. Lehman with an early Physionics bi-stable B-scan ultrasound instrument.


TECHNICARE
CUSTOMER PRODUCT
SERVICE CENTER
SYSTEM ID
Processing
Display
Erase


WFUMB/aium
1960s
WFUMB/aium
1960s
TYPE 545B OSCILLOSCOPE
PHYSIONIC ENG INC
Dr. J. S. Lehman with an early Physionics bi-stable B-scan ultrasound instrument.


WFUMB/aium
TYPE 500A
SCOPE-MOBILE
WFUMB/aium

First Medical Applications

German
Ultrasound
Museum

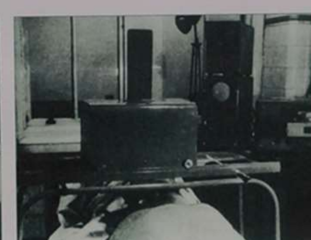
Douglass Howry

The "gun turret scanner"

B-scan image of the neck

D. Howry (Denver) was the first pioneer, who in **1952** presented twodimensional ultrasound images in cooperation with the engineer **R. Bliss**
The examination was carried out with the patient sitting in a water-filled tub. For examinations of the neck the patient therefor hat to be immersed in the water almost to the tip of the nose. The Scanner repeatedly made semicircles around the patient .
Together with **Joseph Holmes** he examined mainly the organs of the andomen, the liver, the spleen, the kidneys and the urinary bladder.

Ian Donald

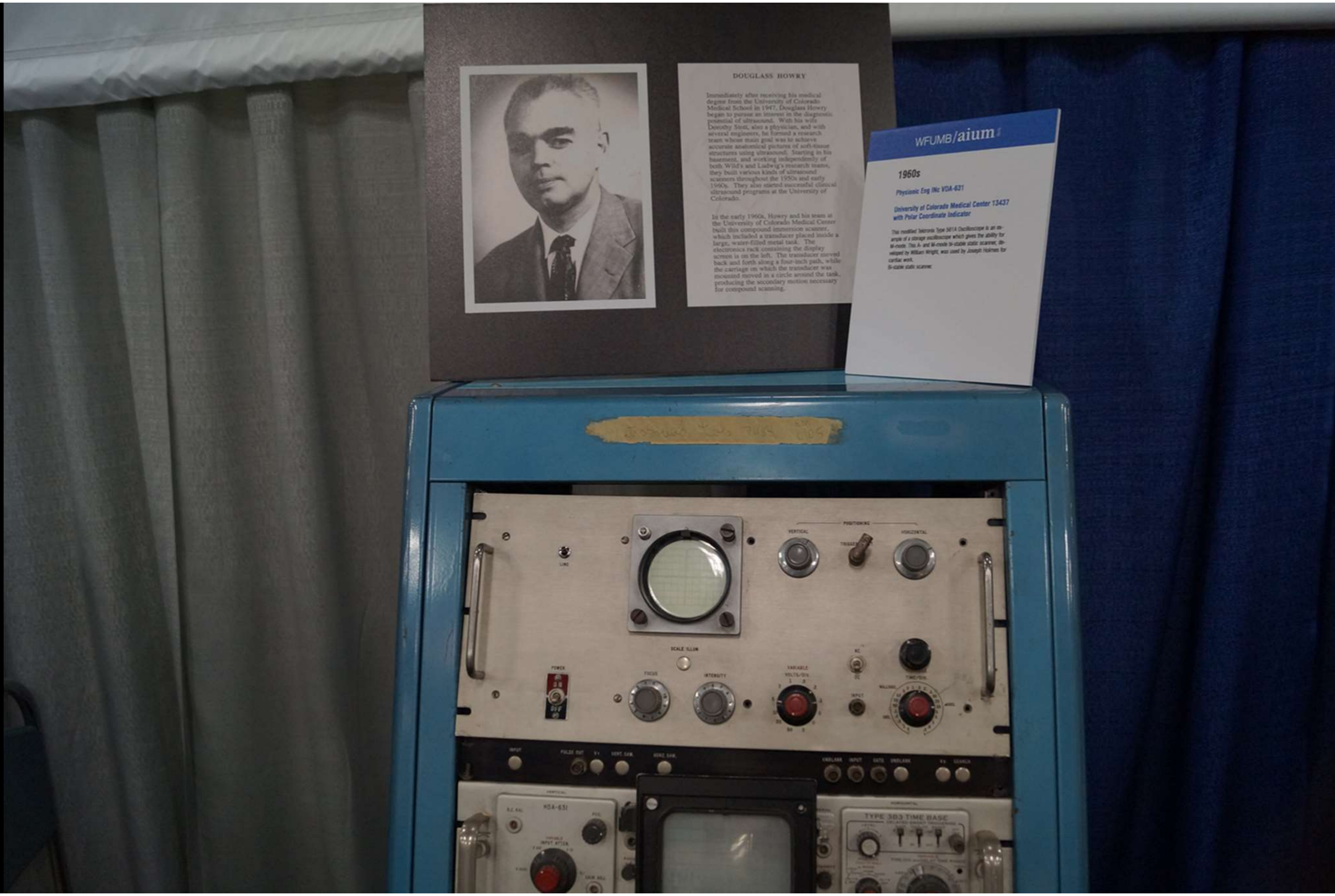


First contact-compound-scanner. The probe was moved by hand in direct contact to the skin

Twins

J. Donald (Glasgow) constructed the first contact-compound-scanner in **1957**.
Instead of immersing the patient in water, ultra-sound gel war placed between the transducer and the body. Now the ultrasound probe could

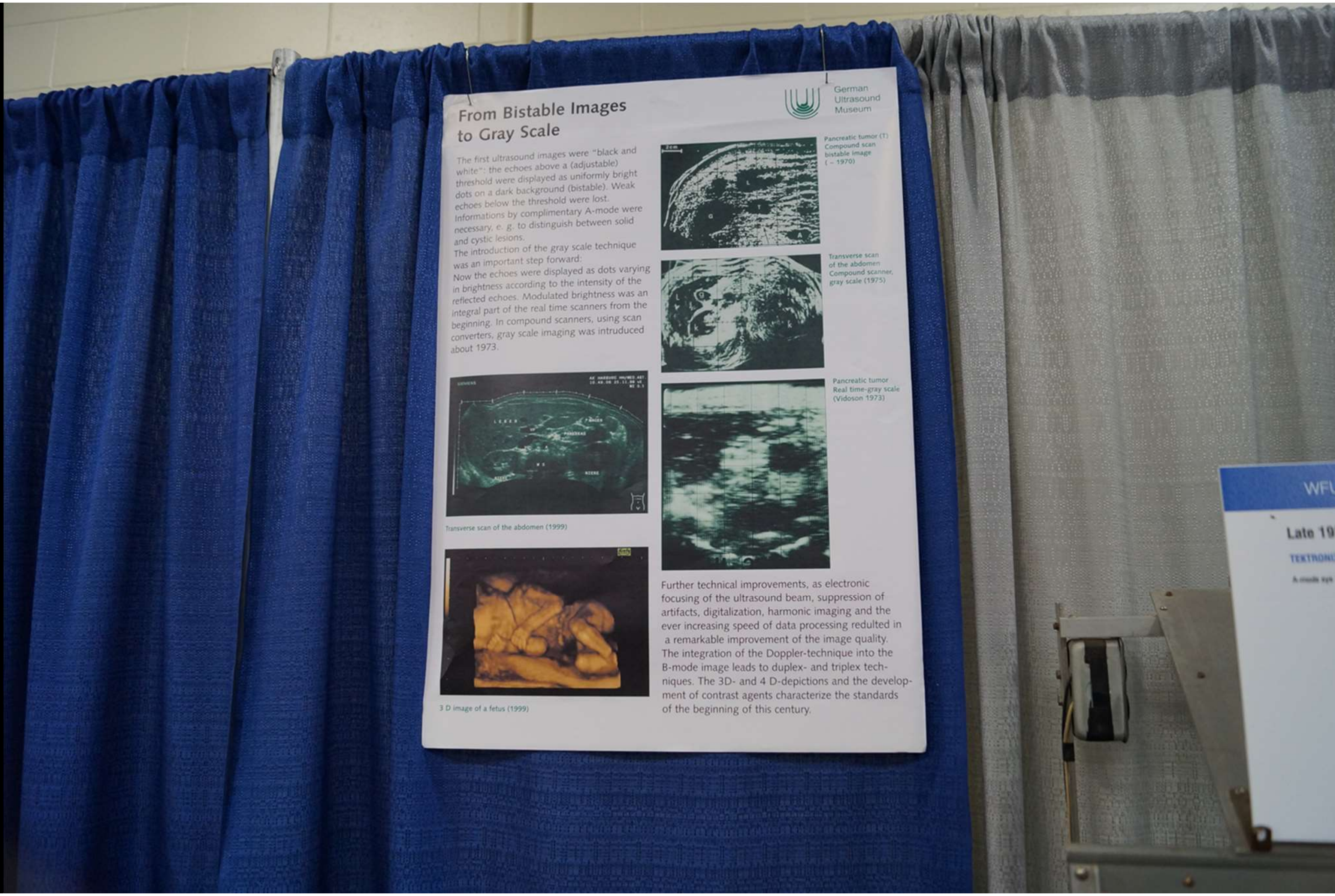
Donald diagnosted twins, triplets, hydramnios and fetal anomalies (hydrocephalus).
He propagated the use a full bladder as an acoustic window. The contact-compound-scanner became the basis for large-scale use of diagnostic


DOUGLASS HOWRY
Immediately after receiving his medical degree from the University of Colorado Medical School in 1947, Douglass Howry began to pursue an interest in the diagnostic potential of ultrasound. With his wife Dorothy Stott, also a physician, and with several engineers, he formed a research team whose main goal was to achieve accurate anatomical pictures of soft-tissue structures using ultrasound. Starting in his basement, and working independently of both Wild's and Ludwig's research teams, they built various kinds of ultrasound scanners throughout the 1950s and early 1960s. They also started successful clinical ultrasound programs at the University of Colorado.
In the early 1960s, Howry and his team at the University of Colorado Medical Center built this compound immersion scanner, which included a transducer placed inside a large, water-filled metal tank. The electronics rack containing the display screen is on the left. The transducer moved back and forth along a four-inch path, while the carriage on which the transducer was mounted moved in a circle around the tank, producing the secondary motion necessary for compound scanning.
WFUMB/aium
1960s
University of Colorado Medical Center 13437
with Polar Coordinate Indicator
TYPE 3B3 TIME BASE


and the body.
be moved manually on the skin.
Early 1960s


WFUMB/aium
1960s
SIEMENS-SCHNITTEBENE USIP 10-W245S
W-NE.818
A-mode instrument, part of the Vidoson 635.
ULTRASONIC ANIMAL TESTER • SONORAY Model No. 12
BRANSON INSTRUMENTS, INC
CALIBRATION STANDARD
ULTRASONIC TRANSDUCER
WFUMB/aium
1960s
SONORAY MODEL NO. 12
ULTRASONIC ANIMAL TESTER
An intensity-modulated B-mode unit designed exclusively for animal evaluation. The instrument is housed in a rugged aluminum case with a detachable cover which contains the cables and transducer during transportation. The movable transducer holder on a fixed curve guide was a forerunner of the mechanical B-scan ultrasonic equipment.


Schnittebene
Netz
Applikator
Raster
WFUMB/aium
2015
1960s
SIEMENS-SCHNITTEBENE USIP 10-W245S
W-NE,818
A-mode instrument, part of the Vidoson 635.
The Vidoson was a mechanical sector scanner with rotating transduces in a container filled with water. The scanning area could be moved without moving the container which was called "Verschiebung der Schnittebene" (shifting of the scanning area). The idea was not to deform the tissue when moving the transducer.


From Bistable Images to Gray Scale
German Ultrasound Museum
The first ultrasound images were "black and white": the echoes above a (adjustable) threshold were displayed as uniformly bright dots on a dark background (bistable). Weak echoes below the threshold were lost. Informations by complimentary A-mode were necessary, e. g. to distinguish between solid and cystic lesions.
The introduction of the gray scale technique was an important step forward:
Now the echoes were displayed as dots varying in brightness according to the intensity of the reflected echoes. Modulated brightness was an integral part of the real time scanners from the beginning. In compound scanners, using scan converters, gray scale imaging was intruduced about 1973.
Pancreatic tumor (T) Compound scan bistable image (– 1970)
Transverse scan of the abdomen Compound scanner, gray scale (1975)
Pancreatic tumor Real time-gray scale (Vidoson 1973)
Transverse scan of the abdomen (1999)
3 D image of a fetus (1999)
Further technical improvements, as electronic focusing of the ultrasound beam, suppression of artifacts, digitalization, harmonic imaging and the ever increasing speed of data processing redulted in a remarkable improvement of the image quality. The integration of the Doppler-technique into the B-mode image leads to duplex- and triplex techniques. The 3D- and 4 D-depictions and the development of contrast agents characterize the standards of the beginning of this century.
WFU
Late 195
TEKTRONIX

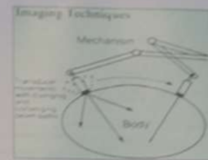

a remarkable improvement of the image quality.
The integration of the Doppler-technique into the
B-mode image leads to duplex- and triplex tech-
niques. The 3D- and 4 D-depictions and the develop-
ment of contrast agents characterize the standards
of the beginning of this century.
D image of a fetus (1999)
TIME BASE A
HORIZONTAL DISPLAY
VAR
MAIN TIME BASE (B)
TRIG
TYPE CA PLUG-IN UNIT
REV
UP
DOWN

From Compound Scanning to Real Time

German Ultrasound Museum

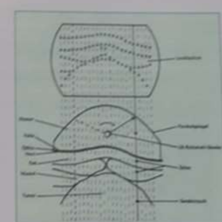
Originally, the *compound scanners* had disadvantages: A rather complex technique for the correct arrangement of the echoes was needed and – not least – no real time-viewing was possible, as the composition of the images was slow and movements of the patient or the organs scanned produced severe artifacts. Furthermore the images gained by manually operated compound scanners were hard to reproduce. These disadvantages were partially overcome by the development of automatic scanners. These mechanical or electronic devices worked faster and the results were better reproducible.

The first commercially available *real time-scanner* was the *Vidoson* (Siemens). The pulses of two or three rotating transducers within a water path were reflected by a parabolic mirror, leading to 15 cm of parallel shifting of the ultrasound beam.



Principle of compound scanners

Twins (bistable compound scan)



Vidoson technique

Compound scan, gray scale (1976)

Real time (Combison 100, Kretz), 1980

The real time technique made its way, finally, because of its automatic, reproducible and fast image construction. Dynamic examinations enabled quick examinations and direct observation of movements.
The further technical development lead to mechanical and electronic scanners with parallel or sector scanning, which are still in use today.


