

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

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German
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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)

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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

The system features large dual monitors with single view, freeze frame or synchronized sequencing modes, and could generate video-taped images. The image memory system was able to store both breasts simultaneously.



WFUMB / aiium

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.



WFUMB / aiium

1960s

ULTRASONIC CAROTIDOGRAPHY

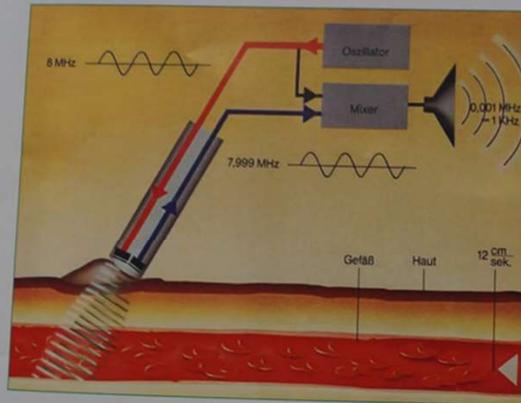
Courtesy of General Corporation Ltd., Pleasantville, New York



Doppler-Sonography



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.

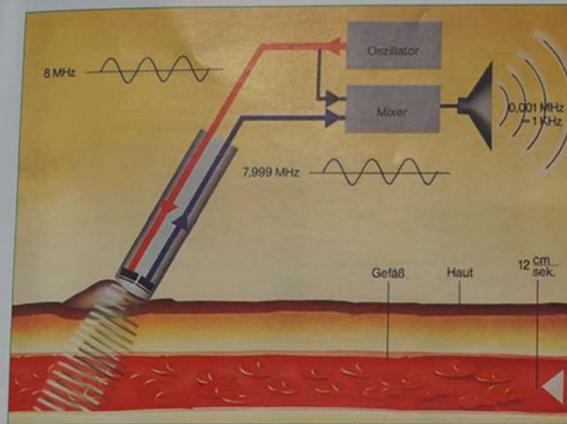
Correspondingly, the frequency of diagnostic ultrasound (about 1 – 20 MHz) will change to a higher or lower pitch when reflected or scattered at moving corpuscular elements within a living body, especially blood cells.

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

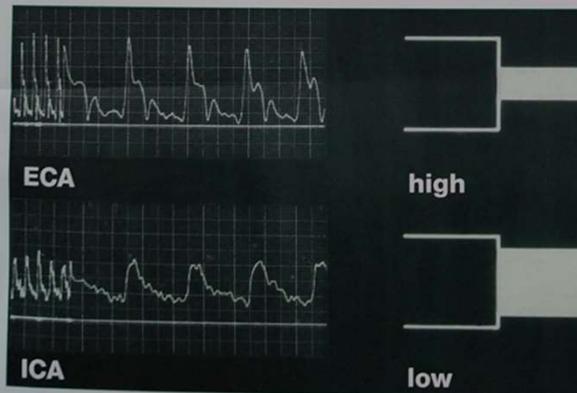


Principle of Doppler-sonography

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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





WPLAB/ALUM

1960

PHYSICIAN'S USE

BY THE UNIVERSITY OF CALIFORNIA

WPLAB/ALUM

1960

PHYSICIAN'S USE

BY THE UNIVERSITY OF CALIFORNIA

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



First Medical Applications

German
Ultrasound
Museum



Douglass Howry



The "gun turret scanner"



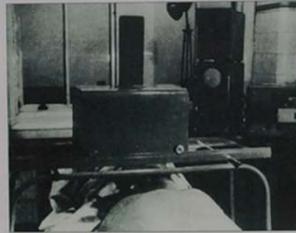
B-scan image of the neck

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 therefore had 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 abdomen, 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, ultrasound gel was placed between the transducer and the body. Now the ultrasound probe could

Donald diagnosed twins, triplets, hydramnios and fetal anomalies (hydrocephalus). He propagated the use of 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, Douglas Howry began to pursue an interest in the diagnostic potential of ultrasound. With his wife Dorothy Scott, 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

Physiologic Eng No: VSA-637

University of Colorado Medical Center 13437
with Polar Coordinate Indicator

The modified Itektron Type W14 Oscilloscope is an example of a storage oscilloscope which gives the ability for 80 msec. This is used to store color scans, developed by William Wright, was used by Joseph Holmes for cardiac work.
It uses such screen.



WFUMB/aium I

1960s

SIEMENS-SCHNITTEBENE USP 10-WZ415

W-NR.818

A-mode equipment, part of the Weisskop 825. The Weisskop was a mechanical sector scanner with rotating transducer in a container filled with water. The scanning area could be moved without moving the container which was called "Schnitzebene" or "Schichtebene" (slicing of the scanning area). The area was set to define the tissue when moving the transducer.




WFUMB/aium I

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 or a fixed curve guide was a forerunner of the mechanical B-scan ultrasonic equipment.



WFUMB/aium

1960s
SIEMENS-SCHNITTEBENE USIP 10-W245S
W-NE.818

A-mode instrument, part of the Vidison 63S. The Vidison was a mechanical sector scanner with rotating transducers 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

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.

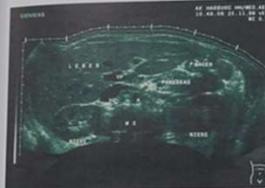
The introduction of the gray scale technique was an important step forward: Now the echoes were displayed as dots varying in brightness according to the intensity of the reflected echoes. Modulated brightness was an integral part of the real time scanners from the beginning. In compound scanners, using scan converters, gray scale imaging was introduced about 1973.



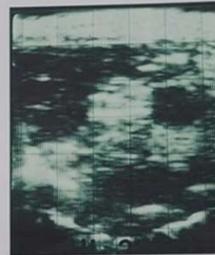
Pancreatic tumor (T)
Compound scan
bistable image
(~ 1970)



Transverse scan
of the abdomen
Compound scanner,
gray scale (1975)



Transverse scan of the abdomen (1999)



Pancreatic tumor
Real time-gray scale
(Vidicon 1973)



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 resulted 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 made eye



D image of a fetus (1999)

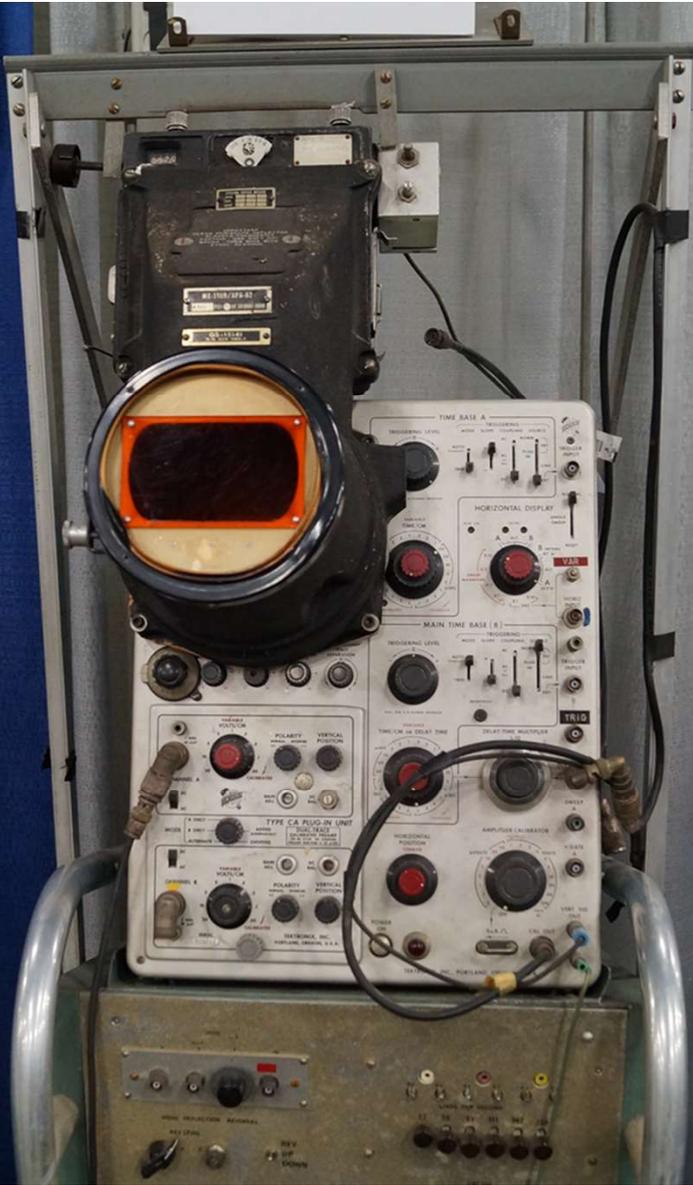
a remarkable improvement of the image quality. The integration of the Doppler-technique into the B-mode image leads to duplex- and triplex techniques. The 3D- and 4 D-depictions and the development of contrast agents characterize the standards of the beginning of this century.



Compound scan, gray scale (1991)

Real time Compound scan, 40Hz, 1993

...with most of mechanical and electronic scanners with parallel or sector scanning, which are still in use today.

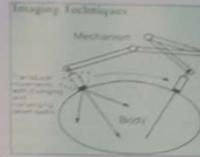


TIME BASE A
REGULATING LEVEL
HORIZONTAL DISPLAY
MAIN TIME BASE (B)
REGULATING LEVEL
HORIZONTAL POSITION
TYPE CA PLUG-IN UNIT
STRONG, INC.
TRIO

From Compound Scanning to Real Time

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.

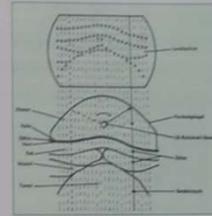
The first commercially available *real time-scanner* was the *Vidoson* (Siemens). The pulses of two or three rotating transducers within a water path were reflected by a parabolic mirror, leading to 15 cm of parallel shifting of the ultrasound beam.



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.

M
the side



WFUMB/atum
1960s
SPERRY REFLECTOSCOPE PULSER / RECON UNIT

A well-known instrument that is a member of the first generation of active electronic systems for sea and land measurements. It is the individual parts for active signal, sea and ground measurement and/or measurement of 1000 to 10000 of the sea level of the sea. The concept was the measurement of depth and measurement of the sea, which are essential for the operation of the sea level measurement system. The instrument was developed by W. J. van der Meer and J. van der Meer at the Department of Hydrography, Coastal Protection and Oceanography.

Collier-Rosen was born and raised in New York City. He studied engineering and physics at the University of Pennsylvania. He worked for the "University of Pennsylvania" in 1947 and for the "University of Pennsylvania" in 1948. He worked for the "University of Pennsylvania" in 1949. He worked for the "University of Pennsylvania" in 1950. He worked for the "University of Pennsylvania" in 1951. He worked for the "University of Pennsylvania" in 1952. He worked for the "University of Pennsylvania" in 1953. He worked for the "University of Pennsylvania" in 1954. He worked for the "University of Pennsylvania" in 1955. He worked for the "University of Pennsylvania" in 1956. He worked for the "University of Pennsylvania" in 1957. He worked for the "University of Pennsylvania" in 1958. He worked for the "University of Pennsylvania" in 1959. He worked for the "University of Pennsylvania" in 1960. He worked for the "University of Pennsylvania" in 1961. He worked for the "University of Pennsylvania" in 1962. He worked for the "University of Pennsylvania" in 1963. He worked for the "University of Pennsylvania" in 1964. He worked for the "University of Pennsylvania" in 1965. He worked for the "University of Pennsylvania" in 1966. He worked for the "University of Pennsylvania" in 1967. He worked for the "University of Pennsylvania" in 1968. He worked for the "University of Pennsylvania" in 1969. He worked for the "University of Pennsylvania" in 1970. He worked for the "University of Pennsylvania" in 1971. He worked for the "University of Pennsylvania" in 1972. He worked for the "University of Pennsylvania" in 1973. He worked for the "University of Pennsylvania" in 1974. He worked for the "University of Pennsylvania" in 1975. He worked for the "University of Pennsylvania" in 1976. He worked for the "University of Pennsylvania" in 1977. He worked for the "University of Pennsylvania" in 1978. He worked for the "University of Pennsylvania" in 1979. He worked for the "University of Pennsylvania" in 1980. He worked for the "University of Pennsylvania" in 1981. He worked for the "University of Pennsylvania" in 1982. He worked for the "University of Pennsylvania" in 1983. He worked for the "University of Pennsylvania" in 1984. He worked for the "University of Pennsylvania" in 1985. He worked for the "University of Pennsylvania" in 1986. He worked for the "University of Pennsylvania" in 1987. He worked for the "University of Pennsylvania" in 1988. He worked for the "University of Pennsylvania" in 1989. He worked for the "University of Pennsylvania" in 1990. He worked for the "University of Pennsylvania" in 1991. He worked for the "University of Pennsylvania" in 1992. He worked for the "University of Pennsylvania" in 1993. He worked for the "University of Pennsylvania" in 1994. He worked for the "University of Pennsylvania" in 1995. He worked for the "University of Pennsylvania" in 1996. He worked for the "University of Pennsylvania" in 1997. He worked for the "University of Pennsylvania" in 1998. He worked for the "University of Pennsylvania" in 1999. He worked for the "University of Pennsylvania" in 2000. He worked for the "University of Pennsylvania" in 2001. He worked for the "University of Pennsylvania" in 2002. He worked for the "University of Pennsylvania" in 2003. He worked for the "University of Pennsylvania" in 2004. He worked for the "University of Pennsylvania" in 2005. He worked for the "University of Pennsylvania" in 2006. He worked for the "University of Pennsylvania" in 2007. He worked for the "University of Pennsylvania" in 2008. He worked for the "University of Pennsylvania" in 2009. He worked for the "University of Pennsylvania" in 2010. He worked for the "University of Pennsylvania" in 2011. He worked for the "University of Pennsylvania" in 2012. He worked for the "University of Pennsylvania" in 2013. He worked for the "University of Pennsylvania" in 2014. He worked for the "University of Pennsylvania" in 2015. He worked for the "University of Pennsylvania" in 2016. He worked for the "University of Pennsylvania" in 2017. He worked for the "University of Pennsylvania" in 2018. He worked for the "University of Pennsylvania" in 2019. He worked for the "University of Pennsylvania" in 2020. He worked for the "University of Pennsylvania" in 2021. He worked for the "University of Pennsylvania" in 2022. He worked for the "University of Pennsylvania" in 2023. He worked for the "University of Pennsylvania" in 2024. He worked for the "University of Pennsylvania" in 2025.





WFUMB/aium

1960s

SPERRY REFLECTOSCOPE PULSER / RECEIVE UNIT TON

A, and B, make accurate...
 This is an example of the first instrument to use an electronic...
 eye. Individual gates to control alignment, size and volume...
 comparison provided accurate measurement of all...
 10 mm of the axial length of the eye. This concept was the...
 foundation of all optical and measurement of the eye, which...
 an aspect of resolution of the non-invasive refractive lens...
 which power following contact refraction. The instrument...
 was developed by Dr. Arthur Coleman and Dr. Benjamin...
 Calkin at the Department of Ophthalmology, California Pacific...
 War Medical Center.

Gilbert Rosen (1923-2002)
 Ophthalmologist and pioneer in ultrasound

Gilbert Rosen was born and raised in New York City by Jewish immigrant parents who had fled the pogroms in Europe. He graduated from the University of Wisconsin-Madison in 1942 and moved to Los Angeles, then to the School of Medicine at USC. After working in the National College of Podiatry in Los Angeles, he returned to USC, where he met with groups...
 "New York, where with groups...
 of health and for 19 years...
 about an ultrasound laboratory...
 early in the 1950s. Coleman...
 and he was a full professor...
 known for the diagnosis of...
 eye in the 1950s. Following a...
 to be named...
 program was developed in...
 and to make accurate eye...
 of the eye. The instrument...
 and Coleman were awarded the...
 by publishing a book in 1961...
 on ocular ultrasonic...
 technique on the use of ultrasound in...
 ophthalmology. Fundamentals of Medical...
 Physics, 1975. The second...
 of ophthalmology, the...
 of ophthalmology (1975-1982) and for...
 his leadership in medicine and teaching.

A remarkable improvement of the image quality...
 The integration of the Doppler technique into the...
 1960s image made it possible to display and...
 Figure. The US and B-Mode and the...
 part of cardiac apex motion for the...
 of the beginning of this century.



Comparison of the two-dimensional electron image with a hard-rod probe in a strong beam.
With the electron scanning the light component is visible.

Table with a blue cloth and a sign.



