# PUBLICATIONS

APL staff authored or co-authored the following unclassified books and technical articles that were recently published:

**Bailey LE, Weiss RO, Harris MA (Celera Genomics Corp.), and Wu DC (Celera Genomics Corp.)**
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The Unicode Character–Glyph Model: What you need to know about processing and rendering multilingual text, in *Proc. Fifteenth Int. Unicode Conf.*, San Jose, CA, p. 50 (1999).

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**Hill SD, Gerencser L (Hungarian Acad. of Sciences), and Vago Z (Hungarian Acad. of Sciences)**
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**Sternberger WI, and Goemmer SA**
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Secondary hyperalgesia to punctate mechanical stimuli: Central sensitization to A-fibre nociceptor input, *Brain* **122**, 2245–2258 (1999).

# PRESENTATIONS

APL staff were among those who gave the following unclassified presentations:

**Arnold AG, and Kujawa WF**
Test and evaluation of complex systems of systems, *Second Conf. on the Economics of Test & Evaluation*, Georgia Inst. of Technology (2–4 Nov 1999).

**Asher MS**
A GPS formation flying testbed for the modeling and simulation of multiple spacecraft, *12th ION GPS Int. Technical Mtg.*, Nashville, TN (14–17 Sep 1999).

**Bargeron CB, Benson RC, Carlson MA, Fraser AB, Ko HW, Phillips TE, Scholl PF, Velky JT, Groopman JD, and Strickland PT**
Immunoaffinity fluorometric biosensor: A handheld, self-contained field device for food safety, environmental monitoring, and healthcare, *Reducing Foodborne Illness Workshop: Advancing Adoption of New Technologies*, Washington, DC (13–14 Dec 1999).

**Boehme MH**
GPS in HSTSS, *1999 Hardened Subminiature Telemetry and Sensor System (HSTSS) Symp.*, Dallas, TX (14–16 Sep 1999).

**Carbary JF, Meng C-I, Liou K, and Newell PT**
Detailed comparison of imagery from POLAR UVI and VIS, *POLAR Science Workshop*, Goddard Space Flight Center, Greenbelt, MD (5–6 Oct 1999).

**Chin DC, and Maryak JL**
An efficient optimization technique for image analysis, *Baltimore Chap. IEEE Aerospace and Electronic Systems Society Mtg.* (18 Nov 1999).

**Conde RF**
Adaptive instrument module through programmable logic, *1999 Military and Aerospace Programmable Logic Devices Conf.*, Laurel, MD (30 Sep 1999).

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Building a digital dynasty, *On-Demand Digital Printing and Publishing Conf.*, New York (5 May 1999).

**Gladstone GR, Stern SA, Slater DC, and Paxton LJ**
EUVE observations of the Venus dayglow, *31st Annual Mtg. of the DPS*, Padua, Italy (1999).

**Guo Y, and Sharer PJ**
Aladdin mission design, *50th Int. Astronautical Congress*, Amsterdam, The Netherlands (4–8 Oct 1999).

**Hart EF**
The Unicode Character–Glyph Model: What you need to know about processing and rendering multilingual text, *Fifteenth Int. Unicode Conf.*, San Jose, CA (30 Aug–2 Sep 1999).

**Hill SD**
Optimization over discrete sets via SPSA, *1999 Winter Simulation Conf.*, Phoenix, AZ (5–8 Dec 1999).

**Holdridge ME**
Contour mission operations, *CNES Knowledge Management Workshop*, Toulouse, France (30 Sep–1 Oct 1999).

**Lamb JL, Wickenden DK, Champion JL, Givens RB, Osiander R, and Kistenmacher TJ**
Micromachined polysilicon resonating xylophone bar magnetometer: Resonance characteristics, *Fall Mtg. of the MRS*, Boston, MA (Dec 1999).

**Linstrom LA**
An open architecture GPS recording system and post-test tracking system, *25th Joint Services Data Exchange (JSDE) Symp.*, Norfolk, VA (18 Nov 1999).

**Luman RR**
Upgrading complex systems of systems: A CAIV methodology for warfare area requirements allocation, *Second Conf. on the Economics of Test & Evaluation*, Georgia Inst. of Technology (2–4 Nov 1999).

**Maryak J**
Modeling cardiac ion channel conductivity: Model fitting via simulation, *Mid-Atlantic Probability and Statistics Day* (13 Nov 1999).

