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How can academics have a more powerful influence on the development of practical environmental solutions and improve the likelihood of their being adopted by society at large?

Given that the public and governmental debates on environmental issues often include discussions about science, technology, and business practices, what do you think is the most constructive path to achieving active working relationships with all members of society?

Dr. de Kreuk [in answer to the first two questions above]:

I believe that academics should listen to the needs of the end users who seek for and would like to apply solutions to environmental challenges. This doesn't mean that academics need to respond to all issues brought up in any media, but that they should sometimes escape from their universities and mingle with companies or government. Of course, many academics cooperate in one way or the other with the outside world, but often this involves acquiring PhD research funding, followed by meeting twice per year. That is not what I mean; I believe in more intensive cooperation and feel it is important to know how "the other part of society" reasons, where legislation comes from, which bottlenecks end-users come across, and what the driver is for people who market

innovations. For example, during academic careers, being able to work for a certain period at another university in order to broaden academic perspective and be inspired by fellow researchers is highly valued experience. I think, from my own experience, that working at governmental organizations or industry should be valued as much. Allowing academics this "real contact" with society and, in the meantime, accepting that publication numbers will decline for a short while, will finally improve communication between researchers and government/industry. This will enhance the adoption of academic-driven research and on the other hand will teach the scientist what society is really asking for. It also teaches the people in the field what scientists are capable of.

What global activity/process/innovation would you put in place immediately to address environmental challenges?

Dr. de Kreuk: The last question is not easy to answer; there are many environmental challenges, all asking for different innovations or approaches. In my field of work, sanitary engineering, I would appreciate it if wastewater is not wasted anymore, but that all its contents are reused as much as possible. This is not a world- or humanity-saving topic, but it helps to close our disturbed natural cycles.

BIOGRAPHY

Merle de Kreuk started her career in 1997 at IHC Holland, a shipyard for dredging vessels, where, with her colleagues, she worked on an innovative technology for the separation of contaminated soil and the clean sand fraction. This so-called *jig-technology* was later applied in many soil remediation projects.

After returning to academics, Dr. de Kreuk obtained her PhD in environmental biotechnology at Delft University of Technology, the Netherlands, in 2006. During her PhD work, she joined with two other scientists to research and develop the aerobic granular sludge technology Nereda, currently brought to the market by Royal HaskoningDHV. The Nereda technology is characterized by the granular growth of the biomass used in wastewater treatment. The use of this single-tank Nereda system makes wastewater treatment plants compact, energy efficient, and cheap. She won several prestigious awards for this technology and was a finalist with her fellow researchers for the European Inventor Award 2012 for the Nereda.

After earning her PhD, Dr. de Kreuk spent a few years bridging academic research with full-scale development of Nereda at Royal HaskoningDHV. Beginning in 2009, she

worked for almost three years at a Dutch Water Authority, where she started a project on the application of Anammox in the mainstream of a wastewater treatment plant. While there, she was part of the "wastewater treatment-plant of the future" studies, that led to the *resource factory* concept, in which technologies are developed and applied to produce energy-producing sewage treatment, as well as to secure the recovery of resources as nutrients and water. In 2011, she returned to TU Delft, where she focuses on granule formation processes (aerobic and anaerobic) and hydrolysis processes in anaerobic digestion. Furthermore, she is still interested in the product formation from waste streams by means of mixed microbial processes.