

# technology TODAY

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## Guardian Fish

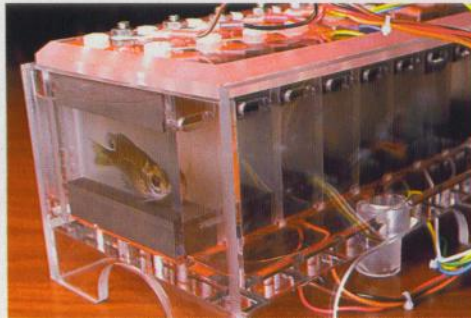
Our biosphere is the life zone and incubator for all the living organisms that inhabit our planet. It includes Earth's atmosphere, land, soil, active geology, oceans, lakes, and streams. Simply put, it comprises the natural super-sized and balanced aquariums, terrariums, and bird sanctuaries that are indigenous to our planet. When a life zone changes, the living organisms that live within that zone must change or face extinction. If the change were sudden and catastrophic, our planet and its inhabitants would face mass extinction.

Small dynamic changes in a local environment can stress the living inhabitants of that ecosystem. In some regions, aquatic creatures currently experience mutations that threaten their very survival. In a sense, frogs have warned human populations in some locations of the danger of pollution. Here "ribbit" has been replaced by silence, because of the local extinction of the frog population.

Animals can serve as an early warning system to tell people that the water they drink or the air that they breathe isn't safe. Until the late 1980s, coal miners used canaries and mice as living biosensors to determine whether underground air was safe to breathe. A silent bird swaying on its perch, as if it was intoxicated, signaled the need to run for your life.

The goal of monitoring an environment is to find and correct hazardous pollutants before they can

endanger the local population. The U.S. Army Center for Environmental Health Research has recently developed a basic biosensor system that determines the safety of water by monitoring the behavior of bluegill fish. (See Photo 1.) The Plexiglas®



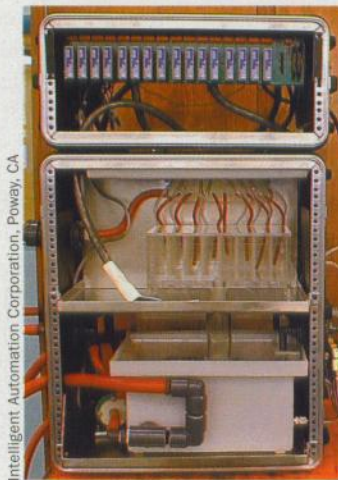
U.S. Army Center for Environmental Health Research

Photo 1

tank in the illustration can contain up to 16 chambers and the sensor in each cell is designed to measure fish activities, including normal behavior involving general body movement, swimming, and breathing. The fish biomonitors react very quickly to a broad range of toxins which causes the Intelligent Aquatic Biomonitoring System® (IABS) to sound an alarm. (See Photo 2.)

The IABS system sensors in each chamber pick up the fishes' micro-volt electric field. Electrodes that don't contact or

harm the fish pick up this natural signal. (We can compare this pickup technology to a sensitive microphone that can detect noise over a great distance.) The signal is then amplified and software analyzed to determine whether the fish are un-



Intelligent Automation Corporation, Poway, CA

Photo 2

der stress. The IABS lab equipment also performs water tests related to oxygen content, pH, electrical conductivity, and temperature. These chemical tests are integrated with the monitored fish data and turned into a 24/7 risk assessment. This system has recently been installed in New York City and other communities to beef up homeland security of local water supplies.

## Recalling the Facts

1. Why is the biosphere critical to life on our planet?
2. Research why coal miners basically stopped using living animals as biomonitors in the late 1980s.
3. Why did the U.S. Army Center for Environmental Health Research build its environmental protection system around sensing the activity of fish? ☺

Alan Pierce, Ed.D., CSIT, is a technology education consultant, technical writer, and public speaker on technology issues.

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