1940s
1940s



1940s
1940s

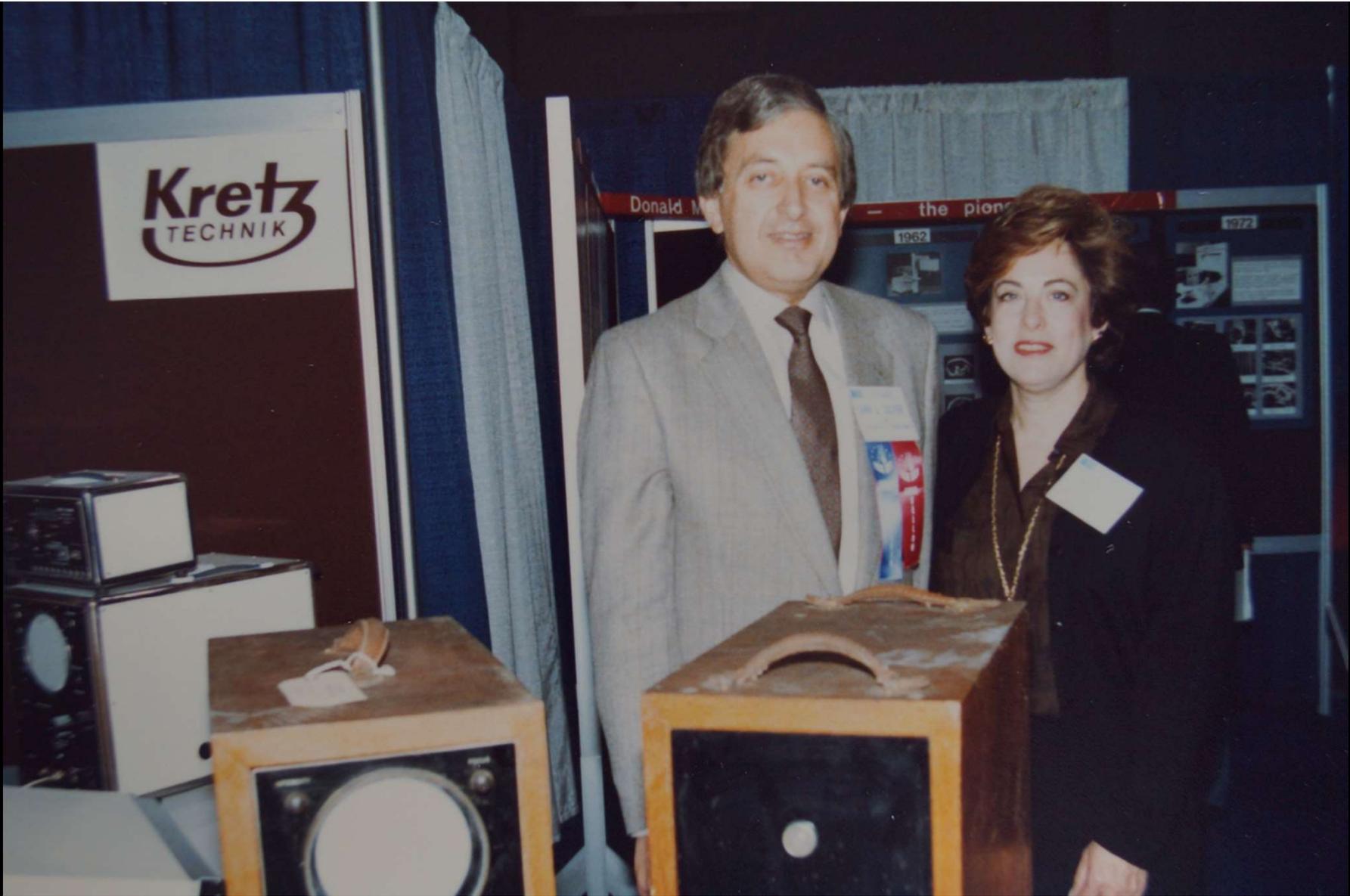


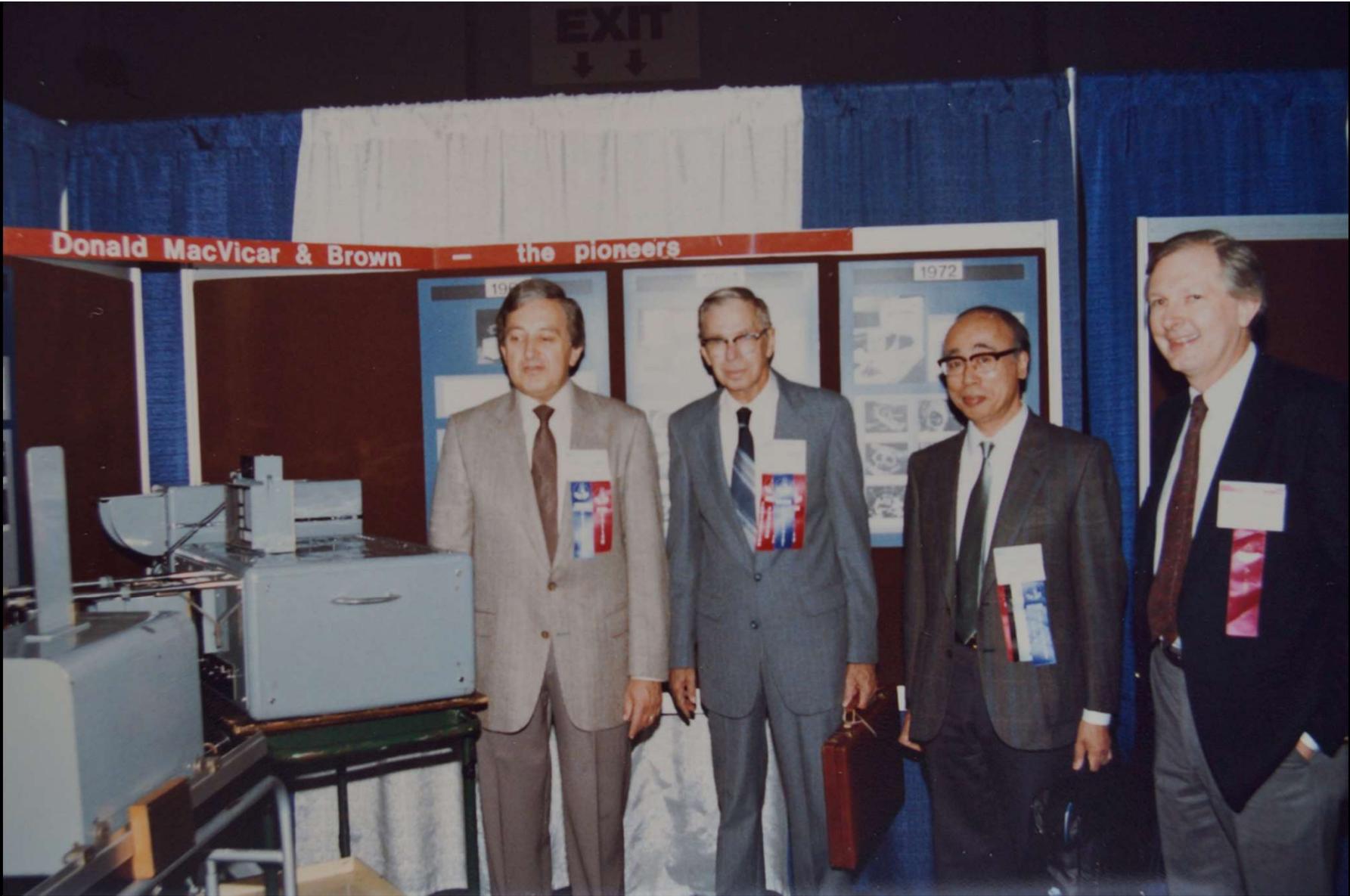
WFUMB / aium
1960s
1960s















ULTRASONICS INSTITUTE AUSTRALIA





SIEMENS

ULTRASOUND

First Commercial Grey Scale
1964

HISTORY

SIEMENS

Siemens Contributions to Clinical Ultrasound

First Commercial Real Time
1974

ULTRASONICS INSTITUTE AUSTRALIA

GYNASTETRICS 1962-1965

GREY SCALE 1968

EYE 1964

BREAST 1966

BRAIN 1972

OCTOSON 1974



ORIGINAL NOTEBOOK 1962

PHASED ARRAY 1972

ULTRASONICS INSTITUTE AUSTRALIA

COPIES
OBSTETRICS 1962-1963

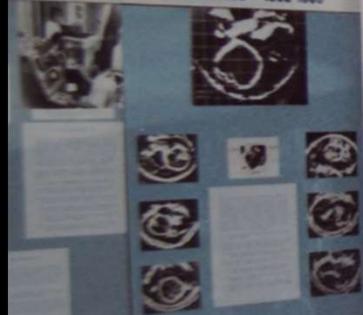
GREY SCALE 1969

EYE 1964

BREAST 1966

BRAIN 1972

OCTOSON 1974





SIEMENS

ULTRASOUND

First Commercial
Grey Scale Sc
1984

HISTORY





EKOLINE 20

SIGNAL CALIBRATED POWER

FINE GAIN

COARSE GAIN

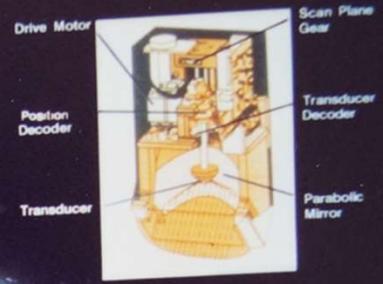
POWER

UP

DOWN

OFF

ON



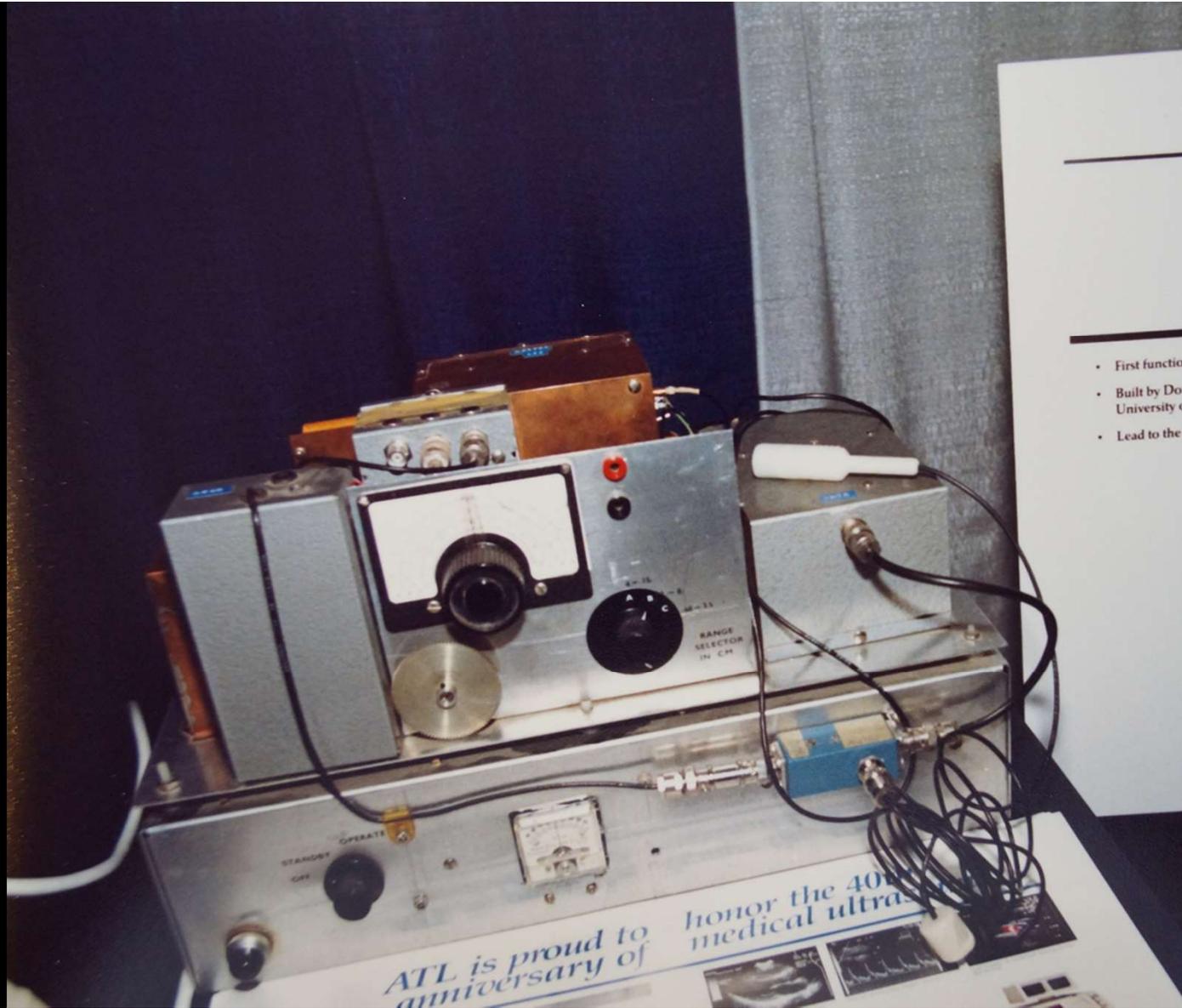
Scanner Head of
1st Real Time System
1963

SOUND

Commercial Real Time
Grey Scale Scanner
1984

ISTORY





ATL is proud to
anniversary of
honor the 40th
medical ultras



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 Bioengineering, University of Washington
- Lead to the ATL MARK I pulsed Doppler system introduced in 1974





