

<BEN R. BREED>

P.O. Box 550 • Dripping Springs, TX 78620 • (512) 894-0544

EMPLOYMENT

JUNIOR OFFICER
U.S. Navy

YEARS EMPLOYED (1958-61)
U.S.S. Montrose (APA-212), San Diego, CA

Navigator and Communications Officer.
Navigated the U.S.S. Montrose (APA-212), traveling independently,
across the Pacific Ocean. This was prior to the Global Positioning System

STAFF MEMBER
Los Alamos Scientific Laboratory

YEARS EMPLOYED (1965 - 67)
Los Alamos, New Mexico

Conducted research on materials under high stress (high explosives)
Discovered a structural phase change in Antimony at high pressure.
Published three refereed journal articles. His work is prominently listed
in two books in the Los Alamos Series in Basic and Applied Science edited and authored
by C.L. Mader.

SENIOR SCIENTIST
Tracor, Inc.

YEARS EMPLOYED (1967 - 69)
Austin Texas

Hired to conduct research in non-linear acoustics.
Headed the Applied Physics Group in the aerospace department.
Calculated radar cross-sections and reentry dynamics of
exo-atmospheric counter measures

HEAD, APPLIED PHYSICS SECTION
Radian Corporation

YEARS EMPLOYED (1969 - 75)
Austin Texas

Participated in the development of the BQQ-5 and BQQ-6
sonar systems for the U.S. submarine fleet.
Developed a suite of digital signal processing (DSP) algorithms
at the start of the general transfer from analog to digital processing
equipment for sonar applications.

CONSULTANT
Ben Breed, Consultant

YEARS EMPLOYED (1975 - 78)
Austin Texas

Consulted with Tracor Inc. on processing of radar signatures of
reentry bodies, to discriminate against decoys. Developed
an exo-chaff cloud model in general use.
Consulted with IBM, Federal Systems Division, on the development
of sonar tracking systems.

SENIOR CONSULTANT
Breed And Harvel Associates
Consulted with

YEARS EMPLOYED (1978 - 2005)
Austin Texas

Tracor Inc., Austin Texas,
IBM, Federal Systems Division, Manassas, VA and Rockville, MD
Softek Inc., Alexandria, VA
Raytheon Corporation, South Hampton, R.I.
Hughes Aircraft Company, Ground Systems Group, Fullerton, CA
Digital System Resources, Fairfax, VA, and Anaheim Hills, CA

At Tracor, performed additional work on signal processing and analytical dynamics involved in exo-atmospheric penetration aids.

At IBM contributed to the development of the BQQ-5 and BQQ-6 sonar systems. Developed under-water systems and DSP algorithms for the Surveillance Towed Array Sonar System (SURTASS). Contributed to the winning proposal for the hardware and software development of the PROTEUS. This resulted in the AN-UYS 1, the Navy's first standard digital processing computer.

At Softek developed and sized algorithms for implementation on the AN-UYS 1.

At Raytheon wrote a proposal for an underwater communications system.

At Hughes Aircraft contributed over a period of twenty five years to continued improvements to the SURTASS sonar system. This included bearing and automated detection algorithms. The automatic detection system resulted in a Hughes patent co-authored by Dr. Breed. Developed a method to find the shape of a long underwater towed array of acoustic sensors. Contributed largely to the beamforming method first used in SURTASS. It is based on two-dimensional Fast Fourier transforms (FFTs). Authored numerous interdepartmental reports. Authored peer reviewed papers and reports at conference proceedings. Was the principal inventor on five patents in the detection of magnetic sources.

At Digital System Resources (DSR) contributed over a period of fifteen years to continual improvements to the Surveillance Towed Array Sonar System (SURTASS), as was also true at Hughes. Developed a "beam-space" method of adaptive beamforming (ABF) based on the two dimensional FFT beamformer developed by Dr. Breed at IBM and Hughes. Authored numerous interdepartmental reports. Authored peer reviewed papers and reports at conference proceedings. Was the co-inventor on a patent that uses ambient sound to detect and locate acoustic sources.

VISITING PROFESSOR
U S Naval Postgraduate School

YEARS EMPLOYED (2009 -)
Monterey, CA

At the Postgraduate school Dr. Breed is involved in general solid state physics. When it shows its applicability he applies his signal processing experience to problems of general interest to the Navy.

He has a theory of the mechanisms by which the Pons-Fleishman effect works in deuterated transition metals that has won sparse but at times enthusiastic acceptance. He provides aid to Prof. M. Melich when appropriate.

He has submitted a paper to Foundations Of Physics explaining how the quantum amplitudes are related to standard probability theory, a simple manner to derive covariant equations of motion using Ito's formula and a derived Lorentz covariant white noise process.

