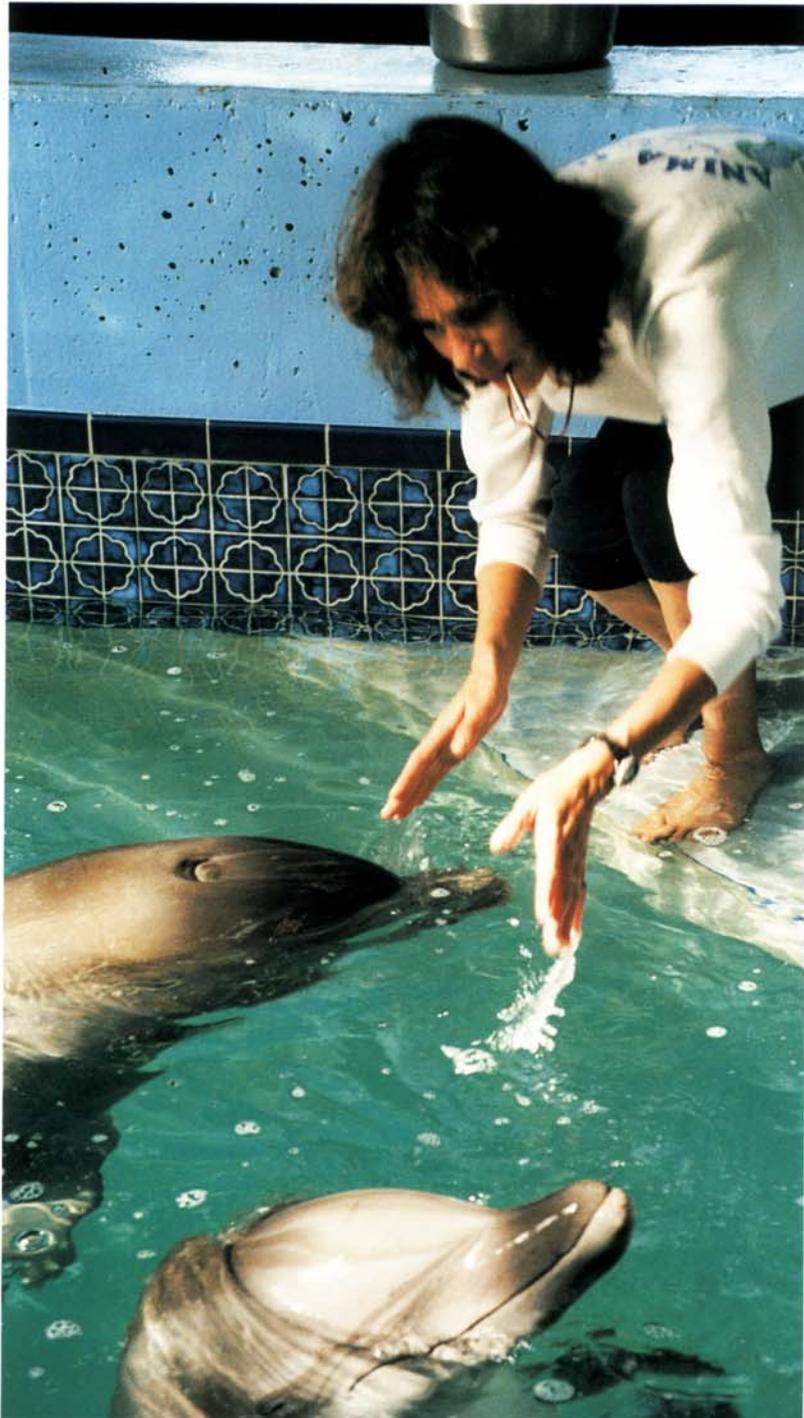


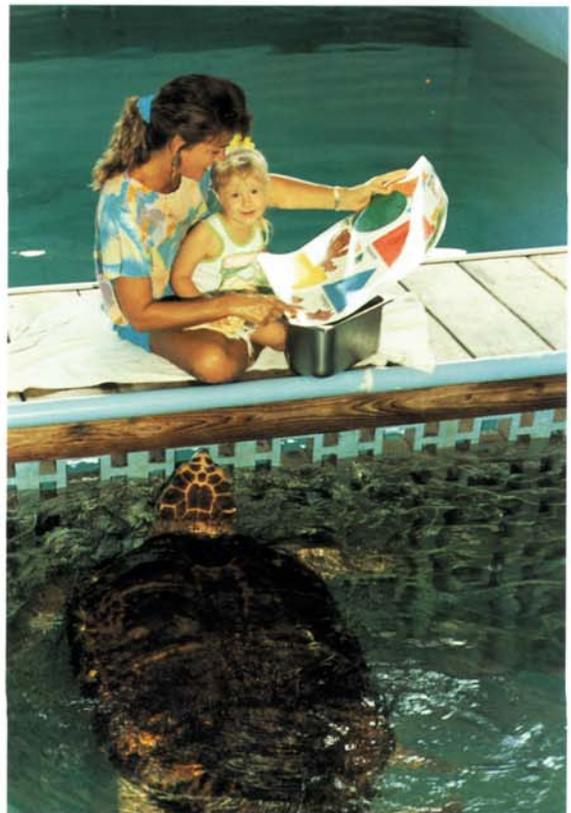
## Water Purification Systems

Consumer/Home/Recreation



**A**t left is a view of the dolphin pool at the Clearwater Marine Science Center, Clearwater Beach, Florida; **below** is the center's sea turtle tank. Because high levels of chlorine cause damage to the skins of dolphins and turtles, the Marine Science Center employs a chlorine-free system of water purification. The system, manufactured by Clearwater Pool Technologies, Inc., Largo, Florida, is based on technology developed by NASA during the Apollo Lunar Landing Program.

In the 1960s, Johnson Space Center conducted a research program aimed at development of a small, light-weight water purifier that would require minimal power and no astronaut monitoring; it was intended to supply pure drinking water for three-man Apollo crews on missions up to two weeks. From that research emerged an electrolytic silver ion generator only slightly larger than a cigarette pack and weighing only nine ounces. One or more units, mounted at various locations in the potable water supply on Apollo or later spacecraft, would disperse silver ion concentrations of 100 to 300 parts in a billion, sufficient to eliminate the bacteria in the water within hours.





This technology has found broad application because it offers an alternative to use of chemical disinfectants, long the standard method of controlling such water pollutants as bacteria, algae and viruses. In recent years, stricter government rules regarding discharge of chemicals into public water supplies, along with increasing costs of complying with environmental regulations, have expanded interest in non-chemical or minimally-chemical water treatment systems.

A number of companies have acquired NASA licenses to commercialize the NASA technology in water management systems. In many instances, they have used the NASA technology as the core of a system and incorporated advancements or refinements developed through their own research efforts.

Clearwater Pool Technologies employs silver/copper ionization to purify water bodies like the Marine Science Center dolphin/turtle pools. The ClearWater Pool Purifier (**above**) consists of a microcomputer that monitors water

conditions; a pair of metallic electrodes; and a rheostat controller. Ions are generated by passing a low voltage current through the electrodes. Distributed throughout the pool, the silver ions kill the bacteria and the copper ions kill algae. The controller automatically introduces the correct amount of ions to the water.

Clearwater Pool Technologies employs variations of the basic technology in a number of other applications. For cooling towers, the ClearWater Purifier cleans tanks of bacteria and algae, while a ClearWater Magnetizer attacks the "scale" and corrosion that commonly build up in such towers. The company produces systems for cleansing spas, hot tubs, water recycling systems, systems for bacteria/algae control in ponds and marine salt-water habitats, systems for hospital water purification, and systems for purifying drinking water in Latin America and the Caribbean.