Advanced Technology
Laboratories

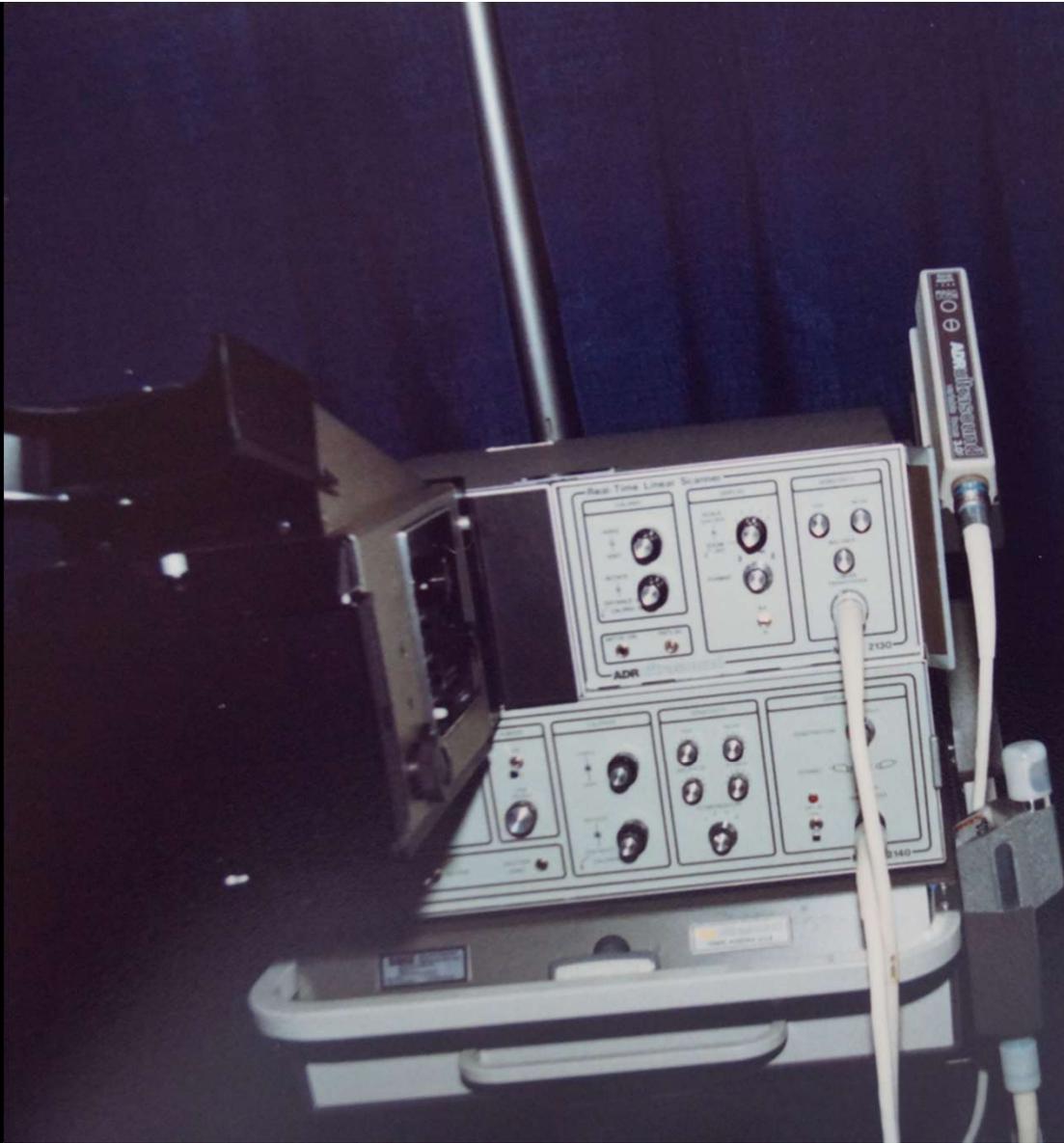
ADR 2130 Ultrasound System 1976

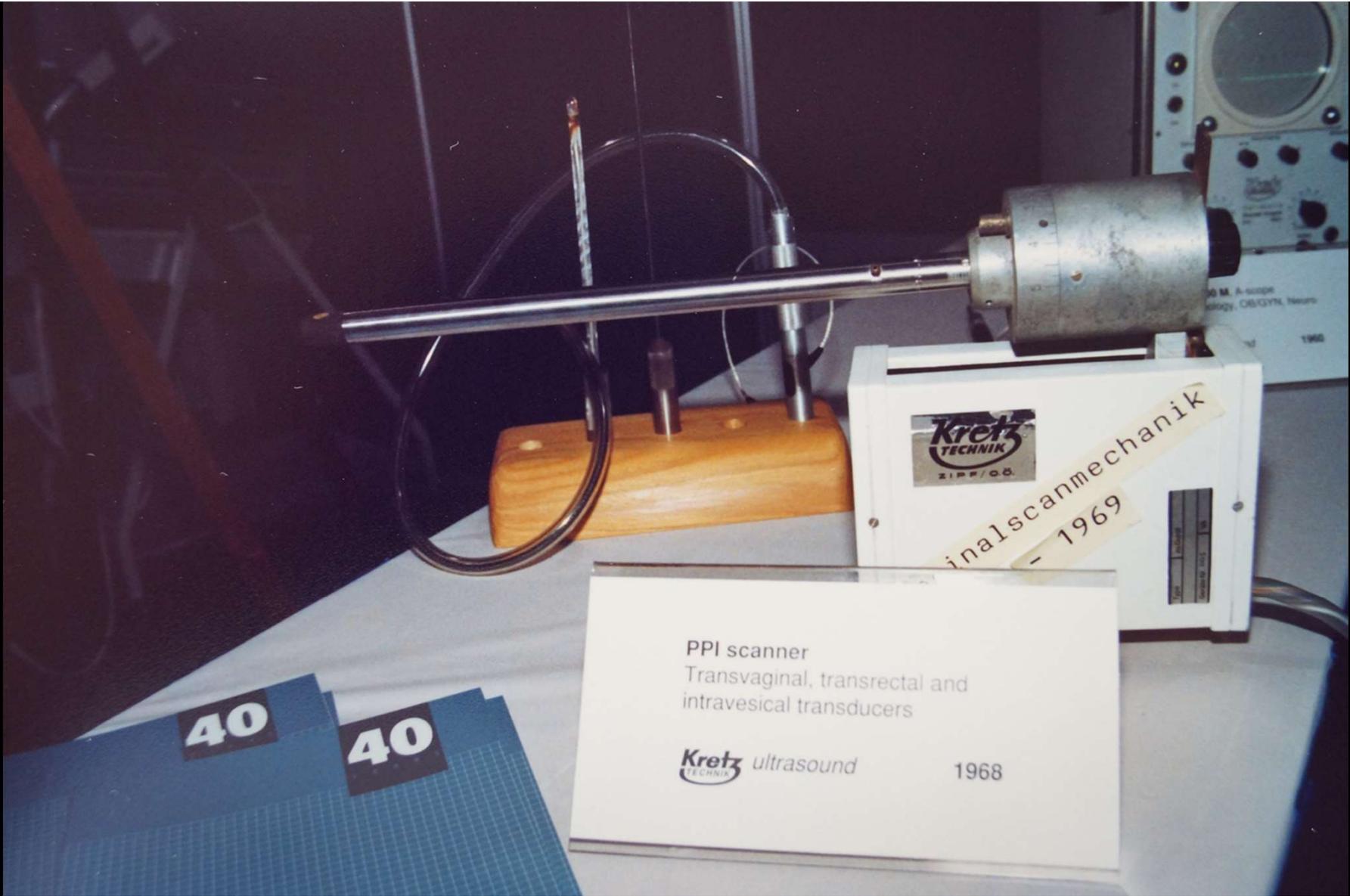
- Linear array real-time scanner for OB and abdominal applications
- First true gray scale processing in real time
- Revolutionized tissue characterization analysis

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

40

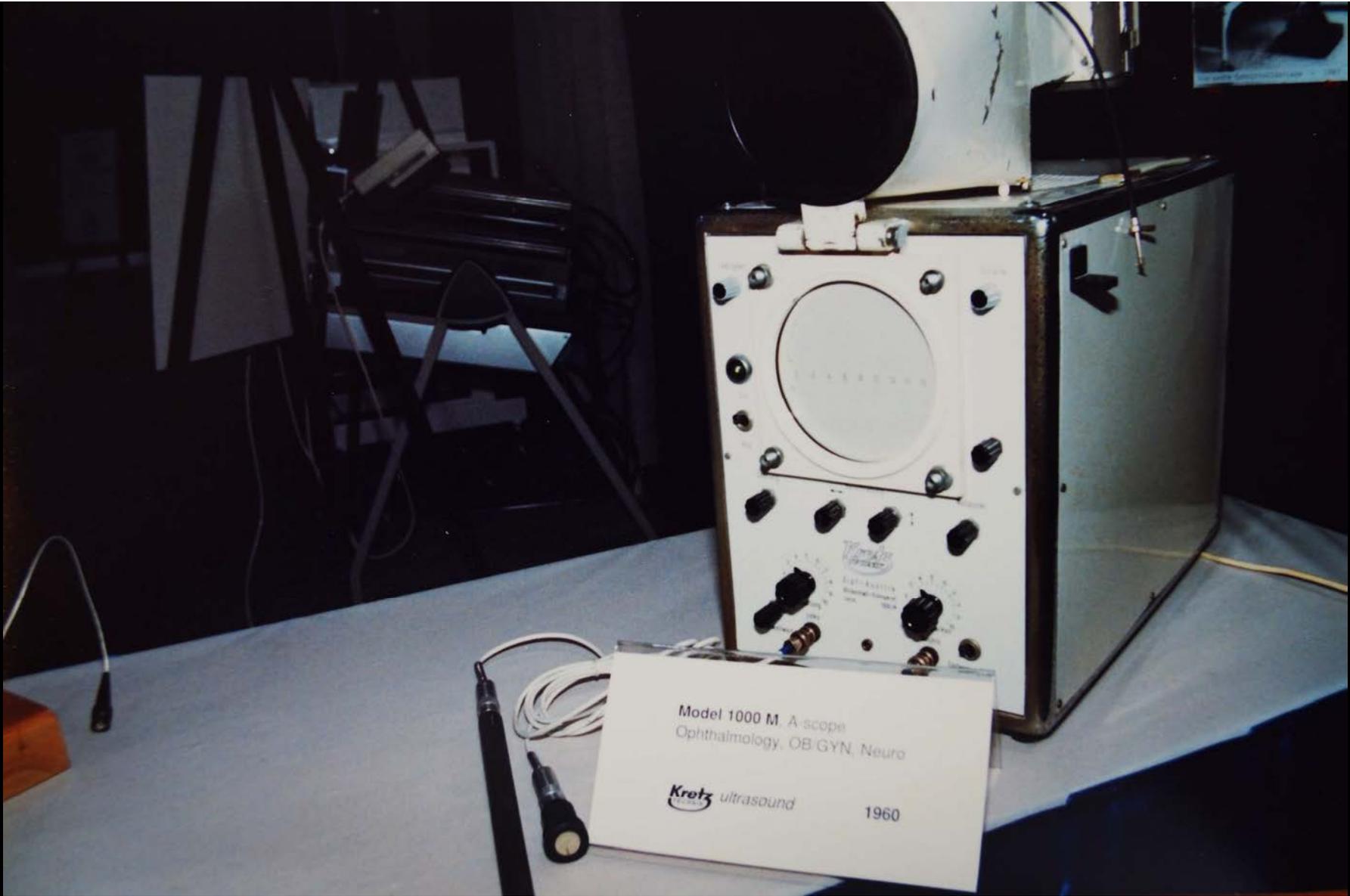
PPI scanner
 Transvaginal, transrectal and
 intravesical transducers

Kretz ultrasound 1968
TECHNIK

Kretz
TECHNIK
 ZIPF/08

inalscanmechanik
 - 1969

10 M. A-scope
 glogy, CH/OTK, Neuro
 1960



Model 1000 M A-scope
Ophthalmology, OB/GYN, Neuro

Kretz ultrasound

1960



COMBISON 100
Multi-purpose mechanical
hand piece scaler

Kreitz Ultrasound 1977

Kreitz

COMBISON 100

COMBISON 100
Kreitz

PAT. NO.
44444

KRETZTECHNIK
Zigf-Austria
Gerät Typ 02-EL
Nr 030

Ein
Aus
Tempo Synchr.
Laufend Einzel

Anzeige

H. F. Eingang

10 Ausgang

Stufenspannung

Einzel Schritte

Amplitudenvergleich

1 2 3 4 5 6 7 8 9 10

Helligkeit

Ein
Aus

Dehnung

Lupenverschiebung

KRETZTECHNIK
Zigf-Austria
Ultraschall-Impuls-Gerät
für Augenuntersuchung
Nr. 1010

Schwellwert

Amplitude

A B

Blitzschleife

Stromschleife

Pumpenschleife

Model 7000. A-scope + B-scan
+ multi - element transducer
Ophthalmology

Kretz ultrasound 1962



Model 7200 MA, A-scope
Ophthalmology
Kretz ultrasound 1971



INTENSITY FOCUS



VERT. HOR.

ULTRASONIC LOCATOR GENERAL PRECISION LABORATORY, INC. PLEASANTVILLE, N.Y.

DURATION SWEEP DELAY

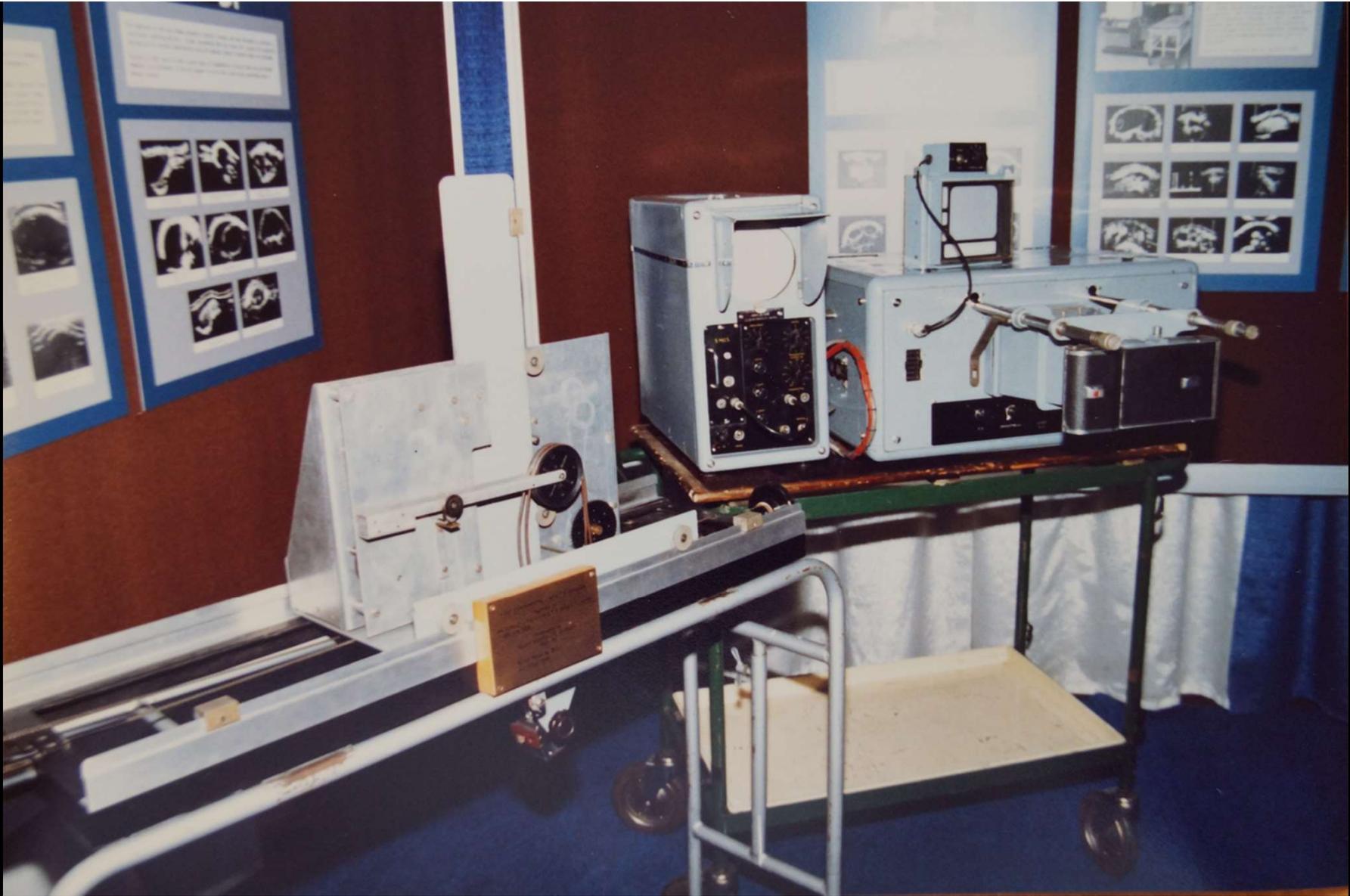
GAIN

RECEIVER T-R

2.5 MC. PULSE PWR.

ULTRASONIC LOCATOR POWER SUPPLY UNIT GENERAL PRECISION LABORATORY, INC. PLEASANTVILLE, N.Y.

Commercial Pulse Echo Instrument, c. 1950.
Built following product patent by Ludwig and Sauerbrey
for gallium detection
under the direction of Dr. Ivan Greenwood
at General Precision Laboratories.