EDUCATION

FRESHMAN YEARS ATTENDED(1954-1955)
Rice University *Houston, Texas*

Jesse Jones Scholarship
NROTC Scholarship

B.S. PHYSICS YEARS ATTENDED (1955-1958)
University of Texas at Austin *Austin, Texas*

Sigma Pi Sigma
Graduated with Honors
NROTC Scholarship
Commissioned as Regular Officer in the U.S. Navy

M.A. PHYSICS YEARS ATTENDED (1961-1964)
Rice University *Houston, Texas*

NASA Assistantship
Shell Oil Company Fellowship

PH.D. PHYSICS YEARS ATTENDED (1964-1965)
Rice University *Houston, Texas*

Shell Oil Company Fellowship
NASA Assistantship

PUBLICATIONS

Dissertation

The Absorption of Longitudinal Sound Waves in CaF₂, written under the direction of Professor Paul Donoho, Rice University (1965)

Contributed Book Chapters

T.E. Posch and B.R. Breed, Space Wave Number Signal Processing, Chapter 21, **Time-Frequency Signal Analysis**, Edited by Boualem Boashash, Longman-Cheshire, Melbourne, Australia, and John Wiley and Sons, Inc. (1995)

Peer Reviewed Journal Articles

B.R. Breed, Impossibility of Three Confluent Shocks in Two-Dimensional Irrotational Flow, *The Physics of Fluids*, No 1, **10** (1967)

B.R. Breed and D. Venable, Dynamic Observation of the Course of a Shock-Induced Polymorphic Phase Transition in Antimony, *Journal of Applied Physics*, No. 7, **39** (1968)

B.R. Breed, C.L. Mader, and D. Venable, Technique for the Determination of Dynamic-Tensile- Strength Characteristics, *Journal of Applied Physics*, No. 8, **39** (1968)

B. R. Breed, k-omega Beamforming on Non-Equally Spaced Arrays, J. Acoust. Soc. Am. No.2, **110** (2001)

B.R. Breed and Jeff Strauss, A Short Proof of the Equivalence of LCMV and GSC Beamforming, IEEE Signal Processing Letters, No. 6, 9 (2002)

Ben R. Breed, Quantum Probabilities, submitted to Foundation Of Physics, April 2009

Reports to Conferences

B.R. Breed, Ben Josephson and P.L. Donoho, American Physical Society , Denver, Colorado (1964)

B. Repasky and B.R. Breed, International Conference on Speech and Signal Processing, Denver, CO (1981)

B.R. Breed and D. Venable, Phase Transformation in Antimony, International Conference on Fluid Dynamics, Stanford University, Palo Alto, CA (1967)

B. R. Breed and T.E. Posch, A Range and Azimuth Estimator Based on the Spatial Wigner Distribution, Proc. Of the International Conference on Speech and Signal Processing (ICASSP), San Diego, CA (1984)

B. R. Breed and T.E. Posch, Space-Wave Number Approaches to Matched Field Processing, Proc. Of the International Conference on Speech and Signal Processing (ICASSP), San Diego, CA (1985)

D. Alexandrou, M.T. Wazenski, D. Dafatta, and B.R. Breed, Adaptive Beamforming with the Multichannel Least Squares Lattice Using Beam-Space Methods, Proc. Of the International Conference on Speech and Signal Processing (ICASSP), Dallas, TX (1992)

R. Jeffers, B.R. Breed and, B. Gallemore, Passive Range Estimation and Range Rate Detection, Boston (1999)

Significant Reports. (This list contains only those company reports that introduced significant innovations)

B.R. Breed, A Sampling Theorem for Periodic, Bandlimited Signals, Radian Corporation, Austin, Texas (1973)

B.R. Breed, Theory and Application of Ring Laser Gyros, Breed And Harvel Associates, Austin, Texas (1979)

B.R. Breed, Frequency Versus Time Domain Beamformer Trade-Offs, Hughes Aircraft Company, Fullerton, CA (1986)

B.R. Breed, Coherent Spatial Discriminator Technical Description, Digital System Resources Inc., Fairfax, VA (1993)

B.R. Breed and R. Warren, Adaptive Filtering of Matched-Filter Data, Hughes Aircraft Company, Fullerton, CA (1994)

B.R. Breed, and Branch Northrup, Development of Channel Deconvolution Filtering, Innovative Technology Associates, Austin, Texas (1995)

B.R. Breed and Branch Northrup, A Technique for Calculating a Cross-Spectral-Density-Matrix Given a Far-Field Noise Distributions, Digital System Resources Inc., Fairfax, VA (1997)

B.R. Breed, Detection of Closing Targets in Torpedo Alertment, Digital System Resources Inc., Fairfax, VA (1999)

B.R. Breed and W. Mahood, Interim Report on Multi-Static Active Sonar Processing, Task 3: Far-Field Source Combining Technique, Digital System Resources Inc., Fairfax, VA (2000)

INVENTIONS (RESULTING IN PATENTS)

SIGNAL PROCESSING

- 5,315,538 SIGNAL PROCESSING INCORPORATING SIGNAL, TRACKING, ESTIMATION, AND REMOVAL PROCESSES USING MAXIMUM A POSTERIORI ALGORITHM, AND SEQUENTIAL SIGNAL DETECTION
- 5,528,554 LINEAR ARRAY LATERAL MOTION COMPENSATION METHOD
- 5,617,099 ADAPTIVE FILTERING OF MATCHED-FILTER DATA
- 6,661,740 MULTI-STATIC, OPPORTUNE-SOURCE-EXPLOITING, PASSIVE SONAR PROCESSING

MAGNETIC DETECTION AND LOCALIZATION

- 5,134,369 THREE AXIS MAGNETOMETER SENSOR FIELD ALIGNMENT AND REGISTRATION
- 5,239,474 DIPOLE MOMENT DETECTION AND LOCALIZATION
- 5,337,259 DIPOLE DETECTION AND LOCALIZATION PROCESSING
- 5,387,863 SYNTHETIC APERTURE ARRAY DIPOLE MOMENT DETECTOR AND LOCALIZER

LOW TEMPERATURE NUCLEAR REACTIONS

APPLICATION FOR PROVISIONAL UNITED STATES LETTERS PATENT FOR LOW TEMPERATURE FUSION, JUNE 6, 2005