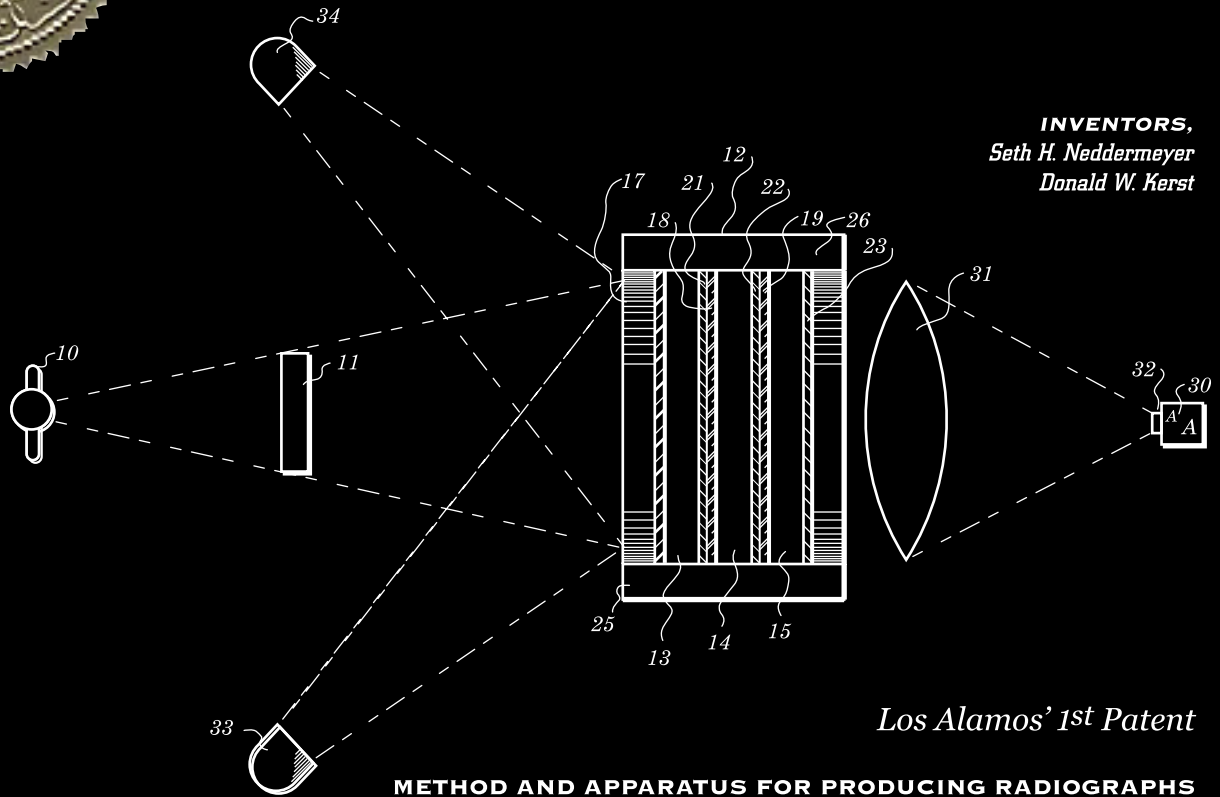




*outStanding
innOvation*
Applauding our innovators



INVENTORS,
*Seth H. Neddermeyer
Donald W. Kerst*

Los Alamos' 1st Patent

METHOD AND APPARATUS FOR PRODUCING RADIOGRAPHS

Issued April 1947

THE 1998 PATENT & LICENSING AWARDS
Carrying on the tradition of world-changing innovation

out **Standing**
inn **Ovation**

Applauding our inventors and entrepreneurs

The 1998 Patent & Licensing Awards

Carrying on the tradition of world-changing innovation

Friday, January 15, 1999

La Fonda Hotel, Santa Fe, New Mexico

Charryl Berger, *Master of Ceremonies*

Los Alamos
NATIONAL LABORATORY



Bravo!

Hurrah!

Kudos!

Accolades!

Encore!

Welcome to our first Annual Patent and Licensing Awards Banquet. Tonight's program is designed to celebrate and recognize outstanding achievements in technical innovation at the Laboratory. These achievements include patents issued, copyrights asserted, technologies licensed, royalties received, and entrepreneurial ventures launched.

This is the first celebration of what will be an annual event and you have the honor to be our first awardees. I am delighted to recognize individual award winners and congratulate them for their personal achievements. Although these achievements range over a broad spectrum of technologies, they all carry what has been the hallmark of the Laboratory since its inception—exploring the unknown and pursuing the impossible.

The Laboratory continues to develop and nurture an unprecedented depth of technical richness and innovation. People the world over expect this Laboratory to provide scientific and creative leadership. The award winners here tonight have far exceeded those expectations.

Congratulations for a job well done! Please join me in a standing ovation to innovation. To our winners, we call out "Bravo!"

A handwritten signature in black ink that reads "John C. Browne". The signature is written in a cursive, flowing style.

out Standing *inn* Ovation

Evening Program

5:45 pm **Reception and No-Host Bar**

6:30 pm **Dinner**

7:30 pm **John Browne, *Director***
Los Alamos National Laboratory

The Honorable Pete V. Domenici
United States Senator

Deborah Wince-Smith, *Senior Fellow*
Council on Competitiveness and
Congressional Economic Leadership Institute