WFUMB/aium
1960s
REFLECTOSCOPE


WFUMB/aium
1960s
SPERRY REFLECTOSCOPE PULSER / RECEIVE UNIT 10N

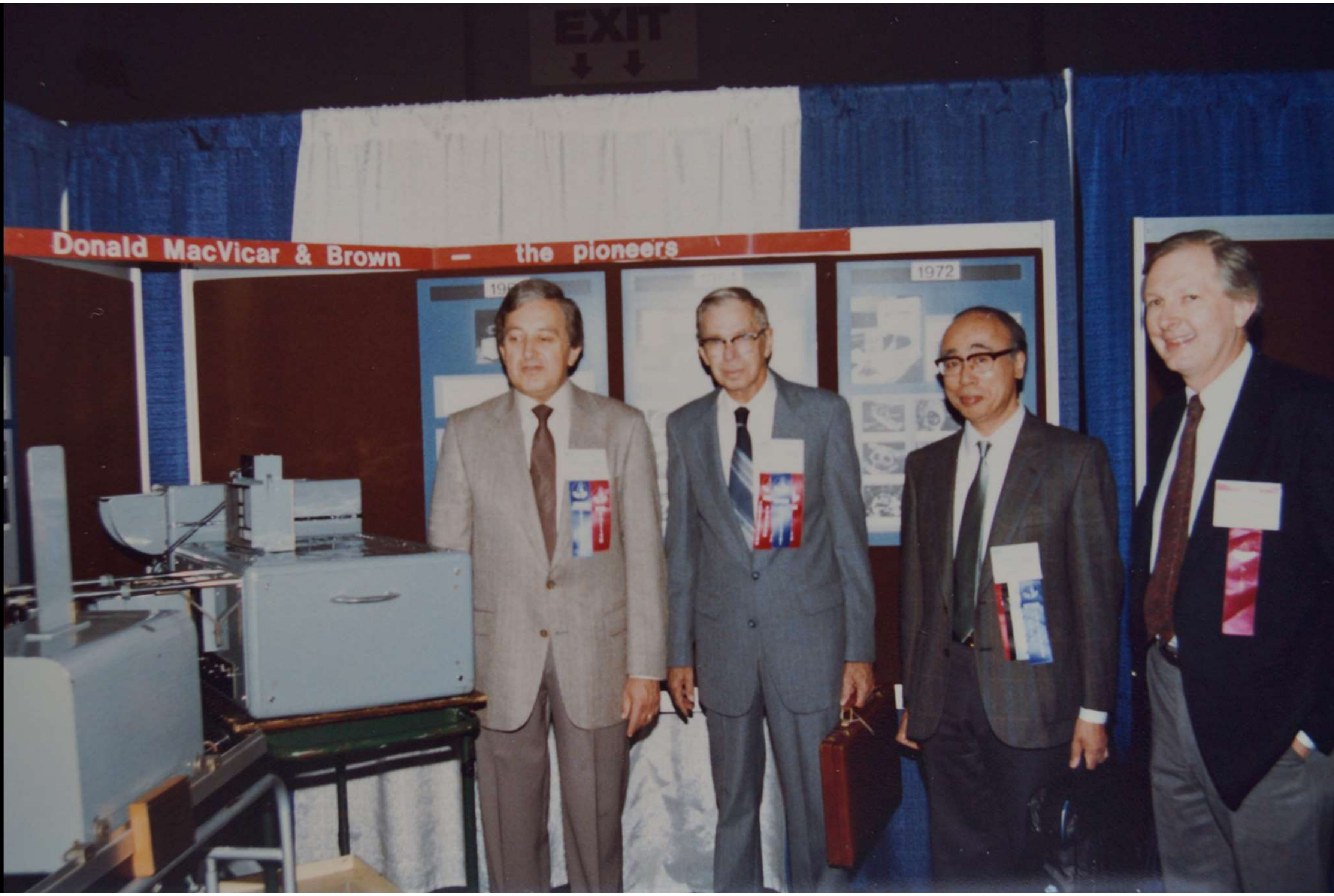

HOFFREL
ULTRA - SONOSCOPE


WFUMB/aium
1960s
EKOLINE 20


ANIMAL ULTRASOUND


ANIMAL ULTRASOUND
TOSHIBA


Kretz
TECHNIK
Donald
1962
1972


EXIT
Donald MacVicar & Brown — the pioneers
1972


ar & Brown — the pioneers
1962
1964
1972


Kretz
TECHNIK
Donald
ULTRASONIC
LOCATOR

ULTRASONICS INSTITUTE AUSTRA
OBSTET 1962-1969
EYE 1964
BREAST 1966
BRAIN 1972
OCTOSON 197


SIEMENS
ULTRASOUND
First Commerc
Grey Scale
1964
HISTORY
ULTRASOUND
HISTORY

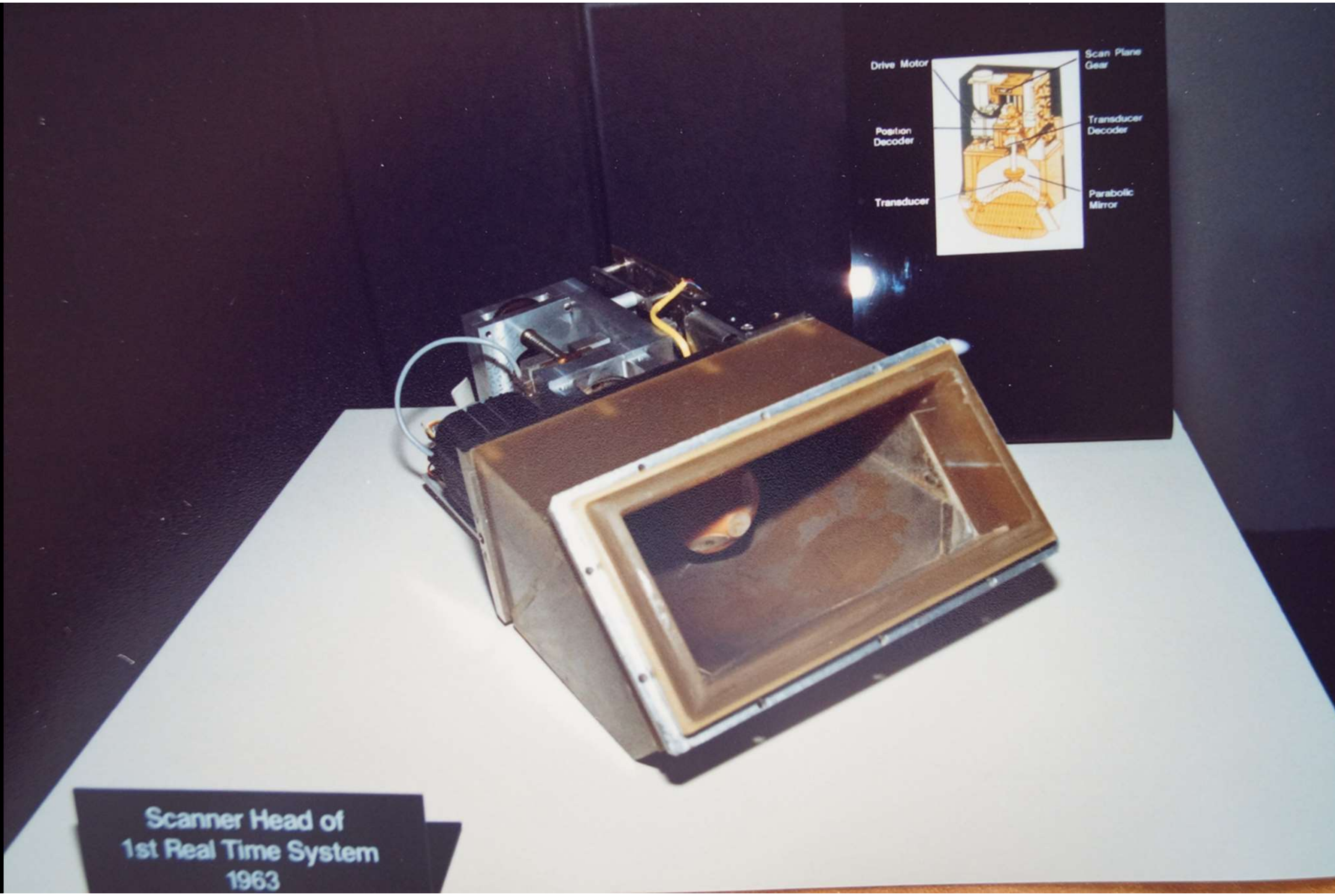
ULTRASONICS INSTITUTE AUSTRALIA
OBSTETRICS 1962-1969
GREY SCALE 1969
EYE 1964
BREAST 1966
BRAIN 1972
OCTOSON 1974
ORIGINAL NOTEBOOK 1962

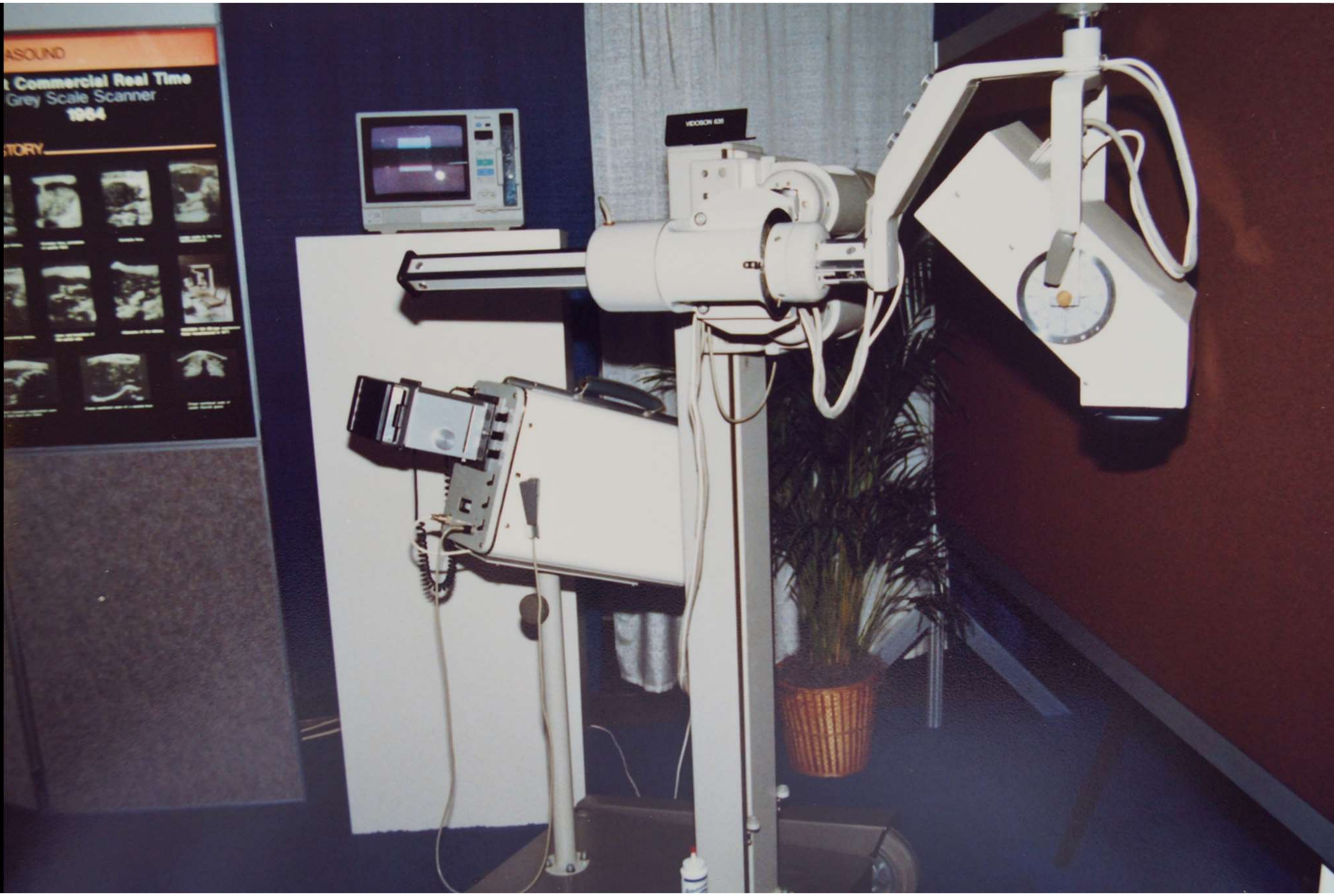

ULTRASONICS INSTITUTE AUSTRALIA
OBSTETRICS 1962-1969
GREY SCALE 1969
EYE 1964
BREAST 1966
BRAIN 1972
OCTOSON 1974
ORIGINAL NOTEBOOK 1962


SIEMENS
ULTRASOUND
First Commercial
Grey Scale
1984
HISTORY


Diagnostic ultrasonography
by electronic sector
scanning

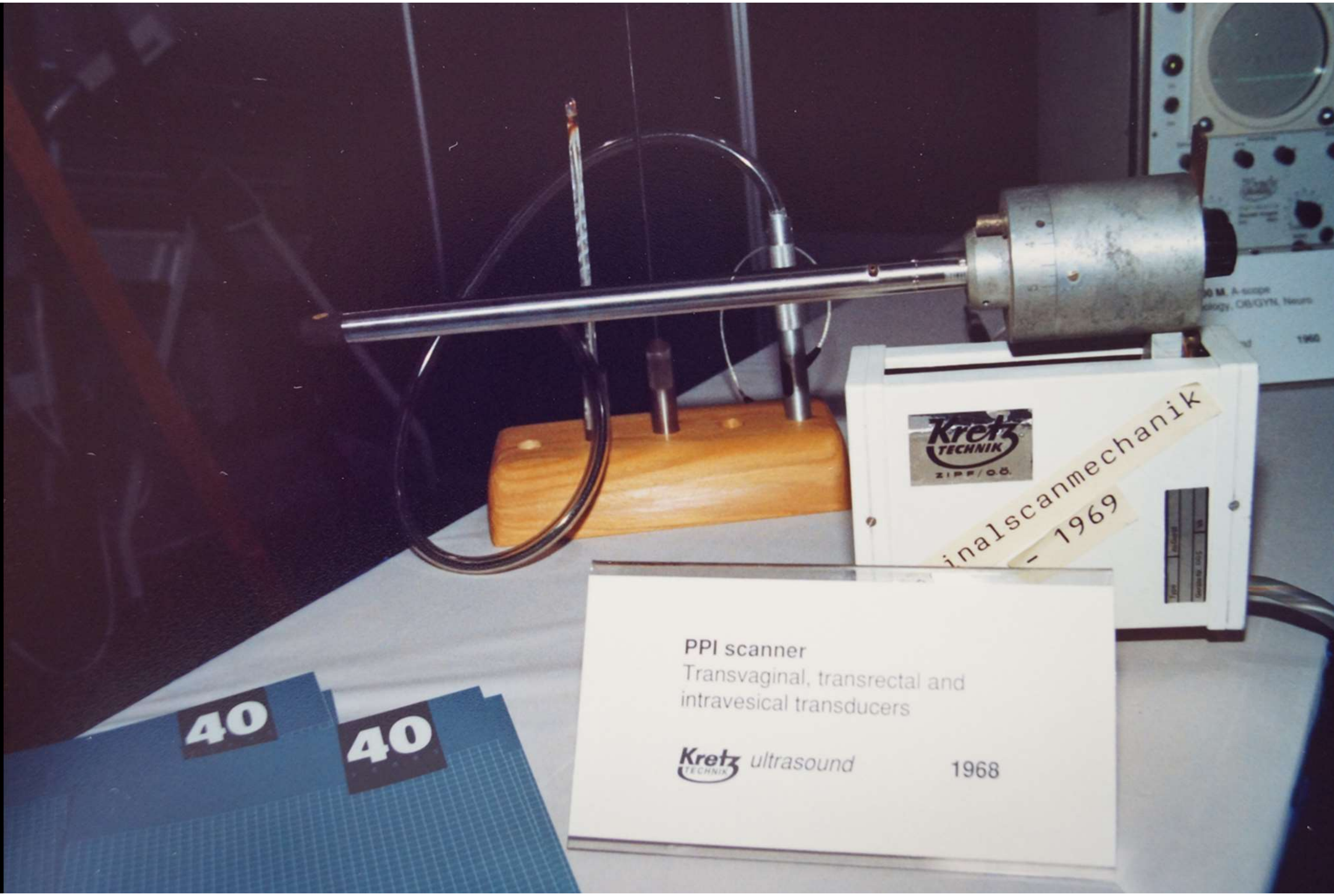

FINE GAIN
COARSE GAIN
POWER
EKOLINE 20

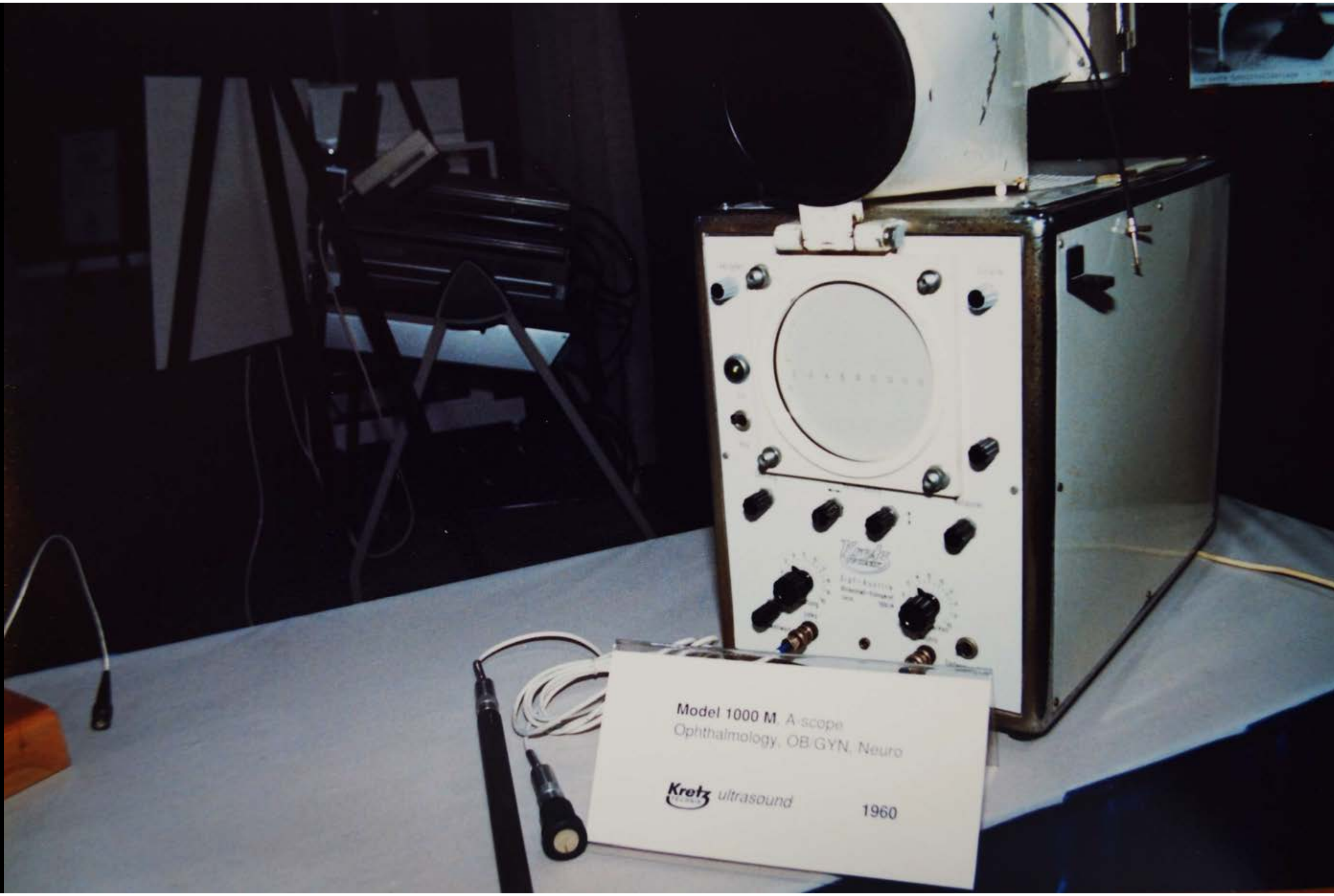

Drive Motor
Scan Plane Gear
Position Decoder
Transducer Decoder
Transducer
Parabolic Mirror
Scanner Head of
1st Real Time System
1963