ULTRASONICS INSTITUTE AUSTRALIA



THE ULTRASONIC GENERATOR AND SPECIFICATIONS - 1962

TO OVERCOME THE ULTRASONIC ENERGY REQUIREMENT... (text continues)

THE ROUND WINDOW ULTRASONIC RADIATOR - 1962

A NEW DEVELOPMENT IN THE TREATMENT OF MENIERE'S... (text continues)



SEMI-CIRCULAR CANAL MENIERE'S PROBE

ULTRASONIC TREATMENT OF MENIERE'S DISEASE

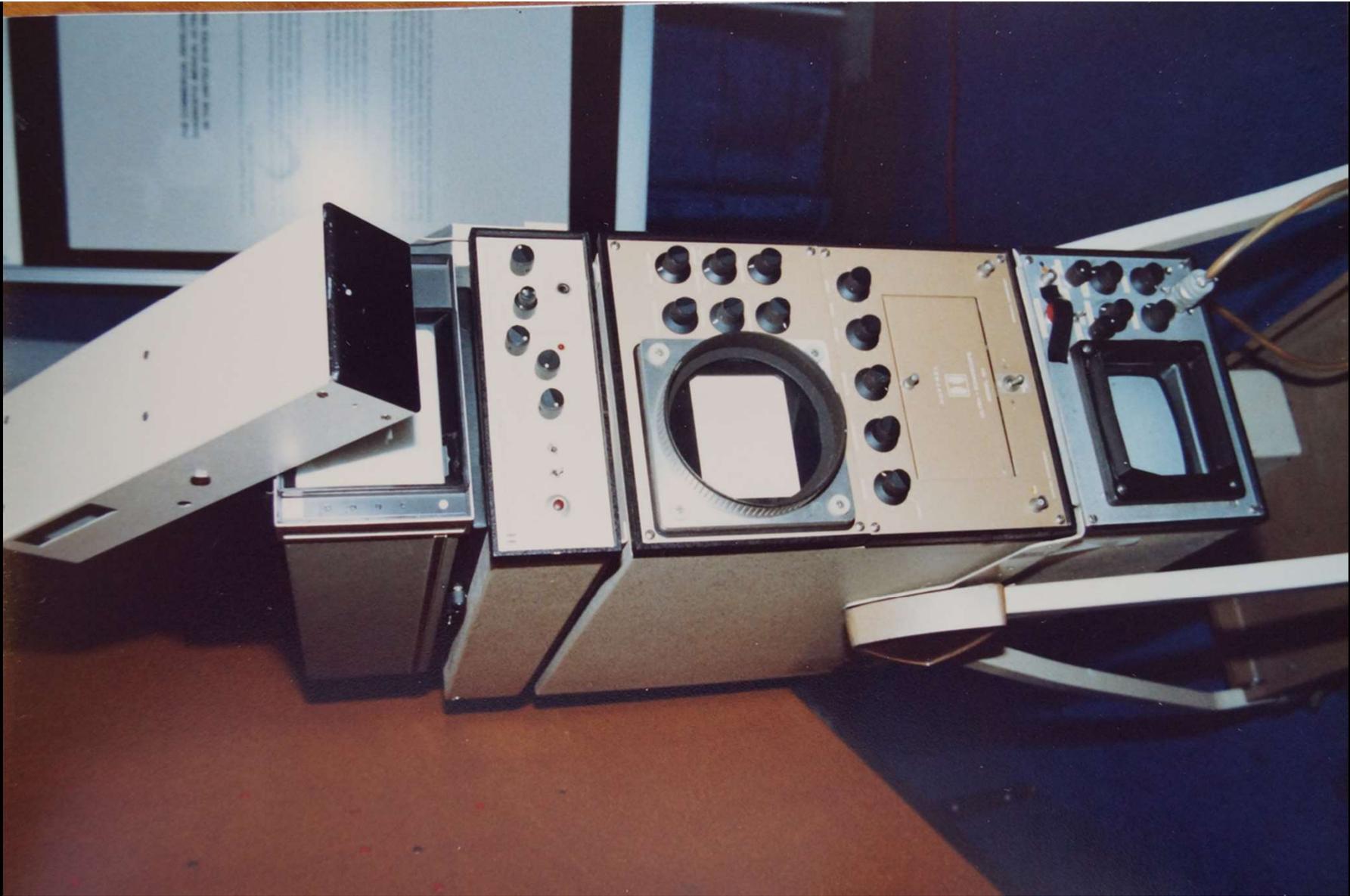
ROUND WINDOW MENIERE'S PROBE

MENIERE'S DISEASE THERAPY 1962



HISTORIC
EXHIBIT





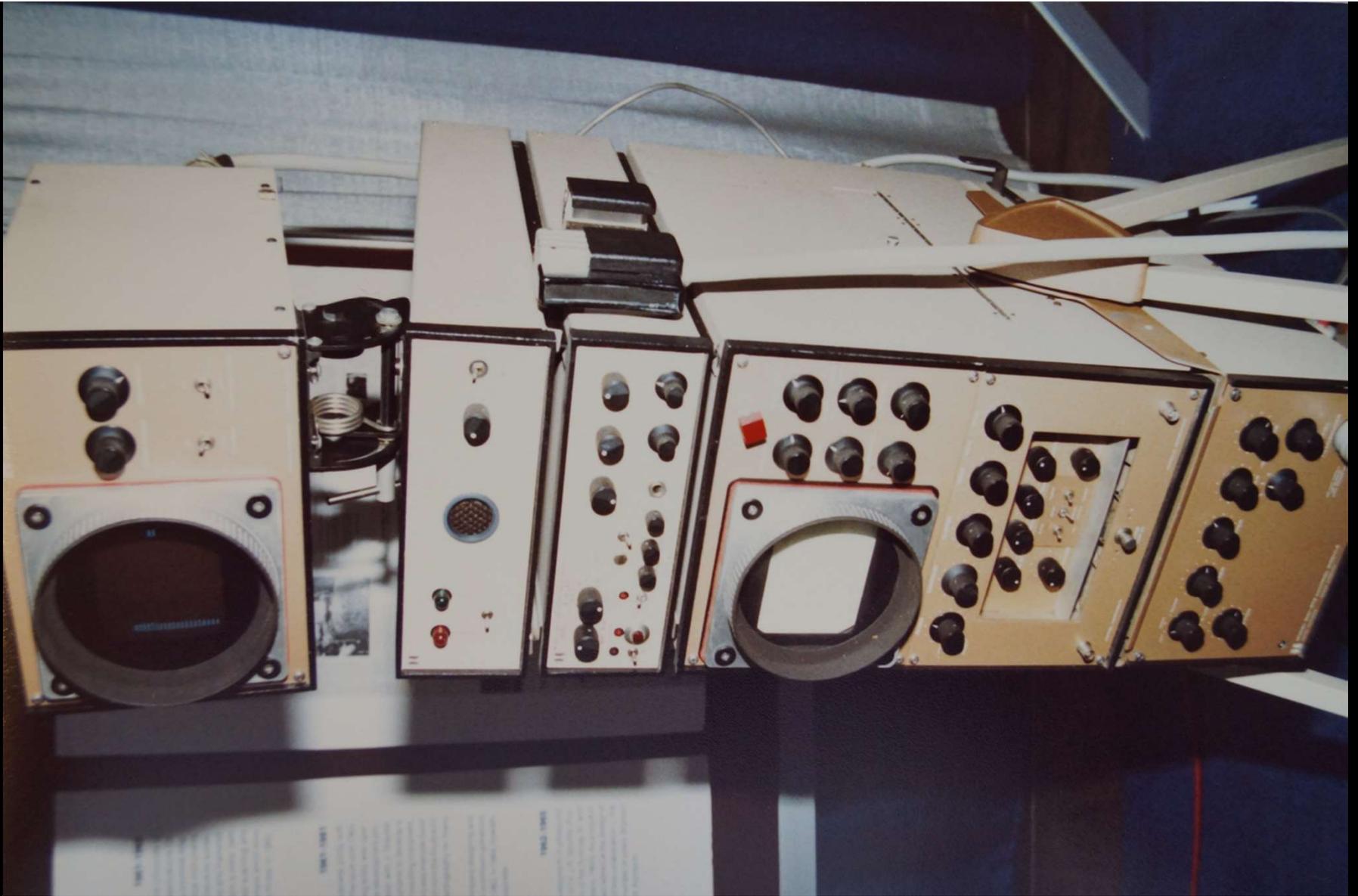
Electrocardiography System
1963

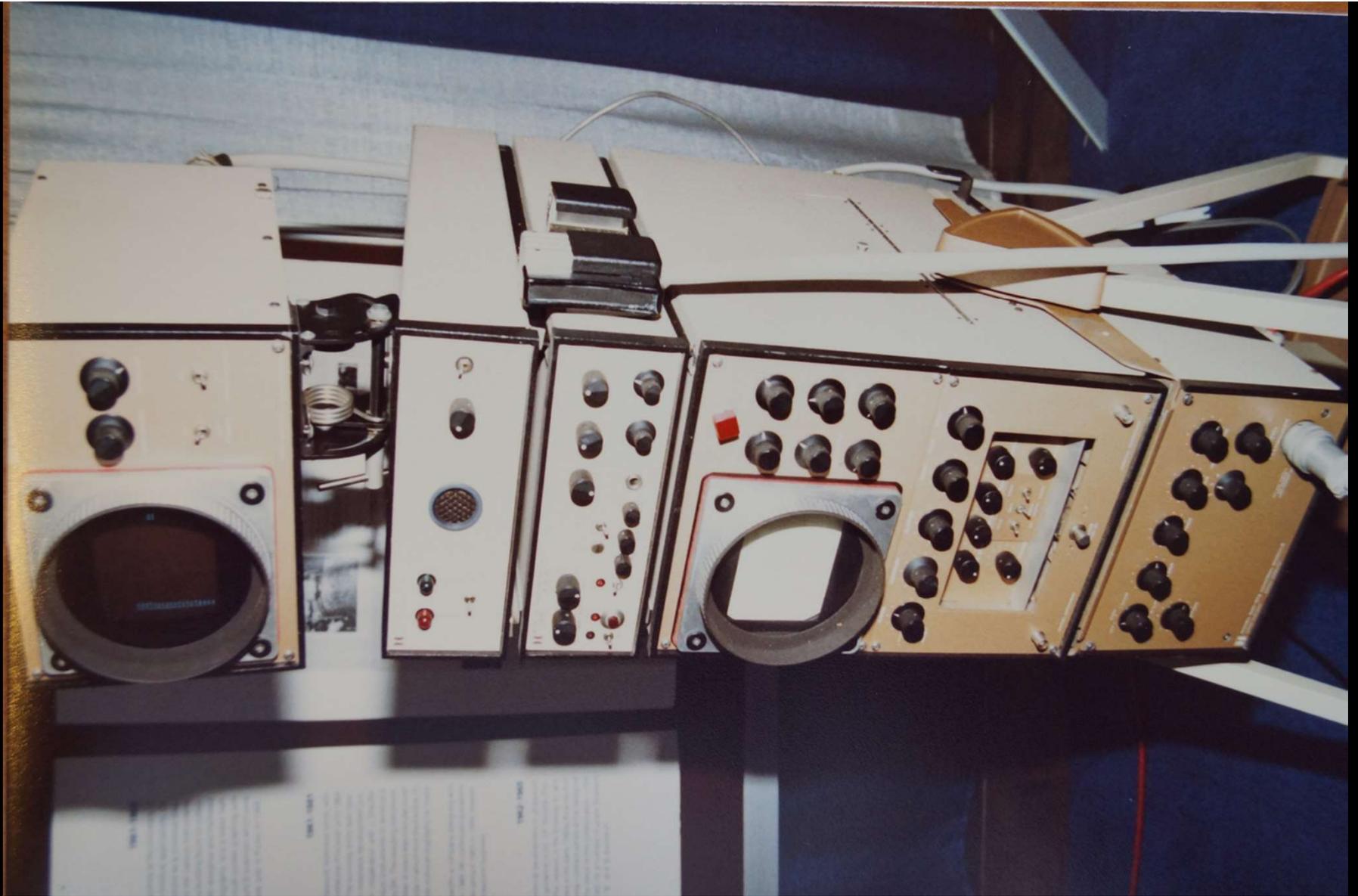






EKOLINE 20





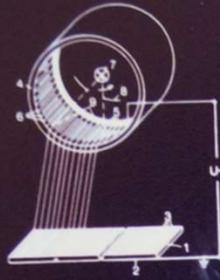


HYALOMETRY IN OBSTETRICS AND GYNAECOLOGY
Diagnosis of a fetal head as an aid to determine the position of the fetus in the pelvis.

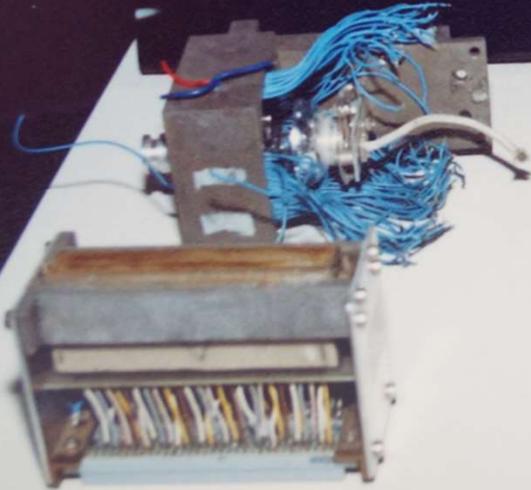
OCULAR BIOLOGY IN OPHTHALMOLOGY
Lens thickness; studying myopia, growth, cataract conditions; and for locating foreign bodies.

RENAL STUDIES IN INTERNAL MEDICINE
The bladder by measuring the A-P diameter; kidney studies; and locating renal stones.

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 linear array developed in 1969 consisting of

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.



Comparison of focussing with fixed focus



Annular Array System 1973

DETAILING THE ...
diameter of a fetal head as an aid to ...
OCULAR PATHOLOGY IN OPHTHALMOLOGY - for
lens thickness, studying myopia, growth, circulation, d
under conditions, and for locating foreign particles in
RENAL STUDIES IN INTERNAL MEDICINE - for ex
measuring the A-P diameter of the blad
during renal stones during surgery

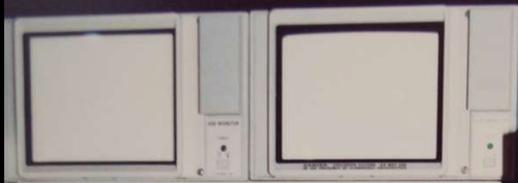




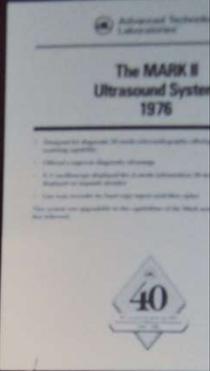
Advanced Technology Laboratories
**The MARK II
Ultrasound System
1976**

Designed to operate in both conventional settings as well as
portable settings.
Efficient operation requires no special training.
Easy to use. Maintenance free. No special accessories
required for operation.
The system is available in the configuration shown or in other
configurations.

40
YEARS



ECHO-DOPPLER cardiographic system



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





Advanced Technology Laboratories

The MARK III Ultrasound System 1978

First digital scan converter for real time imaging.
A major innovation allowing radiologists to view internal tissues in real time imaging with 40 and 60 MHz rotary scanheads.
First on-line display for liver study.
Mark series continued to be upgraded culminating in the Mark V. 5.0 MHz. The Mark 3 had the first spectrum analyzer for Doppler waveform analysis. For the first time radiologists could record the Doppler waveform on the image.



A diamond-shaped logo with the number '40' in the center, surrounded by text indicating a 40th anniversary.

1974



THE CME ULTRASOUND HISTORY

1979



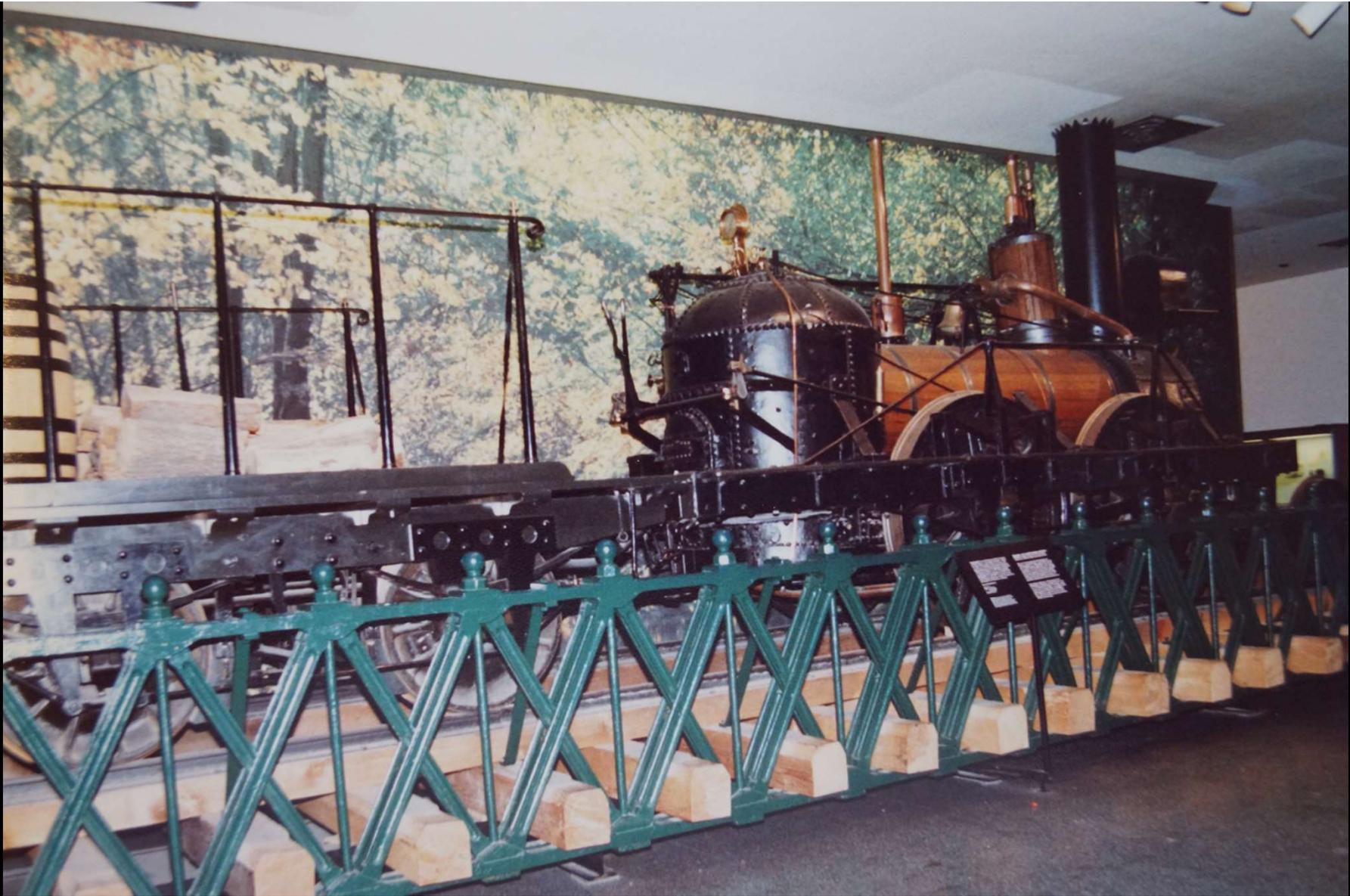
1988
Color Flow Doppler



1983

**Carolina Medical
Electronics, Inc.**







MATERIAL MESSAGES

Development of materials and in the
early 1900s the steel frame replaced
the earlier iron frame. The bicycle
was lighter and more maneuverable.
The bicycle has become a symbol of
freedom and health. It is a popular
mode of transportation, and a
source of recreation. Some of the
most popular models are the
diamond frame, the step-through
frame, and the folding frame.