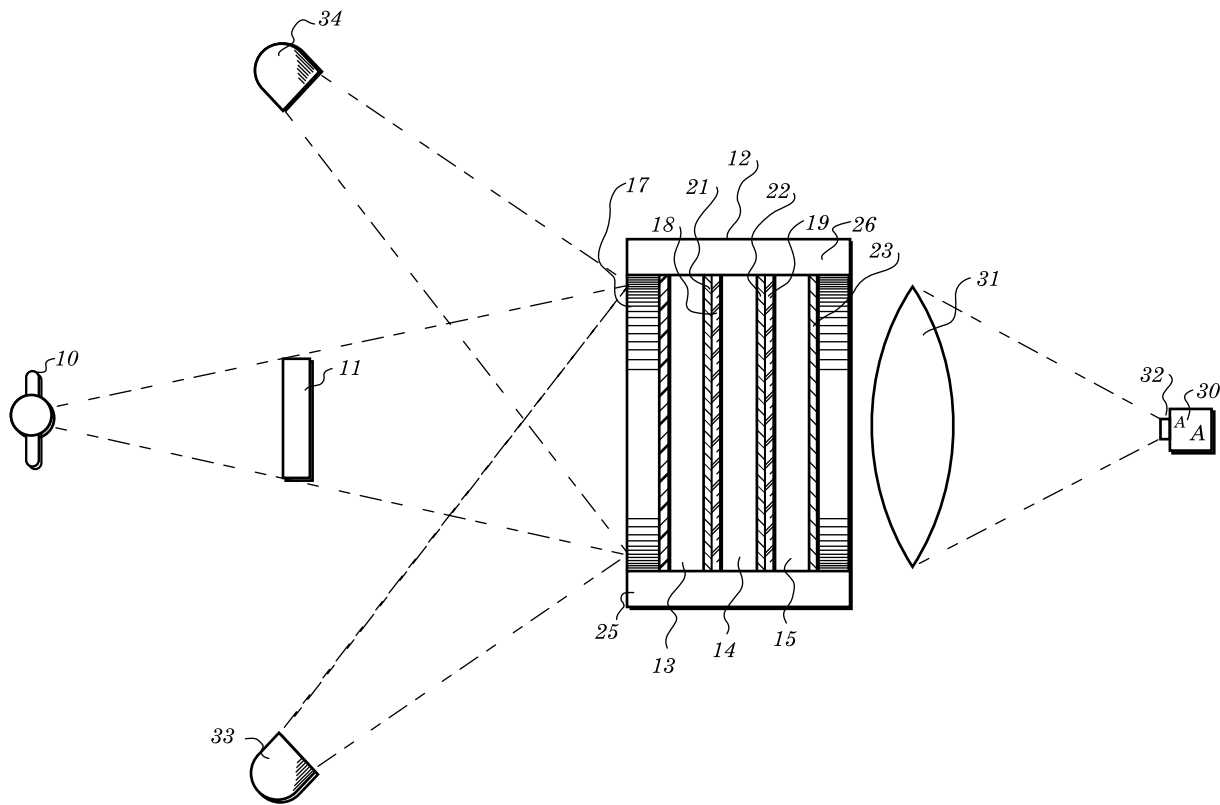
8:00 pm —
10:00 pm **Awards Ceremony**

Bill Eklund, *Director*
Business and Patent Law
Los Alamos National Laboratory

Charryl Berger, *Director*
Civilian and Industrial Technology Program Office
Los Alamos National Laboratory

Distinguished Awards Presentations

Distinguished Patent
Distinguished Copyright
Distinguished Licensing
Entrepreneur of the Year



Method And Apparatus For Producing Radiographs

The first patent obtained at Los Alamos National Laboratory was filed in 1945 in the names of Seth Neddermeyer and Donald Kerst, two original Los Alamos employees who were well-known for their creative and unrestrained experimentations into the explosive compression of materials. The patent covered an apparatus for conducting high-speed x-ray radiography of explosive detonations. This invention was part of a research program that has continued for 55 years and for which Los Alamos is internationally renowned — a program which will attain even greater capabilities with the beginning of operations at DARHT later this year. The patent makes no reference to Los Alamos as it was a “secret city” at that time.

Abstracts of Recognized Patents

Diamond Fiber Field Emitters

Graciela B. Blanchet-Fincher,
Don M. Coates, David J. Devlin,
David F. Eaton, Aris K. Silzars,
and Steven M. Valone

This field emission electron emitter consists of an electrode formed of at least one diamond, diamond-like carbon, or glassy carbon composite fiber. The composite fiber has a nondiamond core and a diamond, diamond-like carbon, or glassy carbon coating on the nondiamond core. The composite fiber has application in electronic devices that use field emission electron emitters.

Microwave Sintering Of Sol-Gel-Derived Abrasive Grain

Ross Plovnick, Ahmet Celikkaya,
and Rodger D. Blake

A method for making free-flowing, alpha alumina-based, ceramic abrasive grain by coupling microwaves with a calcined, alpha alumina-based, abrasive grain precursor. The precursor is sintered at a temperature of at least 1,150°C.

Metal Getter Process For Purifying And Collecting Hydrogen Isotopes

John D. Baker, David H.
Meikrantz, and Dale G. Tuggle

This patent describes a method and apparatus for purifying and collecting hydrogen isotopes in a flowing inert gaseous mixture containing impurities. Metal alloy getters are used to cleanse the gaseous mixture of impurities such as oxygen, carbon dioxide, carbon monoxide, methane, ammonia, nitrogen, and water vapor. After purification, hydrogen isotopes are continuously purified and collected with parallel-process lines using metal getter alloys.

Ignition Methods And Apparatus Using Microwave Energy

Dennis M. DeFreitas
and Albert Migliori

An ignition apparatus for a combustor emits microwave energy into the combustor at a frequency within a resonant response of the combustor. The combustor functions as a resonant cavity for the microwave energy to produce a plasma that ignites a combustible mixture placed inside the combustor. Ideally the plasma is a noncontact plasma produced in free space within the resonant

cavity, and is spaced away from the cavity wall and the microwave emitter.

Beta Particle Monitor For Surfaces

Duncan W. MacArthur

This beta particle monitor detects and measures beta radiation emitted from a surface. An electrically conductive signal collector is mounted inside an electrically conductive enclosure having a large opening for placing against a surface. A voltage source is connected to the signal collector through an electrometer or other display mechanism to create an electric field between the signal collector and the enclosure. Atmospheric ions created by the beta radiation are collected, and the resulting electric current is indicated on the display mechanism.

Optimal Energy Extraction From Hot Dry Rock Reservoirs

Donald W. Brown

This invention provides an improved method for extracting thermal energy in a cyclic manner from a reservoir of water in a fractured hot dry rock formation. Water is added to the through an injection well and is withdrawn from the reservoir through a production well. A heat exchange

apparatus on the surface extracts heat from the water, which is subsequently reinjected into the reservoir to be reheated. Water is continuously provided to and withdrawn from the reservoir at two different flow rates; a base rate and a peak rate. To generate electric power to meet peak demands, the backpressure at the outlet of the production well is rapidly decreased, thereby increasing the water flow from the base rate to the peak rate. The flow of water into the hot dry rock reservoir is maintained at a rate that prevents depletion of the reservoir.

Heterodyne-Generated Two-Dimensional Detector Array Using A Single-Element Detector

Charlie E. Strauss

A synthetic-array heterodyne detection permits a single-element optical detector to behave as though it were divided into an array of separate heterodyne detector elements. A 15-element synthetic array has been realized experimentally on a single-element detector, permitting all of the array elements to be read continuously and in parallel from one electrical connection. A carbon dioxide laser and a single-element mercury/cadmium/tellurium photodiode are used. A different heterodyne local oscillator frequency is incident upon the spatially resolvable

regions of the detector surface. Thus, different regions are mapped to different heterodyne beat frequencies. One can determine where the photons were incident on the detector surface even though a single electrical connection to the detector is used. The single connection also prevents the destructive interference that occurs when multiple speckles are imaged (similar to spatial diversity), which permits a larger field of view when coherent LIDAR is used. An acousto-optic modulator generates the local oscillator frequencies and can achieve adequate separation of optical frequencies on the order of a megahertz apart.

