

Web-Based Scientific Glossary as an Assignment

[The Atmospheric Chemistry Glossary](#)

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Before you begin here, if you have time, take a quick look at three previous [Computer in Chemical Education](#) articles I've done: the first in [fall 2001](#), the second in [fall 2002](#), and the third in [fall 2005](#). They cover authoring computer-based animations, using the server-based software Blackboard to teach chemistry in a predominately undergraduate environment, and just-in-time web-based quizzing in a majors' freshman chemistry course. The 2005 article details correlations between just-in-time quizzing and test grades [over four consecutive semesters](#). If you're interested.

This article will quickly describe a long-term project involving [an Atmospheric Chemistry Glossary published on the web](#) that is authored, almost exclusively, by chemistry students in a senior-level chemistry course; as an outside assignment it counted for laboratory points. It incorporates reading, writing, and library and web work.

a long-term project

Beginning in spring 1995, students in my Air Quality course at Sam Houston State University were assigned to create an on-line glossary for publication on the web. Initially, the job was to use their text book as a source of glossary terms that they thought were appropriate for students in a course like theirs. That is, the students were to find, study, and define words and phrases that were hard or interesting for them in atmospheric chemistry and to write their own definitions. The words, multiple ones from each student, were arranged together alphabetically and each included a literature citation to the initial source of the word or phrase. The citations were all initially from my students' Air Quality textbook, Crutzen and Graedel's [Atmospheric Change: An Earth System Perspective](#); 1993 (Freeman). Initially, the assignment was a one week writing assignment that counted for one of the 10 or 12 labs in the course.

The web glossary was published that year, 1995, and updated in subsequent years (the course was taught every spring at that time). The files were hosted on the Sam Houston State University chemistry department's web site. Each year, the old glossary was augmented/edited to become the new

glossary. Students in succeeding years of this course were asked to avoid the Crutzen and Graedel citations and instead to look to other library sources, books and peer-reviewed journals, all of which were (library-based) hard copies at the time.

growing and changing

As the web grew, we began to find web pages that referenced the same words and phrases, included images or animations, and students asked if we could link our glossary entries to the external web pages. This seemed logical since the pages were authored by scientists working in the field, government environmental sites, or industrial/commercial sites with clear expertise, and so our glossary's initial bolded terms slowly became links. Students were asked to supply new definitions with all the trimmings and links to previously unlinked terms.

Atmospheric Chemistry and Air Quality Glossary
1997 Version

The definitions in this glossary were initially generated by the students in a senior level class studying air quality and atmospheric chemistry at Sam Houston State University during the spring of 1995 in a course entitled Environmental Science 440/Chemistry 442, AIR QUALITY. In the main, they wrote these definitions as part of a class requirement. The references found at the end of most entries are an effort to supply additional resources for each of the terms. No supposition of comprehensiveness or absolute correctness can be assumed in any way. Many of the glossary entries have hypertext links to other sites on the InterNet. These external links were valid in the Spring semester of 1997 and will be updated each year.

Click on a letter to find definitions that begin with that letter.

[A](#) - [B](#) - [C](#) - [D](#) - [E](#) - [F](#) - [G](#) - [H](#) - [I](#) - [J](#) - [K](#) - [L](#) - [M](#) - [N](#) - [O](#) - [P](#) - [Q](#) - [R](#) - [S](#) - [T](#) - [U](#) - [V](#) - [W](#) - [X](#) - [Y](#) - [Z](#)

Here is an example of an entry. There is a link to another site on the InterNet for the entry itself:

Photochemical Smog - Natural and artificially emitted hydrocarbons in the presence of oxides of nitrogen undergo photochemical reactions which produce a cloud of toxic chemicals including ozone and a variety of caustic agents. This process is powered by sunlight and some of the products, such as ozone, reach a peak soon after photon flux from the sun reaches a maximum around midday. The thermal inversions often associated with some cities can lead to a dangerous buildup of smog in urban areas. Human deaths have been attributed to photochemical smog since the Industrial Revolution in cities such as London and New York. [Science; v.241; p.1473; 1988.] [Atmospheric Environment. Part A, General Topics; v.26A; p.625; 1992.]