A Material World MATTER

Informational text on a display case, including a small graphic of a bicycle and the heading "BIKES BY ALL THE PEOPLE".









Cancer Detection Diagnosis

John M. Reid
St. Mary's Hospital

MINN.



The first ultrasound diagnostic system was built in the early 1950s by the University of Minnesota. It was developed by John M. Reid, M.D., and his colleagues. The system used a mechanical transducer to generate sound waves that were reflected off internal organs. The reflected waves were then converted into electrical signals, which were displayed on a screen. This system was used to detect and measure the size of internal organs and to identify abnormalities. It was a significant advancement in medical diagnosis and is still used today.

Acoustic Scanner
The first acoustic scanner system was built in the early 1950s by the University of Minnesota. It was developed by John M. Reid, M.D., and his colleagues. The system used a mechanical transducer to generate sound waves that were reflected off internal organs. The reflected waves were then converted into electrical signals, which were displayed on a screen. This system was used to detect and measure the size of internal organs and to identify abnormalities. It was a significant advancement in medical diagnosis and is still used today.

Transducers

In an ultrasonic diagnostic system, the transducer is the component that converts electrical energy to sound waves and vice versa. The electrical signal drives the crystal and produces sound waves. The returning sound waves, in turn, are then converted and processed into electrical signals for use in a display system.

Here are some examples of the types of transducers used in medical use:





EXIT

Kretz
TECHNIK

pioneers











SCIENTIFIC

PHYSIONICS ENGINEERING, INC.
Lansham, CO

Physionics Engineering, Inc. is a leading manufacturer of precision electronic components and systems. The company's products are used in a wide variety of applications, including medical, industrial, and defense. The company's products are known for their reliability and performance. The company's products are used in a wide variety of applications, including medical, industrial, and defense. The company's products are known for their reliability and performance.

BRANSON

Branson is a city in Missouri, known for its scenic views and historic sites. The city is a popular tourist destination and is home to many cultural and educational institutions.

SOCIAL DEVELOPMENT OF

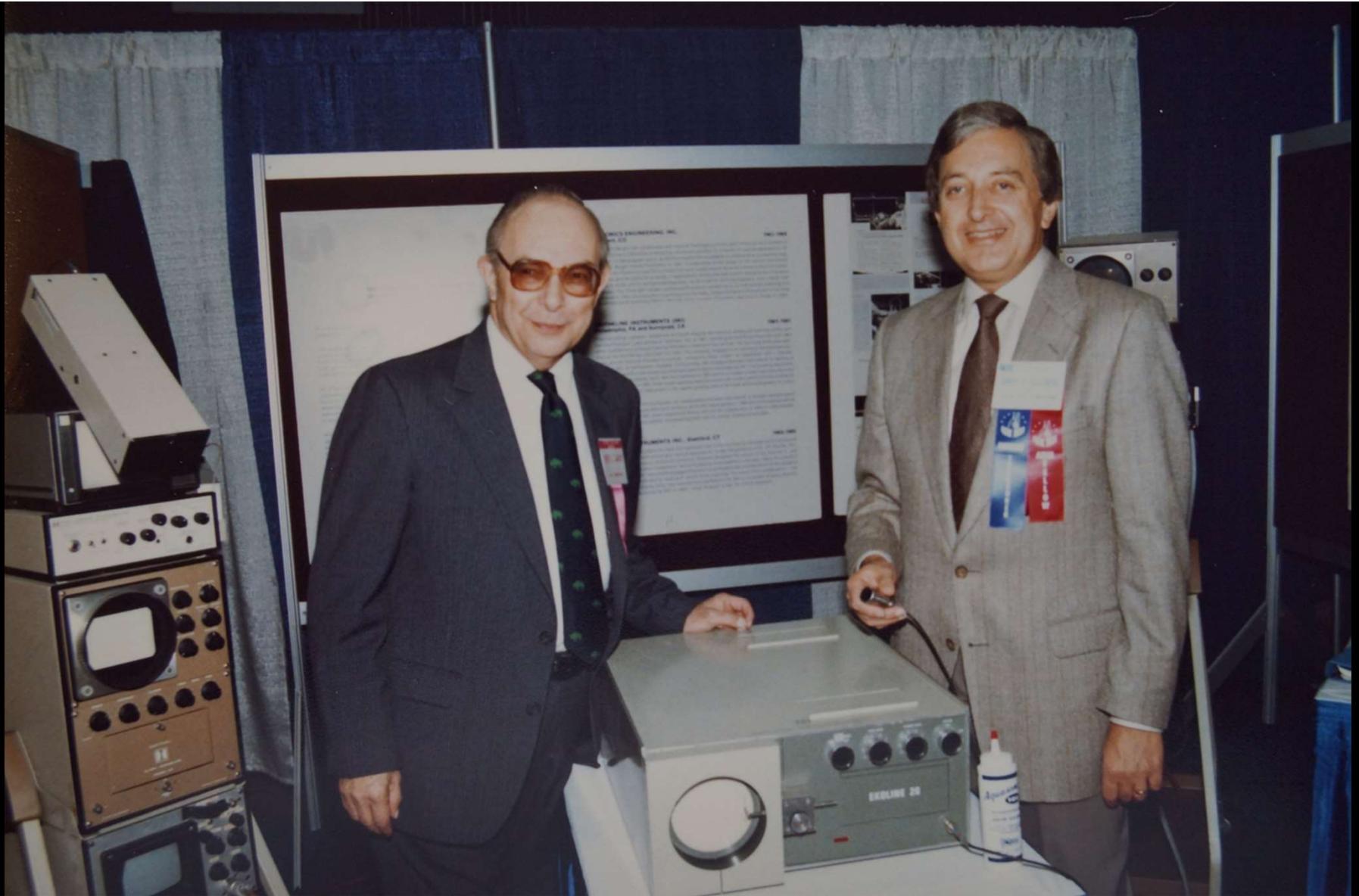
PHYSIONICS ENGINEERING, INC.
Lansham, CO



SCIENTIFIC

THE COMMERCIAL DEVELOPMENT OF
RESEARCH AND DEVELOPMENT IN THE
INDUSTRY





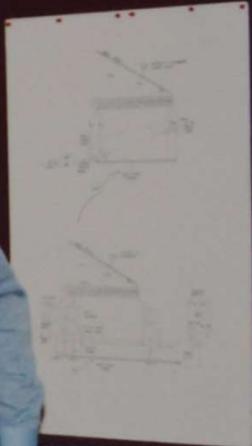


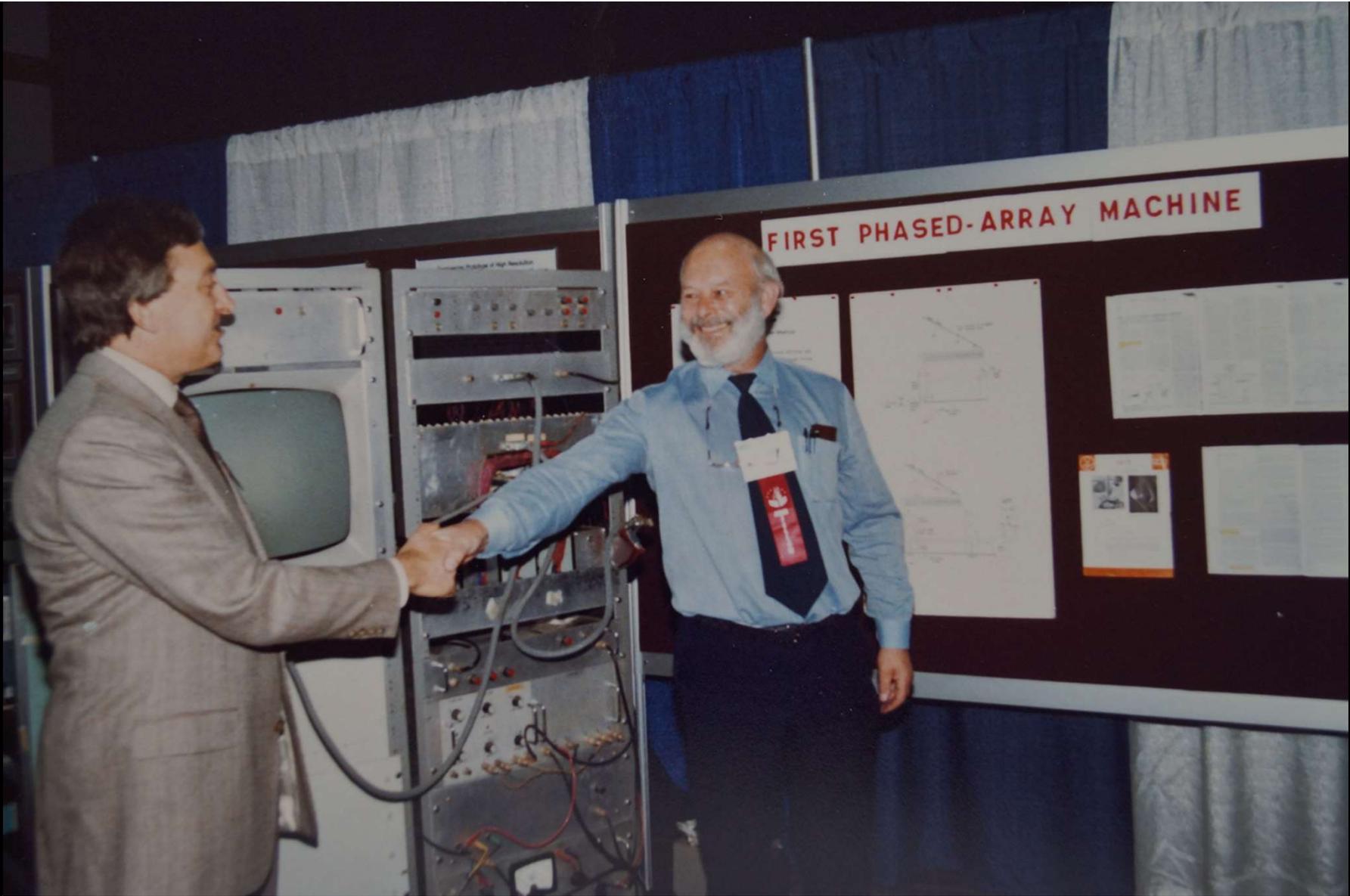


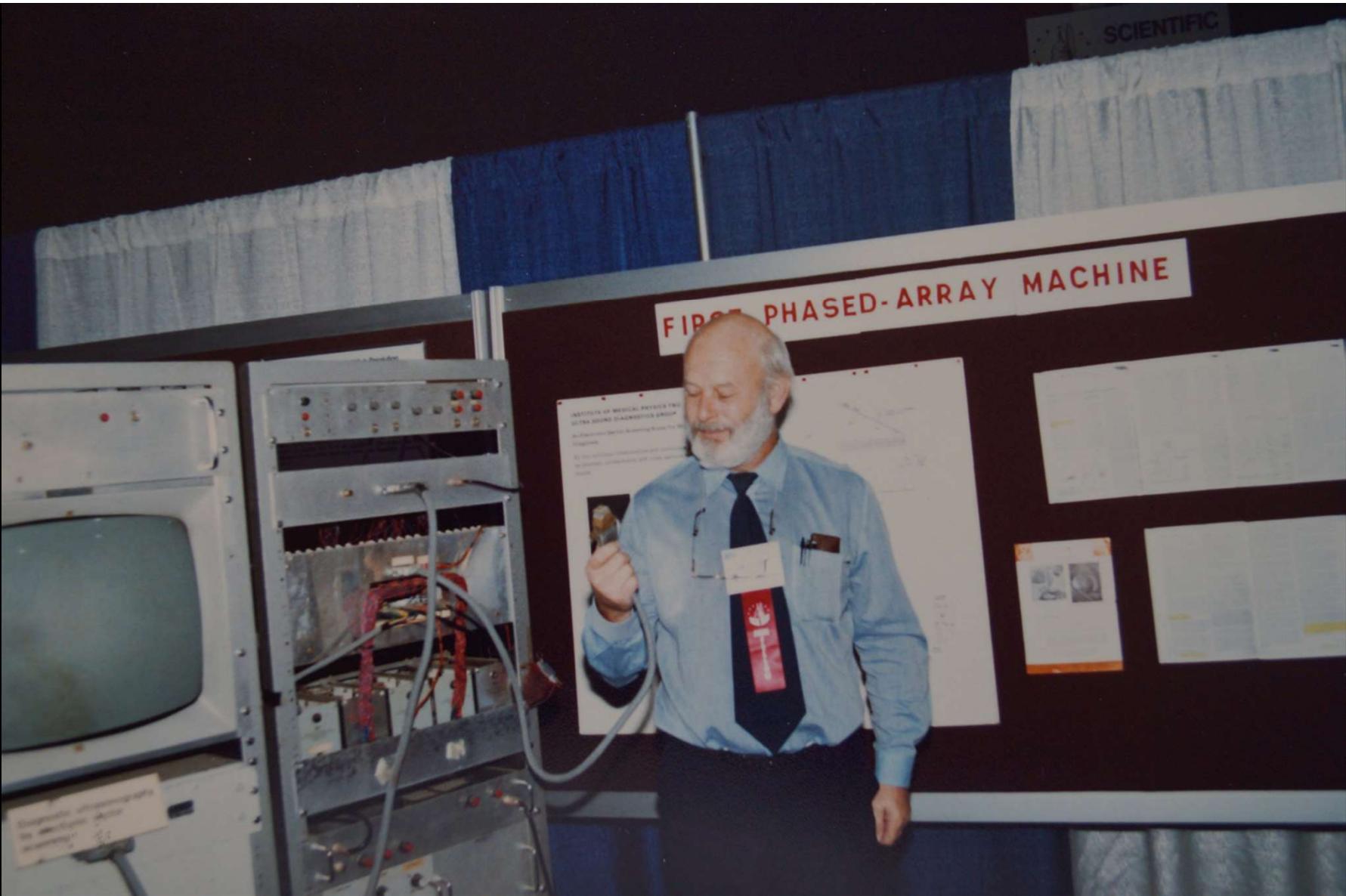
STANDPIPE

FIRST PHASED-ARRAY MACHINE

PHASED-ARRAY TECH
DEVELOPMENT GROUP



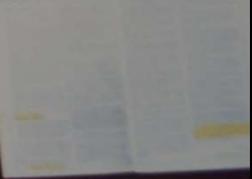
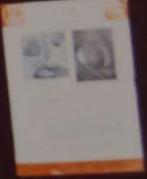




FIRST PHASED-ARRAY MACHINE

SCIENTIFIC

INSTITUTE OF MEDICAL PHYSICS AND
ULTRA SOUND DIAGNOSTICS GROUP



Scientific Ultrasonography
by [Name] [Date]



contact scanning - Donald Mac & Brown - the pioneers

1956

1957

1960

1962

1956 exhibit panel containing a photograph of a scanning device and several small technical diagrams.