Ignition Methods And Apparatus Using Microwave Energy

Dennis DeFreitas, Timothy W. Darling, Albert Migliori, and Daniel E. Rees

This invention provides an ignition apparatus for a combustor. The ignition apparatus emits microwave energy into the combustor at a frequency that is resonant with the combustor, so the combustor functions as a resonant cavity for the microwave energy. When a combustible fuel mixture is placed inside the combustor, a plasma is produced which ignites the mixture. Ideally, the plasma is a noncontact plasma produced in free space within the resonant

cavity, and is spaced away from both the cavity wall and the microwave emitter.

Solid-State Oxygen Sensor

Fernando H. Garzon
and Eric L. Brosha

A potentiometric oxygen sensor has a logarithmic response to a differential oxygen concentration while operating as Nernstian-type sensor. Very thin films of mixed conducting oxide materials form electrode surfaces while permitting diffusional oxygen access to the interface between the zirconia electrolyte and the electrode. Diffusion of oxygen through the mixed oxide is not rate-limiting. To prevent morphological changes in the electrode structure during extended operation at elevated temperatures, metal electrodes are not used.

Nuclear Magnetic Resonance Contrast Agents

Paul H. Smith, James R. Brainard,
Gordon D. Jarvinen, and
Robert R. Ryan

This invention consists of a family of contrast agents for use in magnetic resonance imaging. The contrast of magnetic resonance images may be enhanced by incorporating a contrast agent in the object before or while forming the images. The contrast agent is a paramagnetic lanthanide

hexaazamacrocyclic molecule, where a basic example has the formula $\text{LaC}_{16}\text{H}_{14}\text{N}_6$. Important applications of the invention are medical diagnosis, treatment, and research, involving imaging portions of a human body by means of magnetic resonance techniques.

High-Conductivity Composite Metal

Ruoyi Zhou, James L. Smith,
and John D. Embury

This invention provides electrical conductors that possess both high strength and high conductivity, and methods for producing them. The conductors consist of concentric strands of carbon steel and copper, nickel, silver, or gold, with diffusion barriers placed between the two metals. The components of the conductor are assembled and subsequently subjected to heat treating and mechanical deformation, during which the assembly maintains its integrity.

Optical Selection And Collection Of Dna Fragments

Mary C. Roslaniec, John C. Martin,
James H. Jett, and L. Scott Cram

This invention permits optical selection and collection of large (greater than microgram) quantities of clonable, chromosome-specific DNA from a sample of chromosomes. Selection is achieved by irreversible

photoinactivation of unwanted chromosomal DNA. Chromosomes may be processed in a conventional flow cytometry apparatus in which no droplets are generated. All chromosomes in the sample are first stained with a fluorescent analytic dye and bonded to a photochemically active species which, when activated, renders chromosomal DNA unclonable. After passing through analyzing light beam(s), unwanted chromosomes are irradiated using light that is absorbed by the photochemically active species, thereby causing photoinactivation. As desired chromosomes pass this photoinactivation point, an optical modulator deflects the inactivating light source so that desired chromosomes are not photoinactivated and remain clonable. The selection and photoinactivation processes take place in microseconds. Because droplet formation is eliminated, chromosome selection rates 50 times greater than those possible with conventional chromosome sorters may be obtained. Thus, usable quantities of clonable DNA from any source may be collected.

Highly Cross-Linked Nanoporous Polymers

Warren P. Steckle, Jr., Paul G.
Apen, and Michael A. Mitchell

Condensation polymerization, followed by a supercritical extraction step, is used to obtain highly cross-linked nanoporous polymers

with high surface area, controlled pore sizes, and rigid structural integrity. These polymers are useful for applications requiring separation membranes.

Storage And Retrieval Of Large Digital Images

Jonathan N. Bradley

Image compression and viewing are implemented with (1) a method for performing discrete wavelet transform (DWT) -based compression on a large digital image with a computer system possessing a two-level system of memory and (2) a method for selectively viewing areas of the image from its compressed representation at multiple resolutions and, if desired, in a client-server environment. The compression of a large digital image is accomplished by first defining a plurality of discrete tile image data subsets that, upon superposition, form the complete set of image data. A seamless, wavelet-based compression process is effected on the image data, which consists of successively inputting the tiles in a selected sequence to a DWT routine and storing the resulting DWT coefficients in a primary memory. These coefficients are periodically compressed and transferred to a secondary memory to maintain sufficient memory in the primary memory for data processing. The sequence of DWT operations on the tiles effectively calculates a seamless DWT of the image data. Data retrieval consists of specifying

ing a resolution and a region of the data image for display. The subset of stored DWT coefficients corresponding to each requested scene is determined and then decompressed for input to an inverse DWT, the output of which forms the image display. The repeated process whereby image views are specified may take the form of an interaction with a computer pointing device on an image display from a previous retrieval.

Fluid Sampling Apparatus

David R. Yeamans

This invention provides a sampling syringe having an integral metallic bellows which reduces contaminant ingress, permits replication of collection amounts, and permits multiple sample collections. Incorporation of the bellows and associated valving also enables collection and prolonged storage of samples collected at remote sites.

Discrete Monotron Oscillator Having One-Half Wavelength Coaxial Resonator With One-Quarter Wavelength Gap Spacing

Bruce E. Carlsten and
W. Brian Haynes

A discrete monotron oscillator for use in a high-power microwave

device is formed with a microwave oscillator that has a half-wave-length resonant coaxial microwave cavity operating in fundamental TEM microwave oscillation mode. The oscillator includes an inner conductor that defines a drift tube for propagating an electron beam, and an outer conductor, which is coaxial with the inner conductor. The inner conductor defines a modulating gap and an extraction gap downstream of the modulating gap. The modulating gap and the extraction gap connect the coaxial microwave cavity with the drift tube so that energy for the microwave oscillation is extracted from the electron beam at the extraction gap and modulates the electron beam at the modulating gap. For high-power operation, an annular electron beam is used.

Generalized Local Emission Tomography

Alexander J. Katsevich

This invention provides improved emission tomography methods for determining locations and values of internal isotope density distributions from radiation emitted from a whole object. In the method for determining the values of discontinuities, the intensities of radiation emitted from either the whole object or a region of the object containing the discontinuities are introduced into a local tomography function to define the location S of the isotope density discontinuity. The asymptotic

behavior of the function is determined in a neighborhood of S, and the value for the discontinuity is estimated from the asymptotic behavior of the function knowing pointwise values of the attenuation coefficient within the object. In the method for determining the location of the discontinuity, the intensities of radiation emitted from an object are introduced into a second local tomography function to define the location S of the density discontinuity and the location G of the attenuation coefficient discontinuity. Pointwise values of the attenuation coefficient within the object need not be known in this case.