**McCally RL, and Bargeron CB**
Corneal damage thresholds for exposures to Tm:YAG laser radiation at 2.02 μm, *Second Workshop on Infrared Lasers and Millimeter Waves: Opportunities for Research at the Microwave/Laser Interface*, The Lodge, Cloudcroft, NM (11–13 Aug 1999).

**Miragliotta J, Osiander R, Champion JL, Oursler DA, and Kistenmacher TJ**
Development of a MEMS xylophone bar magnetometer using optical interferometry for detection, *Fall Mtg. of the MRS*, Boston, MA (Dec 1999).

**Morrison D**
SSUSI calibration—Validation plan, *DMSP UV Sensors Working Group Mtg.* (18 Nov 1999).

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SSUSI nightglow F-region algorithms, *DMSP UV Sensors Working Group Mtg.* (18 Nov 1999).

**Olsen DE, Sellers WA, and Phillips RG (FBI)**
The simulation of a human subject for interpersonal skill training, *Interservice/Industry Training Simulation and Education Conf.* Orlando, FL (29 Nov–2 Dec 1999).

**Paschalidis NP, Kottaras G, Paschalidis V, Stamatopoulos N, Karadamoglou K, Sarris E, Keath EP, and McEntire RW**
A time-of-flight system on a chip for space instrumentation, *1999 IEEE Nuclear Science Symp. and Medical Imaging Conf.*, Seattle, WA (Oct 1999).

**Paxton LJ**
Hot oxygen in the upper atmosphere of Mars and Venus, *31st Annual Mtg. of the DPS*, Padua, Italy (1999).

**Saffarian HM, Srinivasan R, Chu D (ARL), and Gilman S (ARL)**
Suppression of methanol interference and enhancement of oxygen reduction rate on Pt cathode by organic additives, *196th Mtg. of the Electrochemical Soc.*, Honolulu, HI (17–22 Oct 1999).

**Sarabun CC**
PADS performance assessment, *PMA 299*, Office of Naval Research/Sonetech.

**Slater DC, Stern SA, Colwell WB, Durda DD, Mahoney DE, Parker JW, Tamblyn PM, Tomlinson WM, Genau V, A'Hearn M, Paxton LJ, Weissman PR, Vilas F, Robinson SK, and Hawley SA**
UV imaging results of comet C/1995 01 (Hale-Bopp) and other planetary targets using the Southwest UV Imaging System (SWUIS) aboard the space shuttle, *31st Annual Mtg. of the DPS*, Padua, Italy (1999).

**Spall JC**
Adaptive stochastic approximation by the abstract: Adaptive stochastic approximation by the simultaneous perturbation method, *Mid-Atlantic Probability and Statistics Day* (13 Nov 1999).

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Stochastic optimization and the simultaneous perturbation method, *1999 Winter Simulation Conf.*, Phoenix, AZ (5–8 Dec 1999).

**Srinivasan R, Chin DC, Ball RE, and Smith WF**
Subsurface discrimination of buried plastic and metal object: The science and technology of unexploded ordnance (UXO) removal and site remediation, *2000 American Control Conf.*, Maui, HI (8–11 Nov 1999).

**Srinivasan R, and Saffarian H**
Effect of surface roughness on the kinetics of Fe(II) oxidation on gold in aqueous perchlorate medium, *196th Mtg. of the Electrochemical Society*, Honolulu, HI (17–22 Oct 1999).

**Swartz WH**
Photolysis rate coefficients during POLARIS: Sensitivity and measurement-model comparison, *IPMMI Data Workshop*, National Center for Atmospheric Research, Boulder, CO (30 Sep–1 Oct 1999).

**Waltrup PJ**
Upper bounds of the flight speed of hydrocarbon fueled scramjet powered vehicles, *XIV ISABE Int. Symp. on Airbreathing Engines*, Florence, Italy (5–10 Sep 1999).

**Waltrup PJ, and Thompson MW**
Steam calorimetry for determining fuel combustion efficiency in scramjet combustors, *USA/French DEA Workshop on Scramjet Combustor Testing*, Paris, France (14–16 Sep 1999).

**White ME**
High temperature materials and structures for hypersonic missile applications, *49th JANNAF Propulsion Mtg.*, Tucson, AZ (13 Dec 1999).

**White ME, and Price WR (DARPA)**
Affordable rapid response missile demonstrator (ARRMD) program status, *DoD Hypersonic Coordination Mtg.*, Eglin AFB, FL (9 Dec 1999).

