

A Primer on Technical Writing in the Sciences: a personal tale

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<http://www.oso.tamucc.edu/pals/writing.pdf>

Early Experiments

- The Scientific Method at *Science Fair*
 - Hypothesis, Collect Data, Analyze, Report
- Writing format is thus fixed at an early age
 - Every report will have the same subheads.
 - Same required content.
 - Null hypothesis (here's how NOT to do something) is acceptable, so anything goes.
- Deadly boring to read.



In Reality...

- A Big Chunk is missing in that *standard format...*

1. **Observation** and description of a phenomenon.
2. Hypothesis to explain the phenomena; a causal mechanism or a mathematical relation.
3. Test the hypothesis by predicting results of other similar phenomena.
4. Recommendations for future work.
5. Replication of the experimental tests by several independent non-affiliated co-parallel investigators - outright acceptance on your arguments (Peer Review).



The Observational Model

Some Lessons from Early Writing Experiments

- Avoid personal pronouns and the royal “we”
 - Common phrasing errors and fixes:
 - ✘ I have demonstrated
 - ✔ These results demonstrate
 - ✘ I have observed these rocks
 - ✔ These rocks have been observed
- Incorporating citations in the text
 - Clumsy: Work by Smith [1988] shows that...
 - Suave: Smith [1988] showed that...
- Excess prose is frowned upon
- *Abstracts* are common. A self-contained and free-standing summary of the entire publication.



Common Writing Assignments

- **Students**

- Research status reports for funding agencies.
- Abstracts of current work for conferences
- Poster Sessions
- Thesis and Dissertation work

- **Faculty or Research Staff**

- Research proposals
- Peer-reviewed publications
- Client-driven technical reports



The Research Proposal



- **Most commonly issued by federal agencies**
 - Request for Proposals (RFPs)
 - Announcement of Opportunities (AOs)
- **Most commonly issued by federal agencies**
 - National Science Foundation (NSF)
 - National Institutes of Health (NIH)
 - NASA, DOE, NOAA, HHS, DOD, ONR...
- **Private Foundations**
 - Rarely offer open competitions



The Research Proposal II

- **Announcements typically 15-30 pages**
 - Program Description
 - Eligibility
 - Estimated funding total and number of awards
- **Proposal Instructions**
 - Topic limitations and review criteria
 - Page limits and sub-page limits
 - Budget
 - Cost Sharing and Indirect Guidelines
 - Due Dates (hard and soft)



~30-50 pages

The Research Proposal III

- Typical Failures

- Outright Rejection for failure to follow instructions (never reviewed)
- Doesn't address Program Goals
- Reviewers don't believe your science
- Reviewers don't think you have capacity

- Tips for Success

- Read and obey the Program Announcement
- Call the Program Officer beforehand
 - Let them know your proposal is coming
 - Pick their brains for a better understanding of program goals
- Focus your argument on the *benefits* of your work



Peer-Reviewed Publications

- *Journal Articles* or articles in *Proceedings* from annual meetings.
- Each article is part of an on-going conversation about a subject of interest to a group of scientists.
- Normal format:
 - Introduction
 - Background and Relevance
 - Boundary definition
 - Observations
 - Evaluation of observations and possible explanations
 - Statistical analysis of results
 - Least controversial conclusion
 - Recommendations for future work



Peer-Reviewed Publications II



- **Page Charges**

- Text ~\$150-500/page
- Black and White Figures ~\$100-700 per insertion
- Color images ~\$2,000-5,000 each

- **Multiple Prestige Levels**

- National Journals: Science, Nature
- Professional Journals: JGR, ACM, Cell, Lancet, NEJM
- Conference/Agency Proceedings (NASA, NIH, et al.)
 - ☹ Commercial Publishers: Elsevier et al.
 - ☹ Second Tier Professional Journals: *Southeastern Soil Science*
 - ☹ Tertiary Professional Journals: *Texas Journal of Science*
 - ☹ Gray Literature: Local Professional Journals and Websites

Peer-Reviewed Publications II

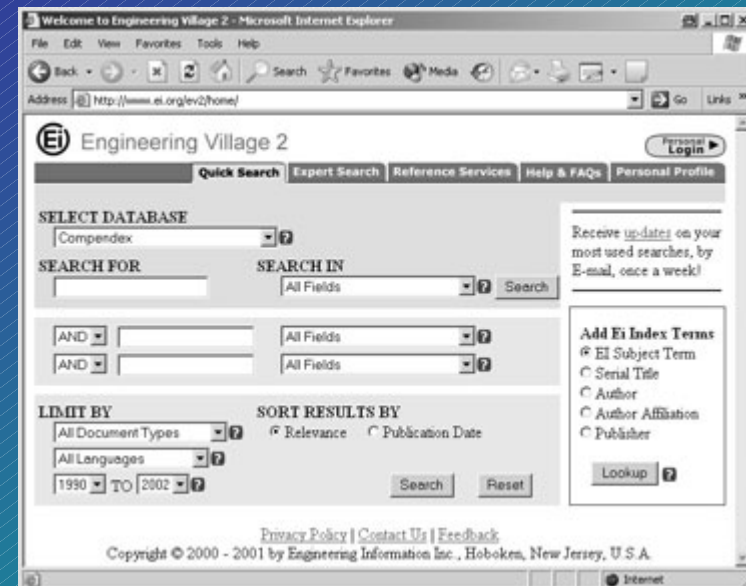
- **How to get rejected:**
 - Confuse cause and effect
 - Make unsupported inferences
 - Write about something completely novel
 - Fail to cite seminal research
 - Fail to cite the peer reviewers
 - Fail to establish relevance of your work
 - Misinterpret your statistics
 - Make a mathematical mistake
 - Fail to reach a reasonable (and usually non-controversial) conclusion



But did It Have Any Value?