Lensless Magneto-Optic Speed Sensor

Lynn R. Veaser, Peter R. Forman, and Patrick J. Rodriguez

This invention provides a speed sensor, which is based on the Faraday effect. Multimode fiber bundles transmit light to a magneto-optic material, from which the light is reflected, modulated, and returned to a detector. The magneto-optic material is subjected to a varying magnetic field created by a rotating tone wheel or other moving magnetic device. If coupled directly with a 100- or 200-mm core fiber, an LED is sufficient to operate the sensor, which ensures against birefringence effects in the input fiber because of the random polarization of LED outputs. No optical lens is required because the sensor uses

large-diameter optical fibers and thin crystals of a magneto-optic material having a high Verdet constant, such as iron garnet, which permits collection of a substantial quantity of light. All of the elements used in the present sensor are planar, and no particular orientation of the elements is required. The sensor operates under harsh environmental conditions, over a wide range of distances from magnetic field sources, and produces large observed signals. When a tone wheel is used, intensity of the signals is independent of wheel speed, and modulation is observed to be about 75 percent. Reliable operation is achieved down to zero frequency, or no wheel rotation.

Ultrahigh Vacuum Focused Ion Beam Micromill

Bruce C. Lamartine and Roger A. Stutz

This invention provides an apparatus and method for ultrahigh vacuum focused ion beam micromilling, as well as a durable data storage medium that uses the micromilling process. The data storage medium is capable of storing, for example, digital or alphanumeric characters, as well as graphical shapes or characters.

Fault Current Limiter And Alternating Current Circuit Breaker

Heinrich J. Boenig

This invention provides a solid-state circuit breaker and current limiter to protect an electrical load served by an alternating current source having a source impedance. The circuit breaker and current limiter include a thyristor bridge interposed between the alternating current source and the load. The thyristor bridge has four thyristor legs and four nodes. The first node is connected to the alternating current source, and a second node is connected to the load. A coil having an impedance value calculated to limit the current flowing through it to a predetermined value is connected from a third node to a fourth node. A control circuit is connected to the thyristor legs to limit the current flow under fault conditions to a predetermined level, and to gate the thyristor bridge under fault conditions, thereby quickly reducing the alternating current flow to zero and maintaining the thyristor bridge in an electrically open condition so as to prevent the alternating current from flowing for a predetermined period.

Compression Embedding

Maxwell T. Sandford, II,
Theodore G. Handel, and
Jonathan N. Bradley

This invention provides a method for embedding auxiliary information in the digital representation of host data created by a lossy compression technique. The method applies to data compressed with lossy algorithms based on series expansion, quantization to a finite number of symbols, and entropy coding. Lossy compression methods represent the original data as integer indices having redundancy and uncertainty in value by one unit. Indices that are adjacent in value are manipulated to encode auxiliary data. By a substantially reverse process, the embedded auxiliary data can be retrieved easily by an authorized user. Lossy compression methods use lossless compressions, known also as entropy coding, to reduce to the final size the intermediate representation as indices. The efficiency of the compression entropy coding is increased by manipulating the indices at an intermediate stage.

Puncture Detecting Barrier Materials

Robert E. Hermes, David R. Ramsey, Joseph F. Stampfer, and John M. MacDonald

This invention provides a method and apparatus for continuous real-time monitoring of the integrity of

protective barrier materials, particularly glove box gloves or other barriers that protect against toxic, radioactive, or biologically hazardous materials. Conductivity, resistivity, or capacitance between electrically conductive layers formed in the multilayer protective materials is measured using leads connected to the conductive layers. Continuous monitoring for changes in the measured conductivity, resistivity, or capacitance enables real-time detection and warning of physical breaches in the protective barrier material.

Rock-Melting Tool With Annealer Section

Gilles Y. Bussod, Aaron J. Dick, and George E. Cort

A rock-melting penetrator includes an afterbody that rapidly cools a molten geological structure formed around the melting tip of the penetrator to the glass transition temperature for the surrounding molten glass-like material. An annealing afterbody then cools the glass slowly from the glass transition temperature through the annealing temperature range to form a solid, self-supporting glass casing. This process allows thermally induced strains to relax by viscous deformations as the molten glass cools and prevents fracturing of the resulting glass liner. Both the quality of the glass lining and its ability to provide a rigid impermeable casing in unstable rock formations are improved.

Optical Imaging Through Turbid Media With A Degenerate Four-Wave Mixing Correlation Time Gate

Andrew D. Sappey

Optical imaging through turbid media is demonstrated by means of a degenerate four-wave mixing (DFWM) correlation time gate. Ballistic and/or snake light are detected while rejecting unwanted diffusive light for imaging structures within highly scattering media. DWFDM of a doubled YAG laser in rhodamine 590 provides an ultrafast correlation time gate to discriminate against light that has undergone multiple scattering and therefore has lost memory of the structures in the scattering medium. Images have been obtained of a test cross-hair pattern through highly turbid suspensions of whole milk in water, which are opaque to the naked eye, demonstrating the utility of DFWM for imaging through turbid media. Use of DFWM as an ultrafast time gate for detecting ballistic and/or snake light in optical mammography is discussed.

Composite Metal Membrane

Nathaniel M. Peachey, Robert C. Dye, Ronny C. Snow, and Stephen A. Birdsell

This invention provides a composite metal membrane that is selectively permeable to hydrogen and its isotopes. The membrane includes a layer of tantalum or vanadium, or other Group IVB or Group VB metals, which is sandwiched between two layers of crystallographically oriented palladium, platinum, or alloys of these metals. This invention also provides a process for separating and collecting hydrogen and its isotopes from a mixture of gases, by contacting a hydrogen-containing gaseous mixture with the composite membrane and allowing the hydrogen and its isotopes to selectively diffuse through the membrane.

Detection Of Alkali-Silica Reaction Swelling In Concrete By Staining

George D. Guthrie, Jr. and J. William Carey

Concentrated aqueous solutions of sodium cobaltinitrite and rhodamine B are used to identify concrete that contains gels formed by the alkali-silica reaction, which causes premature degradation of concrete. These reagents present little health or environmental risk,

are readily applied, and rapidly discriminate between two chemically distinct gels: K-rich sodium/potassium/calcium/silicon gels, identified by yellow staining, and alkali-poor, calcium/silicon gels, identified by pink staining. This method is an alternative to conventional petrographic analysis.

Ultrasonic Characterization Of Single Drops Of Liquids

Dipen N. Sinha

Two closely spaced transducers, or alternatively a single transducer and a closely spaced reflector plate, form an interferometer suitable for ultrasonic characterization of droplet-sized and other small liquid samples, without the need for a container. A droplet is held by surface tension between the interferometer elements, whose distance apart may be adjusted, and is ultrasonically excited to generate characteristic acoustic resonance signals. A single drop of liquid is sufficient for high-quality measurement. This invention is useful for example in the characterization, diagnostic evaluation, or forensic analysis of biological samples such as blood, tear drops, and other bodily fluids.