**Wickenden DK, Davis B (ARL), and Dubey M (ARL)**
An extremely sensitive MEMS magnetometer for use as an orientation sensor on projectiles, *Royal Aeronautical Soc. Mtg.*, London, England (11 Nov 1999).

**Wilkinson WO**
Moisture reduction in ambient pressure thermal/cycling qualification testing, *AIAA Working Group on Space Simulation*, Sao Paulo, Brazil (19–23 Sep 1999).

**Wilkinson WO**
Precautions in specifying molecular contamination free optical cleanrooms, *AIAA Working Group on Space Simulation*, Sao Paulo, Brazil (19–23 Sep 1999).

The following papers were presented at the Digital Avionics Systems Conf., St. Louis, MO (Oct 1999):

**Heggestad BK, and Moore RC**
The Far Ultraviolet Spectroscopic Explorer (FUSE) instrument data system.

**Le BQ**
Low cost microelectronics for space applications with chip-on-board technology: Design, manufacturing and reliability considerations.

**Moore RC**
Characteristics of a successful space system engineer.

**Perschy JA**
Design and implementation of a general-purpose processor for space sytems.

The following papers were presented at the JANNAF Combustion / Airbreathing Propulsion, Propulsion Hazards Subcommittee Mtg., Cocoa Beach, FL (18–21 Oct 1999):

**D'Alessio SM, Van Wie DM, Mattes LA, Clemons DE, Grossman KR, Wolf TD, Messit DG (Aerojet), and Knops EG (Aerojet)**
Development of the JHU/APL combustor test facility with application to dual-combustion ramjet development.

**Rice T, and D'Alessio SM**
Data and measurement sensitivity analysis for dual-combustor ramjet direct-connect testing.

**Thompson MW, Wesner AL, Oldenborg R (LANL), and Early J (LANL)**
Laser ignition of liquid hydrocarbon fuels in a scramjet combustor.

**Waltrup PJ, and Sullins GA**
Flight test lessons learned—A JHU/APL perspective.

**Waltrup PJ, and Van Wie DM**
Advanced hypersonic vehicle technologies.

**White ME, and Price WR (DARPA)**
Status of the DARPA affordable rapid response missile demonstrator program.

The following papers were presented at the JHU/APL 5th Research & Development Symp., Laurel, MD (2–3 Nov 1999):

**Alvarez EB**
Rapid prototyping of electronic designs.

**Bargeron CB, Phillips TE, Miragliotta JA, Vertes RF, and Colvin AE Jr**
Solid-state sensor for gaseous carbon dioxide.

**Chu MI, and Mitnick WL**
Lessons learned from the TIMED Mini-Moc.

**Darrin MA, and Conde R**
Adaptive instrument module(AIM): Space instrument controller "brain" through programmable logic devices.

**Davis JA, and Schlemmer SE**
Advanced electronic design automation using Mentor Graphics software.

**Holdridge ME**
NEAR mission to Eros.

**Linstrom LA, Moore GT, Stadter PA, and Devereux WS**
A communication and navigation system for distributed spacecraft missions.

**Malouf PM, Stilwell RK, Bokulic RS, and Edwards ML**
A robust, efficient, cost-effective power amplifier/phased-array antenna system for interplanetary missions.

**Moore KL, Lewis CL, and Tomey HJ**
Schedule-driven program offers opportunity for semi-automated surface mount technology process development.

**Phillips TE, Bargeron CB, Benson RC, Carlson MA, Fraser AB, Ko HW, Velky JT, Groopman JD, and Strickland PT**
Development of an automated, handheld, immunoaffinity fluorometric biosensor.

**Roth D, and Darrin MA**
Skin sensor—Ultra sensitive dosimetry.

**Sarabun CC, Ondercin DG, Shedd TR (US Army Ctr. for Environ. Res.), Widder M (Geocenters, Inc.), Velky JT, and Schultz R (Lehigh Univ.)**
Real-time monitoring for harmful algal toxins: Sensors, environmental sensors and signal analysis.

**Spicer JW, Wilson DW, Osiander R, Tomey HJ, and Biermann PJ**
Evaluation of high thermal conductivity fibers for thermal management in electronics applications.

**Wallis RE, Bokulic RS, and Reinhart MJ**
Highly integrated spacecraft communication system.

**Williams RL, Eaton HAC, and Wenstrand DS**
A custom integrated circuit for beamforming.

The following papers were presented at the 1999 Fall Mtg. of the American Geophysical Union, San Francisco, CA (13–17 Dec 1999):

**Carbary JF, Morrison D, Romick GJ, and Meng C-I**
Polar mesospheric cloud morphology observed during the summer of 1999.

