

# Technology Transfer Opportunities



## USGS Technology Patents and Pending Patents Available for Licensing

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Patents and pending patents for technologies and inventions developed by the U.S. Geological Survey (USGS) are listed below. Pending patents are identified by asterisks.

Additional information is available on:

--Licensing and License Opportunities

--Participating in the Cooperative Research and Development Agreement (CRADA) program

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**\*Fluid Controlled Isokinetic Fluid Sampler (Patent application no. 08/571,645)**--A means for obtaining a sample of flowing fluid, and material suspended within the fluid, from a flow stream so that the concentration of contaminants in the flow stream can be measured. The device can be used to sample rivers or effluents from industrial or waste water treatment plants. The sample enters the device at a flow rate equal to that of the flow stream, so that the concentration of contaminants in the sample is representative of the concentration in the flow stream.

**\*Electrochemical Technique for Introduction and or Redistribution of Ionic Species into the Earth (Patent application no. 08/476,926, a division of patent application no. 08/169/234)**--A process for introducing and distributing selected ions into hazardous waste for remediation purposes or to change soil properties. The process can be applied to immobilize elemental contaminants or can be used to provide nutrients to biologically active organisms for waste remediation.

**Rotary Seismic Shear-Wave Source**

**(Patent no. 5,483,026, January 3, 1996)**--A device to generate seismic shear waves of greater depth of penetration than can be obtained with conventional shallow-depth sources. The general field of application is in the study of geology to depths of 100 meters in the crust through the use of longitudinal (P) and shear (S) seismic waves. The rotary source can produce both P and S waves; the S waves are generated readily in 12 different directions of propagation.

**Wireline-Powered Inflatable Packer System for Controlling the Movement of the Fluid in Deep Boreholes and Wells (Patent no. 5,404,831, April 11, 1995)**--An easy to use, electrically-powered, low current, inflatable flow concentrator or packer device that can be powered through a geophysical logging cable. The device can be used with a borehole flowmeter, fluid pressure probes, or other similar instruments.

**Enzymatic Reduction and Precipitation of Uranium (Patent no. 5,324,491, June 28, 1994)**--A microbial process for removing uranium from contaminated ground and surface water. The active microbes metabolize uranium from

soluble to insoluble form, concentrating the uranium and then removing it from water. The microbial process is also useful for treating mixed organic uranium wastes because it reduces organic wastes to carbon dioxide. The process can also be used for in situ remediation of contaminated soils.

**Selenate Removal from Waste Water (Patent no. 5,271,831, Dec. 21, 1993)**--A method and apparatus for removing selenate from waste water through the use of selenate respiring microorganisms under substantially anoxic conditions. The method includes a first zone for removing nitrate by assimilation into biomass and a second zone where selenate is respired.

**Deep-Well Thermal Flowmeter (Patent no. 5,226,333, July 13, 1993)**--A highly accurate device for rapidly measuring very slow fluid flow in wells. The probe is modularly constructed to permit easy reconfiguration, service, and repair. It has no moving parts to jam or wear out. Signals from the probe are not affected by stray electrical currents in the ground surrounding the well. The probe is well suited for measuring in situations where long cables are involved, as well as in

high-pressure environments.

**Laser Goniometer (Patent no. 5,189,799, Mar. 2, 1993)**--An apparatus for sighting along geologic features. The goniometer permits the operator to orient a collimated laser beam to determine the attitude of a feature directly. It also provides an electronic means of measuring and recording the strike and dip of a feature.

**Apparatus for Sampling Pesticide Residues in Runoff with Control of Sample Pump and Distributor Valve (Patent no. 5,167,802, Dec. 1, 1992)**--A device for automatically collecting water samples from rivers and streams for pesticide testing. The sample is pumped immediately through a cartridge that extracts and retains organic contaminants. The sampling materials are inert to prevent contamination. Once the sample is taken it is chemically stable and resists degradation. Because this device can take multiple samples without human intervention, the special handling of field sampling units is no longer necessary.

**Distillation Irrigation (Patent no. 5,067,272, Nov. 26, 1991)**--A low-energy distillation process using solar energy to inexpensively and effectively purify saline water for use on row crops in arid and semiarid regions. The apparatus consists of a dark plastic lower sheet covered by a clear plastic upper sheet in the form of an inverted "V." Saline water is ponded on the dark sheet, evaporates and is distilled through the action of sunshine, gathers at the top of the "V," and runs down the sides of the clear plastic sheet to be deposited directly along crop rows.

**Selenate Removal from Waste Water (Patent no. 5,009,786, Apr. 23, 1991)**--A microbial method for restoring water or soil quality in areas that have been affected by agricultural drainage waters containing naturally occurring selenium. The process first requires lowering nitrate concentrations that prevent the microbial degradation of selenium. The selenium in drainage water is then broken down under anaerobic conditions.

