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Information Mapping™: applying some science to scientific communication

By Ed Hanson (edwhanson@home.com)

I have had an interest in science for as long as I can remember. As a child, rocks and chemicals were two of my favorite subjects. In college, I majored in geology and had an instructor who was so interesting that he had to chase us away after class. Unfortunately, I ended up dropping out of college due to lack of financial resources, but I never lost my passion for science. I ended up working as an analytical chemist for twenty-plus years before discovering that I was really a writer and that writing was what I wanted to do for a living. This pointed me straight to technical writing and I now work as a contract tech writer.

In my current assignment, I spend my lunch breaks surfing the 'net for current science information on a variety of topics. To my dismay, many of the articles I find are difficult to read and often have glaring typos and grammatical errors, even in the most professional of works. It's understandable that scientists (like engineers) are not expected to be great writers, although effective communication of their work is vital to their success. This is where good science writers are needed, and a relatively new tool can help science writers make this material more clear and accessible. This tool is "Information Mapping".

What is Information Mapping? It's a structured way to analyze, organize, develop, and present information in print or online. The approach has the advantage of making technical information easier to read and follow by breaking it up into topical "chunks", and presenting the chunks in a logical and easily scanned format that follows the logical development of the material and facilitates information retrieval.

Robert E. Horn, a researcher at Harvard and Columbia universities, developed Information Mapping in the 1960s, and the approach has been continuously refined and developed ever since. It is now used by organizations worldwide as a standard for developing business documents and online knowledge bases such as intranet sites. Information Mapping helps readers by ensuring that:

- All the relevant information is present.
- There is a logical and recognizable organization that facilitates scanning.
- Information can be easily retrieved by the reader.

The table on page 3, based on information from the IMAP web page (www.tmstoday.com/info-mapping/about/default.htm), both describes and illustrates the principles of the Information Mapping method's three key elements:

An example will illustrate this approach. The text on page 3 was taken from a National Academy of Sciences website article "Science in the Headlines", typos and all.

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Editorial: Science writing for non–rocket scientists: don't dumb it down!

By Geoff Hart

Janette Busch, writing to the Scientific Communication e-mail discussion group, reported something rather disturbing:

> *I was talking to the program director of a journalism school yesterday and she quoted the phrase I have heard before about the readers of newspapers having a reading age of 12. She was stating this as her justification for the way reporters "dumb" down science.*

"Anyone who's taken the time to explain something complex to a 12-year-old knows how bright these people-in-training are, and knows that with a bit of thought, you can explain surprisingly complicated things to them."

I've heard this kind of advice many times, and what most irritates me about it is the naïveté of that particular notion. Among other things, it ignores the huge difference between "reading age" and "thinking age". Anyone who's taken the time to explain something complex to a 12-year-old knows how bright these people-in-training are, and knows that with a bit of thought, you can explain surprisingly complicated things to them. But the journalism director reported an even more disturbing revelation. In Janette's words: "She had no students with a science background and neither did the other courses I know of."

To me, this represents the tragedy of democracy: uninformed individuals have the right to make supposedly informed decisions about things they don't understand in the least. I blame the uninformed and those who are supposed to be informing them (*us*, in many cases) in equal measure. Janette continued:

> *When I am writing about science research carried out in my university, I regard my audience as being intelligent adults who can understand science as long as it is written using words and analogies that they understand. I don't like the idea of having it reduced as far as the 12-year-old level, which I find is rather patronizing and runs the risk of dumbing down or trivializing the science so much it is hardly there at all.*

Nancy McGuire added her own thoughts on this issue:

> *The topic of communicating technical information (science in particular) to the general public came up repeatedly at the last two annual meetings of the Council for Chemical Research, and it's a frequent topic of discussion at the American Chemical Society... Everyone seems to agree it's a problem, but no one does much about it. The assumption seems to be that the general public wouldn't care even if you did make the information accessible. Miracle herbs and toxic spills sell newspapers, but 'real science' will only confuse and bore…*
>
> *I would be fascinated to see if this discussion results in some 'action items'. Maybe the science SIG could come up with an agenda for the STC to pursue in conjunction with some of the other professional societies and people in the popular press. I would be willing to help out with some letters or phone calls, if we can come up with a message that we want to put our*

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Geoff Hart, c/o FERIC, 580 boul. St-Jean, Pointe-Claire, Québec, H9R 3J9 Canada (geoff-h@mtl.feric.ca)

Information mapping (continued from page 1)

Table 1. Key elements of the Information Mapping process

Key element	Description
Content analysis	Ensures complete, user-centered analysis of each topic. Replaces the paragraph as means of organizing text with something called an "information block".
Structured development process	Includes analysis of the information's content as part of the approach to creating and maintaining information.
Sequencing and formatting	The method emphasizes effective sequencing, and develops presentation formats that complement the process of content analysis; this element includes the development of an "information map".

Before

April 7 – Government scientists today detected a major solar flare and have issued a forecast for solar activity to persist at moderate levels for the next 24 hours. Using newly developed space weather scales, National Oceanic and Atmospheric Administration's Space Environment Center classified the resulting magnetic storm as "G 2" or "moderate," potentially resulting in effects on power systems and radio transmissions in the Earth's higher latitudes, as well as orbital spacecraft operations. So far the 11-year solar cycle that is now approaching maximum has not produced an abundance of major geomagnetic storms. The rate of activity is expected to continue to increase though the next few months. Readiness for the Upcoming Solar Maximum, a 1998 report from the Research Council's Space Studies Board, assesses the readiness of NASA and other federal agencies to take advantage of the research opportunities unique to the solar maximum. It also discusses agency activities to minimize disruptions to technological systems that can arise from the effects of the active sun. In addition to their geomagnetic effects on Earth, solar storms affect the near-Earth space environment. The potential impact of solar storms on construction and operation of the International Space Station is the topic of the recent report Radiation and the International Space Station: recommendations to Reduce Risk. Solar storms and other examples of space weather are discussed in the 1997 Web-based tutorial, Space Weather: A Research Perspective.

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This activity could potentially affect:

- power systems and radio transmissions in the Earth's higher latitudes
- orbital spacecraft operations

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"Readiness for the Upcoming Solar Maximum", a 1998 report from the Research Council's Space Studies Board, discusses:

- The readiness of NASA and other federal agencies to capitalize on the research opportunities unique to the solar maximum.
- Agency activities to minimize disruptions to technological systems caused by the effects of the solar activity

Solar storms and other examples of space weather are discussed in the 1997 Web-based tutorial, "Space Weather: A Research Perspective".

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Information mapping (continued from page 3)

The original text all runs together and makes scanning for specific information difficult. Moreover, the logical development is murky. My rewrite uses the Information Mapping approach to clarify things. The second version is easier to scan due to its more spread out format and its use of white space. Important points are easier to identify, the overall text is a little more concise, and the writing flows better than in the original.

Information Mapping's format may not currently be acceptable for scientific and medical journals, but when you consider the amount of reading that must be done to keep current in these fields, anything that can help readers extract important information from an article or paper more quickly would be invaluable. **Ω**

"I don't wear black horn-rimmed glasses, I'm not a man, and I definitely don't fit the scientist stereotype. Neither do most scientists, as it happens..."

Is science understandable by non-scientists?

By Janette Busch (buschj@tui.lincoln.ac.nz)

I'm a biochemist. That's a conversation stopper if ever there was one! Why? Are people who work in science so different from people who work in other types of jobs?

Not always. I'm a thoroughly ordinary person. Just like many of you, I have a home and a family. I work in my garden, and enjoy reading, going for walks, and belonging to several community groups.