 

[Department of Chemistry's Home Page](#)

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And then we were really in for it because the links routinely expired (external web pages were deleted or moved) and had to be repaired each year. While a headache, this also provided a way to augment the requirements of the assignment and get students more involved with the work in the next year's update. The glossary web pages themselves were prepared by me, editing html code by hand initially and later using Dreamweaver, and published late in each spring semester. A one week assignment turned into two weeks. We even started adding [NIST webbook](#) structure links choosing compounds commonly found and important in atmospheric chemistry.

The process of filtering what the students wrote was shouldered by the lab's TA and by me. Since this was a technical writing assignment, and since the students were, in the main, seniors and had at least some experience in science writing, formal grammar and spelling rules applied and were followed. Definitions that were submitted to the TA for inclusion were graded, corrected by the TA or me and added to the glossary. As each year's glossary was being updated and placed online I went through and edited one last time.

format format format

The format for the glossary entries have evolved somewhat over the years and this is especially true for the literature citations at the end of each entry. Since we were mixing journal and book citations, a

format template was made available for the students to follow soon after we began adding literature citation. But this was actually the weakest part of the assignment. Not only were the students generally oblivious to the nuance of the citation format (even with the template in their hands) but so were my TA's (last semester seniors or graduate students all). This highlighted to me the importance of discussing more carefully and in depth literature citations in my classes both undergraduate and graduate. The 2007 version of the Atmospheric Chemistry Glossary incorporated [DOI citations](#) for web-only peer-reviewed papers (see the entry for [catalytic destruction of ozone](#)). The [DOI system](#) aims at tracking and making one-click available digital documents (mostly journal articles) on the web even if they change web addresses multiple times after initial publication.

As an interesting aside: In my graduate analytical spectroscopy class this spring (2007) an erroneous literature citation in a paper's bibliography became the topic of two days of discussion and even allowed us to investigate the American Chemical Society's ignorance of which of their journal's *Analytical Chemistry* articles are digitally available. (**Lesson:** *Analytical Chemistry's A pages* are available via **author search** in a particular year and volume, but not via the site's [A-pages index](#). An e-mail communication with the ACS support ([pubs.acs.org](#)) led to their statement to us that *Analytical Chemistry's A pages* were not available on-line before 1997. The A-page article we ultimately digitally retrieved from their site via an author search inside a specific volume was from 1983! An author search in *Analytical Chemistry* from the main [pubs.acs.org](#) search page didn't find that article. I include this datum here because I won't be able to publish it anywhere else.)

statistics

The initial/entry page for the Atmospheric Chemistry Glossary lists an alphabetic link to all the letters of the alphabet: the user can browse terms alphabetically; however, most individual terms from users on the web are initially found via google searches. While the glossary's entry page (see figures above and below) was accessed 27451 times from June 1, 2006 through May 31, 2007, the total accesses in that period of the entire site were 60524. For a chemical site with no pictures or animations this is pretty good, I think. Annually, the highest-use month was September and December the lowest. An example of one of the glossary's entries is immediately below.

example

[Polar Vortex](#) - This is a phenomenon that occurs during the polar winter in which stratospheric air moves in a circular motion, with an area of relatively still air in its center. The temperature in the vortex is approximately -130 degrees F (-80 degrees C), which assists in the formation of polar stratospheric clouds. Though usually more prolonged and colder over Antarctica, the Arctic polar vortex does form to a degree, and when the temperatures there are coldest and the vortex persists, Arctic stratospheric ozone destruction on Arctic polar stratospheric clouds has also been observed. [Science; v251; 46-52; 1991.] [Journal of the Atmospheric Sciences; v51; 2973-2994; 1994.] [Elements: Air; Michael Allaby; page 160; 1992; Facts on File Inc; New York.] [Antarctica; Carl

Eklund and Joan Beckman; page 83; 1963; Holt, Rinehart and Winston, Inc; New York.] [Science; v296; 895-899; 2002.]

