# **Public Understanding of Chemistry**



Public Understanding of Chemistry: Chemistry and its social-political-economic context continue to change.

Chemistry and chemistry-based technology that impact our lives make for the complexity and controversy of life and set the stage for thinking about public understanding of chemistry. The Public Understanding of Chemistry section will try to address chemistry in real life context with original contributions (articles/position papers/policy briefs) and/or published articles and columns in reputable sources (used with permission).

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# NOTHING HAS CHANGED IN ENVIRONMENTAL FORENSICS

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#### Introduction

A dozen years have passed since I wrote a guest editorial, "Where Have All the Chemists Gone?" for "The Chemist." My beef then was with the chemistry profession, the expert witnesses encountered in environmental litigation, and the large disconnect that exists between the science of chemistry and the subject of environmental forensics. Environmental forensics is focused on three questions:

- What hazardous materials were released?
- Who released them?
- When were they released?

The last question is usually referred to as "age-dating" the release. Age-dating is very valuable information, as it often determines who is going to pay for the remediation of the release or releases. It is also a very tough answer to obtain, if, in fact, it can be obtained, and is usually arrived at through the combination of chemistry, geology, and history. The problem arises when the "expert witness" becomes an advocate for the client instead of being a professional advocate for the scientific method.

#### Concerns



## Abstract

Concerns over the misuse of the peerreview process to publish in order to establish expertise in environmental forensics is raised in this paper. It is time that chemists serve as the gatekeepers for environmental forensics dealing with chemistry by peer review.

## Key Words

Chemistry, Environmental Forensics, Expert, Peer Review, Journal

Where are the chemists in the field of environmental forensics? Industrial chemists are not available as experts due to their affiliation with industry. Academic chemists are not inclined to testify in court because of the time constraints, stress, and negativity associated with court room opinions. This leaves the chemistry in

environmental forensics to engineers, geologists, environmental scientists, and pretty much anyone who does site environmental investigations and receives laboratory data. Many site investigations are directed by State criteria, with forensic evaluations placed in the caboose, if they are included at all.

This leaves us with a group of self-proclaimed "experts" with a wide variety of backgrounds and training, developing conceptual models of environmental chemistry that advocate for their client's innocence. To further this position, these "experts" publish their conceptual models in a peer-reviewed journal, prior to or during the litigation process. This accomplishes a deterrent from Daubert<sup>1,2,3</sup> or Frye<sup>4</sup> Hearings for their opinions.

"My opinion is correct because it has received peer-review and it has been published." Here is the crux of this story. The Daubert case in the U.S. Supreme Court made the trial judge the "gatekeeper" for scientific expert testimony in an attempt to eliminate junk science from the courtroom. One of the criteria to be used by the trial judge to ascertain the reliability and credibility of the opinions given by the expert is whether or not the scientific methodology used as the basis for the opinions has been peer reviewed.5



Properly used, peer review places the onus directly in the lap of scientists to keep the forensics honest to the principles of the scientific method. In other words, chemists act as the gatekeepers for environmental forensics dealing with chemistry by peer review. This is not occurring. Instead, environmental forensics articles are being given a pass without tough hard-nosed scrutiny for the data, facts and basis for the conclusions presented.

#### Post Script

After writing this article, I went back to the 2001 guest editorial, which has given me a title for this article. After a dozen years, I still must ask the question, where have all the chemists gone? Who let the dogs out? The gate is open and there is no one tending the gate.

**IMAGE ACKNOLEDGMENT:** The first image is a NIST research biologist Jennifer M. Keller taking a blood sample from a loggerhead turtle. This work is in the public domain in the United States. The second image is from Chemist Kevin Hicks, which is examining a sample of corn fiber oil for color and quality. This image was taken by Keith Weller and is in the public domain as part of the United States Department of Agriculture – USDA.

(http://patapsco.nist.gov/imagegallery/details.cfm?imageid=494, http://www.ars.usda.gov/is/graphics/photos/index.htm)

<sup>&</sup>lt;sup>1</sup>Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993).

<sup>&</sup>lt;sup>2</sup>General Electric Co., v. Joiner, 522 U.S. 136 (1997).

<sup>&</sup>lt;sup>3</sup>Kuhmo Tire Company, Ltd., v. Carmichael, 526 U.S. 137 (1999).

<sup>&</sup>lt;sup>4</sup>*Frye v. United States*, 293 F. 1013 (D.C. Cir 1923).

⁵Ibid.