

Scientific Writing – Part I

CU- Boulder

CHEM-4181

Instrumental Analysis Laboratory

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Lecture will be posted on course web page

1

Objective of this Part of the Course

- You need to master scientific writing
 - Grades
 - Job skill
 - Step in critical thinking
- Learn importance of making time for revisions
- Distinguish
 - Science Writing
 - Scientific Writing

2

Background

- CQ: Do you read science reports on the popular press?
 - A. Yes, at least weekly
 - B. Sometimes
 - C. No
- CQ: Do you read journal papers regularly?
 - A. Yes, often
 - B. Yes, occasionally
 - C. Once or twice
 - D. Never

3

Background

- CQ: have you written part/all of a scientific paper?
 - A. Yes, part/all of several papers
 - B. Yes, part/all of one paper
 - C. No
- Have you used the Writing Center on campus?
 - A. Yes, often
 - B. Yes, occasionally
 - C. No, but I know where they are and what they do
 - D. What is the Writing Center?

4

Example of Science Writing



Human activities found to increase urban haze

Program #5072 of the Earth & Sky Radio Series
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The haze that hangs over many cities originates in car exhaust and industrial activity. But it's helped along by invisible smog-forming gases in the atmosphere, which interact to form dangerous aerosols. ([Daniel Cosman](#))

Jimenez and his colleagues found concentrations of aerosols in urban air eight times greater than what had been predicted by typical air quality computer models. Jimenez said human activities greatly enhance the formation of these dangerous particles.

Jose-Luis Jimenez: *If they can drive less, or drive cars that are more fuel efficient, or buy appliances that are more energy efficient, all of these things in the end come back to us.*

Thanks today to [NASA](#) ; explore, discover, understand. We're Block and Byrd for Earth and Sky.

A scientific study of the air in Mexico City found that human activities contribute even more to the formation of urban haze than previously thought.

Jose-Luis Jimenez is a chemist at the Cooperative Institute for Research in Environmental Sciences at Boulder. He studied Mexico City's haze. It's true that a city's haze originates in car exhaust and industrial activity. But, in addition, invisible smog-forming gases react in the atmosphere to form hazy particles, or aerosols. These particles are dangerous to people. They're believed to exacerbate heart and lung problems and to increase the risk of premature death.

Jose-Luis Jimenez: *It's not that people didn't know that these processes could happen, in which gases become particles. It's just that it was thought that it would happen much more slowly and to a much smaller extent.*

Example of Scientific Writing

GEOPHYSICAL RESEARCH LETTERS, VOL. 33, L17811, doi:10.1029/2006GL026899, 2006

[Click Here for Full Article](#)

Secondary organic aerosol formation from anthropogenic air pollution: Rapid and higher than expected

Rainer Volkamer,^{1,2} Jose L. Jimenez,³ Federico San Martini,^{1,4} Katja Dzepina,³ Qi Zhang,^{3,5} Dara Salcedo,⁶ Luisa T. Molina,^{1,7} Douglas R. Worsnop,⁸ and Mario J. Molina^{1,2}

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[1] The atmospheric chemistry of volatile organic compounds (VOCs) in urban areas results in the formation of 'photochemical smog', including secondary organic aerosol (SOA). State-of-the-art SOA models parameterize the results of simulation chamber experiments that bracket the conditions found in the polluted urban atmosphere. Here we show that in the real urban atmosphere reactive anthropogenic VOCs (AVOCs) produce much larger amounts of SOA than these models predict, even shortly after sunrise. Contrary to current belief, a significant fraction of the excess SOA is formed from first-generation AVOC oxidation products. Global models deem AVOCs a very minor contributor to SOA compared to biogenic VOCs (BVOCs). If our results are extrapolated to other urban areas, AVOCs could be responsible for additional 3–25 Tg yr⁻¹ SOA production globally, and cause up to -0.1 W m⁻² additional top-of-the-atmosphere radiative cooling. **Citation:** Volkamer, R., J. L. Jimenez, F. San Martini, K. Dzepina, Q. Zhang, D. Salcedo, L. T. Molina, D. R. Worsnop, and M. J. Molina (2006), Secondary organic aerosol formation from anthropogenic air pollution: Rapid and higher than expected, *Geophys. Res. Lett.*, 33, L17811, doi:10.1029/2006GL026899.

abundant than state-of-the-art SOA models predict in large compartments of the troposphere [*de Gouw et al.*, 2005; *Heald et al.*, 2005; *Johnson et al.*, 2006]. The sources of these SOA enhancements remain highly speculative, and proved difficult to link unambiguously to anthropogenic influences. Further, the relative importance of first, second, and higher generation oxidation products contributing to anthropogenic SOA growth is virtually unknown [*Hurley et al.*, 2001; *Kroll and Seinfeld*, 2005]. Current estimates deem SOA responsible for about 10–40% of the global organic aerosol (OA) mass (sum of POA and SOA); this portion may be higher regionally. About 90% of SOA is currently believed to be due to biogenic VOCs (BVOCs) [*Kanakidou et al.*, 2005]. AVOCs have therefore not been included in most modeling studies that assess the relevance of SOA to climate forcing [e.g., *Chung and Seinfeld*, 2002].

[3] The chemical transformation of SOA-precursor VOCs was studied in the Mexico City Metropolitan Area (MCMA) during April 2003, as part of the MCMA-2003 field campaign, using data collected at the CENICA super-site in the south eastern part of MCMA [*de Foy et al.*, 2005]. Direct measurements of glyoxal (CHOCHO) by open-path Differential Optical Absorption Spectroscopy (DOAS) have recently become possible, and we present

6

Scientific Writing vs. Science Writing

- Audience?
- Main goal?
- Interesting vs. reproducible
- Nature of title
- Use of references
- Use of direct quotes
- Figures vs. pictures
- Science vs. *about* science

7

Standard Format

- Developed over the last 3 centuries
- Audience is very specialized
 - They have to look at many papers
 - Communicate very efficiently
- Why have a standard format?
 - Make info easy to find
 - Make it possible for someone else to reproduce

8

The Parts of the Scientific Paper

- Parts
 1. Title
 2. Abstract
 3. Introduction
 4. Methods + Materials (or “Experimental”)
 5. Results
 6. Discussion
 7. Conclusions
 8. References
 9. Figures and Tables
- Order of writing: 5, 6, 3, 4, 7, 2, 1

9

Reports for this Course

- Parts
 1. Cover Page – 1 page
 2. Abstract
 3. Introduction – 0.5 page
 4. Experimental – 0.5-1 page
 5. Results & Discussion – 1-2 pages
 6. Discussion
 7. Conclusions
 8. References – as needed
 9. Figures and Tables – 2 pages
 10. Calculations – 1 page

10