ASOUND
t Commercial Real Time
Grey Scale Scanner
1964
STORY
VIDOSON


Advanced Technology Laboratories
First Pulsed Doppler Prototype 1966
First functional ultrasonic pulsed Doppler system
Built by Don Baker and Dennis Watkins, of the Center for Bioengineerin
University of Washington
Lead to the ATL MARK I pulsed Doppler system introduced in 1974
40
ATL is proud to honor the 40th Anniversary of Medical Ultrasound 1948 - 1988
RANGE SELECTOR IN CM
STANDBY
OPERATE
OFF
ATL is proud to
anniversary of
honor the 40
medical ultras

Advanced Technology Laboratories
ADR 2130 Ultrasound System 1976
• Linear array real-time scanner for OB and abdominal applications
• First true gray scale processing in real time
• Revolutionized tissue characterization analysis
ADR 2140 Ultrasound System 1977
• Expanded capabilities
• Mechanical transducer focusing
• First electronic calipers in a real-time scanner
• Digital freeze frame
This ultrasound scanner was upgraded again in 1981, to become industry's first sector/linear real-time system.
40
Real Time Linear Scanner
ADR
2130
2140


PPI scanner
Transvaginal, transrectal and
intravesical transducers
Kretz TECHNIK ultrasound
1968
Kretz TECHNIK
ZIPF / OÖ.
inalscanmechanik
1969
40
40

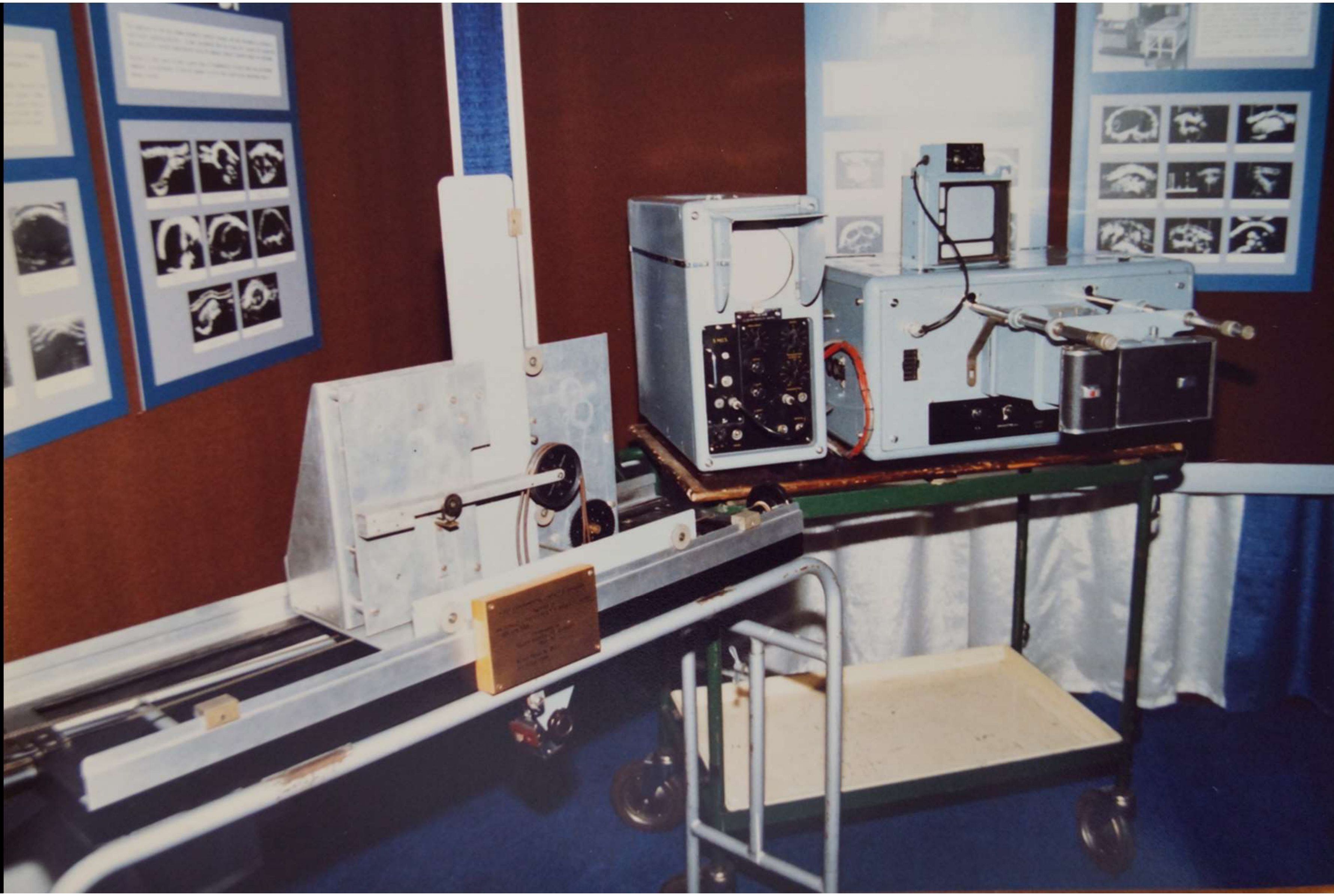

Model 1000 M. A-scope
Ophthalmology, OB/GYN, Neuro
Kretz ultrasound
1960


COMBISON 100
ultrasound
1977
COMBISON 100

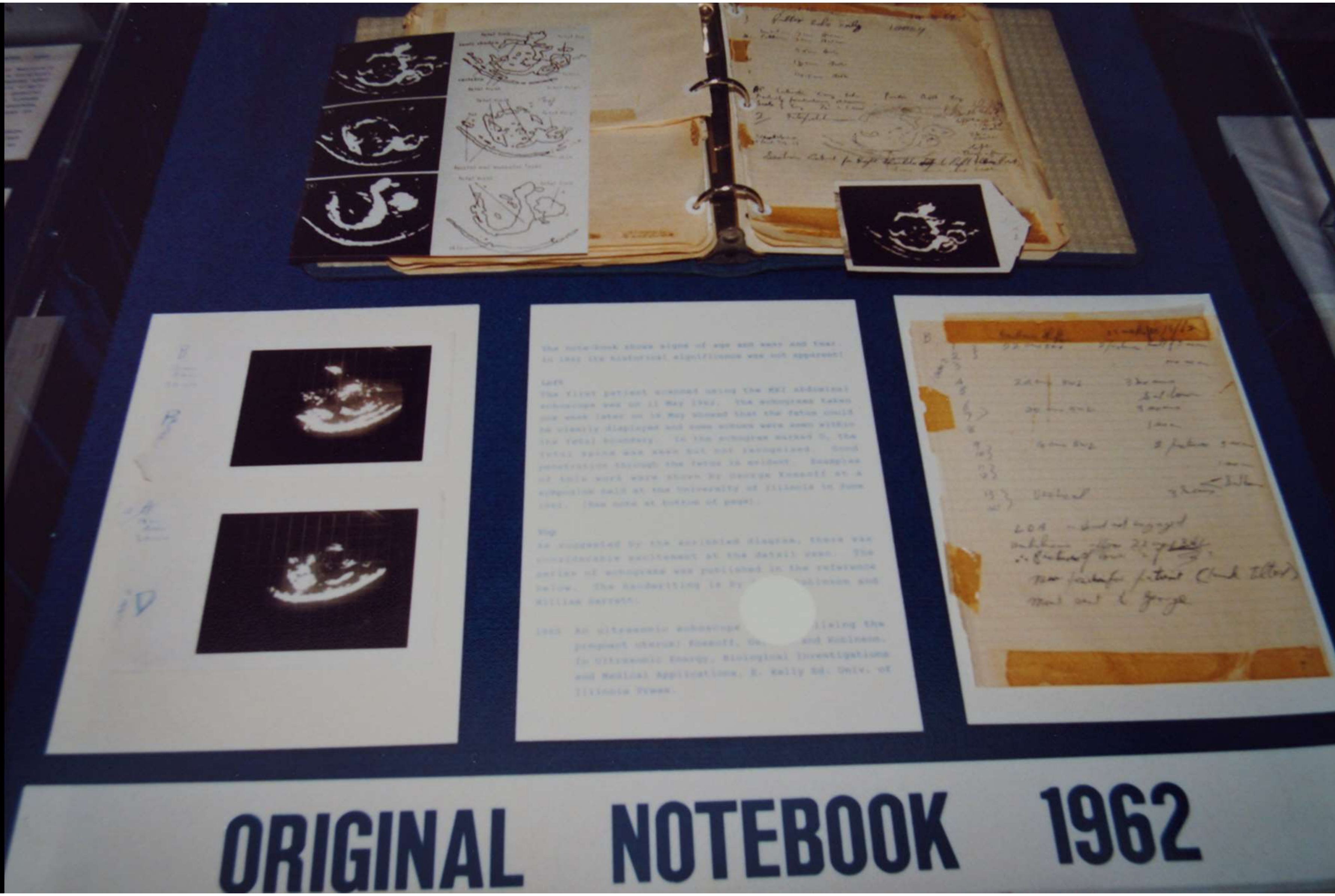

KRETZTECHNIK
Zipf-Austria
Model 7000. A-scope + B-scan
+ multi - element transducer
Ophthalmology
Kretz ultrasound
1962


MASSTAB
KLN
KRETZTECHNIK
HOCHFREQUENZ-ECHOGRAPH
7200 MA
DEHNUNG
Model 7200 MA, A-scope
Ophthalmology
1971
Kretz ultrasound
40

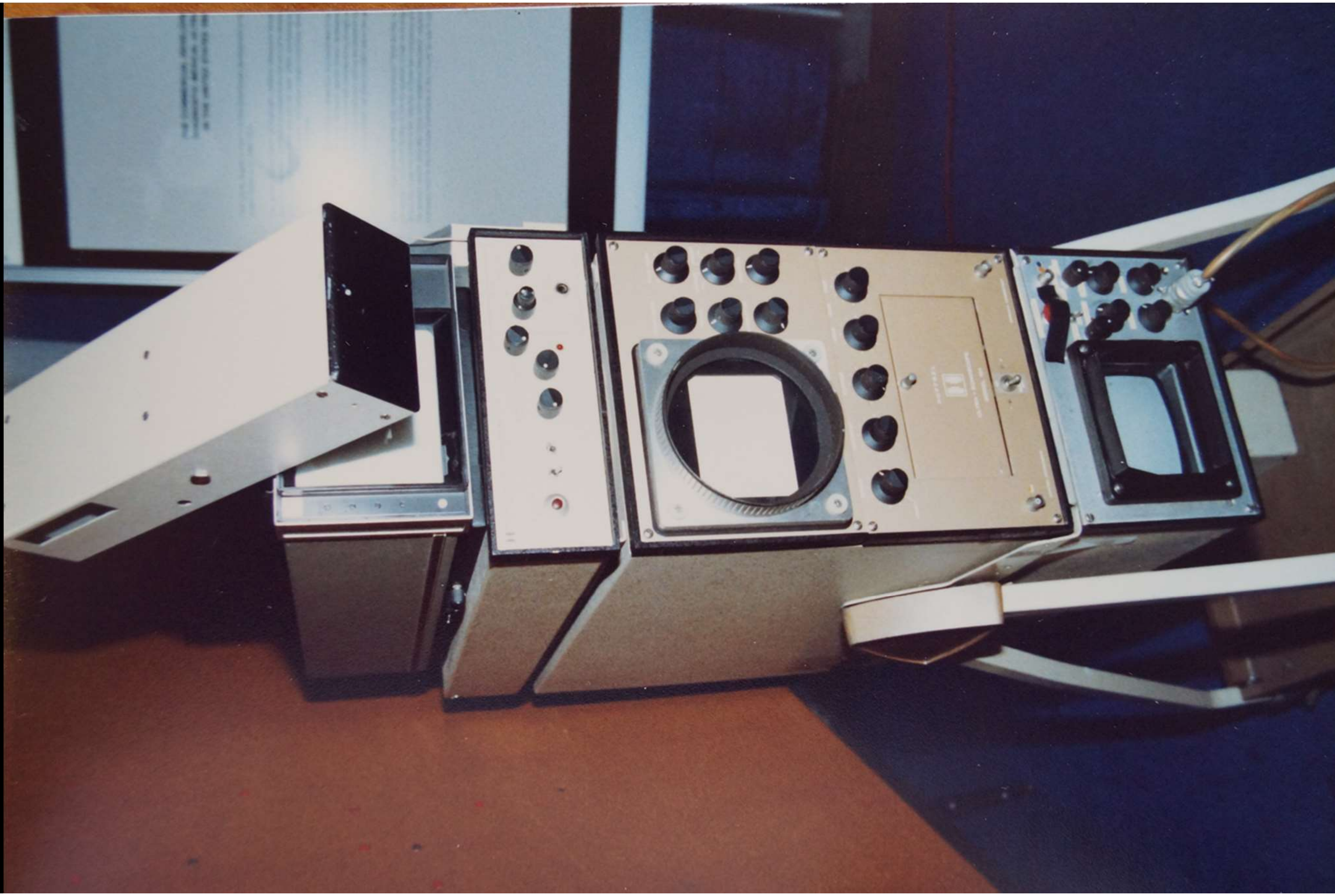

INTENSITY
FOCUS
VERT.
HOR.
ULTRASONIC
LOCATOR
GENERAL PRECISION
LABORATORY, INC.
PLEASANTVILLE, N.Y.
DURATION
GAIN
SWEEP DELAY
2.5 MC.
PULSE
PROBE
RECEIVER
T-R
ON
OFF
ULTRASONIC LOCATOR
POWER SUPPLY UNIT
GENERAL PRECISION LABORATORY, INC.
PLEASANTVILLE, N.Y.