**Christon SP, Lui ATY, McEntire RW, Roelof EC, Williams DJ, Eastman TE, Gloeckler G, and Kokubun S**
Geomagnetic and solar-cycle variation of singly-charged oxygen ions upstream of Earth's bow shock: 1995–1999.

**Decker RB, Roelof EC, and Krimigis SM**
Solar energetic particle propagation to Voyagers 1 and 2 in 1998–1999.

**DelGreco F, Eastes R, O'Neil R, Winick J, Romick GJ, Morrison D, Paxton LJ, Cox R, Strickland D, and Farnham K**
First analysis of limb scans by the MSX UVISI instrument in the far ultraviolet dayglow.

**Eastman TE, Roelof EC, McEntire RW, Lui ATY, Williams DJ, and Christon SP**
Angular distributions of energetic particles in the magnetotail lobes as observed by Geotail/EPIC.

**Fox NJ, Carlowicz MJ, Hoffman RA, and Lopez RE**
Connecting kids to the Sun-Earth connection—A new approach to teacher workshops.

**Fox NJ, Cowley SWH, Davies J, Lester M, and Lockwood M**
Observations of an expanding auroral bulge and current system far poleward of the main substorm electrojet.

**Fox NJ, Lester M, Cowley SWH, Coley WR, Enno G, Greenwald RA, Lockwood M, Murphree JS, and Pinnock M**
A comparison of the poleward boundary of the auroral oval determined using UV images and ion precipitation with convection reversal during a storm.

**Haggerty DK, Roelof EC, Hawkins III SE, Decker RB, and Gold RE**
Implications of ACE/EPAM 38-315 keV beam-like impulsive electron event for coronal acceleration: Comparison with solar radio and SOHO observations on November 4, 1997.

**Ho GC, Decker RB, Roelof EC, Gold RE, Mason GM, and Dwyer JR**
Elemental abundance variations associated with interplanetary shocks as measured by ACE/ULEIS during 1998.

**Jorgensen AM, Henderson MG, Roelof EC, Reeves GD, and Spence HE**
The contribution of energetic neutral atoms (ENAs) to the decay of the ring current.

**Kane M, Williams DJ, Roelof EC, Mauk BH, and McEntire RW**
The energetic ion environment in the Jovian magnetosphere.

**Krimigis SM, and the MIMI science team**
Magnetospheric imaging instrument (MIMI) on Cassini: Overview and in-flight performance at Venus-2 and Earth flybys.

**Krimigis SM, Roelof EC, Paxton LJ, and Mitchell DG**
Detection of an extended neutral gas environment on the dayside of Venus: Observations by the Cassini Magnetospheric Imaging Instrument Ion and Neutral Camera (MIMI/INCA).

**Lloyd SA, Swartz WH, and Anderson DE**
Intercomparison of TOMS satellite, Ozonesonde and ground-based total ozone observations during POLARIS.

**Meng C-I, Carbary JF, Liou K, and Newell PT**
Detailed comparison of imagery from POLAR UVI and VIS.

**Morrison D, Romick GJ, Yee J-H, Morgan M, and Paxton LJ**
Vibrational distributions from the molecular nitrogen ion $N_2^+$ first negative and Meinel bands at altitudes to 900 km.

**Paxton LJ, Morrison D, Crowley G, Strickland DJ, Romick GJ, Christensen AB, and Meng C-I**
Measuring the effective electron energy flux and average energy using multispectral far ultraviolet images: The effect of neutral atmosphere composition and temperature on the retrievals.

**Roelof EC, Mitchell DG, and Krimigis SM**
ENA images from the ion and neutral camera (INCA) during the Cassini Earth flyby.

**Rust DM, and Roelof EC**
Intensity oscillations ~20 minutes in the emission of 40–300 keV solar electrons: Relation to Hα filament oscillations?

**Waldrop LS, Roelof EC, Fritz TA, Williams DJ, McEntire RW, and Mendillo M**
Energetic neutral atoms in the outer Jovian magnetosphere: Upper limits obtained by the Galileo energetic particles detector.

**Williams DJ, Roelof EC, Lagg A, and Krupp N**
The three-dimensional global flow velocity field in Jupiter's magnetosphere as measured by the Galileo energetic particles detector.