(Continued)

Among the many users of NASA's silver ionization technology for water purification is Caribbean Clear® USA, Inc., Hilton Head Island, South Carolina. For more than a decade, Caribbean Clear has been using the silver ion approach as the core technology of its water treatment systems, but the company's own R&D work continues to generate advancements of the basic technology.

An example is the AquaKing shown **at left below**, a system designed for market areas where there is no municipal or satisfactory source of acceptable drinking water. The unit shown is the company's Model AK-20, which automatically provides 20,000 liters of pure, bacteria-free drinking water daily.

The AquaKing combines four technologies. First, it uses a physical catalyst to condition the water and eliminate scale buildup. Next, it uses advanced filtration technology to filter out unwanted color, odor, taste, sediment, chlorine and other contaminants. Then it uses the NASA-developed technology to purify the water by means of silver/copper ionization. Finally, it employs a submicron filter array that removes microscopic particles and organisms.

Another company advancement is the Caribbean Clear Controller, which automatically controls pH, chlorine and ionization levels. The Controller system (**below right**) is designed for commercial pool and water park





applications where sanitizing is combined with feedback control of pH and an oxidizer, chlorine or bromine.

The key to the system's effectiveness, according to company sales literature, is "proportional control." Where some controllers simply offer "on/off" control, the Caribbean Clear Controller automatically adjusts the rate at which chemicals are fed into the water, based on a precise measurement of the rate at which the chemicals are being consumed. Proportional control prevents overfeeding, or slow response when there is a sudden change in chemical demand. The Controller, the company says, offers chemical savings up to 80 percent through a combination of proportional control and computer-controlled ionization.

The mainstay of Caribbean Clear's business is still the pool purification system based on the original NASA technology, although it has undergone a number of advancements and refinements. The company produces a family of models ranging from in-home spa size to multi-million gallon facilities. Caribbean Clear also offers customized systems for specific applications, such as salt water rookeries or koi ponds; such systems present special challenges, either because of non-standard water chemistry (as in a sea lion rookery) or because of the low tolerance to copper exhibited in some species of fish.

\* Caribbean Clear is a registered trademark of Caribbean Clear USA, Inc.