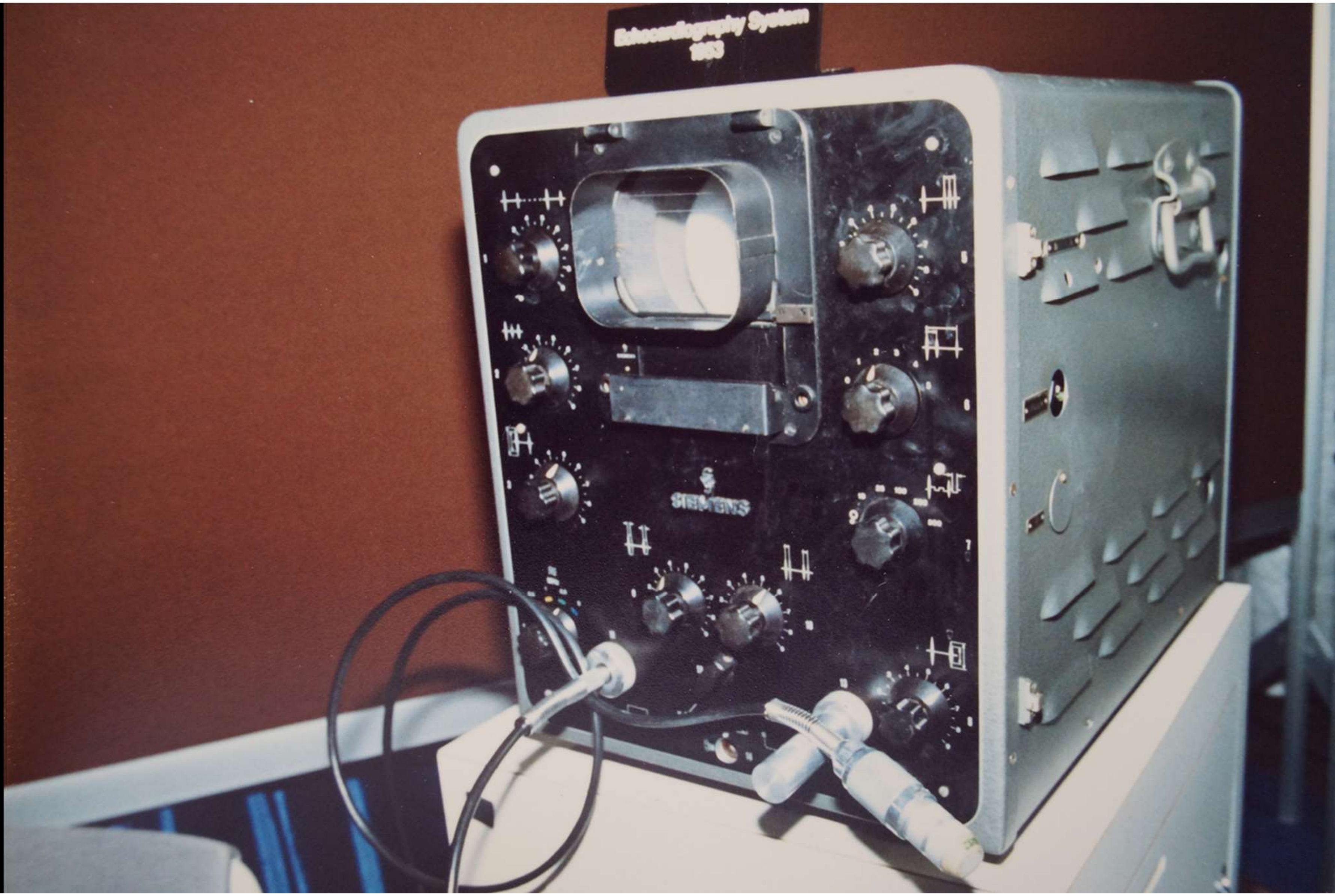


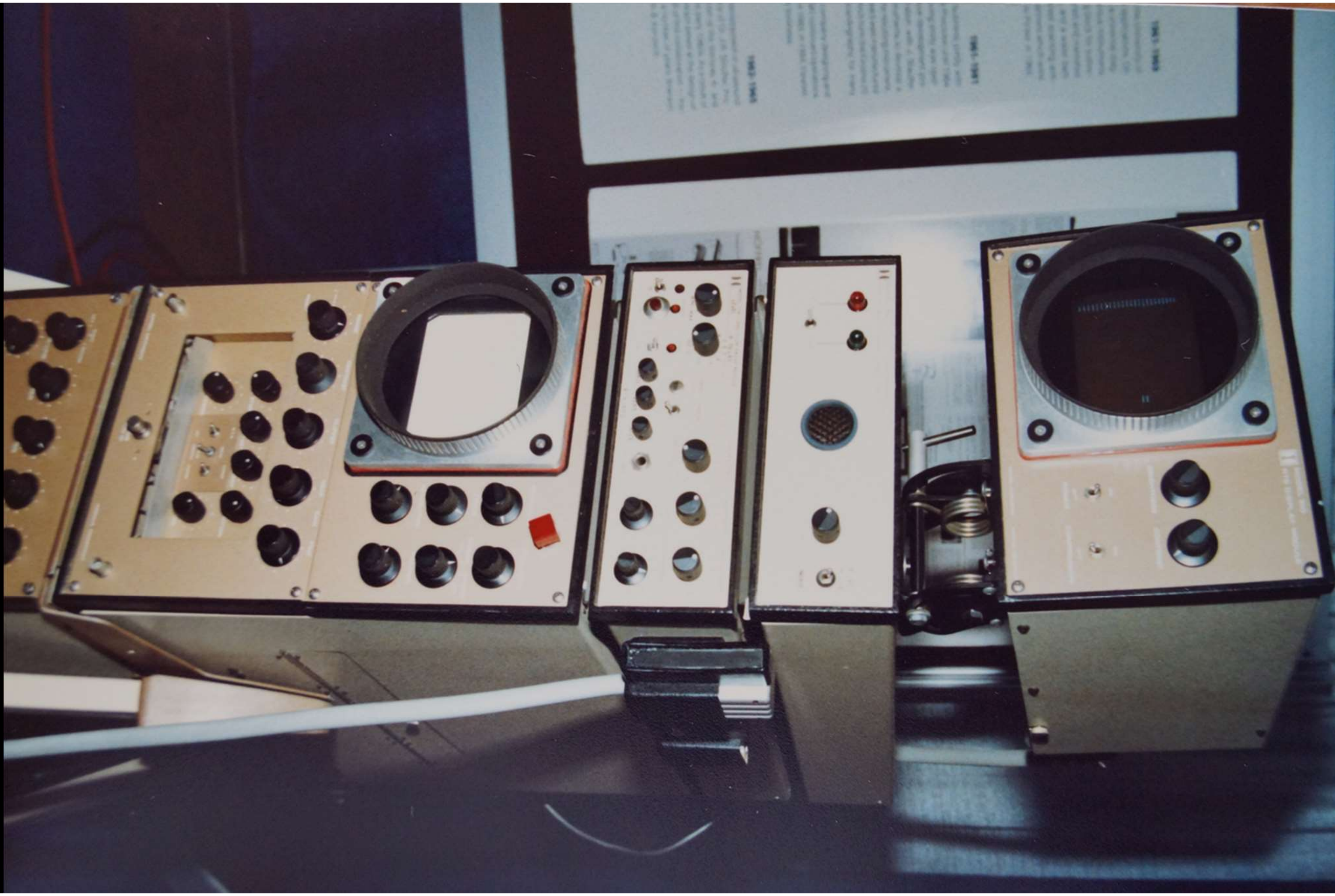

ULTRASONICS INSTITUTE . AUSTRALIA
C.A.L. ROUND WINDOW ULTRASONIC IRRADIATOR
SEMI-CIRCULAR CANAL MENIERE'S PROBE
ULTRASONIC TREATMENT OF MENIERE'S DISEASE
ROUND WINDOW MENIERE'S PROBE
MENIERE'S DISEASE THERAPY 1962