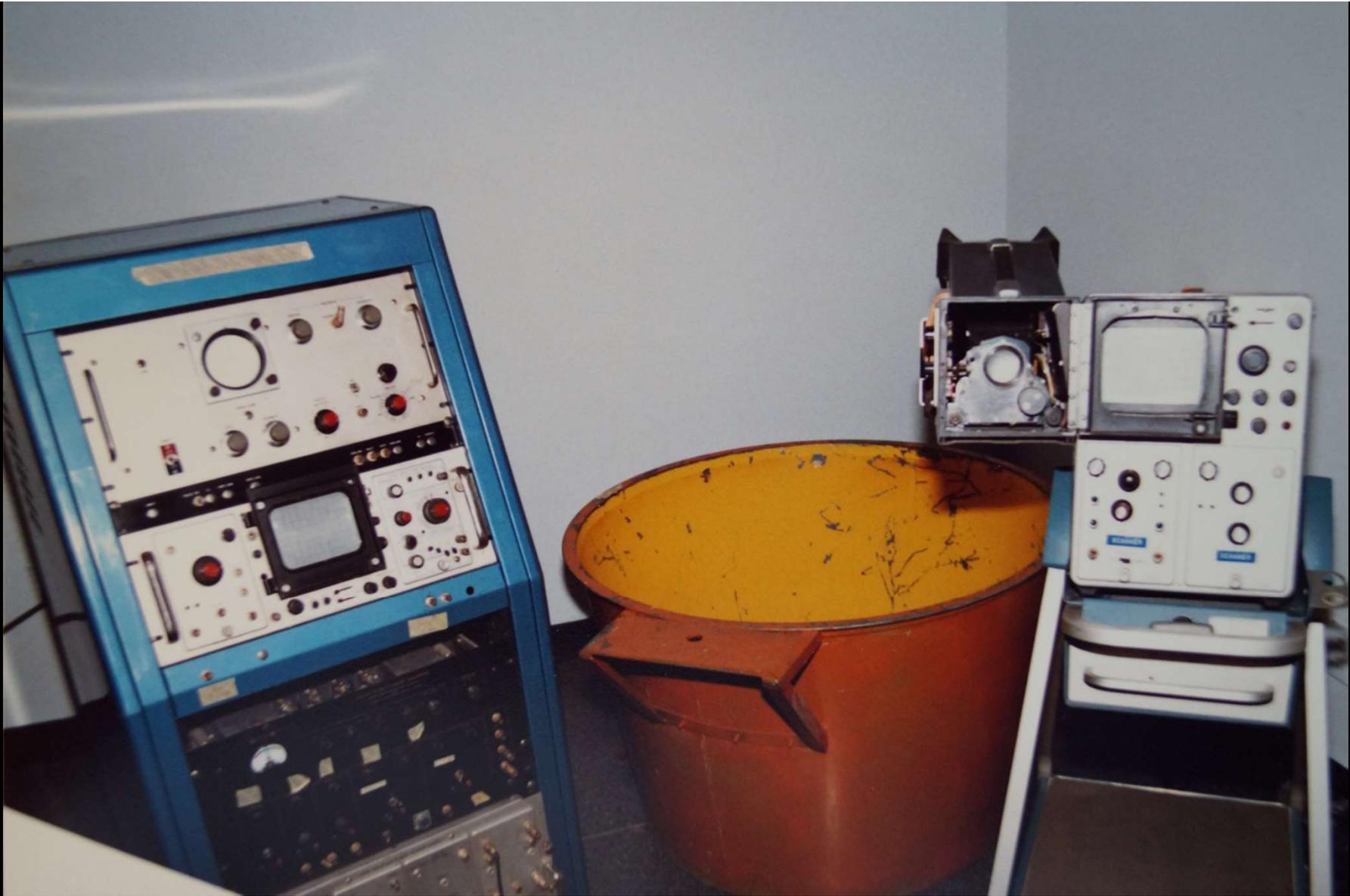
1957 exhibit panel containing a photograph of a scanning device and several small technical diagrams.

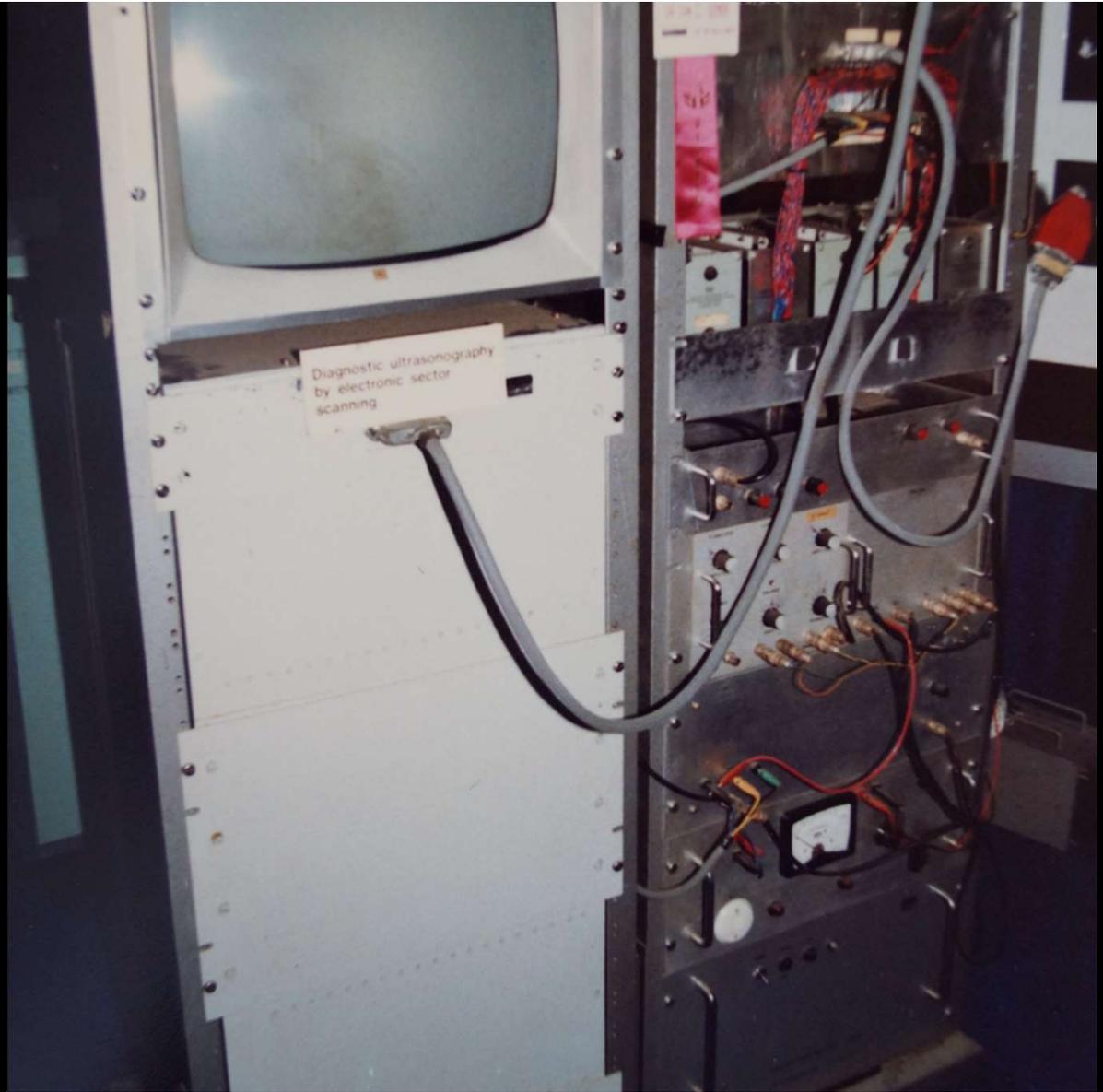
1960 exhibit panel containing a photograph of a scanning device and several small technical diagrams.

1962 exhibit panel containing a photograph of a scanning device and several small technical diagrams.

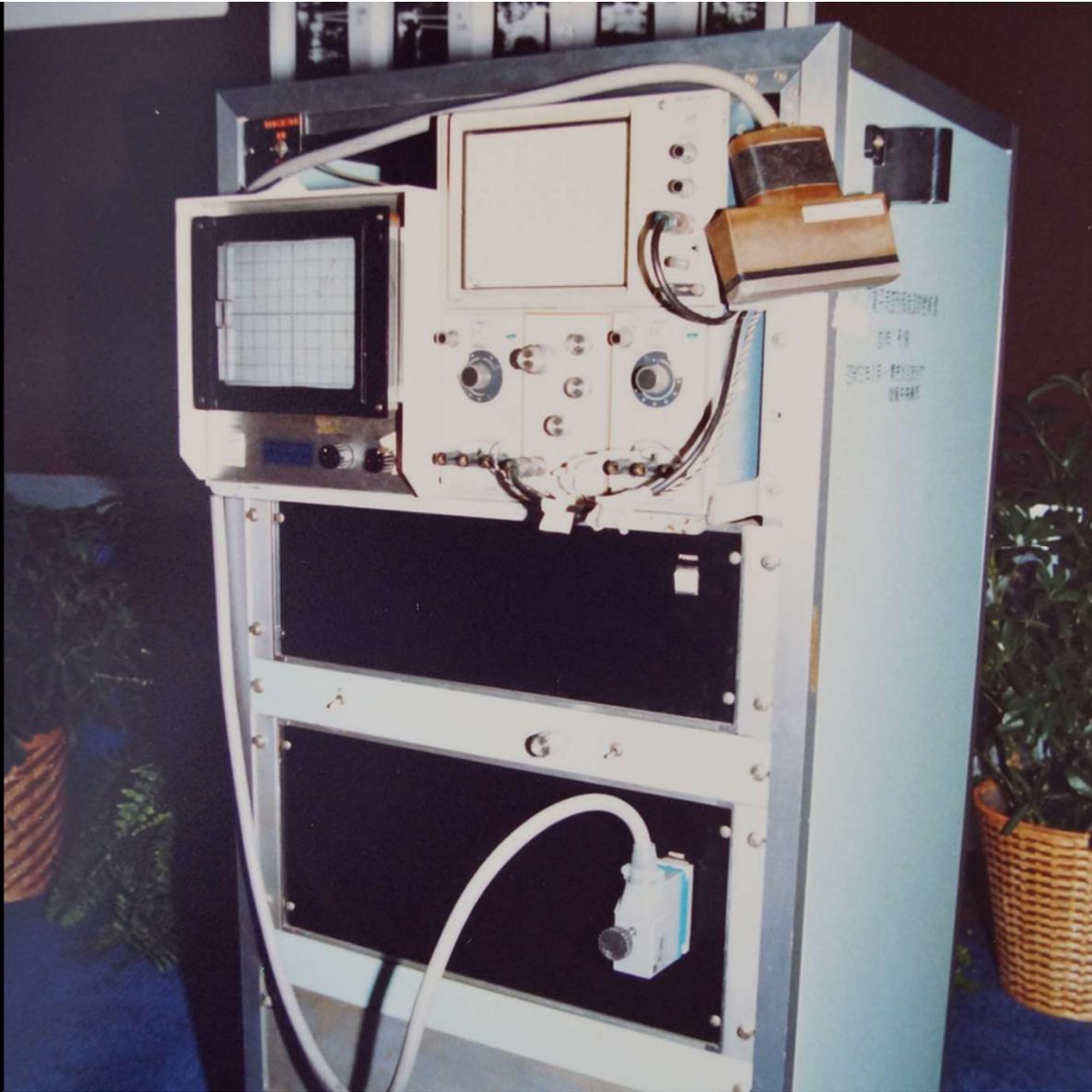
1962 exhibit panel containing a photograph of a scanning device and several small technical diagrams.







Diagnostic ultrasonography
by electronic sector
scanning





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

THE IN



ULTRASONICS INSTITUTE AUSTRALIA

EYE 1964

BREAST 1966

BRAIN 1972

OCTOSON 1974



ORIGINAL NOTEBOOK 1962

ANNULAR ARRAY 1972

ULTRASONICS INSTITUTE AUSTRALIA

TRONICS 1962-1965

GREY SCALE 1968

EYE 1964

BREAST 1966

BRAIN 1972

OCTOSON 1974



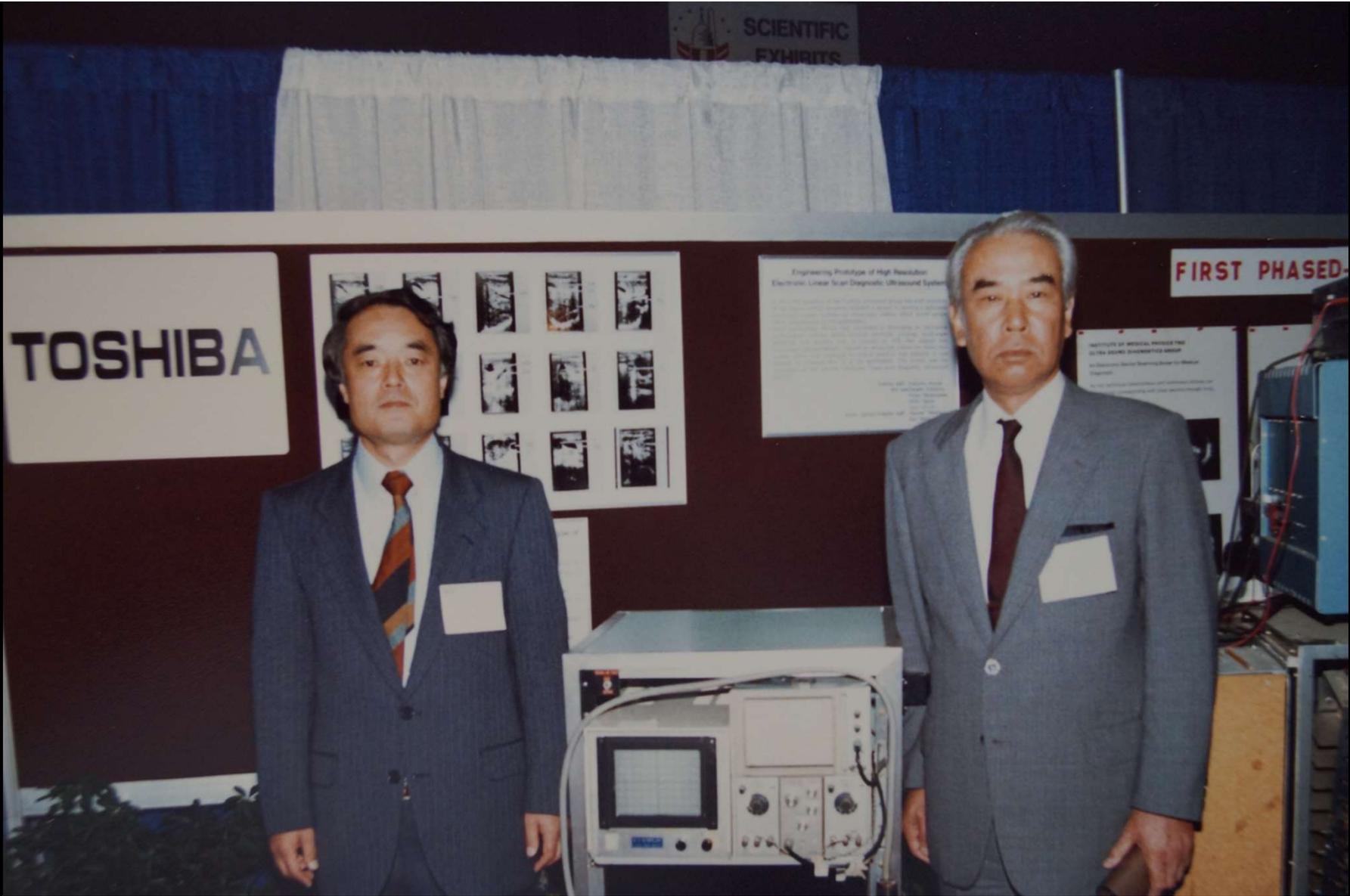




TOSHIBA

PHASED-ARRAY MACHINE

Engineering Through High Resolution
The... ..



