

# Meet the Stockholm Water Prize Laureate

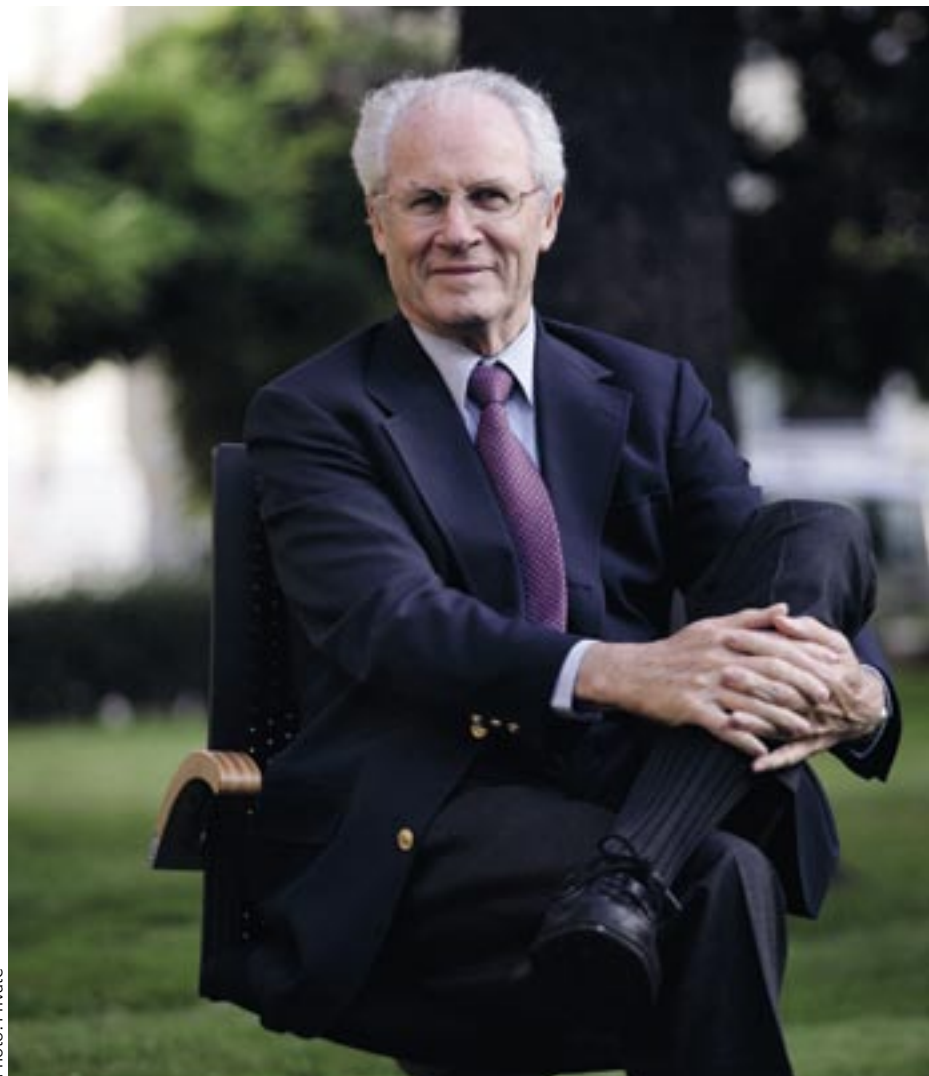


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On August 16, the world-renowned environmental engineer Professor Perry L. McCarty from Stanford University, California, will receive the 2007 Stockholm Water Prize from the hands of H.M. King Carl XVI Gustaf of Sweden. In this interview, we learn more about Professor McCarty and delve deeper into the accomplishments for which he is being honoured.

*Professor McCarty, how did you feel when you found out you would receive the 2007 Stockholm Water Prize?*

Immediately, I felt great surprise, elation and disbelief: too many good simultaneous emotions to easily categorise. I then began to feel satisfaction over the recognition the Stockholm Water Prize provides for our efforts (that includes my students and close colleagues as well) to develop a better fundamental understanding of the complex biological systems involved in water pollution control, suggesting these efforts have been of importance in environmental protection

and to people's lives. This was our ultimate goal and hope.

*What makes you most proud, professionally?*

The most pride comes from the numerous excellent Ph.D. candidates that I have had over the years, essentially all of whom have become highly successful in their careers. As well as many still being close friends, about two-thirds have been educators themselves with 11 becoming chairman of their respective university departments, thus showing significant leadership as well as scholarship. Next has been the success of our graduate

programme in environmental engineering and science at Stanford as measured by the number of its outstanding graduates, so many of whom have contributed much to improving the environment through their professional work with companies and agencies.

