

Plant detective: Missouri S&T professor studies plants as "bio-sentinels" of indoor pollution

9 November 2018, by Alan Scher Zagier



Credit: Missouri University of Science and Technology

Behold the common house plant, the front-yard shrub, the rhododendron around back that's seen better days since the next-door neighbors put their home on the market.

They brighten our lawns, increase our property values, even boost our mental and physical health by reducing carbon dioxide levels.

For Dr. Joel Burken, such [plants](#) are far more valuable than as mere window dressing. The Curators' Distinguished Professor and chair of civil, architectural and environmental engineering at Missouri S&T is an expert in phytoforensics, the process of using plants to study human exposure to pollutants.

Plants are "place-bound. They grow in one location and they interact with the soil, the groundwater and the surrounding air," he explains. "They're really masters of mass transfer. They harvest from those surroundings all the carbon, all the water, all the nutrients they need. But chemicals in those surroundings also can accumulate in those plant

tissues.

"So if we sample those plants, we're actually sampling those surroundings. And by understanding the chemical exposure to plant pathways, we can also then understand the chemical exposure to human pathways," Burken adds.

In an upcoming article in the journal *Science of the Total Environment*, doctoral students Majid Bagheri and Khalid Al-jabery, working with Burken and Dr. Donald Wunsch, the Mary K. Finley Missouri Distinguished Professor and professor of computer science at S&T, use machine learning techniques and statistical analysis to help better understand how groundwater contaminants are absorbed by plant roots.

That research builds on a three-year National Science Foundation (NSF) grant awarded to Burken; Dr. V.A. Samaranayake, Curators' Teaching Professor of mathematics and statistics; and Dr. Glenn Morrison, professor of [environmental engineering](#), to study how pollutants absorbed by plants can move through soil and enter a building in a process known as vapor intrusion.

"By understanding the chemical interactions, we really have a potential to sample almost anywhere on the globe—especially the places that we inhabit. And by sampling that plant—a bio-sentinel—we may better understand how we're exposed to chemicals, and how to better prevent that," Burken says.

S&T's phytoforensics efforts have drawn a spate of attention in recent months, and the sensing methods are being put in action.

In addition to the upcoming journal article, "A deeper look at plant uptake of environmental

contaminants using intelligent approaches," which will be published in February 2019 but is now available online, NSF is expected to soon publish a video produced by S&T about the work. The video is intended to communicate the research to a broader audience and help transfer S&T's scientific breakthroughs into practice while further protecting human health.

In July, the publication and website Science Journal for Kids presented its own take on the topic, spurred by the S&T research and an article by Burken, Samaranayake, and former doctoral students Dr. Jordan Wilson, now a U.S. Geological Survey hydrologist; and Dr. Matt Limmer, now a University of Delaware postdoctoral fellow, that was published in February 2018 in the *PLOS One* journal.

The article, "Phytoforensics: Trees as bioindicators of potential indoor exposure via vapor intrusion," summarizes the analysis of 121 trees in Nebraska contaminated by the chemical tetrachloroethene (PCE), comparing the tree-core samples (a faster, cheaper and less intrusive collection method) to PCE levels in the surrounding groundwater, soil and nearby indoor locations.

More information: Jordan L. Wilson et al. Phytoforensics: Trees as bioindicators of potential indoor exposure via vapor intrusion, *PLOS ONE* (2018). [DOI: 10.1371/journal.pone.0193247](https://doi.org/10.1371/journal.pone.0193247)

Provided by Missouri University of Science and Technology

APA citation: Plant detective: Missouri S&T professor studies plants as "bio-sentinels" of indoor pollution (2018, November 9) retrieved 16 September 2019 from <https://phys.org/news/2018-11-missouri-st-professor-bio-sentinels-indoor.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.