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NAME: **Darrell R. Word**

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EDUCATION: Ph.D. in Electrical Engineering
The University of Texas at Austin, 1970.

MEMBERSHIPS:
-- Life Senior Member IEEE (Institute of Electrical & Electronic Engineers)
– Member IEEE Circuits and Systems Society
– Member IEEE Signal Processing Society
– Member IEEE Central Texas Consulting Network
-- Tau Beta Pi (Engineering Academic Honorary Society)
-- Eta Kappa Nu (Elec. Engineering Academic Honorary Society)

PROFESSIONAL REGISTRATION: - Registered Professional Engineer / State of Texas

PRINCIPAL FIELDS OF INTEREST AND ABILITY:

- Electromagnetic (EM) Fields
- Sensors and Instrumentation
- Analog and digital signal processing
- Analog and digital circuits
- Low-noise amplifiers
- Systems design and analysis
- Power systems engineering and analysis
- Computer driven systems and A-D interfacing
- Micro-processor and micro-controller applications
- Control systems / electromechanical systems.
- Communications, telemetry and navigation systems
- Imaging and image processing
- RF systems - Spread-spectrum systems - Antennas
- EM Geophysical systems and applications
- Software environment UNIX, MS-Windows, MS-DOS // Fortran, LISP, C, various assemblers.
- Strong in math, physics, and engineering principles.

EXPERIENCE SUMMARY: (See detail in next section.)

1990-Present	D. R. Word Associates Electrical Engineering Consulting Adjunct Faculty member / UT Electrical and Computer Engineering Dept. (not presently active in teaching)
2002-Present	Eureka Environmental Engineering, Inc. – Austin, TX Principal; Engineering Advisor
2004-Present	Cone Corporation – Dripping Springs, TX Member of Nuclear Research Group (Four Research Scientists).
1985-1990	AET/Advanced Energy Technology, Inc. - Austin, TX VP - Director of R&D (Company sold to Haliburton in 1987).
1976-1985	Geotronics Corporation - Austin, TX Exec. VP - Director Director of R&D

1970-1976 Geotronics Corporation - Austin, TX
Vice President, Director, Research Engineer

1969-1970 EE Department Faculty - (temporary app't while finishing dissertation).
The University of Texas at Austin
Assistant Professor of Electrical Engineering

1960-1969 Electrical Engineering Research Laboratory (EERL)
The University of Texas at Austin

EXPERIENCE DETAIL:

1990-Present D. R. Word Associates
Electrical Engineering Consulting

Engineering projects have included the following sample areas of work (plus others not listed):

- Design and development of a radio receiver unit for a position location system for military and civilian applications -- The receiver is a computer controlled spread-spectrum type system which acquires and analyzes encoded signals from up to four ground-based transmitters and computes coordinate position.

- Design and development of micro-wave telemetry antennas and related systems for use in data telemetry.

- Design of strip-line and micro-strip PCB circuits for RF signal transmission, impedance matching, filtering, and antenna implementations.

- DBS Satellite TV signal studies (12.5 GHz band) on propagation, signal / noise, and interference, etc.

- RF filter design and modulation bandwidth analysis and other engineering work on an 8 channel DC - 10 MHz data acquisition system and fiber optic link for aircraft instrumentation.

- Optimization of high-speed data telemetry modems; compensation and matched filter designs.

- DSP Algorithms and Code development.

- DSP Algorithm and Code development for single chip modem for major IC maker.

- Design and development work on special test instrumentation for high-performance PAL and EPLD devices for major IC maker.

- Embedded micro-controller design and development and implementations with Motorola HC-11 and Intel 80C51/52, and also Infineon, PIC, and numerous others; industrial control and instrumentation control.

- Design and development of computer automated smokestack sampling instrumentation; Motorola MC68332BCC was used as embedded computer.

- Theoretical analysis and modeling studies related to the technology of formal methods for hardware and software verification; client is a major developer of this technology.

- Consulting work on plant control instrumentation.