Optical Limiting Materials

Duncan W. McBranch, Benjamin R. Mattes, Aaron C. Koskelo, Alan J. Heeger, Jeanne M. Robinson, Laura B. Smilowitz, Victor I. Klimov, Myoungsik Cha, N. Serdar Sariciftci, and Jan C. Hummelen

Optical limiters, or optical surge protectors, which are useful for protection against the damaging effects of short pulse laser beams and other intense light sources, are formed from ethanofullerenes, fulleroids, or other buckminsterfullerenes which are chemically altered. The addition of large side chains enhances their solubility in liquid solution and in solid blends with transparent glass (SiO_2) gels or polymers, or conjugated polymers. The nonlinear absorption of the blend is tunable by selecting the host material for its absorption wavelength and its ability to transfer absorbed energy into the optical limiting fullerene, such that the energy transmitted through the blends saturates at high input energies over a wide range of wavelengths (from 400-1,100 nm). This phenomenon should be generalizable to compositions other than substituted fullerenes.

Synchronous Differentiation Of Remote Objects

John M. Telle and Roger A. Stutz

This invention provides a system for identifying designated remote objects and distinguishing them from other, similar remote objects. The system includes a transceiver that has a stabilizing oscillator, a synchronous amplifier, and an omnidirectional receiver, all in electrical communication with each other. A beacon is attached to a designated object having a blackbody radiation source, the beacon including an amplitude modulator in electrical communication with an omnidirectional optical source. The amplitude modulator is set so that the optical source transmits radiation at a frequency approximately the same as or lower than that of the blackbody radiation source of the designated object. The receiver of the transceiver is adapted to receive frequencies approximately at or below blackbody radiation signals and sends such signals to the synchronous amplifier. The synchronous amplifier then rectifies and amplifies those signals that correspond to the predetermined frequency to differentiate between the designated, or known, object, and other similar objects also emitting blackbody radiation.

Method And Apparatus For Measuring The Intensity And Phase Of An Ultrashort Light Pulse

Daniel J. Kane and Rick P. Trebino

The pulse shape and phase evolution of ultrashort light pulses are obtained using an instantaneously responding nonlinear optical medium to form a signal pulse. A light pulse, such as a laser pulse, is split into a gate pulse and a probe pulse, where the gate pulse is delayed relative to the probe pulse. The gate pulse and the probe pulse are combined in an instantaneously responding optical medium to form a signal pulse functionally related to a temporal slice of the gate pulse corresponding to the time delay of the probe pulse. The signal pulse is then input to a wavelength-selective device to output pulse field information comprising intensity versus frequency for a first value of the time delay. The time delay is varied over a range of values effective to yield an intensity plot of signal intensity versus wavelength and delay. In one embodiment, the beams are overlapped at an angle so that a selected range of delay times is within the intersection to produce a simultaneous output over the time delays of interest.

Method Of Cleaning Plastics Using Supercritical Media

Samuel P. Sawan, W. Dale Spall, and Abdelhafid Talhi

This invention provides a method for removing organic contaminants from the surface of a plastic, such as polyethylene or polypropylene, by treating the surface with a supercritical medium of carbon dioxide or sulfur hexafluoride, so as to dissolve the contaminant in the supercritical medium and remove it from the plastic. The medium is repeatedly or continuously applied to the plastic surface to effectively remove contaminants, and is returned to non-critical temperatures and pressures to allow the contaminants to be separated and recovered while also allowing the dissolving medium to be purified and recycled.

Multiple Laser Pulse Ignition Method And Apparatus

James W. Early

Multiple laser light pulses with differing temporal lengths and peak pulse powers are used sequentially to regulate the rate and duration of laser energy delivery to fuel mixtures. Fuel ignition performance is improved over a wide range of fuel parameters such as fuel/oxidizer ratios, fuel droplet

size, number density and velocity within a fuel aerosol, and initial fuel temperatures.

Detection Of Counterfeit Currency

Donald A. Burns

Counterfeit currency is detected by contacting a currency to be tested with near-infrared beams in the spectrum below 1,250 nm, measuring reflectance of the near-infrared beams, and comparing the reflectance values with those from genuine currency.

Method For Narrow Gap Laser Welding

John O. Milewski and Edward Sklar

A laser welding process includes the use of optical ray tracing to model a laser beam and the geometry of a narrow metal gap, or joint, to be welded with the laser beam. The resulting model enables prediction of the reflective propagation and absorption of the beam in the metal gap. By adjusting model variables such as frequency, divergence, focal point and angle of incidence of the laser beam, optimum values of such variables can be selected to optimize the quality of a resulting laser weld. The process enables the production of improved narrow gap laser welds with high depth-to-width aspect ratios.

Light Gas Gun With Reduced Timing Jitter

Gary W. Laabs, David J. Funk, and Blaine W. Asay

A gas gun includes a prepressurized projectile held in place with a glass rod in compression. The glass rod is destroyed with an explosive at a precise time, which results in removal of a restraining pin and launching of the projectile with minimum timing variability.

Water-Soluble Polymers For Recovery Of Metal Ions From Aqueous Streams

Barbara F. Smith and Thomas W. Robison

This invention provides a process for selectively separating a target metal from an aqueous solution. The separation is achieved by mixing an aqueous solution containing the target metal in with an aqueous solution that includes a water-soluble polymer, such as polyethyleneimine, capable of binding with the target metal long enough to form a water-soluble polymer target metal complex. The water-soluble polymer target metal complex is then separated from the solution.

Noninvasive Identification Of Fluids By Swept-Frequency Acoustic Interferometry

Dipen N. Sinha

This invention provides a method for rapidly and noninvasively identifying and monitoring chemicals in sealed containers or in containers to which direct access to the chemical is not possible. Multiple ultrasonic acoustic properties (up to four) of a fluid are simultaneously determined. This invention can be used for identifying chemicals and for determining changes in known chemicals resulting from a variety of causes. It is not possible to identify all known chemicals based on the measured parameters, but known classes of chemicals in suspect containers, such as those used in chemical munitions, can be characterized. In addition, a large number of industrial chemicals can be identified.

Laser Ablation-Based Fuel Ignition

James W. Early and Charles S. Lester

A fuel/oxidizer mixture is ignited by applying a laser beam to a material surface that absorbs laser radiation, heating the material surface with the laser beam to produce an ablation plume that emanates from the heated surface

as a hot cloud of vaporized surface material, and contacting the fuel/oxidizer mixture with the hot ablation cloud at or near the surface of the material to heat the mixture to a temperature sufficient to initiate ignition.

