



Urs von Gunten, the unsung hero of water treatment

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For a scientist who's won numerous international honors for his research, Urs von Gunten, a professor at EPFL and the Swiss Federal Institute of Aquatic Science and Technology (Eawag), is disarmingly modest. Urs von Gunten will retire in one year: Time to look back at his career.

"People are always eager to hear about my field of research," says von Gunten with a smile. "But that all changes once I start going into the details." Since obtaining his Master's degree in chemistry from ETH Zurich, he's built a reputation as an international authority on water treatment, helping develop oxidation and disinfection processes that have become standard practice in the production of drinking water and wastewater. His research interests obviously put him on the "right side" of science: while we take access to plentiful drinking water for granted in many parts of the world, the processes that make it safe to drink still need to be improved.

To understand the importance of von Gunten's work, you only need to look at his long list of accolades and achievements. In 2022, he featured on the prestigious Highly Cited Researchers list, with his work on water oxidation now serving as a reference in the field. Also in 2022, he received the American Chemical Society's Award for Creative Advances in Environmental Science and Technology at a ceremony worthy of the Oscars, becoming only the third scientist from outside the US to earn this distinction. In January 2023, he featured on the cover of Environmental Science and Technology. And in December of last year, the same magazine released a special issue looking back on his career.

This year, von Gunten and six colleagues will receive the Sandmeyer Award from the Swiss Chemical Society for "the development of an advanced wastewater treatment process involving the degradation of organic micropollutants during ozonation." In January 2024, Water Research published an article

entitled “Oxidation Processes and Me,” in which he summarized the highlights of his research. In typically self-deprecating fashion, von Gunten points out that the title of the piece was the journal’s choice, not his. Because for all his success, he’s someone who doesn’t take himself too seriously.

Von Gunten attributes his modesty to the hunch that he’s enjoyed a lot of luck in his career – as if the planets have somehow aligned at key moments in his life. He’s also quick to stress the importance of teamwork and collaboration in producing successful, high-impact research.

With one year to go before retirement, von Gunten feels a deep sense of gratitude – not just to his mentors and his family, but also to the people of Switzerland, whose support has allowed him to devote most of his time to his research and, ultimately, put his skills to good use for society. In sum, he describes his career as a “privilege.”

An emerging discipline

In the early 1980s, von Gunten – a Zurich native and the son of a nuclear chemistry professor – had just completed his Master’s degree at ETH Zurich and, instead of pursuing a career in drug development or synthetic chemistry, he opted to do a PhD at the same university. After completing a thesis on “iron cycling in lakes” in 1989, he moved to Eawag for a two-year postdoc position, where he focused on “biogeochemical processes during riverbank filtration processes.” Both research topics related to an emerging field that would eventually enter the mainstream: environmental science and engineering.

During his time at Eawag, von Gunten met professor Jürg Hoigné, a leading figure in oxidative water treatment who would go on to become his mentor. “I was delighted,” he says. “I could keep working as a chemist while applying my research to wastewater treatment and the production of drinking water. I felt like I’d found my place.”

Bridging research and practice

A turning point in von Gunten’s career came when Hoigné dispatched him for a seven-month stint at the R&D center run by Compagnie Lyonnaise des Eaux, now known as Suez Environment. It was his first hands-on experience in the water treatment industry, coming at a time when pesticide contamination in drinking water was a matter of serious concern. Von Gunten was able to test his hypotheses in a real-world setting, with his advanced oxidation processes proving successful at breaking down these compounds. He continued bridging the gap between research and practice in other locations: Zurich and Basel, elsewhere in Europe, and in the US, Australia and Asia.

In the Canton of Basel-Landschaft, he explored the potential of regional water supplies to make the drinking-water supply more resilient to pollution and climate change. “The Netherlands is a fascinating case in point,” says von Gunten. “There are only a dozen or so drinking-water suppliers for the whole country, which makes it easier to do large-scale, long-term planning and look ahead to future problems. This kind of big-picture thinking is much harder in Switzerland, where most drinking water comes from small suppliers operated by part-time municipal employees.”

Early success stories

Following his return to Eawag, von Gunten was appointed group leader and scientific lead for his discipline in 1995. Eawag had received notice from the World Health Organization that bromate, a potentially carcinogenic compound, had been found in drinking water following disinfection by ozonation. To this day, ozone is considered a highly effective oxidant and disinfectant for water treatment. Von Gunten and his team decided to put their minds to addressing this public-health concern. He presented their work at his first conference in the US – and, to his surprise, found that Switzerland was well ahead of the pack on this issue. “Eawag became a global leader in the field

thanks to its pioneering research and long-term strategy of using practical, applied processes,” he explains.

This was just the first in a long line of success stories. For instance, von Gunten and his research group teamed up with Swiss ecotoxicologists to address a problem resulting from the contamination of water with the active substance in birth-control pills. When flushed away in wastewater, this substance was causing male fish in rivers to turn female. “By partially modifying the estrogenic compounds through oxidation, we were able to counteract their effect on fish,” he says. “This achievement wouldn’t have been possible without a cross-disciplinary effort.”

Von Gunten joined EPFL’s School of Architecture, Civil and Environmental Engineering (ENAC) as a full professor in 2011, sharing his passion with students through his classes on environmental chemistry and drinking-water treatment. He’s also involved in research projects with fellow ENAC colleagues, drawing on the strong collaborative relationship between Eawag and EPFL.

Passing the baton to the next generation

Von Gunten is confident that the future of his discipline is in safe hands. Many of his former PhD students and postdocs are now active in the water treatment industry – working for environmental protection agencies, chemical manufacturers, or water treatment plants, or as professors. Wenyu Gu has already joined EPFL as a tenure track assistant professor to replace outgoing colleague Christof Holliger, a fellow scientist and faculty member specialized in biological wastewater treatment. Applications are currently being reviewed for von Gunten’s own position.

The challenge that awaits the next generation is immense. As research progresses, scientists are getting better at detecting new micropollutants in water sources and wastewater. These include microplastics, per- and polyfluoroalkyl substances (PFAS), and metabolites of pesticides. Despite these challenges, von Gunten remains optimistic: “By modeling chemical processes, we’ll be able to develop new methods for predicting how these compounds behave in the environment and identify strategies for breaking them down. In an ideal world, we’ll be able to predict how long these micropollutants will last right as they’re developed – or, better still, before they enter the environment.”

In retirement, von Gunten intends to spend his time indulging two other, longstanding passions: climbing and ski touring. And while he plans to ease the transition to his successor at Eawag, he has no intention of becoming “the old, long-forgotten researcher who hangs around the corridors.” But one thing’s for certain: science won’t be forgetting him any time soon.

Cover picture: Urs von Gunten has always combined research with practice. (© Alain Herzog / 2024 EPFL)

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