- Theoretical and experimental analysis and development work on ion beam optics and beam scanner for an ion implanter system to improve dose uniformity; work done for the developer/manufacturer; work included considerations of sensors, signal processing and control systems related to handling the beam, with some focus on optimal filtering and signal to noise improvement.

- Modification designs for fluorescent lighting systems to reduce harmonic distortion in the 60 Hz power line.

- Consulting work on development of inert gas tube x-ray source, to produce high power and broad beam.

- Investigation, measurement and analysis of field emissions from electrical power systems; works to identify and remedy sources of anomalous high fields.

- Project conducted with City of Austin and the management of a high-rise building tower in down-town Austin to redesign the transformer/distribution system for reduced magnetic field emission; work includes measurements, system analysis and modeling, recommendations for design changes, and follow-up assessment.

- Analysis of city power distribution lines and systems and associated problem location and solutions.

- Power transformer design -- including special requirements for power, frequency, size, high temperature, etc..

- Development and production of low-frequency magnetometers for a study of lightning sourced EM fields being conducted at MIT / Cambridge.

- Specialized processing of electromagnetic geophysical exploration data for major oil companies.

- Development and evaluation work on numerous EM geophysical systems.

- Development of Electrical Density Gage (EDG) for measurement of soil density and moisture content; for use in the construction engineering field for testing of required compaction of base soil material.

- Design and development of field instruments for multi-sensor sampling of water quality parameters in lakes and streams and reservoirs – (Sonde-type instruments for depth profiling and fixed depth scheduled logging).

- Misc. forensic engineering consulting and expert witness legal work.

2002-Present Eureka Environmental Engineering, Inc. – Austin, TX
Principal; Engineering Advisor

Development and manufacture of field instruments for measurement of water quality parameters (temperature, pH, dissolved oxygen, conductivity, turbidity, depth, stage, and others) in lakes and streams. Conducted initial circuit and system designs and continue to provide technical advice and oversight.

2004-Present Cone Corporation – Dripping Springs, TX
Member of Nuclear Research Group (Four Research Scientists).

Private research group – participating in basic nuclear research and fusion studies.

1985-1990 AET/Advanced Energy Technology, Inc. - Austin, TX
VP - Director of R&D (Company sold to Haliburton in 1987).

EM Geophysical company providing instrumentation and exploration services to the oil industry, including Magnetotellurics (MT) and various controlled source methods.

Principal duties were to direct the R&D effort and provide technical management for the company.

R&D emphasis was on development and implementation of a new technology called EMAP (ElectroMagnetic Array Profiling - invented and patented by Dr. F. X. Bostick, Jr. of UT/Austin). EMAP is a special MT method in which natural surface EM fields are measured and analyzed in linear arrays in a manner to estimate and map

the subsurface earth resistivity distribution. A surface impedance array is determined over a frequency range of 0.001 to 1000 Hz, or so, and spatial filtering techniques are used in the analysis. The EM signals are very small, and the method requires low-noise data channels and various signal/noise enhancement techniques.

My main work during this period included the following areas:

- Assembled and directed an R&D staff.

- Directed the development of the EMAP1 field data acquisition/ processing system ($ 3 Million program). Designed the system concept and architecture. Designed the sensors and the sensor systems, the analog signal channel hardware, and most of the signal processing algorithms. Worked closely with other engineers on all hardware and software development.

- Conducted field tests of the EMAP1 system and participated in production field operations in the USA, Canada, Japan, and Egypt.

- Served as company-wide technical consultant and problem solver. Helped in Field Operations, Data Processing, and Marketing.

- Prepared and conducted a 12 week course of instruction on the MT methods for client groups from the Peoples Republic of China.

- Visited clients in the Peoples Republic of China to consult on MT problems and negotiate business.

1970-1985 GC/Geotronics Corporation - Austin, TX
Exec. VP - Director, Research Engineer,
Director of R&D

Geotronics was organized to offer electromagnetic (EM) geophysical exploration services and instrument sales to the oil and gas, geothermal, and minerals industries. During this period, GC grew from a small start-up

enterprise to an aggressive and rapidly growing company that became a leader in its field. I was very closely involved in most of the work, including matters of company development, equipment and technology development, personnel acquisition, and the like. The company experienced a steady growth and reached a personnel level of about 140 by 1981 and later suffered declines due to the depressed oil economy.