Data Storage Medium For Focused Ion Beam Micromilling

Bruce C. Lamartine
and Roger A. Stutz

This invention provides a durable metallic data storage medium for use with an ultrahigh vacuum focused ion beam micromilling apparatus. The medium is milled to include characters having a high aspect ratio so as to enable long-term storage of data as well as graphical shapes or characters.

Compression Embedding

Maxwell T. Sandford, II,
Theodore G. Handel, and
Jonathan N. Bradley

This invention provides a method and apparatus for embedding auxiliary information in the digital representation of host data created by a lossy compression technique, and a method and apparatus for constructing auxiliary data from the correspondence between values in a digital key-pair table with integer index values existing in a representation of host data created

by a lossy compression technique. The methods apply to data compressed with algorithms based on series expansion, quantization to a finite number of symbols, and entropy coding. Lossy compression methods represent the original data as ordered sequences of blocks containing integer indices having redundancy and uncertainty of value by one unit, allowing indices that are adjacent in value to be manipulated to encode auxiliary data. Also included is a method to improve the efficiency of lossy compression methods by embedding white noise in the integer indices. Such compression methods use lossless compression to reduce an intermediate representation to a final size as indices. The efficiency of the lossless compression, known also as entropy-coding compression, is increased by manipulating the indices at the intermediate stage, improving the performance of lossy compression by as much as ten percent.

Fluidized Bed Deposition Of Diamond

Joseph R. Laia, Jr., David W. Carroll, Mitchell Trkula, Wallace E. Anderson, and Stephen M. Valone

This invention provides a process for forming a diamond or diamond-like coating on a particulate substrate. The substrate is supported in a fluidized bed of host particles while the diamond or

diamond-like coating is formed by chemical vapor deposition from a carbon-containing precursor gas mixture that is passed through the bed. The precursor gas mixture typically includes a carbon source gas, for example methane, in a carrier of hydrogen, and may further include an inert diluent gas. The precursor mixture is introduced into the fluidized bed under conditions of temperature and pressure, and with both thermal and high frequency plasma excitation, which result in excitation conditions sufficient to form the diamond coating.

Dense Gas Compatible Enzymes

Fu-jung Kao, Kenneth E. Laintz,
Samuel P. Sawan, L. Dale Sivils,
and W. Dale Spall

A modified enzyme, such as a lipase, protease or cellulase, has improved compatibility with dense gas phase systems, particularly including halocarbon systems and supercritical carbon dioxide systems. The enzyme is modified by addition of a covalently linked hydrophobic arm, which increases the compatibility of the enzyme with the dense gas system without diminishing the activity of the enzyme.

Prolonged Cold Storage Of Red Blood

Mark W. Bitensky and
Tatsuro Yoshida

A cost-effective, 4°C storage procedure preserves red blood cell quality and prolongs post-transfusion in-vivo survival. Improving in-vivo survival time and preserving adenosine triphosphate levels, along with reducing hemolysis and membrane vesicle production of red blood cells stored at 4°C for prolonged periods, is achieved by reducing the oxygen level in the blood at the time of storage. Oxygen levels are reduced by flushing the cells with an inert gas and storing them in an aqueous solution that includes adenine, dextrose, mannitol, citrate ion, and dihydrogen phosphate ion, but no sodium chloride, in an oxygen-permeable container located in an oxygen-free environment containing oxygen-scavenging materials.

Compact Chemical Energy System For Seismic Applications

Raymond P. Engelke, Robert O. Hedges, Alan B. Kammerman, and James N. Albright

This invention provides a chemical energy system for producing detonations in a confined environment. An explosive mixture is formed from nitromethane (NM) and diethylenetriamine (DETA). A

slapper detonator is arranged adjacent to the explosive mixture to initiate detonation of the mixture. NM and DETA are not classified as explosives when handled separately and can be safely transported and handled by workers in the field. In one aspect of this invention, the chemicals are mixed at a location where an explosion is to occur. For application in confined environment, the chemicals are mixed in an inflatable container to minimize storage space until it is desired to initiate an explosion. To enable an inflatable container to be used, at least 2.5 wt percent DETA is used in the explosive mixture. A barrier is formed of a carbon composite material to provide the appropriate barrel geometry and energy transmission to the explosive mixture from the slapper detonator system.

High Performance Parallel Interface To Synchronous Optical Network Gateway

Wallace B. St. John and David H. DuBois

Formatted data signals are transmitted along sending and receiving systems having gateways for high performance parallel interface (HIPPI) interconnection systems. Electronic logic circuitry formats data signals and overhead signals in a data frame that is suitable for transmission over a connecting optical fiber link. Multiplexers route the data and overhead

signals to a framer module. The framer module allocates the data and overhead signals to multiple nine-byte words, which are arranged in a selected protocol. The formatted words are stored in a storage register for output through the gateway.

Fuel Cell With Metal Screen Flowfield

Mahlon S. Wilson and Christine Zawodzinski

A polymer electrolyte membrane fuel cell includes a metal mesh defining a rectangular flow field pattern having an inlet at one corner and an outlet at another corner located diagonally from the first corner. The mesh supplies reactants to membrane surfaces in the fuel cell. All flow paths from the inlet to the outlet over the mesh are equivalent, such that the reactant is uniformly distributed over the catalyzed membrane assembly.

Polymers With Increased Order

Samuel P. Sawan, Abdelhafid Talhi, and Craig M. Taylor

This invention provides a method for increasing the order of polymeric materials, particularly synthetic fibers, by exposing such materials to supercritical carbon dioxide or other dense gas systems while applying an orienting force to the materials.

Reduction Of Diffusional Defocusing In Hydrodynamical L y Focused Fl ows

Rhett L. Affleck, James N. Demas, Peter M. Goodwin, Richard A. Keller, and Ming Wu

An analyte fluid stream with a first molecular species having relatively low molecular weight and a corresponding high coefficient of diffusion has reduced diffusional defocusing out of an analyte fluid stream. The analyte fluid stream of the first molecular species is associated with a second molecular species of relatively high molecular weight having a relatively low coefficient of diffusion and a binding constant effective to associate with the first species. A focused analyte fluid stream is maintained because the combined molecular weight of the associated first and second molecular species is effective to minimize diffusion of the first species out of the analyte fluid stream.

Hydrostatic Extrusion Of Copper-Sil ver Mel t Spun Ribbon

Mary Ann Hill, John F. Bingert, Sherri A. Bingert, and Dan J. Thoma

A high-strength and high-conductance copper and silver conductor is produced by combining a prede-

termined ratio of copper with silver to produce a composite material. This material is melt-spun to produce a ribbon of copper and silver. The ribbon is heated in a hydrogen atmosphere and then die-pressed into a slug. The slug is placed in a high-purity copper vessel, and the vessel is sealed with an electron beam. A cold hydrostatic extrusion process is used to extrude the vessel and slug into wire form.