ORIGINAL NOTEBOOK 1962

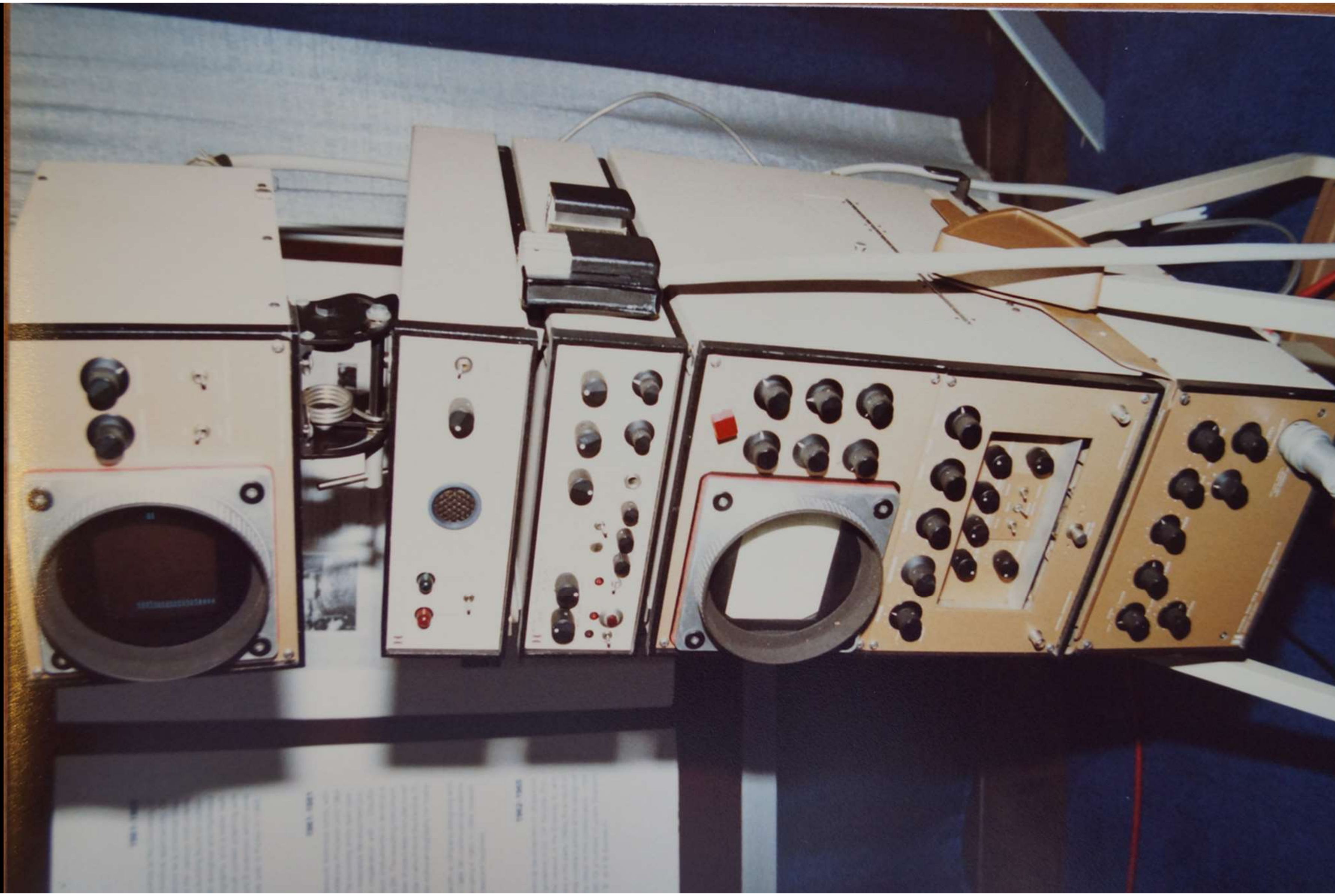

HISTORIC
EXHIBITS
contact scanning

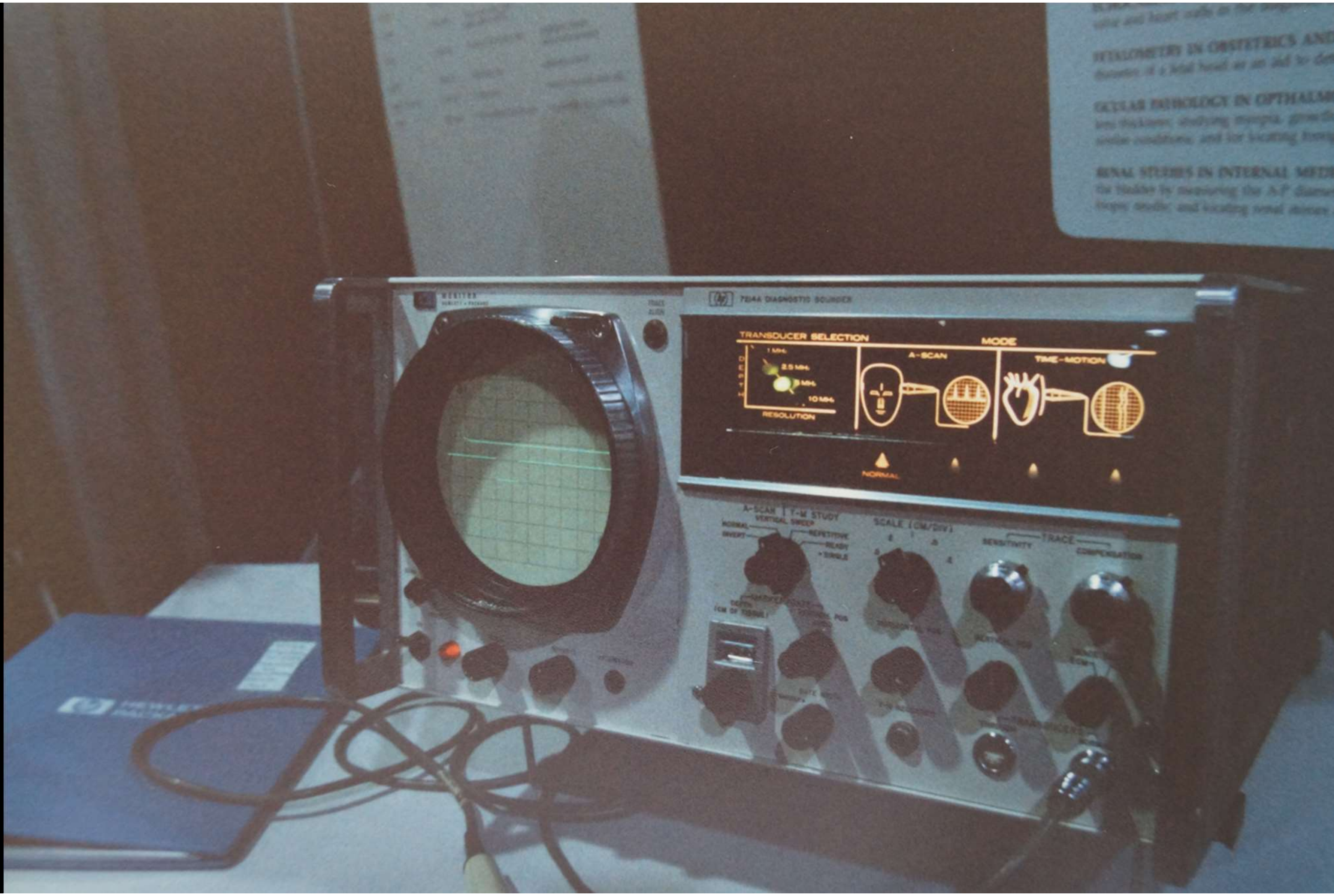



Echocardiography System
1953
SIEMENS

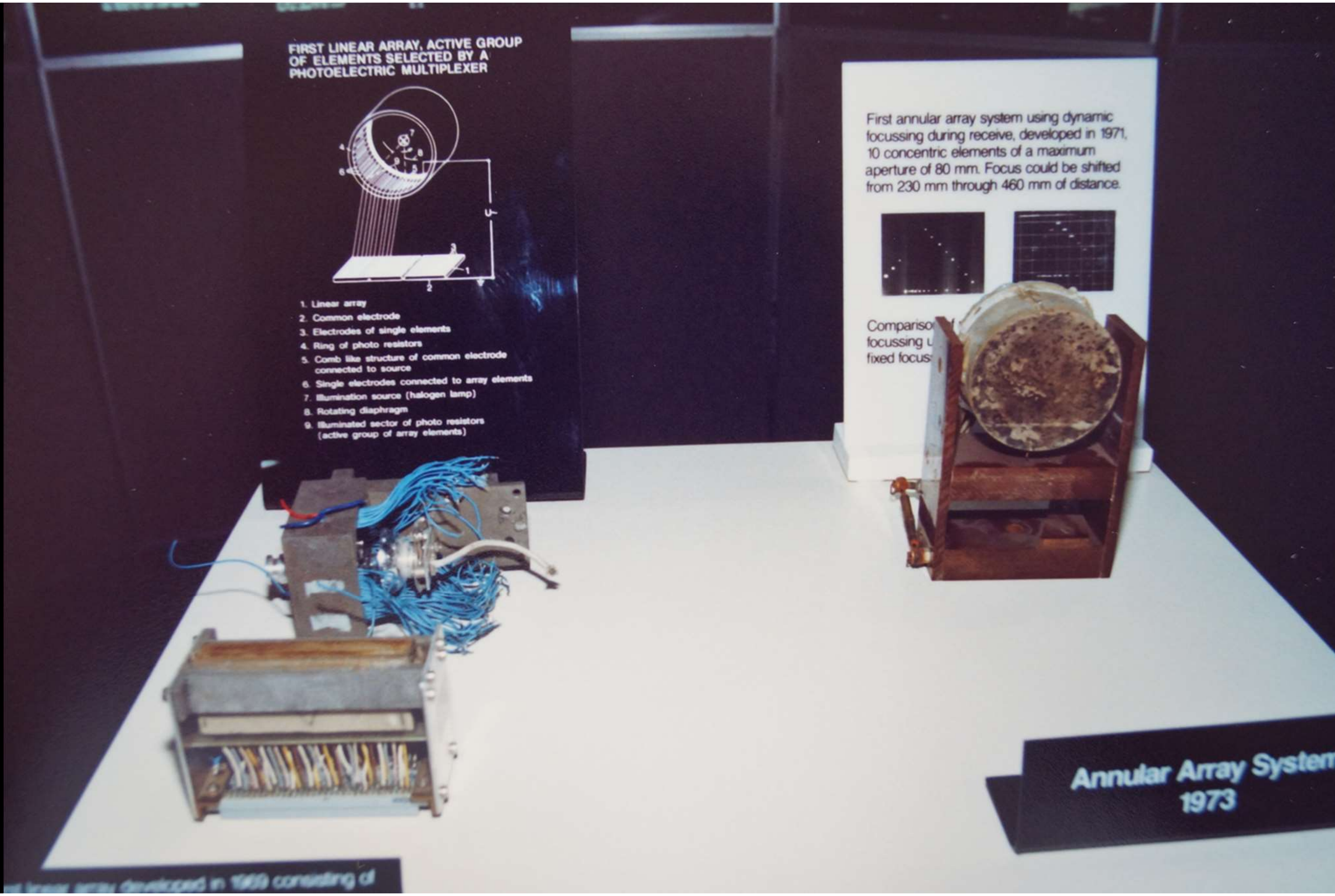



FINE GAIN
COARSE GAIN
POWER
OFF
ON
EKOLINE 20

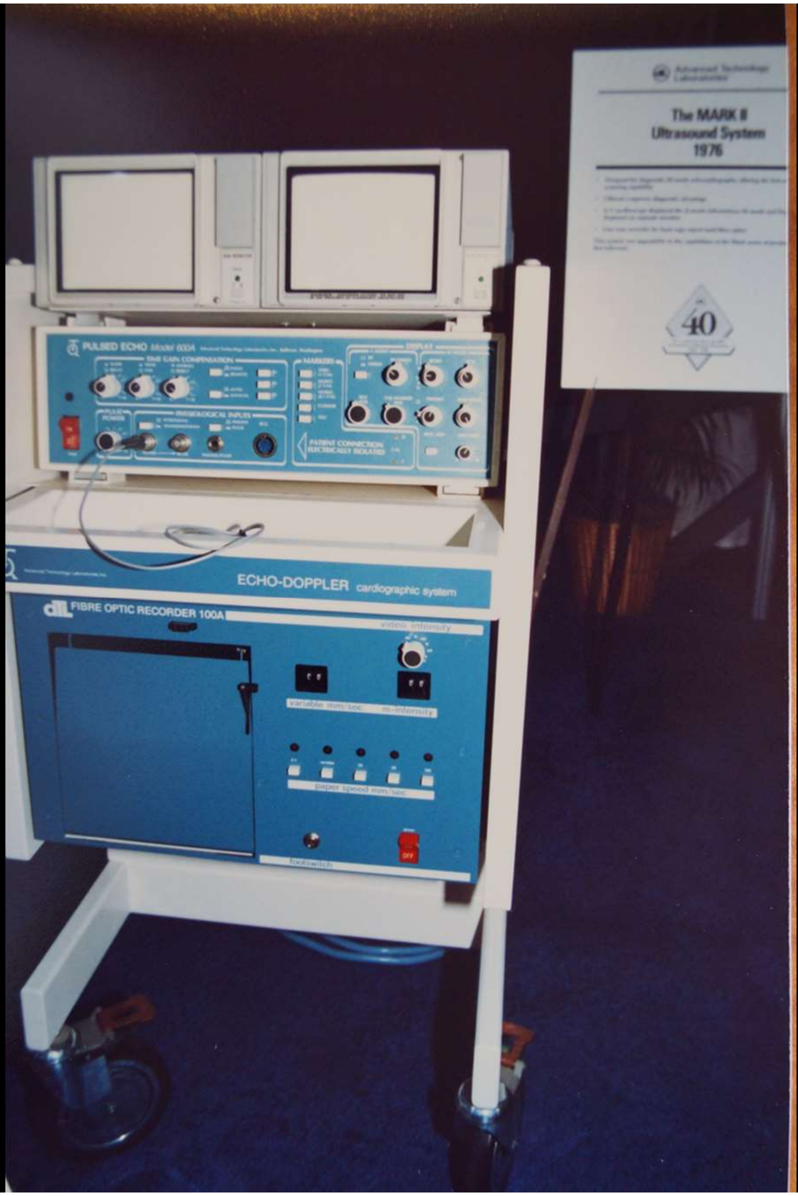


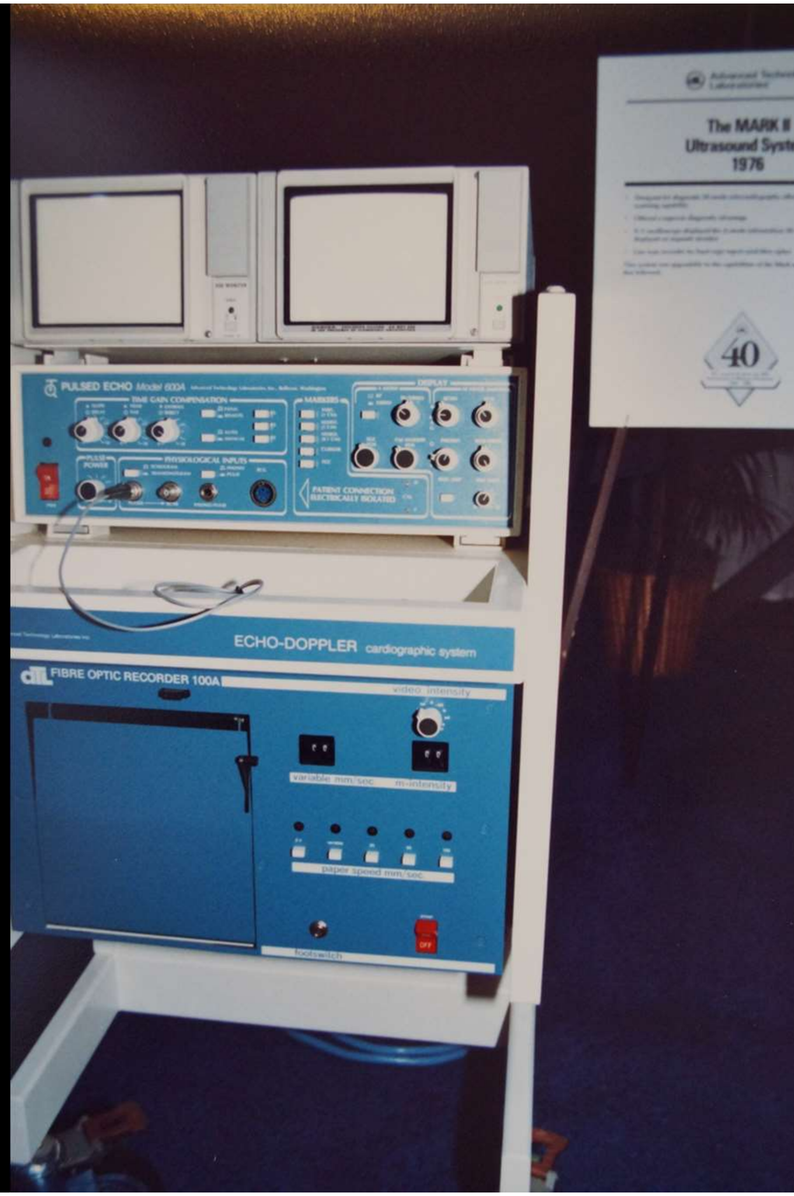


7214A DIAGNOSTIC SOUNDER
TRANSDUCER SELECTION
MODE
A-SCAN
TIME-MOTION
RESOLUTION
NORMAL
SCALE (CM/DIV)
TRACE
SENSITIVITY
COMPENSATION


FIRST LINEAR ARRAY, ACTIVE GROUP OF ELEMENTS SELECTED BY A PHOTOELECTRIC MULTIPLEXER
1. Linear array
2. Common electrode
3. Electrodes of single elements
4. Ring of photo resistors
5. Comb like structure of common electrode connected to source
6. Single electrodes connected to array elements
7. Illumination source (halogen lamp)
8. Rotating diaphragm
9. Illuminated sector of photo resistors (active group of array elements)
First annular array system using dynamic focussing during receive, developed in 1971, 10 concentric elements of a maximum aperture of 80 mm. Focus could be shifted from 230 mm through 460 mm of distance.
Annular Array System 1973
linear array developed in 1969 consisting of


OCULAR PATHOLOGY IN OPTHALMOLOGY — for
RENAL STUDIES IN INTERNAL MEDICINE — for
TRANSDUCER SELECTION
MODE
A-SCAN
TIME-MOTION
RESOLUTION
NORMAL
INVERTED
REPETITIVE
SINGLE
A-SCAN | T-M STUDY
VERTICAL SWEEP
NORMAL
INVERT
REPETITIVE
READY
SINGLE
SCALE (CM/DIV)
TRACE
SENSITIVITY
COMPENSATION
DEPTH
(CM OF TISSUE)
VERTICAL POS
HORIZONTAL POS
VERTICAL POS
TRACE HEIGHT
GATE WIDTH
MARKER
RECORDER
THROUGH
NORMAL


Advanced Technology Laboratories
The MARK II