My main work included the following areas of focus:

- Co-designed (with company president) a Magnetotelluric (MT) geophysical system. Critical design issues, including low-noise sensors and amplifiers and specialized active filters, required extensive custom design of most system components. This was the first MT system to be commercially developed, produced, and sold.

- Designed and developed induction magnetometers for use in MT and other EM geophysical data acquisition in the frequency band from 0.0001 to 1000 Hz. Two models were manufactured and widely sold by GC.

- Designed and developed numerous other EM geophysical systems, including high-power transmitter units for controlled source techniques such as the CSAMT, IP, and Resistivity methods.

- Developed MT software package for data analysis and interpretation and implemented a data processing operation.

- Developed MT production methodology for contracting services and helped to implement a field operation and to recruit and train operating crews.

- Assembled and directed an R&D staff (which grew to 25 engineers and programmers). Responsible for on-going development of equipment and technology. Served as technical resource and problem solver for the rest

of the company; and helped to manage Field Operations and Data Processing/Interpretation.

- Established in-house computer facilities to replace outside services. Installed DEC computer systems operating with UNIX. GC was an early user of UNIX and was a source license station with sub-licensing authority. Software development was done mostly in the C language.

- Directed development of the PROMT (service mark) portable MT field data acquisition/processing system with UNIX based real-time field data processing capability. I specified the system concept and participated directly in all portions of the hardware and software design.

- Conceived and developed a new MT data processing scheme RMT (service mark) for signal/noise enhancement. This work (done in 1977) became a standard production routine in MT work.

- Developed a portable remote data acquisition system using tactical fiber-optical cable for data and communications telemetry. The systems, with cable deployable over spans up to 10 km, were used extensively (esp. in Japan) to collect data in regions of difficult access.

- Participated in USA and international marketing and client contacts.

1969-1970 EE Department Faculty -
The University of Texas at Austin
Assistant Professor of Electrical Engineering

- Taught undergraduate EE courses in Electronics and Circuit Theory and in Numerical Analysis and Computer Programming.

1960-1969 Electrical Engineering Research Laboratory (EERL)
The University of Texas at Austin
Research Engineer

- 1967-1969 Ph.D. Research Project - "Crustal Investigations by the Magnetotelluric Tensor Impedance Method". Developed field instrumentation; acquired extensive EM data along a traverse line across the Ouachita geologic system in central Texas; examined and developed field instrumentation techniques; and performed study of noise and geometry effects in the MT method.

- 1966-1967 Project Engineer - EM Ship Detection Experiment at Port Aransas, TX. Study and development of ship and sub-marine detection to several miles using low-frequency EM signatures.

- 1965-1966 Conceived and Developed a low-frequency induction magnetometer with a metallic enclosure for tactical field use in the frequency range of 0.001 - 1000 Hz.

- 1965 Engineer in charge of instrumentation for a world-wide EM micro-pulsation measurement project utilizing a chain of recording stations in Texas, Maine, Peru, Hawaii, and the Philippines.

- 1964 ELF underground communications study made near Pecos, Texas - Co-Project Engineer; designed and developed the ELF transmitter system and participated in the field work, data analysis, and theoretical studies.

- 1963 Deep earth resistivity measurement project and earth current study in the states of Washington, Oregon, and Idaho - joint effort by EERL, MIT, Geoscience, Inc., and the Bonneville Power Administration. I designed a portion of the instrumentation and participated in the field work.

- 1962-1964 Designed and developed a high-power ELF transmitter (500V/ 100A / 50kW/ 0-3kHz) for use in geophysical and communication studies.

- 1962 Simultaneous earth micropulsation measurements made in Puerto Rico and Austin, TX. Participated in the instrumentation work and the data analysis.