Smart Tool Hol der

Robert D. Day, Larry R. Foreman, Douglas J. Hatch, and Mark S. Meadows

An apparatus for machining surfaces to accuracies in the nanometer range utilizes an electrical current flowing through the contact of the cutting tool to the workpiece to provide a feedback signal which controls the depth of the cut.

Radial El ectron-Beam-Breakup Transit-Time Oscil lator

Thomas J. T. Kwan and Michael A. Mostrom

A radial electron beam breakup transit time oscillator (RBTO) provides a compact high-power microwave generator. The RBTO includes a coaxial vacuum

transmission line having both an outer and an inner conductor. The inner conductor defines an annular cavity whose dimensions can support an electromagnetic field in a TEM_{0om} mode. A radial field emission cathode is formed on the outer conductor for providing an electron beam directed toward the annular cavity electrode. Microwave energy is then extracted from the annular cavity electrode.

Minimizing Radiation Damage In Nonl inear Optical Crystal s

D. Wayne Cooke, Bryan L. Bennett, and Nigel J. Cockcroft

Laser-induced damage to nonlinear crystals, such as potassium titanyl phosphate crystals, is minimized by electrically grounding the crystals to diffuse electrical discharges in the crystals caused by an incident laser beam. In certain embodiments, electrically conductive material is deposited onto or into surfaces of the nonlinear crystal, and the electrically conductive surfaces are connected to an electrical ground. To minimize electrical discharges on crystal surfaces that are not covered by the grounded electrically conductive material, a vacuum may be created around the nonlinear crystal.

Blue, Green, Orange, And Red Upconversion Laser

Ping Xie and Timothy R. Gosnell

A laser which produces visible light at wavelengths in the blue, green, orange, and red ranges is formed by doping a substrate, such as an optical fiber or waveguide, with Pr^{3+} ions and Yb^{3+} ions. A light pump such as a diode laser is used to excite these ions into energy states that will produce lasing at the desired wavelengths. Tuning elements such as prisms and gratings are used to select desired wavelengths for output.

Royal ty Recipients

Allander, Krag

Patent:

Single and Double Grid Long
Range Alpha Detectors

Patent:

Radon Detection

Patent:

Background Canceling Surface
Alpha Detector

Bigio, Irving

Patents (2):

Apparatus and Method for
Topographic Spectroscopic
Analysis

Birdsell, Stephen A.

Patent:

Composite Metal Membrane

Bitensky, Mark

Patent:

Method Using CO for
Extending the Useful Shelf-
Life of Refrigerated Red Blood
Cells

Patent:

Method Using Oxygen
Removal for Extending The
Useful Shelf-Life of
Refrigerated Red Blood Cells

Patent:

Prolonged Cold Storage of Red
Blood Cells By Oxygen
Removal and Additive Usage

Bolton, Richard D.

Patent:

Event Counting Alpha Detector

Patent:

High Gas Flow Alpha Detector

Bounds, John

Patent:

Radon Detection

Patent:

Fan-Less Long Range
Alpha Detector

Patent:

Background Canceling Surface
Alpha Detector

Patent:

High Gas Flow Alpha Detector

Bradley, Jonathan

Patent:

Storage and Retrieval of Large
Digital Images

Buchwald, Melvin I.

Patent:

Fluorescent Refrigeration

Buican, Tudor N.

Patent:

Laser Particle Sorter

Patent:

Method and Apparatus for
Simultaneously Measuring a
Plurality of Spectral
Wavelengths Present In
Electromagnetic Radiation

Butterfield, Kenneth

Copyright:

NAVI-2 Version: 4.00

Carey, James William

Patent:

Detection of Alkali-Silica
Reaction Swelling in Concrete
by Staining

Patent:

Detection of Concrete
Deterioration by Staining

Cole, Dean

Patent:

Method Using 5, 10, 15, 20 -
Tetrakis (4- Carboxyphenyl)

Porphine For Detecting and Treating Cancers of the Lung

Patents (2):

Method of Using 5, 10, 15, 20 - Tetrakis (4-Carboxyphenyl) Porphine For Detecting Cancers of the Lung

Patent:

Method of Using 5, 10, 15, 20 - Tetrakis (4-Carboxyphenyl) Porphine For Treating Cancers of the Lung

Cole, Roger

Copyright:

EPICS Version 3.8

Cucchiara, Alfred L.

Patent:

Long Range Alpha Particle Detector

Dalesio, L. Robert

Copyright:

EPICS Version 3.8

Davies, Mathew

Copyright:

SPECTRA Version: 3.0

Dye, Robert C.

Patent:

Composite Metal Membrane

Eaton, Cynthia

Copyright:

EPICS Version 3.8

Edwards, Brad

Patent:

Fluorescent Refrigeration

Ehler, Deborah Sue

Patent:

Water-Soluble Polymers for Recovery of Metals from Solids

Epstein, Richard I.

Patent:

Fluorescent Refrigeration

Faber, Vance

Patent:

Digital Color Representation

Patent:

Population Attribute Compression

Gohdes, Joel W.

Patent:

Water-Soluble Polymers and Composition Thereof

Gosnell, Timothy

Patent:

Fluorescent Refrigeration

Guthrie, George D. Jr.

Patent:

Detection of Alkali-Silica Reaction Swelling In Concrete By Staining

Patent:

Detection of Concrete Deterioration by Staining

Hill, Jeffrey O.

Copyright:

EPICS Version 3.8

Howat, Andrew

Copyright:

SABRINA Version 3.63

Huchton, Roger L.

Patent:

Long Range Alpha Particle Detector

Jason, Andrew

Patent:

Seal Device for Ferromagnetic Containers

Johnson, Jeffrey R.

Copyright:

SABRINA Version 3.63

Kelley, Thomas

Copyright:

PC/FRAM Version: 2.1C

Kerstiens, Debora

Copyright:

EPICS Version 3.8

Kozubal, Andrew

Copyright:

EPICS Version 3.8

Kress, Joel

Copyright:

CLSMAN (CLuSter MANipulator) Version: 2.0

Lamartine, Bruce

Patent:

Ultra High Vacuum Focused Ion Beam Micromill and Articles Therefrom

Patent:

Depth Enhancement of Ion Sensitized Data

Loree, Thomas R.

Patents (2):

Apparatus and Method for Topographic Spectroscopic Analysis

MacArthur, Duncan

Patent:

Long Range Alpha Particle Detector

Patent:

Alternating Current Long Range Alpha Particle Detector

Patent:

Single and Double Grid Long Range Alpha Detectors

Patent:

Radon Detection

Patent:

Fan-Less Long Range
Alpha Detector

Patent:

Background Canceling Surface
Alpha Detector

Patent:

Event Counting Alpha Detector

Marrone, Babetta

Patent:

Optical Probe for the
Cytochrome P-450 Cholesterol
Side Chain Cleavage Enzyme

Martin, John C.