**Wing S, and Newell PT**
Quiet time plasma sheet pressure contribution to Birkeland currents.

**Woch J, Krupp N, Lagg A, Wilken B, Livi S, Williams DJ, and Roelof EC**
Particle flow pattern in the Jovian magnetosphere: The average state and its deviations.

# COLLOQUIA

The following topics were recently presented at the weekly APL Colloquium (*part of the Millennial Challenges: Colloquium 2000 series):

**7 January 2000**
Breakthrough Propulsion Physics Research Program, MG Millis, NASA

**14 January 2000***
The Quantum Physics Model of the University in the New Millennium, WR Brody, President, JHU

**21 January 2000**
Systems Architecting of Organizations, E Rechtin, University of Southern California (ret.)

**28 January 2000**
The Virtual Triceratops—Creating the First Digital Dinosaur, R Chapman, Smithsonian Institution

**4 February 2000**
Extraterrestrial Water, ME Zolensky, NASA Johnson Space Center

**11 February 2000**
Footwear Technology on the Cutting Edge: Computerized Footwear, R Demon, VectraSense Technologies, Inc.

**18 February 2000***
A Telecommunications Architecture for the 21st Century, RT Roca, Director, APL

**25 February 2000**
Attaining Level 5 in the Capability Maturity Model, FE McGarry, Computer Sciences Corp.

**3 March 2000**
Deformable Templates and Image Understanding, MI Miller, JHU Center for Imaging Science

**10 March 2000**
A Century of Controversy over the Foundations of Mathematics, G Chaitin, IBM TJ Watson Research Center

**17 March 2000**
Breaking the Sound Barrier, JD Anderson, Jr., National Air & Space Museum

**31 March 2000**
Searching the Web: It Is Worse Than You Thought, CL Giles, NEC Research Institute

**7 April 2000***
U.S. Navy in the 21st Century, RADM RP Rempt and RADM MG Mullen, U.S. Navy

**14 April 2000***
Science and Engineering Education of Women in the 21st Century, SA Jackson, President, Rensselaer Polytechnic Institute

# U.S. PATENTS (1999)

APL staff received the following U.S. patents during 1999:

**JC Roberts, PJ Biermann, and AA Corvelli**
*Apparatus and Methods for Embedding a Biocompatible Material in a Polymer Bone Implant*, No. 5,881,443 (16 Mar): An apparatus and methods are disclosed for partially embedding a biocompatible material (e.g., a titanium coil) in the surface of a polymer bone implant to provide a porous coating through which bone cells can grow, thereby promoting long-term stabilization of the implant.

**TR Sanderson, RC Benson, TE Phillips, JJ Suter, and JC Poret**
*Narrow Band Optical Radiation Sensor Using Pyroelectric Material*, No. 5,923,029 (13 Jul): A pair of interleaved finger-like electrodes is positioned over a pyroelectric sheet of polyvinylidine fluoride, and a pair of coatings is formed on the electrodes having different optical reflectance. As a result, a light beam energy-absorption differential is produced between the coatings, and the subsequent change in temperature in the sheet material under the electrodes causes a voltage to be generated. A differential amplifier is connected across the electrodes to sense this voltage, which is indicative of the detection of an incoming laser light beam.

**JL Abita, J Sadowsky, W Schneider, and RW Massof**
*Passive Alarm System for Blind and Visually Impaired Individuals*, No. 5,933,082 (3 Aug): The device warns blind or visually impaired travelers that they have entered a potentially dangerous area near the edge of a boarding platform like those typically found in public railway transit systems. An array of transmitters creates a beam of infrared light that bathes the section of the

platform proximal to the platform edge. As the traveler moves into the region of the platform covered by the emission, the sensors in a portable, handheld warning device are activated, and by audio, tactile, or other stimuli alert the traveler of entry into the danger zone.

**BG Boone and OB Shukla**
*Optical-Digital Method and Processor for Pattern Recognition*, No. 5,953,452 (14 Sep): The invention uses micro-optical lenslet arrays and fixed masks to implement an angular correlation algorithm and the Hough transform for extracting amplitude and geometric features from objects embedded in video imagery. The optical-digital processor can be interfaced to a variety of sensors and can be employed to classify objects when used in conjunction with a neural network.