Ultrasound System
1976
40
PULSED ECHO Model 600A
ECHO-DOPPLER cardiographic system
FIBRE OPTIC RECORDER 100A
video intensity
variable mm/sec
m-intensity
paper speed mm/sec
footswitch
OFF

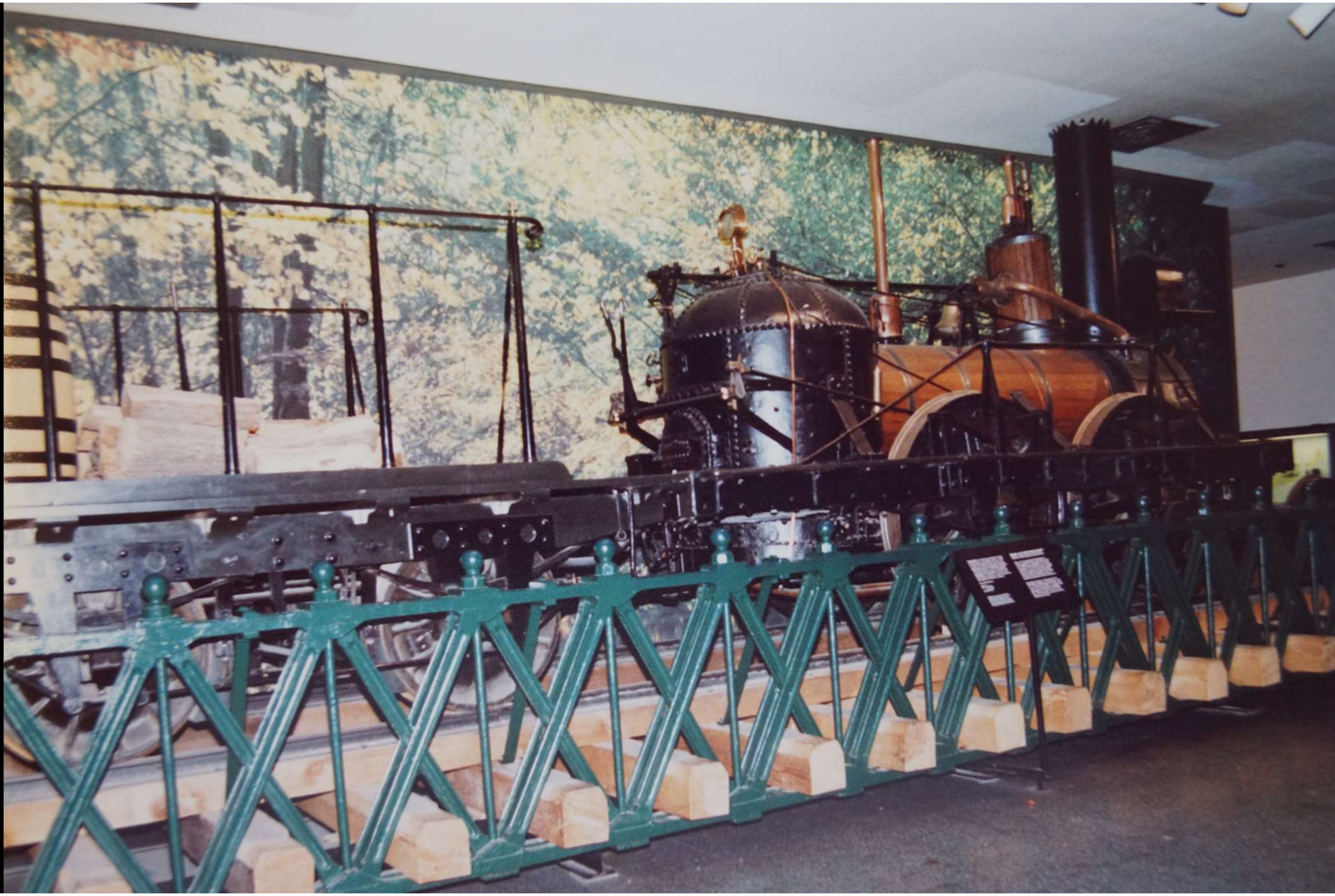

The MARK II
Ultrasound Syste
1976
PULSED ECHO Model 600A
TIME GAIN COMPENSATION
MARKERS
DISPLAY
PHYSIOLOGICAL INPUTS
PATIENT CONNECTION
ELECTRICALLY ISOLATED
ECHO-DOPPLER cardiographic system
FIBRE OPTIC RECORDER 100A
video intensity
variable mm/sec
m-intensity
paper speed mm/sec
footswitch
OFF


ADR 4000
Ultrasound System
1982
• Sector/linear scanner, with variable focus linear array
• First portable, microprocessor-based scanner
• Electronic focusing
• A quantum leap forward in linear array image quality
4000 S/L
format
brightness
contrast
power
push off
near
balance
far
transducer output power
compression
drive
linear scroll
image processing
position
data entry
4000 S/L

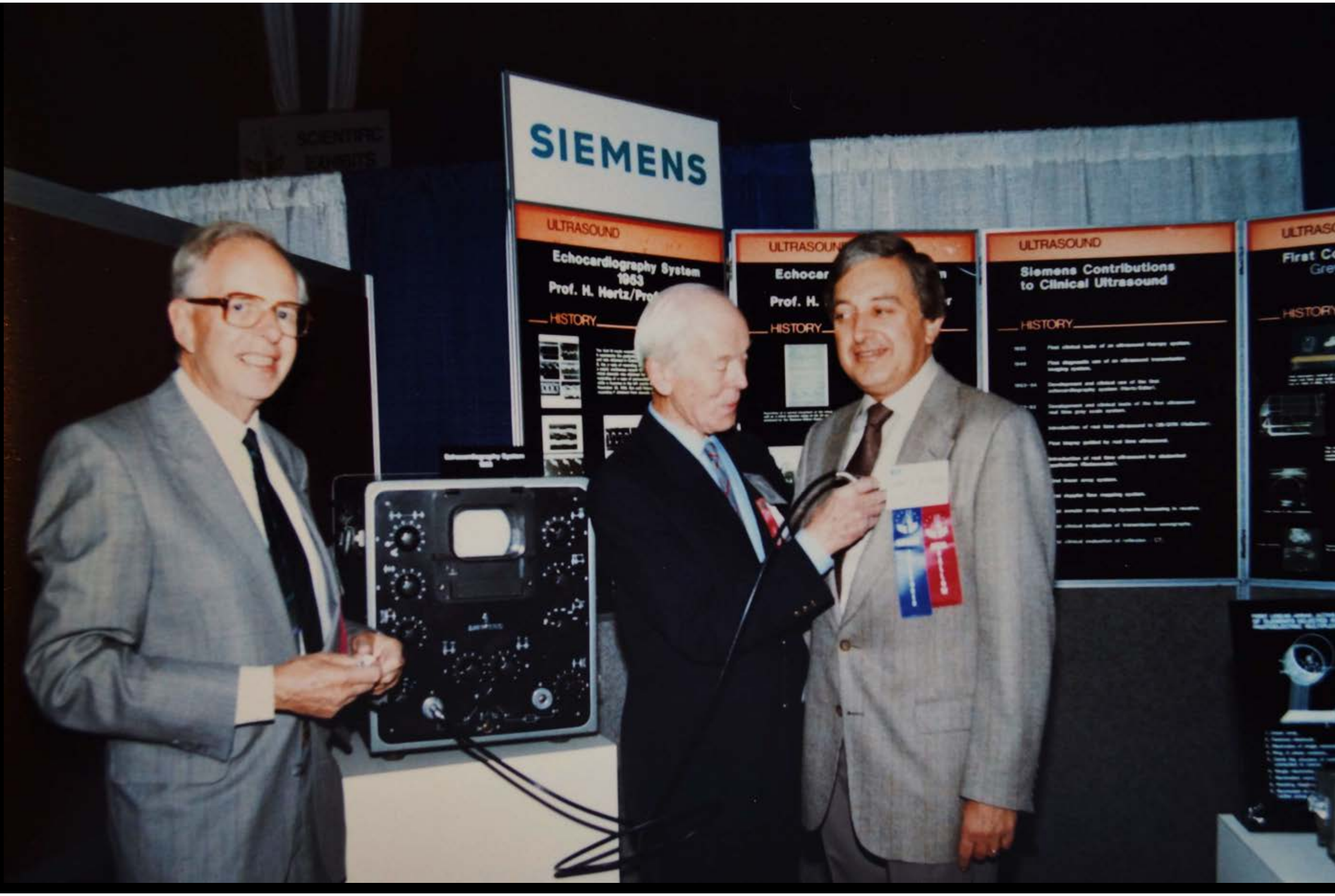

Advanced Technology
Laboratories
The MARK III
Ultrasound System
1978
40
315A VIDEO DISPLAY
851B REAL TIME DIGITAL
SCAN CONTROLLER


1974
1979
THE CME
ULTRASOUND
HISTORY
DOPSCAN
1988
Color Flow Doppler
DOPSCAN PLUS
1983
Carolina Medical
Electronics, Inc.
CAROLINA MEDICAL ELECTRONICS
DOPSCAN
ECG AMPLIFIER


PRE ANNULAR ARRAY
ANNULAR ARRAY
ANNULAR ARRAY 1972




MATERIAL MESSAGES


SIEMENS
ULTRASOUND
Echocardiography System
1953
HISTORY
ULTRASOUND
HISTORY
ULTRASOUND
Siemens Contributions
to Clinical Ultrasound
HISTORY
ULTRASOUND
HISTORY


ancer Detection
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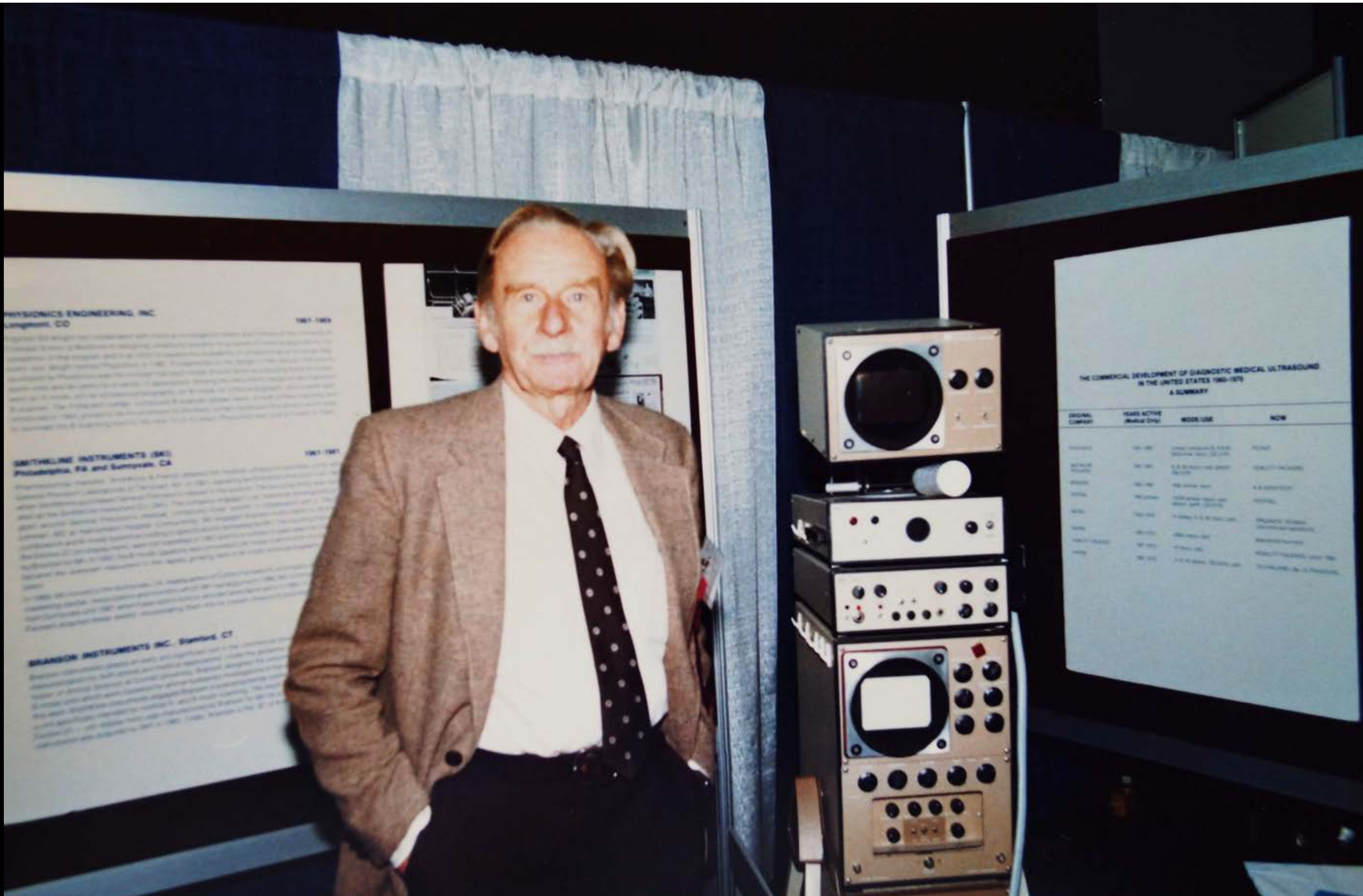
John M. Reid
bas Hospital
MINN.
Transducers
AIUM 03