Patent:

Laser Particle Sorter

Patent:

Method and Apparatus for
Simultaneously Measuring a
Plurality of Spectral
Wavelengths Present in
Electromagnetic Radiation

Martin, Richard A.

Patent:

Acoustic Cryocooler

McAtee, James L.

Patent:

Long Range Alpha Particle
Detector

Patent:

Alternating Current Long
Range Alpha Particle Detector

Meyer, Ross

Patent:

Magnetic Gripper Device

Patent:

Seal Device for Ferromagnetic
Containers

Migliori, Albert

Patent:

Intrinsically Irreversible Heat
Engine

Murray, William S.

Copyright:

NAVI-2 Version: 4.00

Peachey, Nathaniel

Patent:

Composite Metal Membrane

Radebaugh, Ray

Patent:

Acoustic Cryocooler

Rawool-Sullivan, Mohini

Patent:

High Gas Flow Alpha Detector

Robison, Thomas W.

Patent:

Water-Soluble Polymers and
Composition Thereof

Patent:

Water-Soluble Polymers for
Recovery of Metals from Solids

Patent:

Process for the Displacement
of Cyanide Ions from Metal
Cyanide Complexes

Patent:

Water-Soluble Polymers for
Recovery of Metal Ions From
Aqueous Streams

Rodgers, John

Patent:

Apparatus Having Reduced
Background for Measuring
Radiation Activity in Aerosol
Particles

Patent:

Quick-Change Filter Cartridge

Saltzman, Jeffrey S.

Patent:

Digital Color Representation

Patent:

Population Attribute
Compression

Sampson, Thomas E.

Copyright:

PC/FRAM Version: 2.1C

Sauer, Nancy N.

Patent:

Water-Soluble Polymers for
Recovery of Metals from Solids

Saunders, George

Patent:

Fingerprint Detection

Shera, Brooks

Patent:

Ordered Transport and
Identification of Particles

Simpson, Daniel J.

Patent:

Optical Probe for the
Cytochrome P-450 Cholesterol
Side Chain Cleavage Enzyme

Smith, Barbara F.

Patent:

Water-Soluble Polymers and
Composition Thereof

Patent:

Water-Soluble Polymers for
Recovery of Metals from Solids

Patent:

Process for the Displacement
of Cyanide Ions from Metal
Cyanide Complexes

Patent:

Water-Soluble Polymers for
Recovery of Metal Ions from
Aqueous Streams

Snow, Ronny C.*Patent:*

Composite Metal Membrane

Stanciu, Nikolai*Copyright:*CLSMAN (CLuSter
MANipulator) Version: 2.0**Strobl, Karlheinz***Patents (2):*Apparatus and Method for
Topographic Spectroscopic
Analysis**Stutz, Roger***Patent:*Ultra High Vacuum Focused
Ion Beam Micromill and
Articles Therefrom**Swift, Gregory W.***Patent:*Intrinsically Irreversible Heat
Engine*Patent:*

Acoustic Cryocooler

Terwilliger, Tom C.*Copyright:*

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Copyright:

SOLVE Version: 1.0

Unkefer, Clifford J.*Patent:*Optical Probe for the
Cytochrome P-450 Cholesterol
Side Chain Cleavage Enzyme**Unruh, Wes***Patent:*Long Range Alpha Particle
Detector**Van Riper, Kenneth A.***Copyright:*

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Voter, Arthur F.*Copyright:*CLSMAN (CLuSter
MANipulator) Version: 2.0**Walker, Robert B.***Copyright:*CLSMAN (CLuSter
MANipulator) Version: 2.0**West, Jim***Copyright:*

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Whaley, Thomas W.*Patent:*Optical Probe for the
Cytochrome P-450 Cholesterol
Side Chain Cleavage Enzyme**Wheatley, John C.***Patent:*Intrinsically Irreversible
Heat Engine**White, James M.***Patent:*

Digital Color Representation

*Patent:*Population Attribute
Compression**Windl, Wolfgang E.***Copyright:*CLSMAN (CLuSter
MANipulator) Version: 2.0**Wolf, Michael A.***Patent:*Long Range Alpha Particle
Detector**Yamada, Ted***Copyright:*

HOTMAC/RAPTAD

Yoshida, Tatsuro*Patent:*Method Using CO for
Extending the Useful Shelf-
Life of Refrigerated Red Blood
Cells*Patent:*Method Using Oxygen
Removal for Extending the
Useful Shelf-Life of
Refrigerated Red
Blood Cells*Patent:*Prolonged Cold Storage of Red
Blood Cells by Oxygen
Removal and Additive Usage

Distinguished Awards

Distinguished Patent Award

This award honors patent recipients whose technologies exhibit outstanding innovation. The Laboratory's patent attorneys and representatives from the Civilian and Industrial Technology Program Office rate all issued patents and submit the ten highest rated to a committee of Laboratory Fellows. The Fellows decide which patent is most distinguished based on technical advance, benefit of the invention to the mission of the Laboratory, and adaptability of the invention to public uses.

Distinguished Copyright Award

This award honors the author(s) of disclosed copyrighted materials determined to be extraordinary by a selection committee of nine members who represent the Licensing Program, the Intellectual Property Management Group, the Business and Patent Law Office, and Civilian and Industrial Technology Program Office Management. The six highest rated materials nominated by members of the committee were reviewed for final determination based on potential commercial applications, programmatic impact, and potential to enhance the reputation of the University of California and the Laboratory. In addition, if the copyrighted material is software, selection is based on whether the DOE requirements for distribution have been met.

Distinguished Licensing Award

This award honors innovators who have effectively used the Laboratory's Licensing Program to license their technologies. The award is determined by a selection committee of nine members who represent the Licensing Program, the Intellectual Property Management Group, the Business and Patent Law Office, and Civilian and Industrial Technology Program Office Management. The five innovators nominated by members of the committee are reviewed for final determination based on the number of technologies licensed, the number of licenses per technology, the individual's support of multiple uses of their technologies (DOE/programs/commercialization), the individual's promotion of their technologies, the extent to which the individual actively engages in the licensing process, and the contribution the licensing activities make to the enhancement of the University of California's and the Laboratory's reputation.

Entrepreneur of the Year

This award honors individuals who have successfully started and managed, or contributed significantly to the development of, a Northern New Mexico business based on a Los Alamos relationship. Nominees may be current or former employees or have a licensed technology from the Laboratory. The award recipient exhibits the

characteristics of successful entrepreneurship, such as risk taking, strong personal commitment, and creative thinking and ingenuity. The honoree has conducted business relationships with the highest integrity and has served as an inspirational role model in encouraging others to engage in entrepreneurial activities that contribute to the Northern New Mexico economy.

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