- 1960-1961 Experiments to measure EM perturbations due to high-altitude atomic blasts and missile reentry. Participated in instrumentation work and data acquisition and analysis.

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Professional References: (others available on request).

Dr. Francix X. Bostick, Jr. -- Prof. of Electrical Engineering / UT-Austin / 512-471-1174 /
Mr. Bud Dublin -- President / Industrial Sensors and Instruments --Round Rock, TX / 512-255-3790 /

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List of Publications, Patents, etc. available on request.

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Brief Summary of My Legal Case Experience – as Consultant and/or Expert Witness.

Some of my stored files are not easily accessible; and thus
the following information is what I can readily provide at this time.
Please tell me if you need other information, and I will try to provide it.
I have marked the cases in which I recall being deposed; none of them
went to trial; most settled favorably.

(1) Chambers vs. Davis -- about 1993.
Law Firm: (cannot recall). I consulted for Don Chambers of Decco Operating, Inc., of Abilene, TX, on an intellectual property dispute related to a geophysical instrumentation development project conducted for Chambers by Davis, et al, in Lubbock, TX. I visited both parties and studied the instrumentation and the said development work and testified at a court hearing in Abilene. Chambers prevailed.

(2) Zamora vs. Duff Norton -- Nov. 1996. (Deposed).
Law Firm: Jiles W. Roberts, P.C., Buchannan Dam, TX. This was an electrocution case in a factory environment in Houston, TX. I worked for the plaintiff; I studied the electrical nature of the cause and reported on it. I was also deposed. The case settled favorably out of court.

(3) Breed & Harvel vs. Baker Hughes -- Jan 1998.
Law Firm: Saur & Wagner, L.L.P., Los Angeles, CA. Breed was suing Hughes over a patent dispute involving technology for submarine detection by a particular electromagnetic scheme. I worked for Breed. I studied both the work of Breed and of Hughes personnel (mostly theoretical and mathematical work) and reported on my opinions.

(4) Green vs. Con-Equipment, Inc. & Simon-RO -- 1999. (Deposed).
Law Firm: Merritt and Associates, in Oklahoma City, OK. This case involved an industrial electrical accident involving a crane boom contacting a HV power line while Green was handling the hook to connect a load. Green had an arm burned off and was suing the contractor he worked for and the crane manufacturer. I worked for the plaintiff side and was asked to analyze and comment on specific electrical safety devices and procedures for crane safety in the presence of power lines. This included an available proximity detector for use on a crane boom to sense the power line electric field and warn of close approach; an insulated cage device; and an insulated link. I had to compete with a well organized defense by the crane industry and a high profile counter expert that claimed such safety devices were not fool proof and therefore should not be used. We were successful in bringing the case to a favorable settlement.

(5) State of Texas vs. B&B Amusements Company, Inc. -- May 2000.
Law Firm: District Attorney -- in Austin, TX. This is a case in which a carnival ride "The Hymalaya", set up in Round Rock, TX, malfunctioned by exceeding its safe speed and expelled a teen age girl and killed her. There were several court cases related to the event. I worked for the D. A.'s office, which brought criminal charges against the owner of the ride. The owner claimed that the device had safety features and an automatic speed limiting control system to avoid such accidents. I was asked to analyze the control system for the ride, which I did and reported to the DA on its function and condition. The ride owner was convicted of the charges brought against him.

(6) BankOne Tower Investments, Ltd. vs. (Mfg. of Magnetic Shield Flooring -- name not presently avail.) -- Feb 1997.
Law Firm: Scott, Douglas, Luton, McConnico, L.L.P.-- Austin, TX. The BankOne Tower in Austin sued a company that had installed a special flooring shield that was claimed to adequately reduce an offending magnetic field sourced by an underlying basement substation for the AC power system. The shield was deficient. I was asked to analyze the shield system, theoretically and experimentally, and to determine the shield performance. I did this and prepared a report to the BankOne Tower, which successfully recovered costs and damages.