SCIENTIFIC EXHIBITS

TOSHIBA

Engineering Prototype of High Resolution Electronic Linear Scan Diagnostic Ultrasound System

FIRST PHASED-

INSTITUTE OF MEDICAL PHYSICS THE UNIVERSITY OF CHICAGO

ULTRASONICS INSTITUTE AUSTRALIA

GREY SCALE 1969

EYE 1964

BREAST 1966

BRAIN 1972

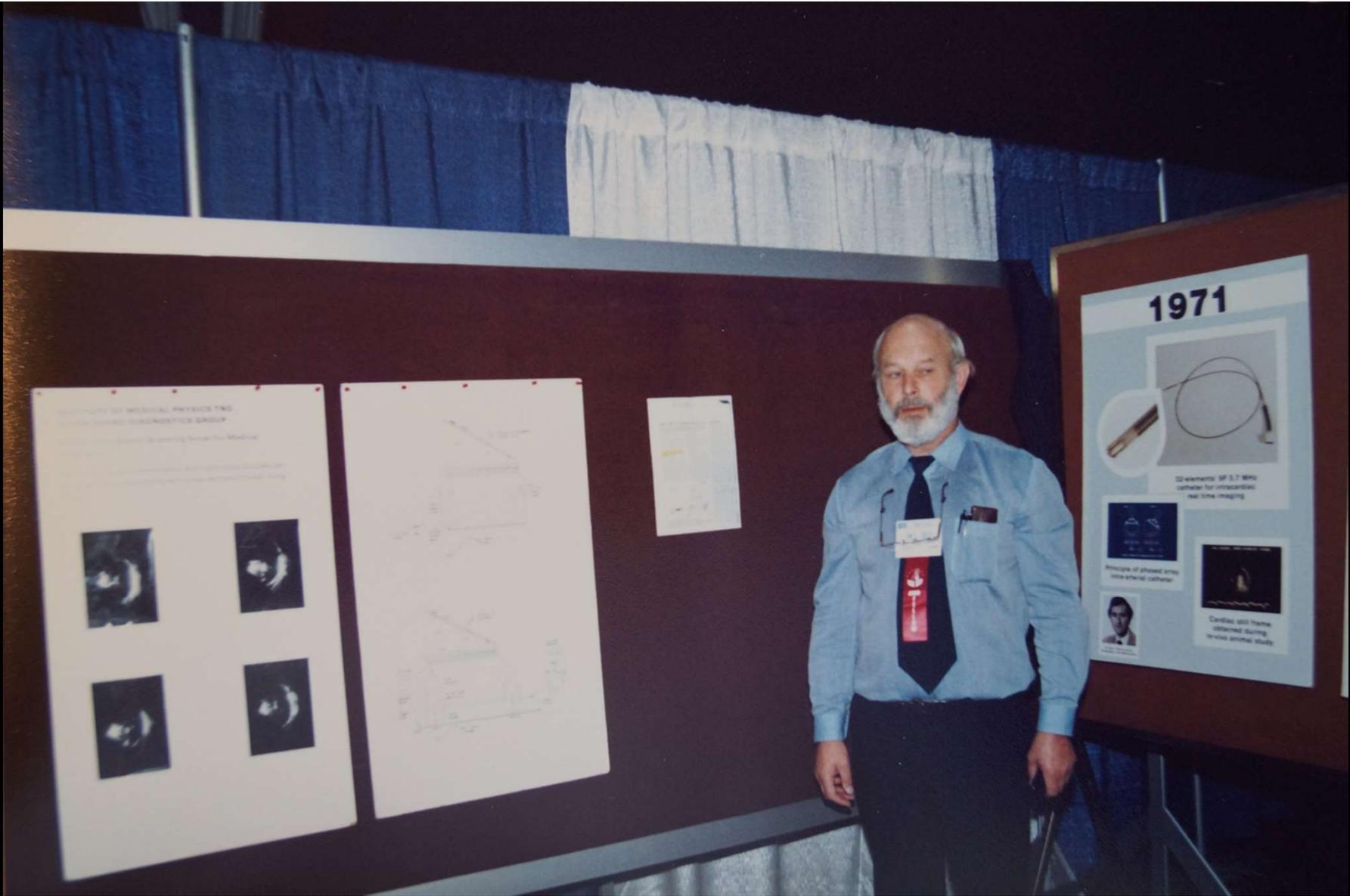
ECHOCARDIOGRAM 1974

THE INSTITUTE









INSTITUTE OF MEDICAL PHYSICS AND
CLINICAL PHYSICS GROUP

Department of Diagnostic Imaging Services for Medicine

... ..

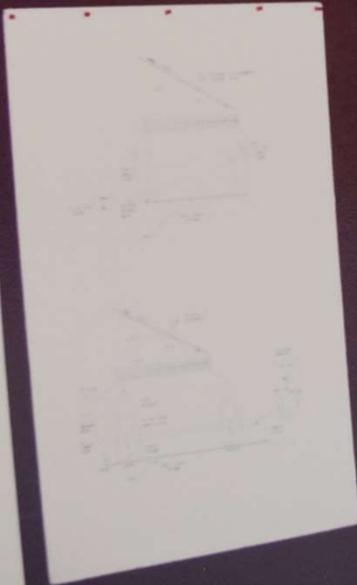
... ..

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1971

32 elements of 5.7 MHz catheter for intracardiac real time imaging

Principle of focused array catheter

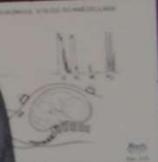
Cardiac wall frame observed during initial animal study





Kretz ultras
TECHNIK
4871 - ZIPF / AU

4871 Handpiece
4872 Handpiece
4873 Handpiece

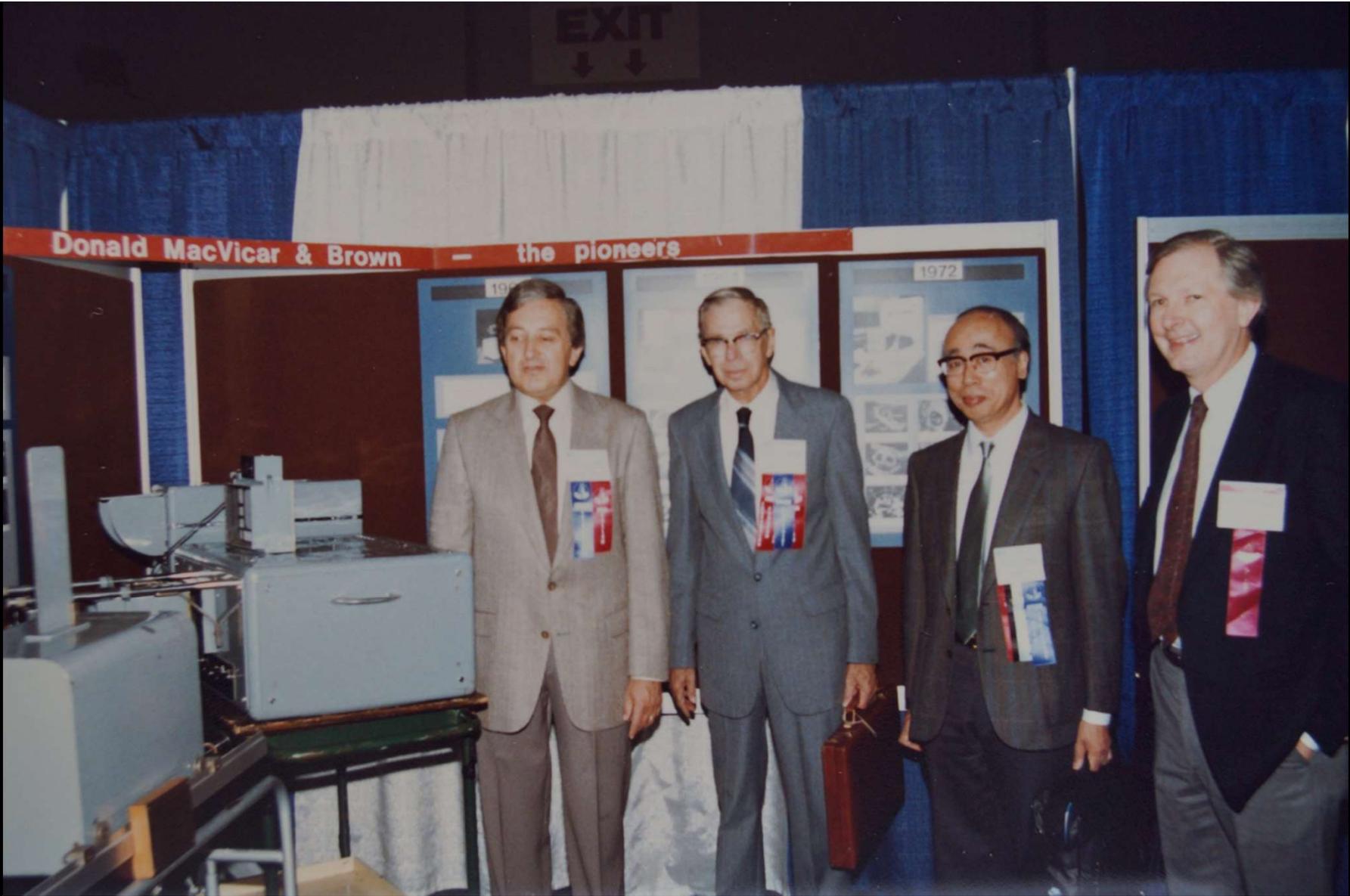






Kretz ultrasound
TECHNIK
4871-ZIPF / AUSTRIA

COMISON 100





SIEMENS

ULTRASOUND

Siemens Contributions to Real Ultrasound

ULTRASOUND

First Commercial Real Time Grey Scale Scanner 1984

HISTORY

ULTRASOUND

First Commercial Real Time Grey Scale Scanner 1984

HISTORY

EMERSON
The world's first real-time B-mode scanner was developed by Siemens in 1984. It was a major milestone in the history of ultrasound technology.

Award
1984

Award
1984





Sounding the Body

A History of Diagnostic Ultrasound in the United States

Young Group
The young group of scientists and engineers who were instrumental in the development of diagnostic ultrasound in the United States. This group included pioneers like Dr. John D. Wood and Dr. Gerald S. Kino, who were instrumental in the development of diagnostic ultrasound in the United States.

Since World War II, the United States has been a leader in the development of diagnostic ultrasound. In the 1950s and 1960s, researchers in Europe, Japan, and the United States began to investigate the application of ultrasound to medical diagnosis. By the mid-1970s, medical diagnostic ultrasound had become widely available in the United States and abroad.

The early studies were limited to research in the areas of obstetrics and gynecology, and most were of diagnostic value.

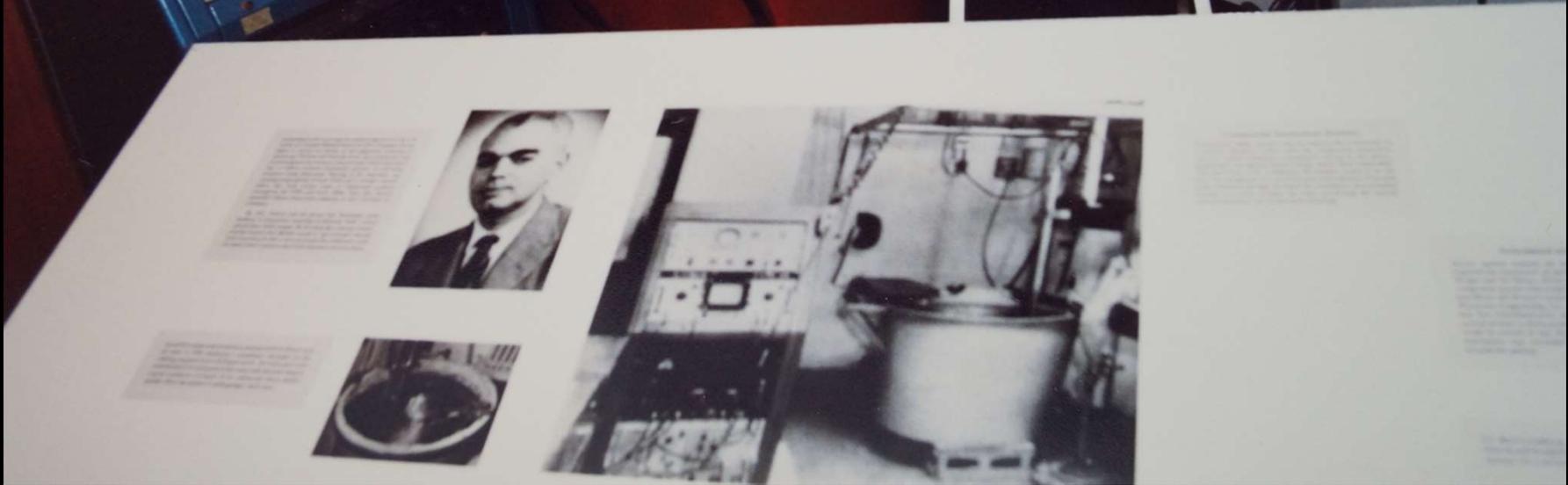
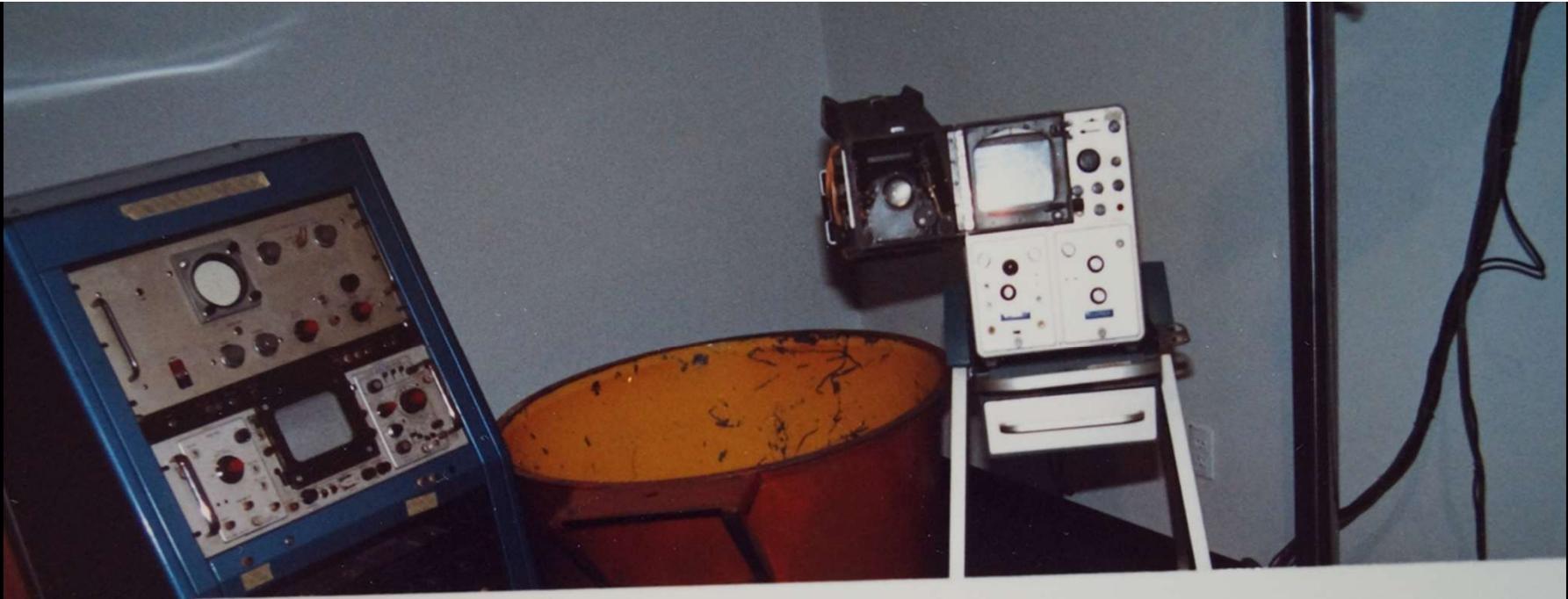
Ultrasound for Disease Detection and Diagnosis
The use of ultrasound for disease detection and diagnosis has become an important part of medical practice. It is used to detect and monitor a wide variety of conditions, including heart disease, kidney disease, and cancer.

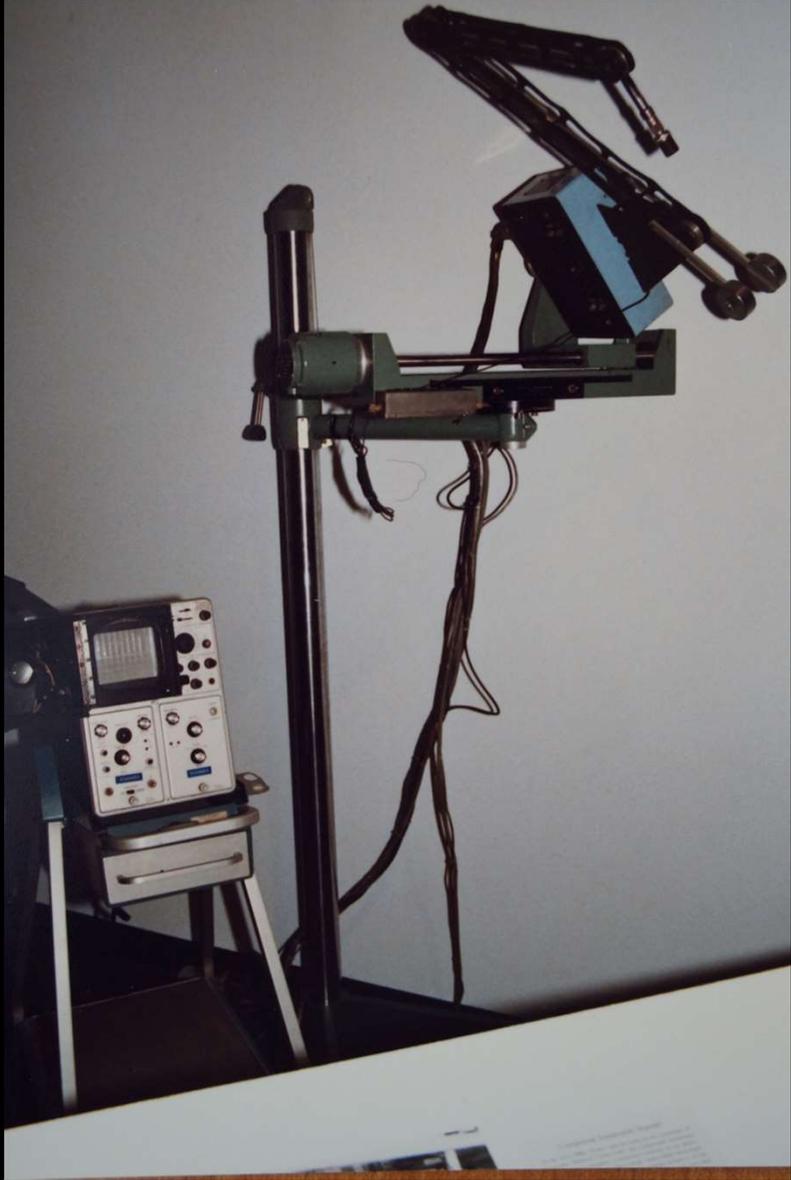
Transducers

The transducer is the part of the ultrasound machine that sends and receives sound waves. It is usually a small, rectangular device that is placed on the skin over the area to be examined. The transducer converts electrical energy into sound waves and vice versa.



