NATIONAL WATER RESEARCH INSTITUTE

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2007 CLARKE PRIZE RECIPIENT HIGHLIGHTS RESOURCE RECOVERY TO ADDRESS EUTROPHICATION

FOUNTAIN VALLEY, Calif. – The critical need to remove and recycle surplus nutrients that are detrimental to water resources was highlighted at the Fourteenth Annual Clarke Prize Lecture and Award Ceremony, held by the National Water Research Institute (NWRI) of Fountain Valley, California, on Thursday, July 12, 2007, in Huntington Beach, California.

The Clarke Prize – a gold medallion and $50,000 award – was presented by NWRI co-founder Joan Irvine Smith to environmental engineer James L. Barnard, Ph.D., BCEE., of the global engineering, consulting, and construction company, Black & Veatch, for his groundbreaking use of bacteria through the biological nutrient removal (BNR) process to remove both nitrogen and phosphorous from wastewater.

"Dr. Barnard is an outstanding selection for the Clarke Prize," said Jeff Mosher, Executive Director of NWRI. "BNR is not only a more economic alternative than traditional chemical treatment, but it also improves the environment by addressing the issue of nutrient control. The Clarke Prize was established to recognize these types of achievements by scientists who have demonstrated excellence in water research."

As part of the award, Barnard presented the 2007 Clarke Lecture on eliminating eutrophication through resource recovery. Eutrophication occurs when the accumulation of nutrients such as nitrogen and phosphorous supports the growth of algae, killing fish and contributing to poor water quality, including taste and odor problems. These excess nutrients can enter lakes, rivers, and other water bodies by several means, such as through wastewater discharge or fertilizer runoff from agricultural activities.

During the Clarke Lecture, Barnard pointed out that the world's current population of 6 billion people is expected to grow to around 10 billion by 2050. An increase in population will result in an increase in wastewater production, as well as an increase in demand for food and the fertilizers used in food production. To prevent the eutrophication of waters receiving an overabundance of nutrients from waste and runoff, Barnard suggested several possible nutrient management strategies.

"The first line of attack," he said, "is to remove nutrients from point sources, such as domestic and industrial wastewater treatment plants." To do so, treatment plants can apply Barnard's natural BNR process, which not only removes phosphorous and nitrogen, but can also recycle phosphorous to help in the removal process.

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Recovering and reusing these nutrients are just as critical as removing them because, for instance, known deposits of phosphorous ore "may be depleted within 200 years if nothing is done to recover and recycle phosphorous." Some treatment plants throughout the world are already producing fertilizer or compost with phosphorous recovered from the wastewater, effectively recycling it.

Another way to recover phosphorous and nitrogen, suggested Barnard, is to employ urine-separating toilets to capture urine, which contains "70 percent of nitrogen and more than 50 percent of phosphorous and potassium in all household wastewater." This urine, which is "fairly pathogen free," can be harvested and used as fertilizer – as is already being implemented in countries such as Sweden and Uganda. The fertilizer produced through urine separation has been reported to be well-balanced, with the effects of nitrogen and phosphorous close or equal to that of chemical fertilizers (which are too costly for most developing countries).

Using algae – the product of too much phosphorous and nitrogen in water – may also provide benefits. As some algae are high in oil content, it is possible to grow and harvest algae as an alternative to petroleum-based diesel fuel. The algae, growing on the excessive nutrients present in wastewater and agricultural runoff, can help "bacteria break down wastewater compounds" while at the same time allowing for the possibility of generating renewable energy.

The ultimate goal, concluded Barnard, is that wastewater effluent should be recycled to prevent eutrophication. "Today, we can imitate nature and produce recycled water of the same purity as that falling from the heavens," he said, reiterating the idea that "all wastewater treatment plants should be turned into water reclamation plants to lessen the impact of nutrients of receiving waters."

Barnard, who has worked for Black & Veatch in Kansas City, Missouri, since 1998, is the fourteenth recipient of the Clarke Prize. For over 40 years, he has researched and implemented better ways to conserve water resources and improve wastewater treatment. He actively designs and supervises the construction and start-up of BNR systems in various parts of the world, constantly adapting his innovative technology to varying climates, existing infrastructure, and environmental pressures. It has been estimated that the hundreds of plants worldwide employing BNR rather than chemical treatment processes have saved hundreds of millions of dollars in costs.

Named after NWRI's co-founder, the late Athalie Richardson Irvine Clarke, the Clarke Prize was established by NWRI in 1993 to recognize outstanding research scientists in the areas of water-science research and technology. Copies of the 2007 Clarke Lecture may be downloaded at NWRI's website at www.nwri-usa.org/ClarkeLecture.

A 501c3 nonprofit, the National Water Research Institute (NWRI) was founded in 1991 by a group of Southern California water and wastewater agencies in partnership with the Joan Irvine Smith and Athalie R. Clarke Foundation to promote the protection, maintenance, and restoration of water supplies and to protect the freshwater and marine environments through the development of cooperative research work. NWRI's member agencies include Inland Empire Utilities Agency, Irvine Ranch Water District, Los Angeles Department of Water and Power, Orange County Sanitation District, Orange County Water District, and West Basin Municipal Water District.

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