Solid Phase Microextraction (or SPME) is a method of enhancing sample concentration by selective diffusion of sample components onto a treated fiber contained inside of a syringe needle. The needle is then injected into a gas or liquid chromatograph where the analyte is thermally desorbed into the analyzer. This method is very sensitive, but not highly quantitative.

APL’s patented device provides an enhancement to the SPME device which improves collection of the analyte by causing the sample to flow concentric to the SPME fiber, reducing diffusion distances and decreasing the time to acquire a sample for analysis. This enhancement allows control of the quantity of sample carrier, thus allowing the use of SPME in a quantitative fashion.
Arcing faults are sustained luminous discharges of electrical power in power supply systems. These discharges conduct sufficient current to sustain an arc, but remain below the trip threshold of circuit breakers. They typically start as inline high-resistance caused by a dirty or loose connection; the heat from the faulty connection eventually melts the connection causing an in-line arc. The in-line arc then jumps phase to generating temperatures over 20,000° which consumes the switchgear within seconds.

APL’s patented arc fault detection sensor integrates a photodetector, a pressure detector, and an accelerometer into an integrated module for detection of arcs and an enhanced discrimination against false alarms.
Hydrophones are acoustic transducers which detect and convert acoustic signals into electrical impulses. These impulses are then transmitted by radio waves to a distant receiver. Hydrophone arrays are loaded onto sonobuoys and dropped by airplane into the ocean. They are then used to detect and track submarines over vast areas of ocean.

APL’s patented technology is a **collapsible hydrophone array support system** which maintains the deployed array in a predetermined configuration.
Acoustic sensors typically utilize expensive accelerometers to provide directional information about acoustic signals.

APL’s patented acoustic sensing system provides directional information about acoustic signals at a lower cost. APL’s system comprises multiple parallel hydrophone units, assembled in a cylindrically symmetric, spatial relationship with each other.
Noise generated by distant merchant ships and tankers has a negative impact on the performance of low frequency, passive sonars.

APL’s patented sonar system, which is comprised of hydrophone units, mitigates clutter from shipping noise while maximizing detection range and minimizing processor demand. The system is affordable and deployable from air or surface platforms.
Aerosols of biological origin represent a potential threat of infection by pathogens. This threat is particularly daunting in the context of closed spaces, such as buildings. Most biological detectors incorporate fluorescence as a means for detecting the presence of a biological aerosol. Although fluorescence is a relatively simple approach, its major disadvantage is low selectivity for bioaerosols of interest.

APL’s patented apparatus utilizes luminescence spectroscopy to detect bioaerosols. It exploits the time delay of phosphorescence emission signals such that time-resolution is used as a discriminator between samples that fluoresce versus those that phosphoresce.
Electronic products have markings that identify performance and the particular part type and when it was made. Counterfeiting and parts substitution are rampant in the industry. Unscrupulous individuals, companies, and even nations are substituting lesser quality parts or parts with known flaws on the unsuspecting customer.

APL’s patented technology is a method of authenticating the origin, commercial source or supplier of a given product. APL’s method utilizes a molecularly imprinted polymer (MIP) and is particularly well adapted to electronics packages. MIPs patterns are like finger prints except they can not be detected or copied without knowing the key. Selectively these polymers can be embedded within the epoxy molding compound or cases used to encapsulate the products-thus producing distinct invisible patterns and codes which can later be revealed by using specific chemical treatments and observation methods.
Biometrics utilizes intrinsic physical modalities (e.g., *thumbprint*, *iris*, *voice patterns*) to identify or verify an individual’s identity. Multi-biometric fusion combines the results of multiple modality measurements to increase the performance of a biometric system. Current systems treat each modality equally, using, for example, simple score summing. This results in error rates making large-scale operation difficult.

APL’s patented system improves the matching performance of existing multi-biometric systems by taking advantage of the relative utility of the various biometric modalities and the *quality* of each measurement. The system utilizes a Bayesian Belief Network fusion engine, thus significantly lowering error rates and making large-scale biometric identifiers more feasible.
Wireless Networks with Quality of Services (QoS) guarantees generally require a dedicated or central control node to provide access control to channel resources in the network. Mobile Ad-hoc Networks (MANET) must use decentralized Medium Access Control (MAC) methods such as Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) MAC. CSMA/CA and other decentralized basic contention based MAC methods can not provide QoS guarantees for MANET.

APL patented a fully decentralized Medium Access Control (MAC) method to allow mobile nodes to self-organize and collaborate in forming four hops clusters where many nodes participate in managing the resources of a single channel by partitioning the bandwidth into alternating Contention Periods (CP) and Contention Free Periods (CFP) that occur at regular interval. D²QMAC supports cluster merge and split events and full integration of CSMA/CA and Time Division multiplexing to improve QoS support in MANET.
During a mass casualty event, large numbers of people sustain injuries of different types and severities. Therefore, triage (assigning treatment priority) is essential so that all injured people can be helped as quickly and effectively as possible. Current systems use colored paper triage tags that lack the ability to continuously monitor and locate patients.

APL’s patented device is an electronic triage tag that monitors vital sign data, stores and processes these data, sends an alert based on detection of significantly worsening conditions in the patient, tracks patient location, and initiates and establishes communications links with remote network devices, thereby improving the speed and efficiency of first responders helping large numbers of patients.
The objective of this invention is to realize the benefits of polarimetric data from a satellite-borne imaging radar using simpler flight hardware than would be required by the conventional approach.

Polarimetry is beneficial because it provides data that allow interpretation of radar backscatter mechanisms, thus differentiating reflections from volumetric frozen volatiles (e.g. ice) in contrast to solid random surfaces, for example.

APL’s patented, game-changing, hybrid-polarimetric synthetic aperture radar architecture (transmitting circular polarization while receiving two orthogonal linear polarizations) for the Mini-RF instruments on India’s Chandrayaan-1 and NASA’s LRO were the first polarimetric imaging radars outside of Earth orbit.