The transducer is connected to the ultrasound machine by a cable. The machine sends electrical signals to the transducer, which then sends sound waves into the body. The sound waves are reflected back to the transducer, which converts them back into electrical signals that are processed by the machine to create an image.



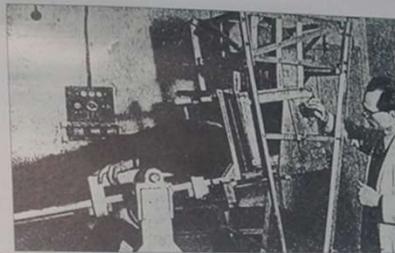


Pioneers of Medical Ultrasound

German
Ultrasound
Museum



K. Th. Dussik



The machine, constructed by Dussik and his brother



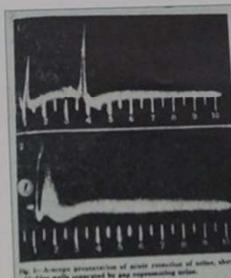
Hypersonogram of the 3rd ventricle

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

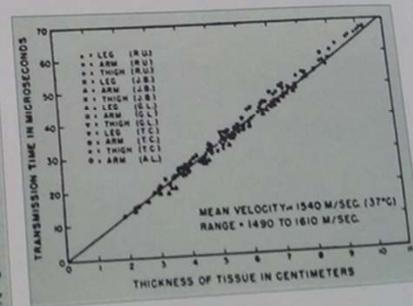
sides of the skull in fixed relations. The intensity of the signal was recorded on a film. By moving the probe line by line across the skull, a two-dimensional image was created, giving information about changes in absorption of ultrasound (in analogy to classical x-ray).



G. Ludwig



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

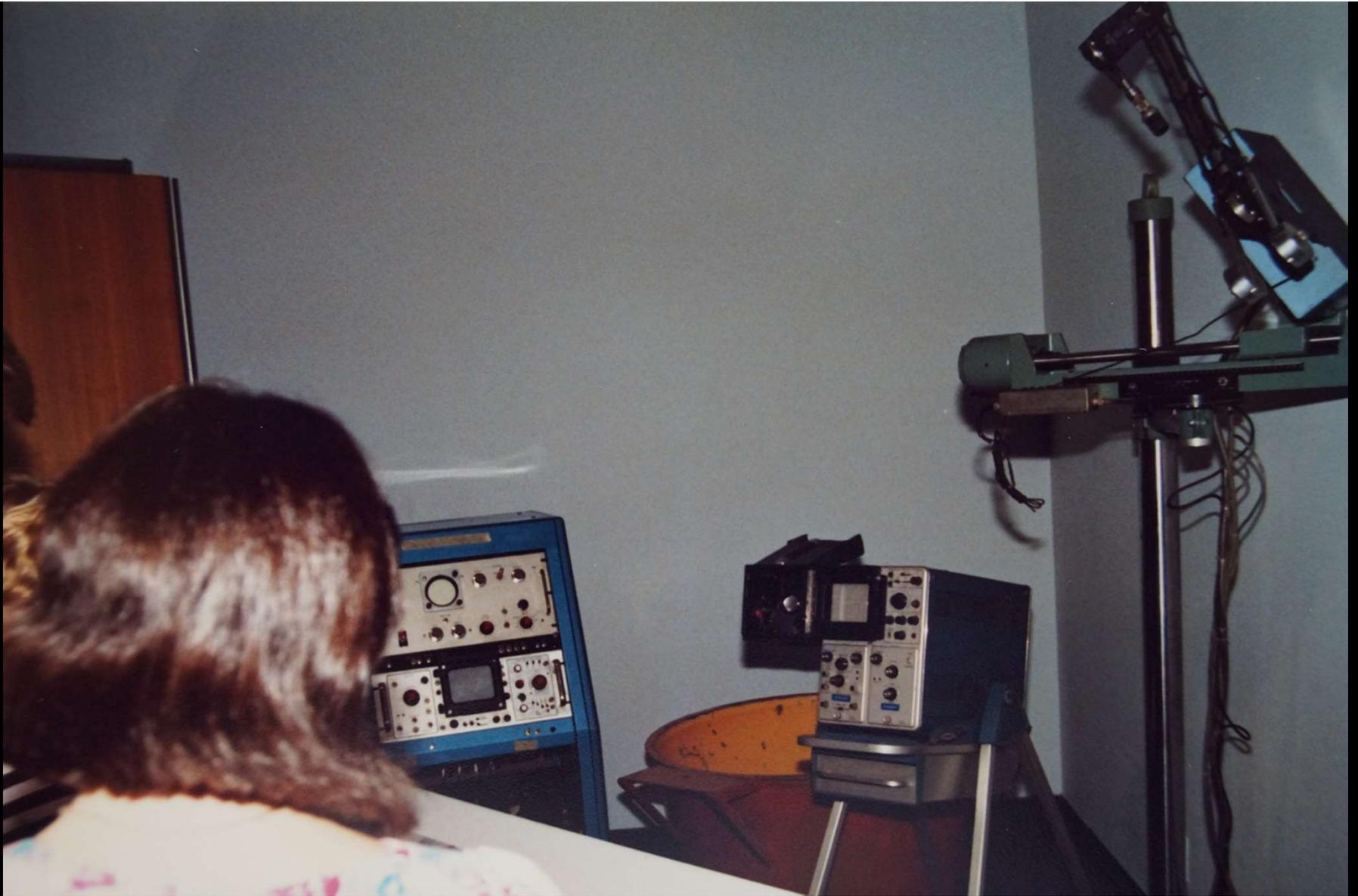


Ultrasound velocity in different soft tissues

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

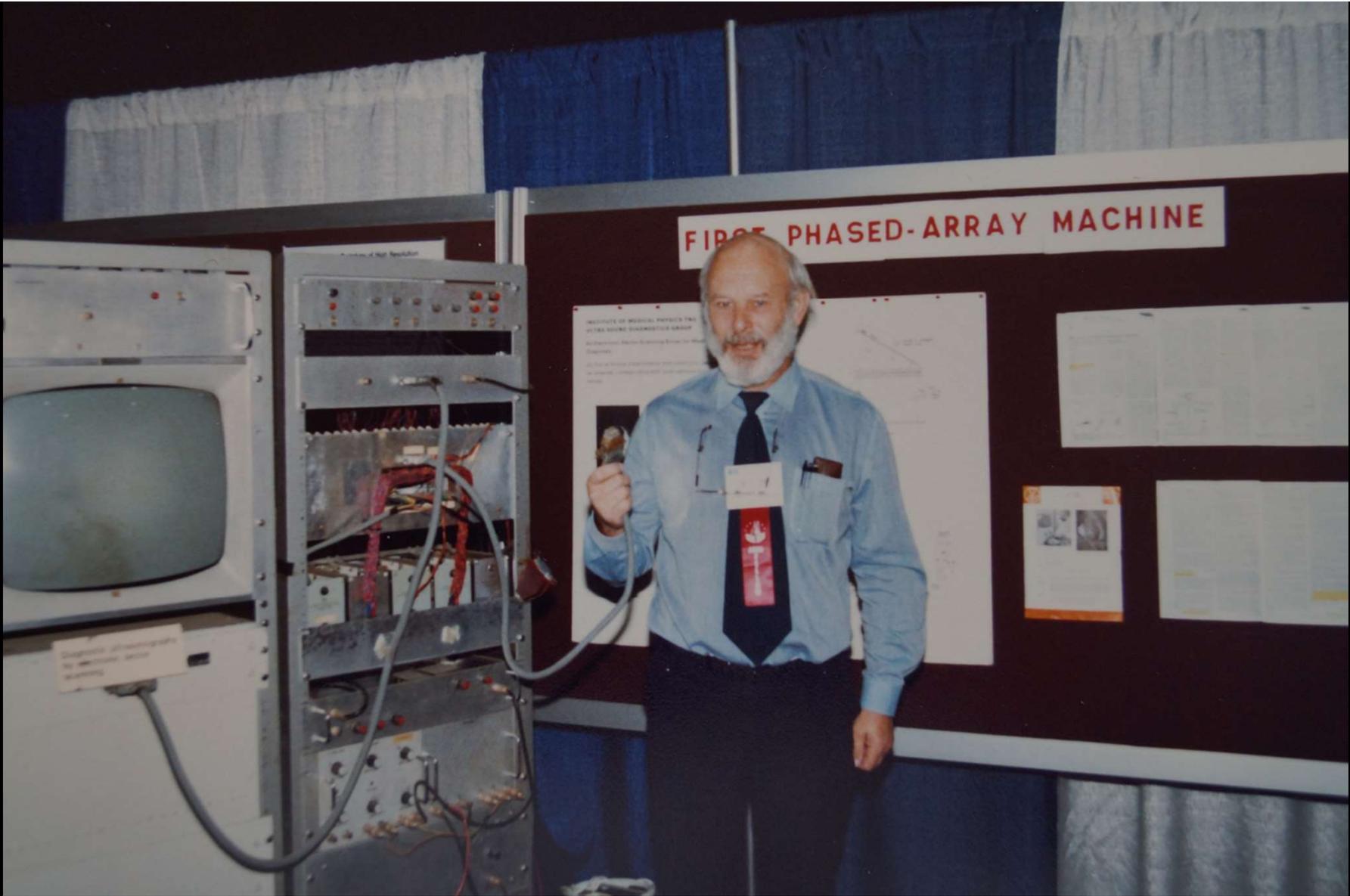
Ludwig reported an accuracy of around 85% in vivo. Another one of his important works was the





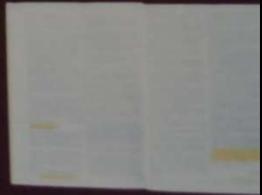






FIRST PHASED-ARRAY MACHINE

INSTITUTE OF MEDICAL PHYSICS THE
ULTRA SOUND DIAGNOSTICS GROUP







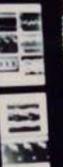
SCIENTIFIC
EXHIBITS

SIEMENS

ULTRASOUND

Echocardiography System
1963
Prof. H. Hertz/Prof. J. Edler

HISTORY



ULTRASOUND

Echocardiography System
1963
Prof. H. Hertz/Prof. J. Edler

HISTORY



ULTRASOUND

Siemens Contributions
to Clinical Ultrasound

HISTORY

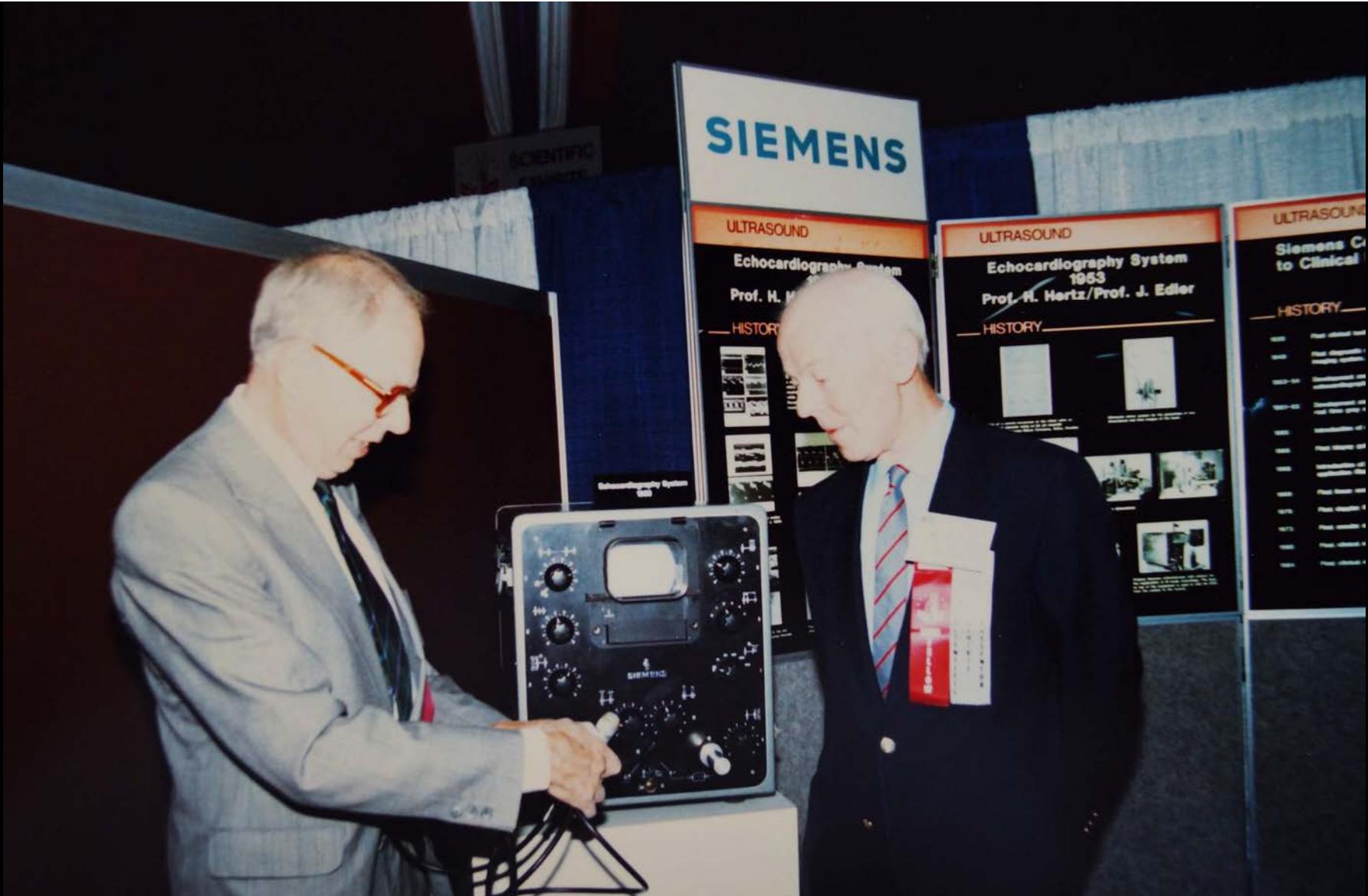
- 1958 First clinical tests of an ultrasonic Doppler system.
- 1960 First diagnostic use of an ultrasonic Doppler system.
- 1961 First clinical use of the first ultrasonic Doppler system.
- 1962 Development and clinical tests of the first ultrasonic and Doppler system.
- 1963 Introduction of real time ultrasonic Doppler system.
- 1964 First clinical application of real time ultrasonic Doppler system.
- 1965 First clinical application of real time ultrasonic Doppler system.
- 1966 First clinical application of real time ultrasonic Doppler system.
- 1967 First clinical application of real time ultrasonic Doppler system.
- 1968 First clinical application of real time ultrasonic Doppler system.
- 1969 First clinical application of real time ultrasonic Doppler system.
- 1970 First clinical application of real time ultrasonic Doppler system.

ULTRASOUND

First Commercial
Grey Scale

HISTORY





SIEMENS

ULTRASOUND

Echocardiography System
Prof. H. Hertz/Prof. J. Edler

HISTORY

ULTRASOUND

Echocardiography System
1963
Prof. H. Hertz/Prof. J. Edler

HISTORY

ULTRASOUND

Siemens C
to Clinical

HISTORY



SIEMENS

ULTRASOUND

First Commercial Real Time
Grey Scale Scanner
1964

HISTORY

ULTRASOUND

Siemens Contributions
to Clinical Ultrasound

HISTORY

ULTRASOUND

First Commercial Real Time
Grey Scale Scanner
1964

HISTORY

System

K. J. Eiler