- **The Citation Index**

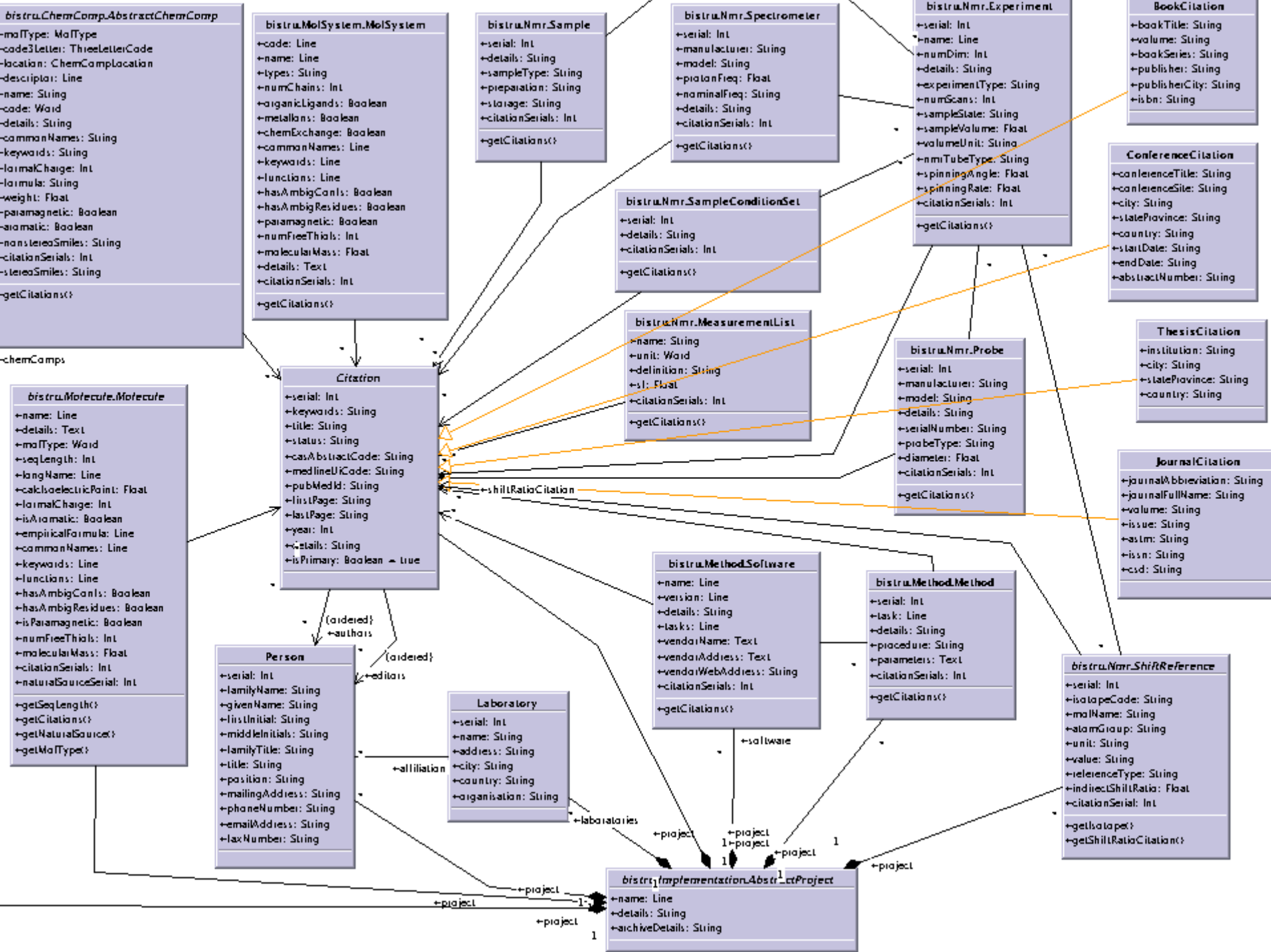
- Compiled and updated internationally each month.
- Created by examining the bibliographies of every paper published in a peer-reviewed journal.
- Can backfire. Being cited doesn't mean you are right.



Sample Listing

Citation Index for Grady Price Blount through Winter 2003-04

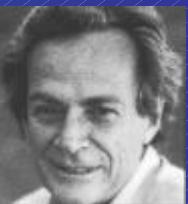
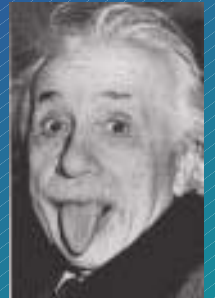
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Peer-Reviewed Publications II

• Entering the Conversation:

- Scientific writing serves scientists who are hooked in a particular story
- Unique Cultural Situation
- Think of Sit-Com Writers
 - Must know the characters
 - What they have said in the past
 - What sort of reasonable things they might say
 - What they are wondering
- In some cases, stories written over several hundred years by a multitude of people



Writing in Science: a personal tale

redux

- The Science Fair Model, duh...
- The Observational Model, Wow!
- Common writing tasks for all scientists
- Proposal Writing Ins and Outs
- Journal Writing and Pitfalls
- Joining the conversation