**Soapfilm Flowmeter Device (Patent no. 4,914,955, Apr. 10, 1990)**--A device that can easily measure gas-flow rates over a wide range of gas pressures in a variety of applications. It uses a simple

nonapertured flow tube and photoelectric measuring means to improve the accuracy and convenience of gas-flow measurement.

**Fiber Optic Current Meter with Plastic Bucket Wheel (Patent no. 4,840,062, June 20, 1989)**--A flow measurement device that incorporates a lightweight plastic bucket wheel with a fiber optic head counting system to transmit velocity signals. The design of the meter allows it to be used in a variety of flow conditions such as under ice-covered rivers and in deep, shallow, slow, or swift streams.

**Solid State Apparatus for Imaging with Improved Resolution (Patent no. 4,765,564, Aug. 23, 1988)**--A means for improving the quality of a remotely-sensed image without requiring a larger image size, more picture elements (pixels), or more wave bands. The pixels are offset to form subpicture elements, depending on the number of wave bands involved. This requires processing a larger number of pixels, but by using modern computer capabilities, more information can be gathered from a remotely-sensed image without significant increase in costs.

**Method and Apparatus for Steady State Measurement of Liquid Conductivity in Porous Media (Patent no. 4,679,422, July 14, 1987)**--A device that reduces the time required to measure permeability and increases the ability to judge the permeability of fine media with minimal accuracy loss. The device substitutes centrifugal force for the traditional use of gravitational force to achieve the steady-state flow needed for permeability determinations.

**General Earthquake Observation System--(GEOS) (Patent no. 4,604,699, Aug. 5, 1986)**--A portable, computerized system for monitoring, recording, and transmitting a wide variety of seismic signals. It can be used for general seismic data acquisition. The system uses English-language-driven interactive operating commands. It features a high dynamic range and a wide frequency response for studying strong-motion structural response, after-shock, reflection-refraction, teleseismic and near-surface seismic exploration, hydrofrac, and free oscillation

investigations.

**In Situ Tritium Borehole Probe for Measurement of Tritium (Patent no. 4,464,338, Aug. 7, 1984)**--A device for measuring tritium, a radioactive waste product of nuclear power production, in ground water deep within the Earth. The system measures only tritium, not naturally-occurring gamma radiation. It is sensitive enough to measure very low levels of tritium. The tritium-counting device operates automatically to change water samples and ensure total program evaluation sequence.

**Method and Apparatus for Obtaining a Core at In Situ Pressure (Patent no. 4,317,490, Mar. 2, 1982)**--A device for gathering core samples of unconsolidated materials at in situ pressure so their bearing strength can be determined for oil and gas production purposes. Conventional devices cannot successfully sample such materials. The accompanying procedure allows the operator to take samples at various depths without having to pull the drill bit out of the well bore. This is particularly important when coring below a deep body of water, such as an ocean.

**Automated Satellite Mapping System (Patent no. 4,313,678, Feb. 2, 1982)**--A system for automatically mapping the surface of a celestial body using two or three linear sensing photograph detector arrays mounted on a satellite with a near polar sun-synchronous orbit. The two arrays produce data that, when correlated, represent elevation information. This system allows instant planimetric and topographic mapping in a variety of spectral bands.

**Sample Mount for X-Ray Diffraction (Patent no. 4,278,883, July 14, 1981)**--A metal membrane mount for sample analysis in an X-ray diffractometer. This mount provides a fast, accurate means for analyzing clays minerals analysis. Unlike other mounting systems, this system produces flat, even, and reusable samples.

**Precision Drafting Instrument (Patent no. 4,222,693, Sep. 16, 1980)**--An instrument for scribing small dots on a drafting medium, with particular applications in map and technical drawing reproduction. The penetration depth of the cutter is limited to prevent damage to

the drafting film. User safety features and energy conservation devices are also incorporated in the design.

**Eolian Sand Trap (Patent no. 4,199,974, Apr. 29, 1980)**--A device made of a rotating trap housing for capturing and measuring airborne particles. Its design, low in aerodynamic resistance, permits less sand loss and thus assures more accurate measurements than prior sand traps. In combination with telemetry equipment, the device also can instantaneously weigh the collected sand.

**System for Producing Orthophotographs (Patent no. 4,170,415, Oct. 9, 1979)**--A system for digitizing and printing stereo pairs of aerial terrain photographs in a format that requires little data storage and allows for line-by-line editing of the scanned image. The digital data are used to control the exposure of a photosensitive sheet in a printing device for producing orthophoto maps.