**RB Givens, JC Murphy, DK Wickenden, R Osiander, and TJ Kistenmacher**
*Lorentz Force Magnetometer Having a Resonator*, No. 5,959,452 (28 Sep): The invention consists, in one embodiment, of a resonator, e.g., a conductive bar supported by two wires placed at the nodal points of the fundamental resonance frequency. The wires also supply current of this frequency to the resonator. In the presence of a magnetic field, the Lorentz force causes the resonator to vibrate. The amplitude of this vibration is proportional to a vector component of the magnetic field. The motion of the resonator is detected using one of a number of possible methods including optical beam deflection. The invention has a sensitivity of at least 1 nT, comparable to that of a commercial fluxgate magnetometer, and a dynamic range exceeding 80 dB.

**PN Cutchis**
*Automatic Battery Power Switch*, No. 5,969,504 (19 Oct): An automatic battery power switch circuit switches from $n$ to $(n + m)$ cells, where $n$ and $m$ are integers in a battery. The circuit delivers a relatively constant voltage over a wide range of load current conditions and, depending on the embodiment, switches on the basis of load current or the output voltage of the circuit. The circuit provides a high-speed automatic switch, used in devices requiring at least two power states, which can function as a voltage regulator and can significantly prolong functional battery life.

**JC Roberts and MH Luesse**
*Heat Sink for Increasing Through-Thickness Thermal Conductivity of Organic Matrix Composite Structures*, No. 5,975,201 (2 Nov): Polymer matrix composites have a through-thickness thermal conductivity whose value is realized in applications such as composite spaceborne electronics enclosures where heat dissipation depends entirely on thermal conduction to a heat sink. The technique involves interlaminating a high-thermal-conductivity pitch fiber/epoxy and a low-thermal-conductivity carbon fabric epoxy within a sandwich of copper foil outer plies. Once the copper is laminated on the surface, it is etched from areas not exposed to the heat. A hole may be drilled transversely through the laminated composite, and the walls of the space defining the

opening are copper-plated. The high thermal conductivity of the copper allows heat transfer from the heat source through the opening to the high-thermal-conductivity fibers that then transfer the heat to a heat sink.

**JR Jensen and RS Bokulic**
*Method and Apparatus for Precise Noncoherent Doppler Tracking of a Spacecraft*, No. 5,995,039 (30 Nov): A method and apparatus are disclosed for making precise velocity measurements of a spacecraft using a two-way noncoherent Doppler tracking system. The received uplink and transmitted downlink frequencies onboard the spacecraft are compared. The resulting information is then included in the downlink signal and used to cancel spacecraft oscillator drift rate effects in the two-way Doppler measurement made by the ground station. The information can also be used to characterize the drift rate of the spacecraft oscillator, thus permitting periods of accurate one-way Doppler tracking by the ground station. To improve accuracy, the times at which the measurements comprising the information would have been observed on the ground are inferred from the measurement of a signal generated by the spacecraft, e.g., the telemetry frame start times made by the ground station.

**R Osiander, SA Ecelberger, RB Givens, DK Wickenden, JC Murphy, and TJ Kistenmacher**
*Microelectromechanical (MEMS)-Based Magnetostrictive Magnetometer*, No. 5,998,995 (7 Dec): A microelectromechanical-based magnetostrictive magnetometer which uses a commercial (001) silicon microcantilever as an active element is coated with an amorphous thin film of the giant magnetostrictive alloy Terfenol-D and has a compact optical beam deflection transduction scheme. A set of Helmholtz coils is used to create an ac magnetic excitation field for driving the mechanical resonance of the coated microcantilever. When the coated microcantilever is placed in a dc magnetic field, the dc field will change the amplitude at the mechanical resonance of the microcantilever, thereby causing a deflection that can be measured. The magnetometer has been demonstrated with a sensitivity near 1 mT.

**WI Sternberger and RS Greenberg**
*Passive, Non-Invasive Method to Quantify Objectively the Level and Density of a Neural Blockade*, No. 6,002,960 (14 Dec): Electromyogram temperature and heart rate measurements, which correlate to the dermatomal level and density of neural blockade, are obtained passively, i.e., the patient is not stimulated or exposed to any sensor that requires an active conduction in order to make a measurement, and no active patient participation or response is required. The measurements obtained provide objective and quantitative indications of, for example, epidural blockade with local anesthetics, thus allowing objective, real-time assessment of density and level of neural blockade.

**GL Burks, DE Fort, ELS Spencer, and HP Widmer**
*Networked Sensor System*, No. 6,002,996 (14 Dec): This networked sensor system simultaneously acquires, processes, and transmits sensor data under the control of a central processing unit.