Sounding the Bo
A History of Diagnostic Ultrasound in the Unite
Transducers



BRANSON INSTRUMENTS INC., Stamford, CT
THE COMMERCIAL DEVELOPMENT OF DIAGNOSTIC MEDICAL ULTRASOUND
IN THE UNITED STATES 1960-1970
A SUMMARY
ORIGINAL COMPANY
YEARS ACTIVE (Medical Only)
MODE/USE
NOW

EXIT
Kretz
TECHNIK
pioneers

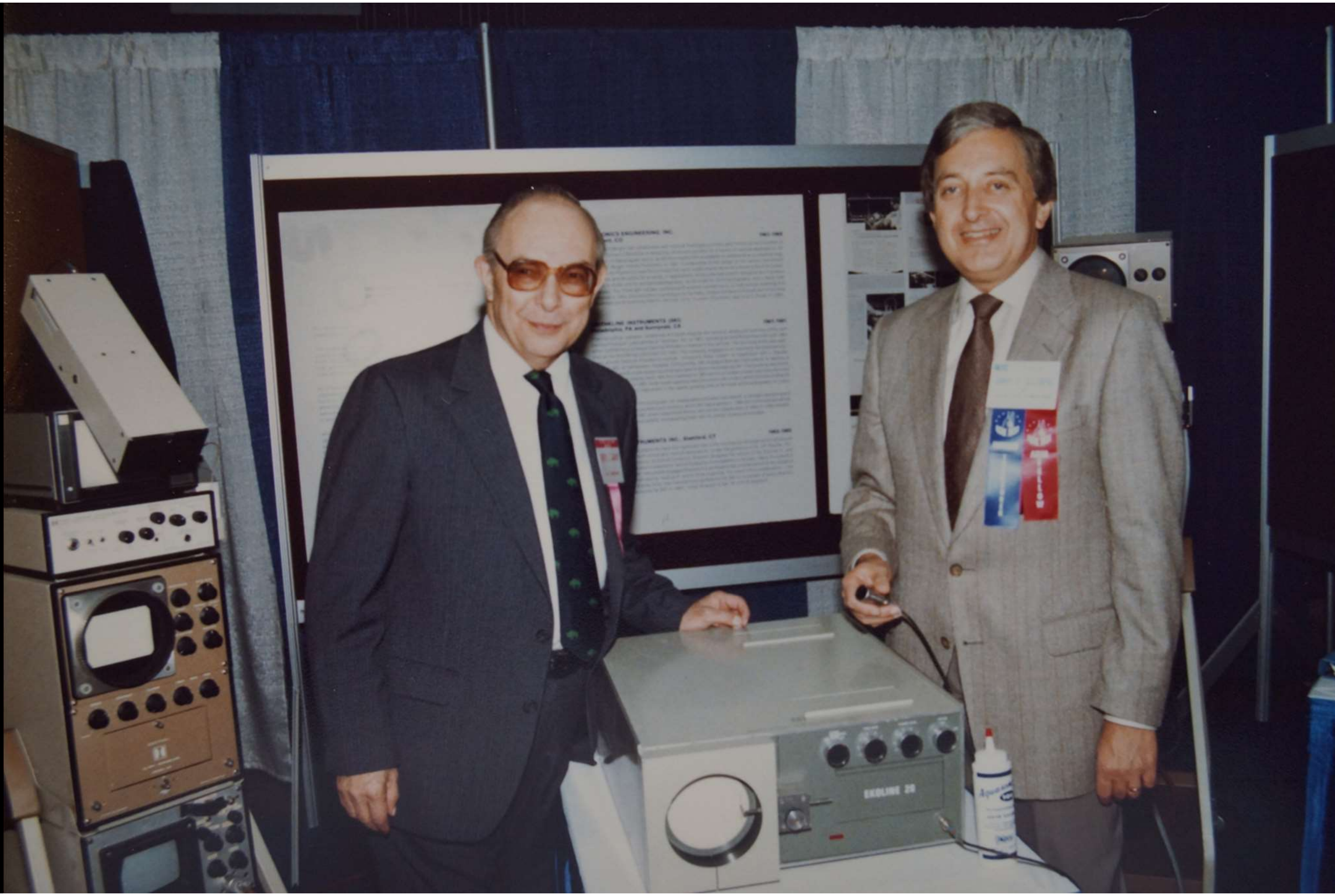

contact scanning – Donald MacVicar & Brown – the pio
1956
1957
1960
1962


contact scanning
Donald Mac
& Brown
the pioneers
1956
1957
1960
1962


Kretz
TECHNIK

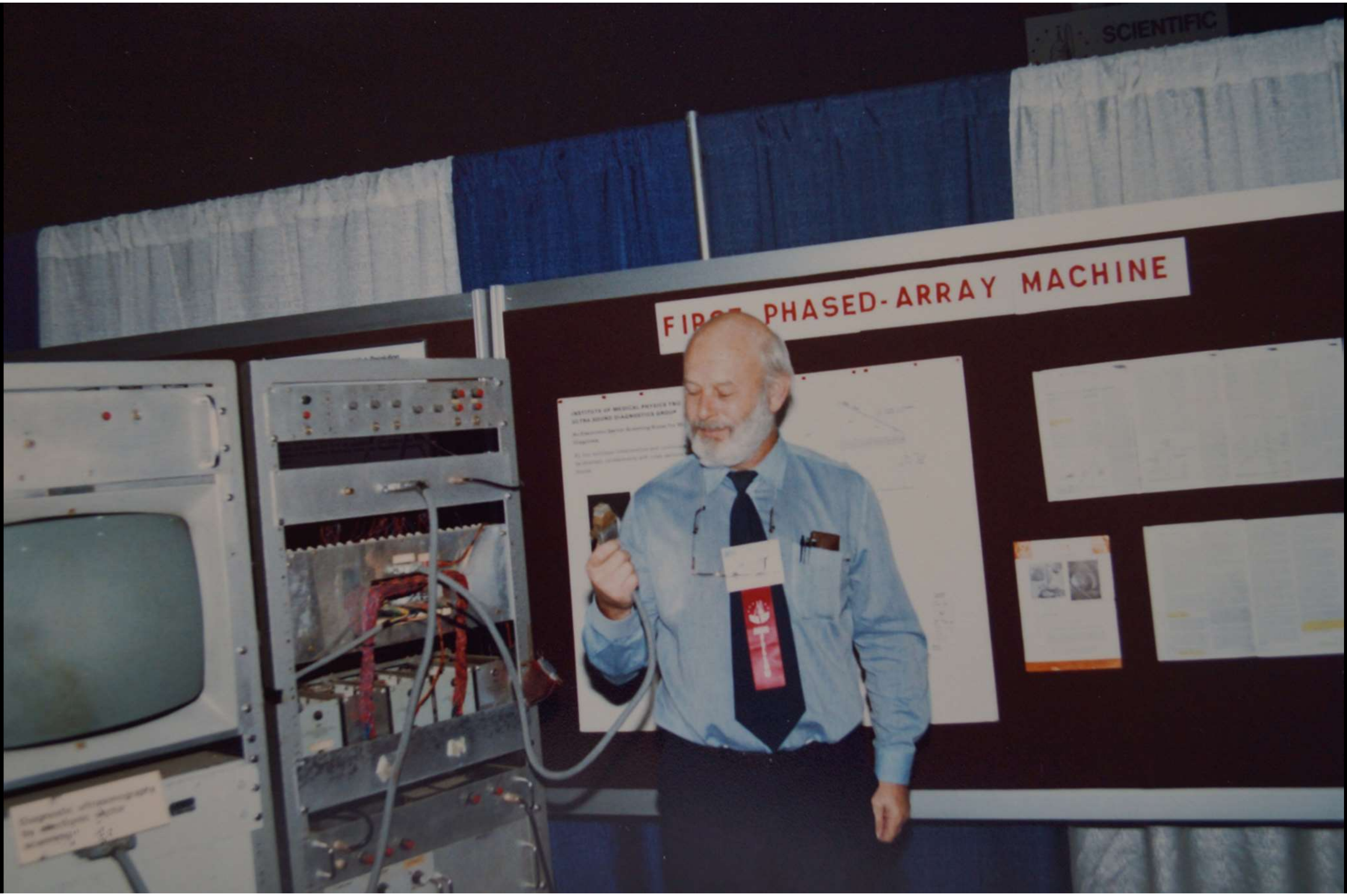

SCIENTIFIC
PHYSIONICS ENGINEERING, INC.
Longmont, CO
TREASURER
FELLOW


SCIENTIFIC

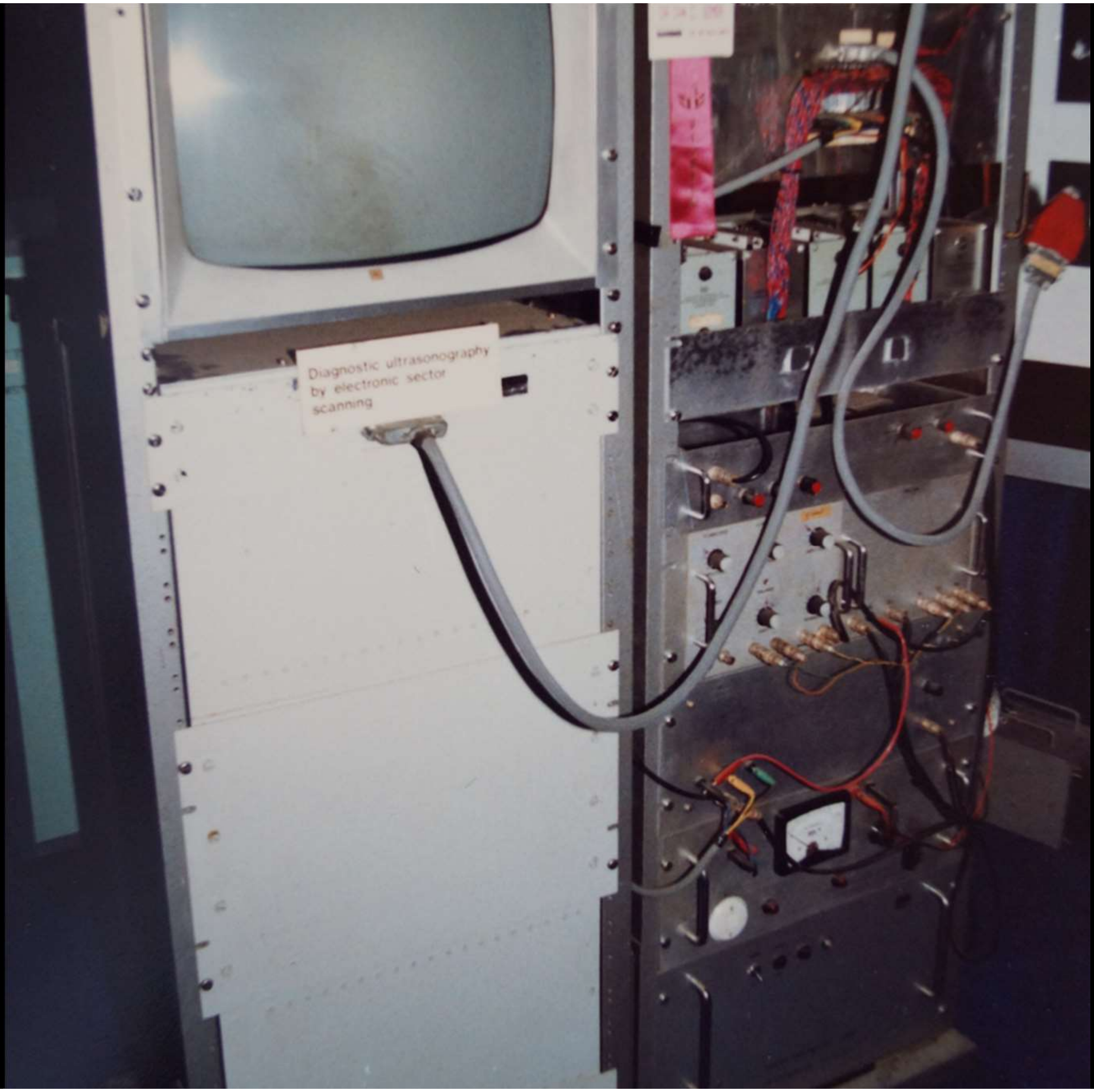

EKOLINE 20

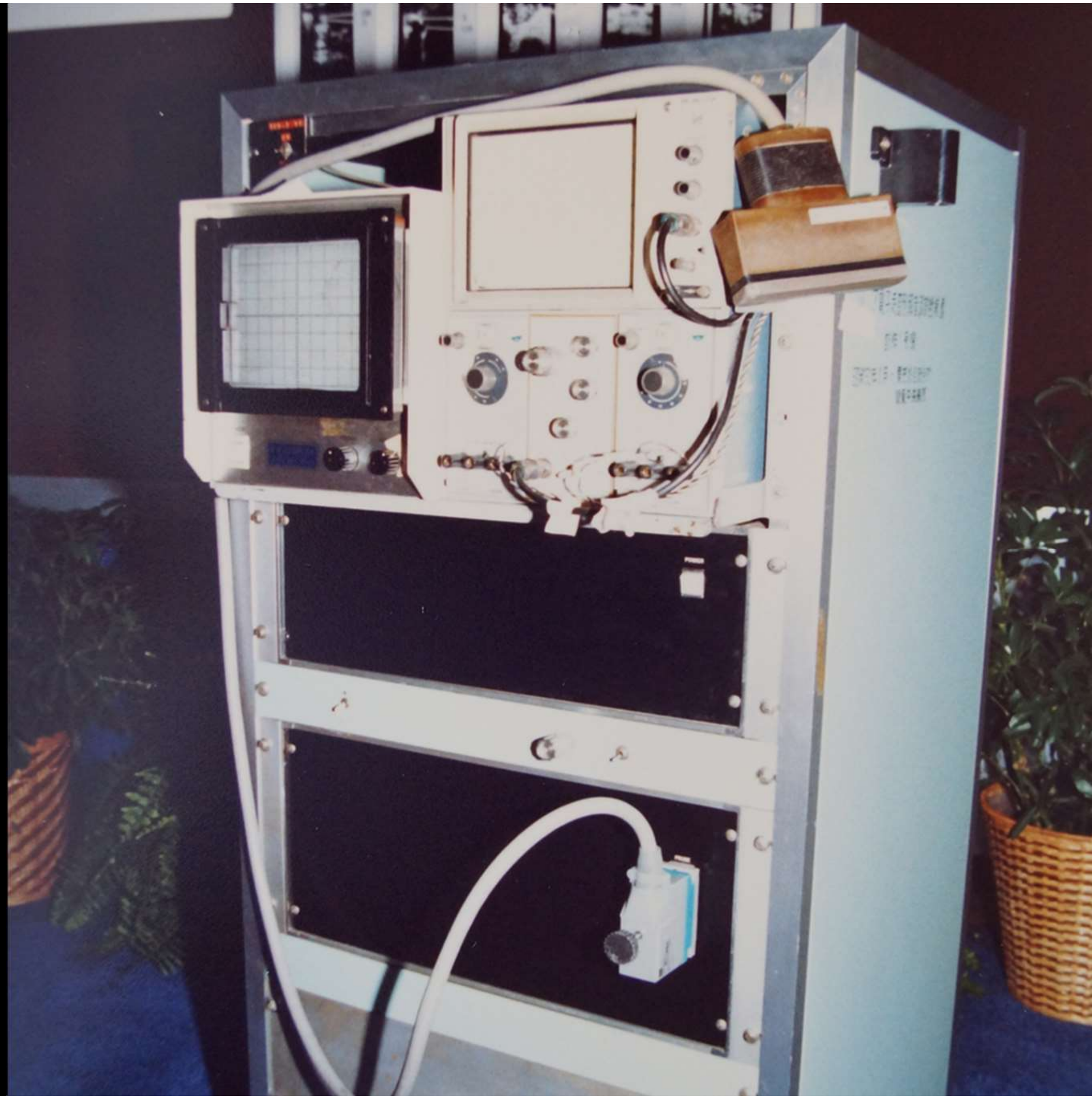

STANDPIPE
FIRST PHASED-ARRAY MACHINE

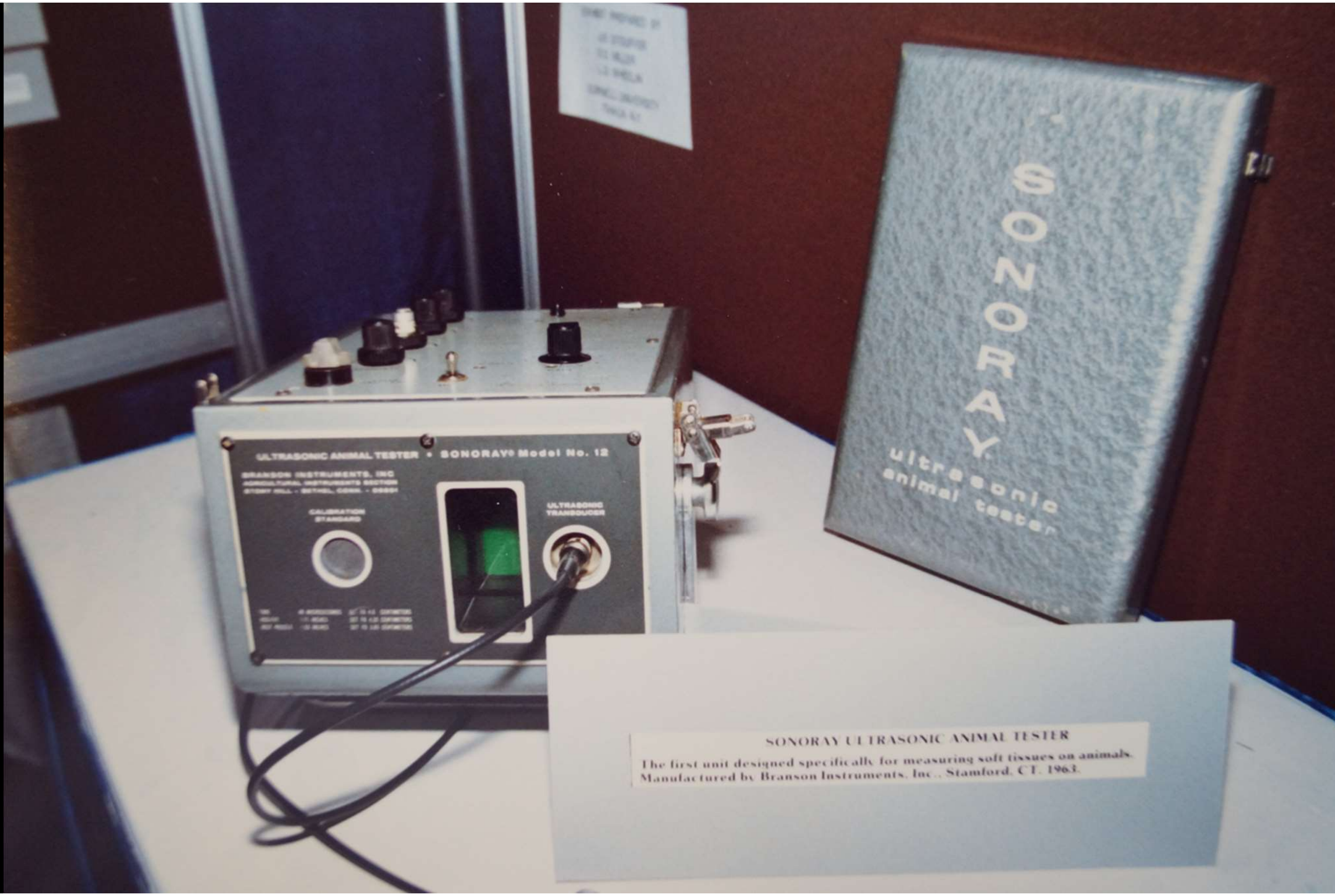

FIRST PHASED-ARRAY MACHINE


SCIENTIFIC
PHASED-ARRAY MACHINE


contact scanning –
Donald Ma
& Brown
– the pioneers
1956
1957
1960
1962


Diagnostic ultrasonography
by electronic sector
scanning




ULTRASONIC ANIMAL TESTER • SONORAY® Model No. 12
BRANSON INSTRUMENTS, INC
CALIBRATION STANDARD
ULTRASONIC TRANSDUCER
SONORAY
ultrasonic
animal tester
SONORAY ULTRASONIC ANIMAL TESTER
The first unit designed specifically for measuring soft tissues on animals.
Manufactured by Branson Instruments, Inc., Stamford, CT. 1963.

ULTRASONICS INSTITUTE AUSTRALIA
EYE 1964
BREAST 1966
BRAIN 1972
OCTOSON 1974


ULTRASONICS INSTITUTE AUSTRALIA
EYE 1964
BREAST 1966
BRAIN 1972
OCTOSON 1974
ORIGINAL NOTEBOOK 1962
ANNULAR ARRAY 1972


ULTRASONICS INSTITUTE AUSTRALIA
GREY SCALE 1969
EYE 1964
BREAST 1966
BRAIN 1972
OCTOSON 1974
ORIGINAL NOTEBOOK 1962
ARRAY 1972


SCIENTIFIC
EXHIBITS
OSHIBA
ASED-ARRAY MACHINE

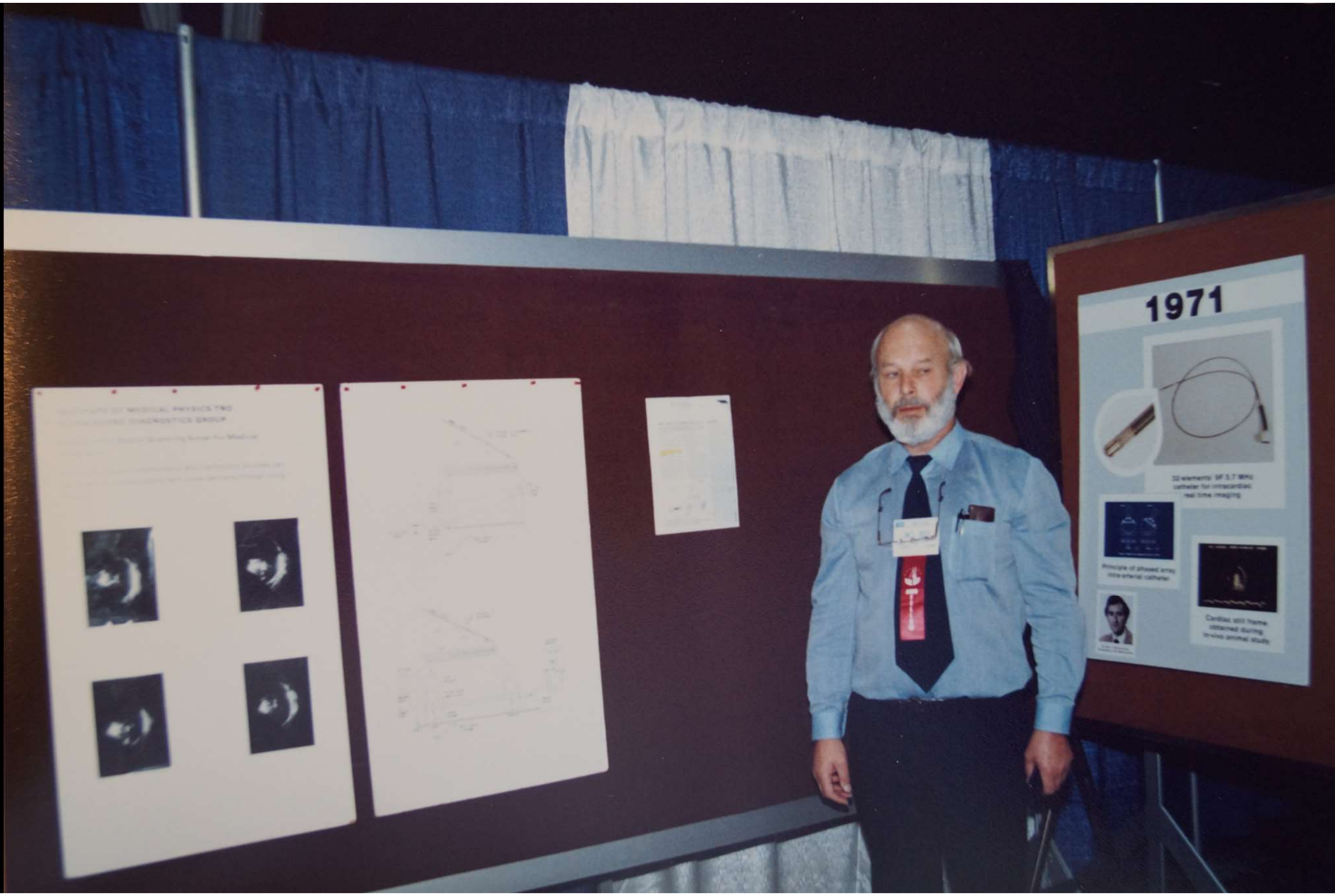

TOSHIBA
PHASED-ARRAY MACHINE


SCIENTIFIC
EXHIBITS
TOSHIBA
FIRST PHASED-
Engineering Prototype of High Resolution
Electronic Linear Scan Diagnostic Ultrasound System


ULTRASONICS INSTITUTE AUSTRALIA
GREY SCALE 1969
EYE 1964
BREAST 1966
BRAIN 1972
THE INSTITUTE
MENIERE'S DISEASE THERAPY
ORIGINAL NOTEBOOK 1962


STANDPIPE
STANDPIPE
ANIMAL ULTRASOUND

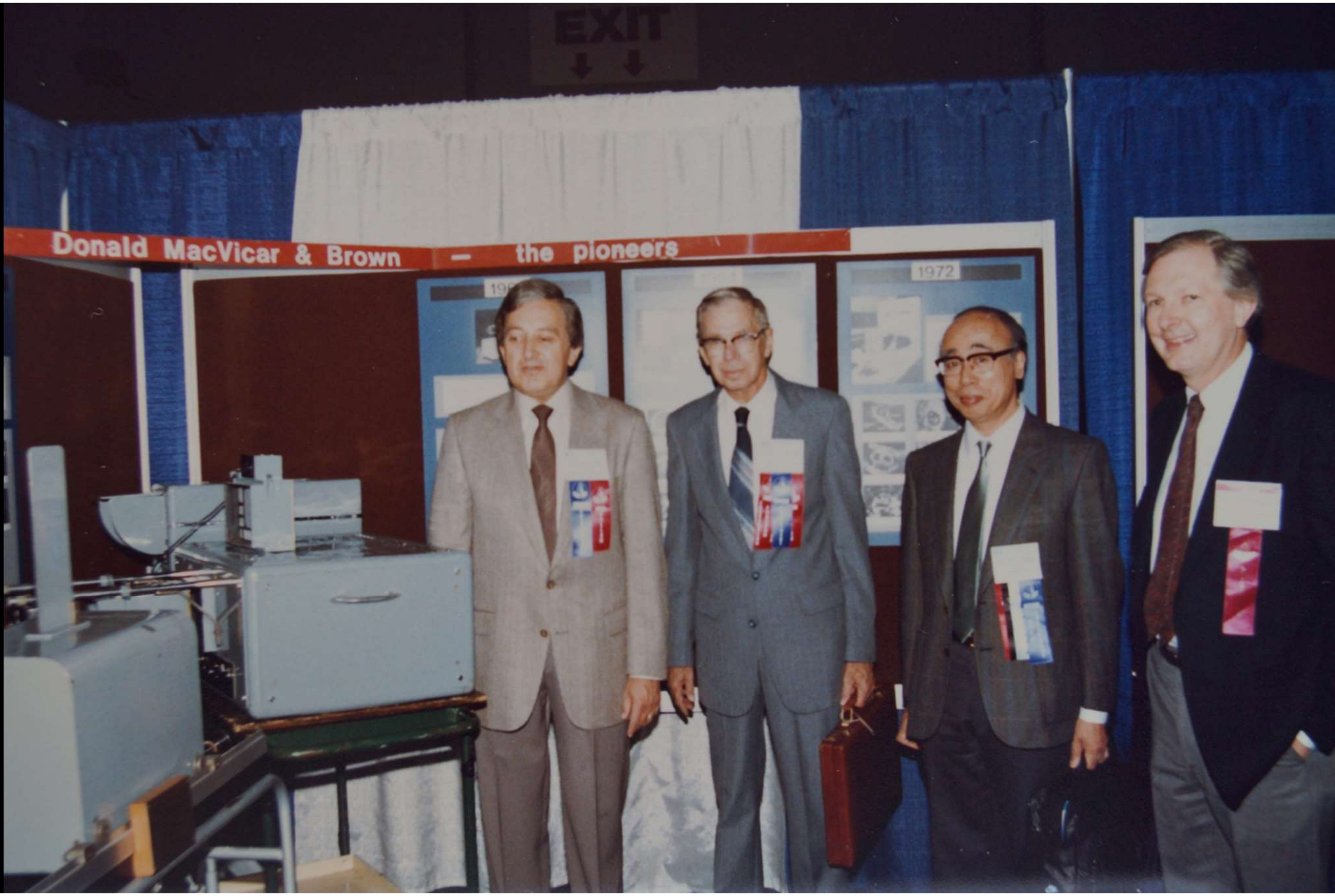

SIEMENS
ULTRASOUND
ULTRASOUND
First Commercial Real Time
Grey Scale Scanner
1964
HISTORY
ULTRASOUND
First Commercial Real Time
Grey Scale Scanner
1964
HISTORY