the most difficult part

The most difficult part of this entire project is the html page authoring, editing, and layout. As noted above, most of the authoring I did, but this can, in theory, be handled by the TA. For a few years, we tried giving one or two of the course's students a break on the part of the glossary assignment in exchange for editing the glossary's html code. While this appeared to work at first it turned out to be quite a problem: the student had imported the previous year's glossary into Microsoft Word[®] and adding that semester's changes using Word's html export. The appeared-to-work part was that the

**Atmospheric Chemistry
Glossary**

2007 Version

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The 2007 version was created in the twelfth year for this project and is dedicated to the SHSU Air Quality students who are its authors.

Click on a letter to find definitions that begin with that letter.

[A](#)- [B](#)- [C](#)- [D](#)- [E](#)- [F](#)- [G](#)- [H](#)- [I](#)- [J](#)- [K](#)- [L](#)- [M](#)-
[N](#)- [O](#)- [P](#)- [Q](#)- [R](#)- [S](#)- [T](#)- [U](#)- [V](#)- [W](#)- [X](#)- [Y](#)- [Z](#)

Here is an example of an entry. There is a link to another site on the Internet for the entry itself:

Photochemical Smog - Natural and artificially emitted hydrocarbons in the presence of oxides of nitrogen undergo photochemical reactions which produce a cloud of toxic chemicals including ozone and a variety of harmful chemical gaseous and particulate agents. This process is powered by sunlight and some of the products, such as ozone, reach a peak soon after photon flux from the sun reaches a maximum, around midday. The thermal inversions often associated with some cities can lead to a dangerous buildup of smog in urban areas. Human deaths have been attributed to photochemical smog since the Industrial Revolution in cities such as London and New York. [Science; v.241; 1473; 1988.] [Atmospheric Environment, Part A, General Topics; v.26A; 625; 1992.] [Science; 315; 772-773; 2007.]

[E-mail about this page here.](#)

[Department of Chemistry's Home Page at Sam Houston State University](#)

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Word-authored pages looked fine in Internet Explorer for Windows (whose Word version was used for authoring) but looked horrible with other browsers. Specifically in widely-used alternates like Netscape (now Mozilla) or Internet Explorer for the Macintosh OS versus the Windows OS we saw uneven display of fonts, special character errors, and uneven paragraph breaking. MS Word's application of html is so enigmatic and specialized that one of the standard html (web) editors, Dreamweaver[®], includes a command set called "Clean up Word HTML...". Since I couldn't find students with hands-on html editing or Dreamweaver experience, I ended up editing the pages myself. Using a dedicated HTML editor such as Dreamweaver is almost a must if one wants consistency across the entire glossary. I consider the clean, consistent look of the glossary one of its strong points.

conclusions

The advantages to my students of this project includes a chance to think about and accomplish writing technical definitions in atmospheric chemistry, to research the scientific literature--in the early days in the library but now almost entirely online at site like sciencedirect.com and pub.acs.org, to look for web documents that augment their own, authored definitions, to have others read what they write and to read other's writing, and finally to experience writing literature citations. This last appears to be a sorely needed exercise.

On-line Bibliography

- [American Chemical Society](#) publications site.
- Chasteen, T.G.; "[Animations in an Instrumental Methods Chemistry Class?](#)"; CCE Fall 2001 Newsletter.
- Chasteen, T.G.; [Teaching Chemistry Students Using Blackboard as a Platform for "e-education"](#); CCE Fall 2002 Newsletter.
- Chasteen, T.G.; [Continuing to Teaching Chemistry Students, Still Using Blackboard and Flash for "e-education"](#); CCE Fall 2005 Newsletter.
- [Digital Object Identifier](#) System.
- [Dreamweaver](#); HTML editor (Adobe.com).
- [Education Glossaries on the Web](#).
- [Glossary of Key Terms](#): National Air Toxics Assessment (EPA).
- [NIST Chemistry Webbook](#).
- [ScienceDirect.com](#); Elsevier's on-line publications site.

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