*How did you become interested in bacteria and microbiological processes?*

I had a strong interest in both science and the out-of-doors even as a child. While an undergraduate civil engineering student, a career path chosen largely because of the environmental activities involved, I had a course in wastewater treatment where the scientific basis of the Streeter-Phelps equation was described. This equation permitted predicting the dissolved oxygen concentration in a river resulting from the competing forces of depletion by microbial consumption of organic waste and replenishment by mass transfer from the air above. I found it intriguing that a simple equation could describe so well the interactions between such complicated processes, and wondered whether a similar approach might be developed for describing complex biological wastewater treatment processes. While a graduate student at MIT in a laboratory course by Dr. Clair Sawyer, my professor of environmental chemistry, I was exposed to anaerobic wastewater treatment – that is a process in which bacteria use waste organics for their own life's energy in the process while converting a portion of the organics into methane, a useful energy source for us. The process is not simple but depends upon many different organisms working together in parallel and sequence, sharing the little energy resources available between them, and accomplishing something of benefit to both them and us. This appeared to be the ideal wastewater treatment process as it converts a waste into an important resource for use. What could be more perfect? And so developing a fundamental understanding of the chemistry and ecology of the system became a challenge so that it could be applied more widely. This then became my Ph.D. research, and subsequent to that, a large part of my life's work. The principles developed turned out to be applicable to most biological treatment processes, not only anaerobic wastewater treatment.

*Who are some of your role models?*

Dr. Sawyer certainly was my role model for teaching. He had the knack of making complex subjects easy to understand. His is the example that I have tried to follow in my own teaching. I felt very honoured in my early career when he asked me to co-author the second edition of his book on environmental chemistry, a book that is now in its fifth edition and is available in four languages. Prof. Ross McKinney, my dissertation advisor who was also an excellent teacher, and Dr. Sawyer both strongly encouraged the development of fundamental understanding and basic principles for the design of biological treatment systems, and this has become the goal in all my research activities. Another inspirational leader for me was Dr. Arthur Buswell, who many years before conducted wide-ranging research on anaerobic processes, particularly for the treatment of agricultural and industrial wastes. I have always been amazed at the

extent of his accomplishments in both the basic understanding of process chemistry and microbiology and full-scale application, especially since the ability to conduct the chemical and biological analyses required were so limited in his time.

*What did you find hardest to accomplish within your career?*

Finding the time to do all the professional activities that I enjoy and wish to do. There are so many interesting research avenues that one could follow, but both time and research funds greatly limit which ones can actually be pursued. Selecting the best path to follow is always difficult as one never knows where each might lead, but then that is the fun/challenge of the pursuit.

*What are the remaining challenges within wastewater and pollution to be tackled?*

There are so many: the ones of the past such as providing safe water for drinking and basic

sanitation are still with us for so many people in the world; non-point source pollution especially from agricultural drainage, leading to eutrophication of rivers and lakes is still most difficult and expensive; and then the concerns with persistent organic pollutants, both in cleaning up the legacy problems with now banned chemicals and addressing the potential risk from new ones, is of ongoing and great concern. But now we must face in addition the coming major challenges with climate change and sustainability. More now than ever, wastewater must be looked at as a valuable resource rather than a waste. We must do what we can to capture its energy content (generally in the form of methane, a biofuel), clean it sufficiently so that it can be reused for beneficial purposes (perhaps for drinking), and reduce the greenhouse gas emissions from its treatment. This all must be done in a resource efficient manner, and for this reason I believe that processes that enlist natural microorganisms, those that provide their services so willingly for our benefit, will be the best ones.



(Left) Graduation in 1959 at MIT was one milestone in Prof. McCarty's life. The Stockholm Water Prize is yet another one. (Right) Yosemite National Park – "I know no place on earth that is more beautiful," Prof. McCarty says.

*What do you try to convey to your students as a basic "take home" message for their future scientific career?*

Pursue excellence in whatever they do, and do not be afraid to chase the difficult but important problems in their research.

*What do you like to do in your spare time?*

Hiking, reading (especially history), the beach, listening to music. No one thing in particular; it all depends upon the mood.

*Where is your favourite place to travel to for vacation?*

There are many places in the world where we have enjoyed to travel, but our favorite, where we have returned the most over the years, is Yosemite National Park, the place we spent the first night when we entered California on the way to Stanford University in 1962. We subsequently returned there many times for family hiking and backpacking trips in the wilderness and the high country around Tolumne Meadows. I know of no place on earth that is more beautiful.

*What are you reading right now?*

I just finished Steven Johnson's *The Ghost Map*, which is about John Snow's mid-nineteenth century historical epidemiological study around Broad Street in London that provided the first convincing evidence that cholera is a waterborne disease.



Yosemite National Park is also where the whole family spends their favourite winter days. From left: Prof. McCarty, daughter Cara, his wife Martha, daughter Kathleen, daughter Susan, and son Perry, Jr.

Photos: Private

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