(7) Estate of Dennis Allen Ryan vs. Commercial Body Corp. & Williamson Co. Cable Vision -- Sep 2001.
Law Firm: Douglas D. McAninch, P.C.. This case involved an electrocution of a cable company worker while installing cable from a bucket truck made by Commercial Body Corp. I worked for the plaintiff, and was asked to analyze the nature of the accident and some related technical infractions. This included some unsuitable equipment and preparation, including the outfitting of the bucket trucks and some inadequate bucket insulation aspects that were deceptive to a layman worker. I was also able to identify and point out some important procedural deficiencies that compromised safety. The case settled favorably.

(8) Oatsvall / Hickman vs. Hek America -- Nov 2002. (Deposed).
Law Firm: Levin, Papantonio, Thomas, Michell, Echsner & Proctor -- Pensecola, FL. This was an injury and death case in which a commercially produced 'tower climbing' type scaffold system (for use on high rise buildings) failed to stop when it came to the top of the tower and thus climed completely off and fell to the ground. Although there were several procedural and safety infractions involved, a core contributing cause was failure of a key limit switch made by Square D and a French affiliate Telemechanique. I worked for the plaintiff, who was suing the manufacturer of the device, as well as Square D. I was asked to help in examining the system failures; but particularly to analyze the said limit switch for cause of failure and design deficiencies. I was able to do both. I was deposed by the defense, but they had no way to effectively refute my findings; and the case was settled favorably.

(9) Lyntech, Inc. vs. Hydrogenics, Corp. -- Feb 2003.
Law Firm: Streets & Steele, L.L.P., Houston, TX. This was a patent infringement case, brought by Lyntech, which produces and sells load systems for testing of fuel cells. I worked for Lyntech as a non-testifying consultant. The case involved a detailed study and analysis of electronic circuit schemes
from both factions and the tedious parsing and analysis of claim statements. I prepared a report for Lyntech. Lyntech appeared to have a sound argument, which was further improved by an interim Judge's Order on how certain claim language would be interpreted for this case. I am not presently aware of the final outcome of this case.

(10) Federal Pacific Electric (FPE) vs. (home owner insurance company—Don't recall name.) -- Nov. 2003.
Law Firm: McGinnins, Lockridge & Kilgore, L.L.P. -- Austin, TX. FPE is a major producer of AC power circuit breakers for both residential and commercial use. In this case, an insurance company was suing FPE with the claim that an FPE circuit breaker failed and somehow initiated a house fire. I worked for the FPE defense. FPE gave this case special priority in order to combat a plantiff trend of this type and to avoid a precedent. Fire examination had shown that the subject house fire had started at a kitchen electrical cook stove. I was asked to conduct an examination of the subject circuit breakers (still intact) to determine whether or not they then presently met performance specifications and to render an opinion as to whether the said breakers could have caused the fire. I did an analysis and experimental examination, with performance tests under controlled conditions and I found the subject breakers to be properly functional, and with no evidence to suggest that they had been otherwise; and additionally, I prepared some special
tests and demonstrations for court room illustration (if necessary) of some key aspects of electrical fire prevention measures that are routinely employed in contemporary home installations. It is commonly not understood that circuit breakers for appliances such as cook stoves do not necessarily open (or trip) immediately on the incidence of a load fault; and they are not meant to. For example, a typical 50 A rated circuit breaker is intended to trip within 4 minutes after application of a 100 A load (due to fault conditions or other). The circuit interruption in this case is intended for protection against major faults; whereas,
a shorted stove burner wire (for example) would flash and burn in two at such current, and long before 4 minutes had passed. Usual practice is to avoid fire hazzard by electrical shorts in cook stoves by isolating the candidate regions of the system within metal enclosures, avoiding combustible materials, and using special high temperature and flame retardant wireing. Electrical shorts in such conditions with tend to burn themselves free very quickly and flame out. I prepared some possible displays for the court, and an explanation of this concept was explained in my report. The case was settled favorably for FPE.

In addition to the above, there are a few other cases I have been involved with, which did not proceed very far prior to settlement, and I have not
attempted to list them here.