1971
Principle of phased array intra-arterial catheter
Cardiac still frame obtained during in-vivo animal study


Kretz
TECHNIK
ultras
4871 - ZIPF / AU


Kretz
TECHNIK

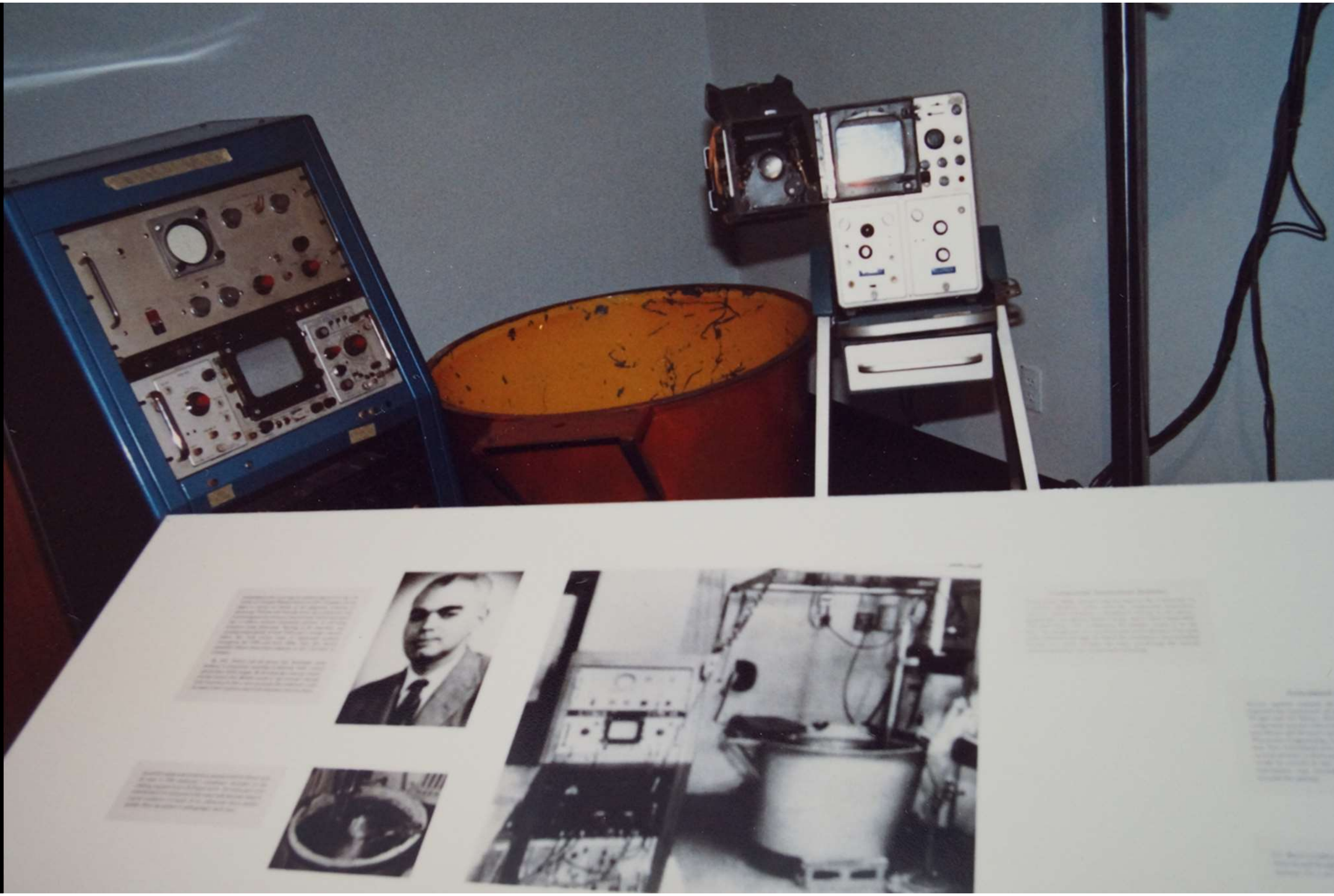

Kretz TECHNIK ultrasound
4871-ZIPF / AUSTRIA

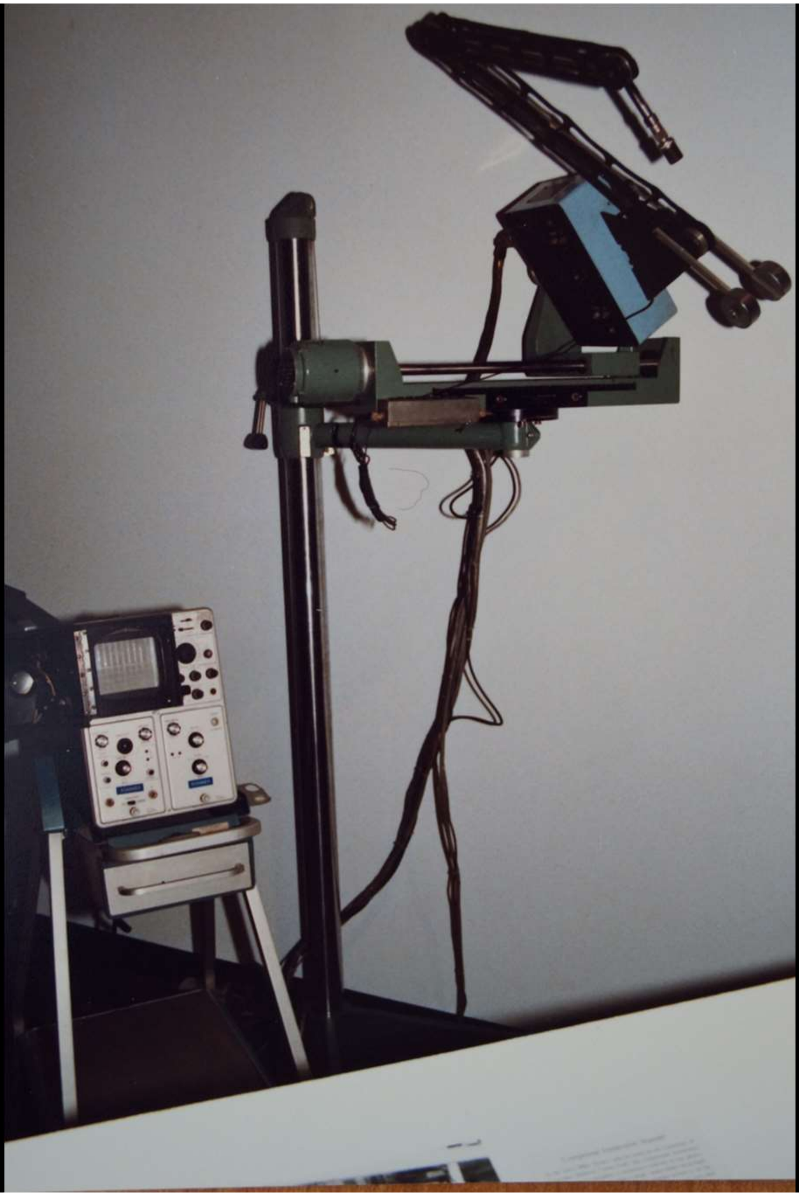

EXIT
Donald MacVicar & Brown — the pioneers
1972

SIEMENS
ULTRASOUND
First Commercial Real Time
Grey Scale Scanner
1984
HISTORY


ultrasound


Sounding the Body
A History of Diagnostic Ultrasound in the United States
Transducers

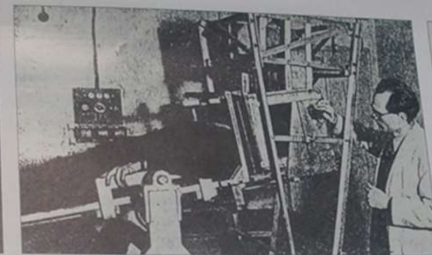




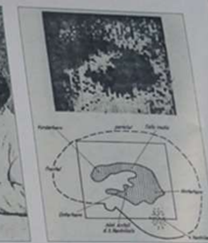
Pioneers of Medical Ultrasound

German Ultrasound Museum

K. Th. Dussik



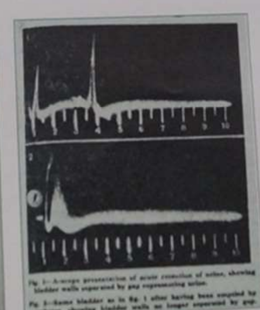
The machine, constructed by Dussik and his brother



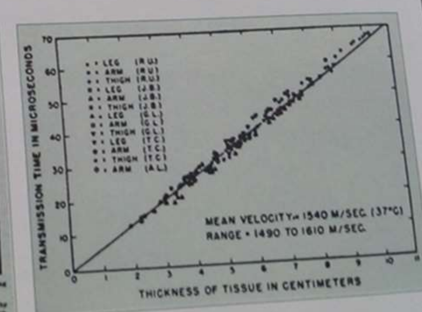
Hypersonogram of the 3rd ventricle

K. Th. Dussik, neurologist in Vienna, was the first physician, who tried to use ultrasound for diagnostic purposes in medicine.
In **1942** he published a method of depicting the cerebral ventricles named "hypersonography" Transmitter and receiver were placed at opposites sides of the skull in fixed relations. The intensity of the signal was recorded on a film.
By moving the probe line by line across the skull, a two-dimensional image was created, giving information about changes in absorption of ultrasound (in analogy to classical x-ray).

G. Ludwig



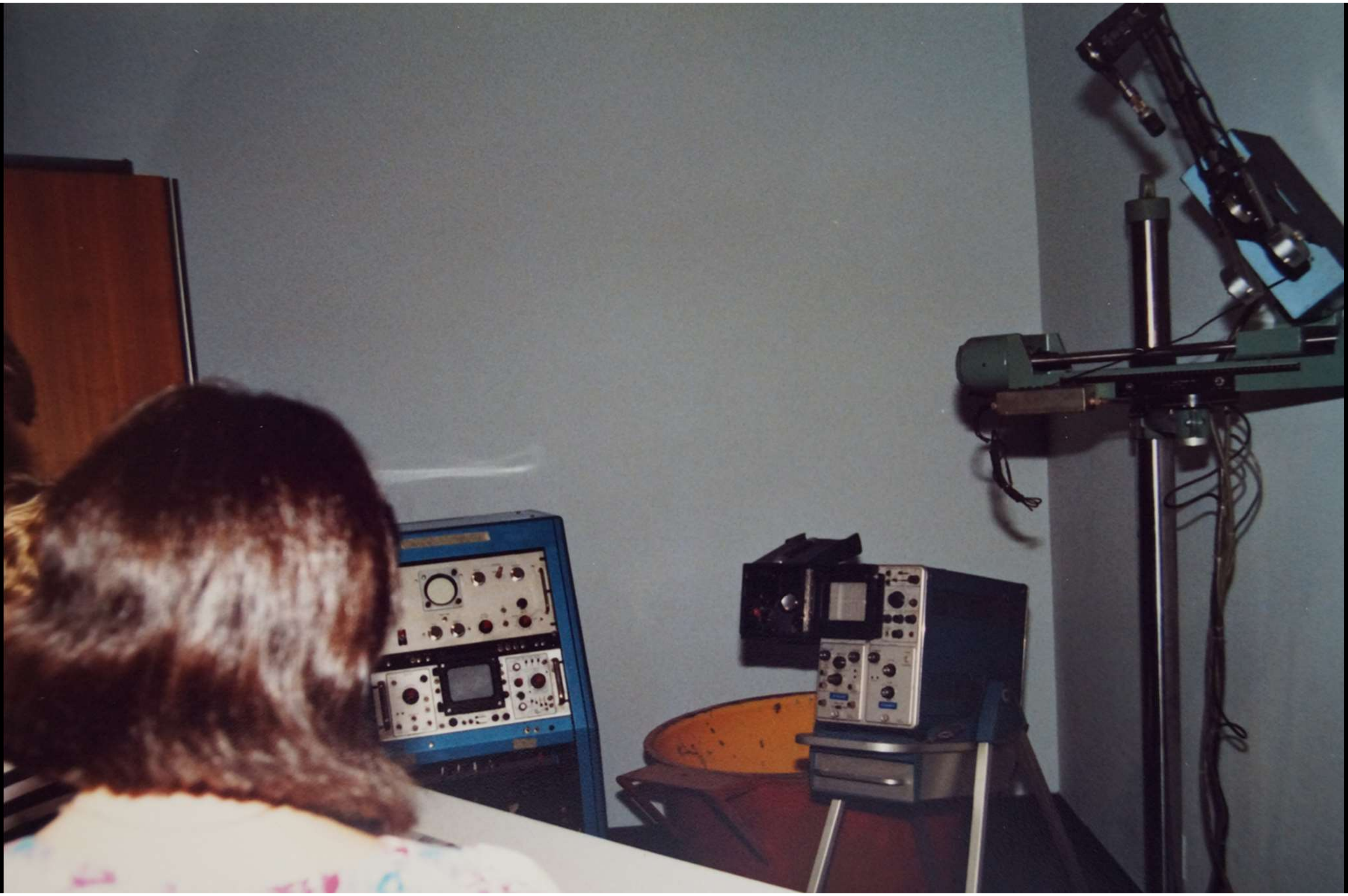
A-scan of the bladder, before (above) and after miction



Ultrasound velocity in different soft tissues

In **1949 G. Ludwig** (Pennsylvania) presented the ... application of a pulse-echo-device (echo-ran-

Ludwig reported an accuracy of around 85% in vivo.
Another one of his important works was the ...

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1960
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contact scanning – Donald MacVicar & Brown! the pioneers
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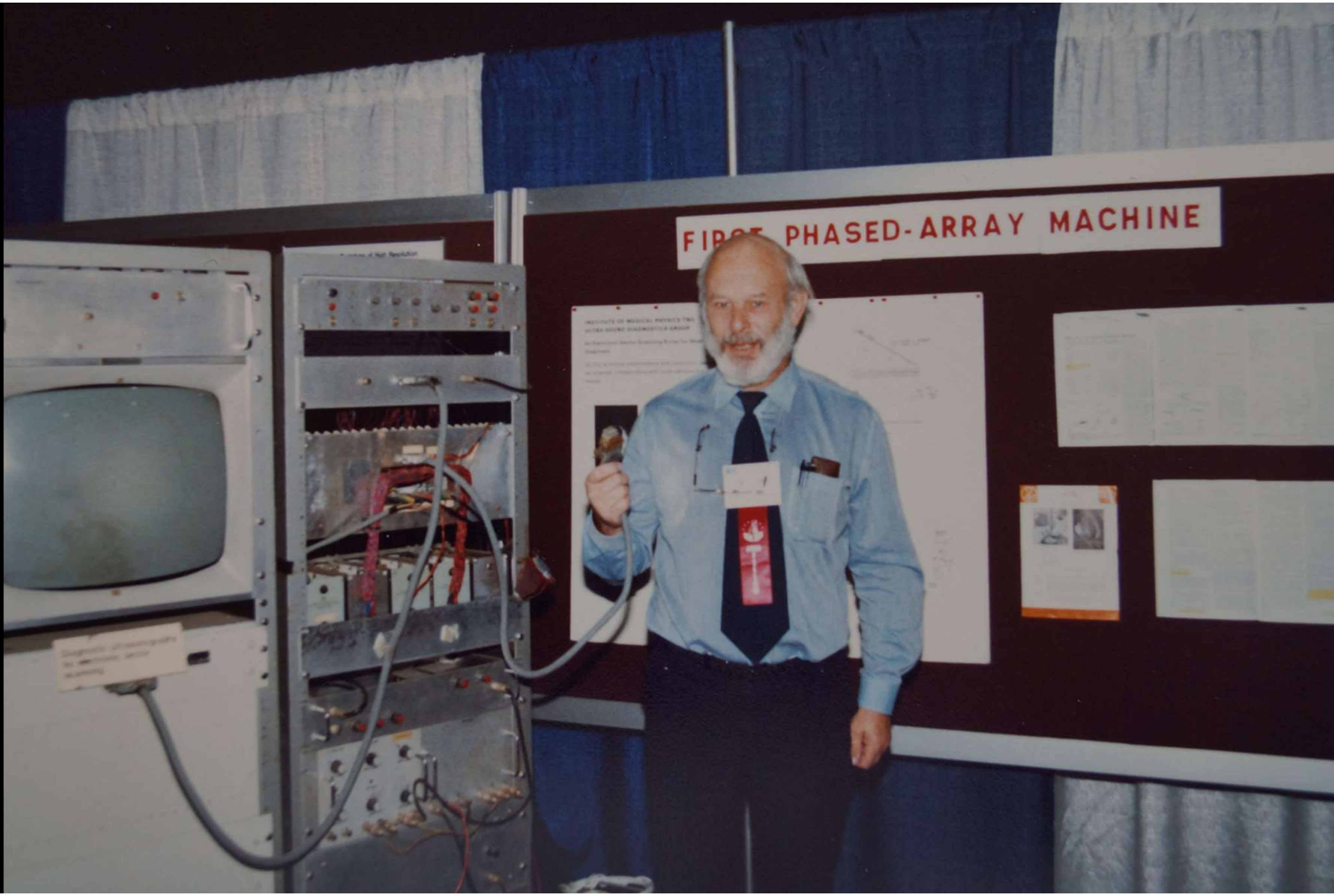
PHASED-ARRAY MACHINE


contact scanning – Donald MacVicar & Brown – the pioneers
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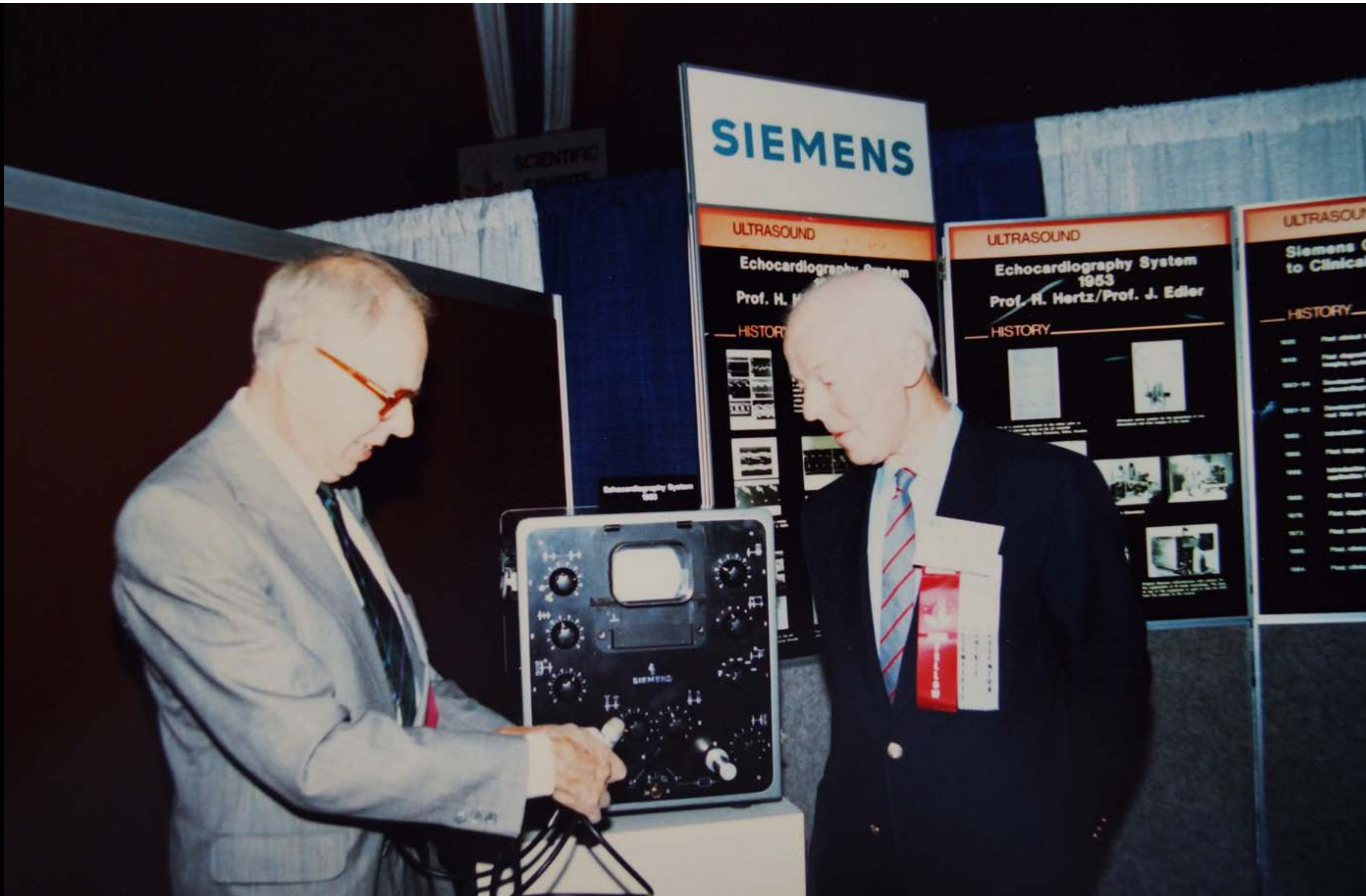
EXIT
TOSHIB


SCIENTIFIC
EXHIBITS
SIEMENS
ULTRASOUND
Echocardiography System
1963
Prof. H. Hertz/Prof. J. Edler
HISTORY
ULTRASOUND
Siemens Contributions
to Clinical Ultrasound
HISTORY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Echocardiography System
1953
Prof. H. Hertz/Prof. J. Edler
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First Commercial Real Time
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