Before I began work at Lincoln University, I worked in the lab at a meat processing plant, for volunteer groups, at schools, and at a food research institute. Somewhere in the middle I was an at-home parent for about 13 years. At work, I now provide technical assistance (materials and equipment) for staff who run practical lab classes for students in animal science, food science, and biochemistry. I also do research on a rather obscure but colorful South American vegetable called an *ulluco* that may be released shortly in New Zealand. Another part of my job involves writing about science for people who are not scientists. This means I am involved in communicating rather complex concepts in everyday language; in effect, I'm translating the information from something comprehensible only to the discoverer of the information into something suitable for the person who uses the information.

When some scientists write about their research, they can't always translate their work into words that everybody can understand. Conversely, some of the science reported in the media is watered down so much that the science itself is almost lost. Either way, the reader misses out. I passionately believe that I have an obligation to write in a way that is understandable by a wide range of people. To do otherwise runs the risk of distancing both the science and scientists from the very people they are ultimately working for. I believe it's my responsibility to make science understandable by everybody. If all of us who work in science did this routinely, we would ensure that people could read about the advances made in research and understand them. Then each person could make up their own mind about the issues we all face.

And so to finish. Yes, I do wear a white coat sometimes (clothes are expensive to replace if damaged accidentally in the lab), but I don't wear black horn-rimmed glasses, I'm not a man, and I definitely don't fit the scientist stereotype. Neither do most scientists, as it happens, and that's a revelation each of us needs to communicate to our audiences. **Ω**

Editorial (continued from page 2)

name on. I forwarded Janette's original posting to the head editor of our magazine, [who agrees] that this would make an excellent topic for our Viewpoint department."

Nancy suggested that an article 800 to 1600 words long would be appropriate, and provided contact information if you'd like to pursue this: the ACS author's guide is online at http://pubs.acs.org/ci; you can contact Nancy (n_mcguire@acs.org) for further details. Karen Graber reminded us of the technical communicator's mantra:

This goes back to knowing your audience. If your audience consists of academics with masters or Ph.D. levels of education then I think 'dumbing' down to a 12th grade reading level is too much. If the audience predominantly consists of people with high school diplomas, then it's probably pretty close. It's a personal decision fueled by each person's experiences and beliefs. To use it as a rule of thumb is not necessarily the best course of action as there are always exceptions. My belief is that people who are interested in reading about science probably have more background/knowledge than the average high school graduate to begin with so it may not be necessary to dumb it down.

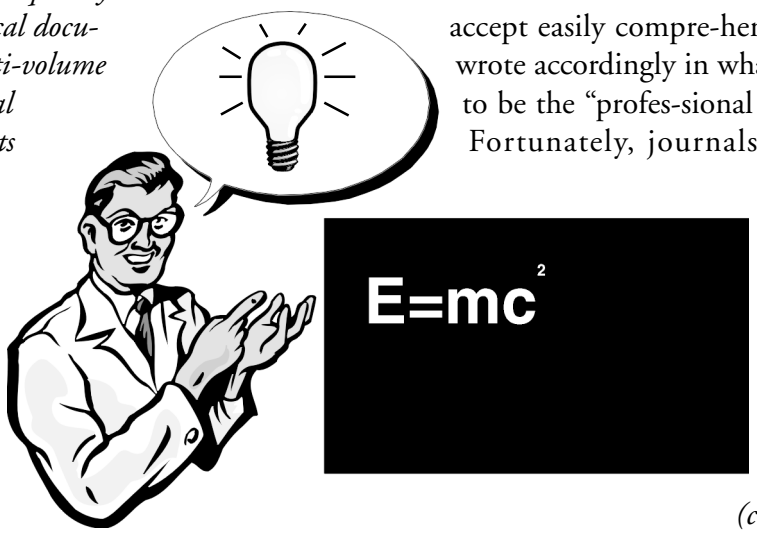
Lyndsey Davis reported that in the field of environmental consulting:

...editors are most frequently involved in technical documents such as multi-volume Superfund remedial investigation reports and engineering evaluation/cost analysis reports… written by degreed experts and scrutinized by regulators. But we are also called on to prepare fact sheets and other newsletter-like documents that are distributed to the general public... These brief documents (generally fewer than 8 pages) are presented with short articles and simple diagrams. We're instructed to edit for a 6th grade comprehension level… I'd suppose our mandate takes into account that the general public is less educated than the subset of readers that makes up newspaper audiences. So that our text isn't overwhelmingly cluttered with explanations, we often resort to a glossary of terms as a way of defining not only the technical jargon that goes along with the various cleanup methods, but the regulator-ese that goes along with Superfund sites.

It's not really all that hard for a good writer to explain something complex, provided the writer first understands it—something each of us must do daily as part of our work in scientific communication. The problem is that most modern journalists *don't* understand what they're writing about: they've taken little science at school (or no science, in the case of Janette's journalism director), and as I've discovered many a time while tutoring children, you can't explain what you don't really understand.

"It's not really all that hard for a good writer to explain something complex, provided the writer first understands it"

None of this supports the notion that complex topics require complex writing: indeed, many of the scientists whose papers I've edited assumed that science journals won't accept easily compre-hensible writing and wrote accordingly in what they considered to be the "profes-sional scien-tist's" voice. Fortunately, journals are changing—slowly—in recognition of the fact that clear writing benefits everyone. Greg Egan expressed my



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Editorial (continued from page 5)

own take on science writing so well that I adopted his comments as my e-mail signature. Egan makes the point sufficiently well that it serves as a nice conclusion for this editorial, with no need of further elaboration:

> *Arthur C. Clarke had suggested that any sufficiently advanced technology would be indistinguishable from magic—referring to a possible encounter with an alien civilization—but if a science journalist had one responsibility above all else, it [is] to keep Clarke's Law from applying to human technology in human eyes.—Greg Egan,* Distress **Ω**

The *Technical Editors' Eyrie Newsletter*

For some time now, Jean Hollis Weber (jean@wrevenge.com.au) has been publishing a helpful free online newsletter entitled *Technical Editors' Eyrie Newsletter.* You can receive it by e-mail, or read it online at her Web site; the latest issue is available at:

www.wrevenge.com.au

Sample topics in issue 38 include a feature article on editing glossaries, information on how to obtain draft chapters of her upcoming book (*Editing Online Help*), where to find the original "Lorem Ipsum…" text used for creating dummy layouts, and a roundup of tools (Macro Magic, for opening PDF files from within WinHelp files; Style Master, for cascading style sheets; a validation tool for HTML and XML code; etc.). Worth a look!

Jean has also written a few books on editing that you should have a look at if you want to pad out your editing library. Check her Web site for details. **Ω**

Useful Web sites for science communicators

By Margaret Knox Morris
(margaret.morris@jhuapl.edu)

[Editor's note: All of the following Web addresses begin with http:// but not all begin with www]

Reference lists

In editing articles for peer-reviewed journals (including the Johns Hopkins APL Technical Digest, which we produce in-house), I have to edit reference lists. Figuring out the correct abbreviation for a journal title used to be a pretty big pain. This site makes it easier by providing access to a list of journal titles and abbreviations (in BIOSIS format):


csssrvr.entnem.ufl.edu/~pmc/journals/all_journals.htm

Dictionaries

A scientific editor needs a bunch of specialized dictionaries and reference books, and I have several shelves full, but the Web has really made looking stuff up a lot easier. It is a great place to find out What the Audience Probably Already Knows in a particular discipline (which every so often stops me from asking a stupid question). My favorite source of links to reference data has lists of links to online dictionaries and encyclopedias; engineering databases; databases of hazardous chemicals; material safety data sheets; patent databases; periodic tables of elements; spectral databases; thermodynamic databases; weights, measures and conversions; and other miscellaneous scientific databases:


www.mlc.lib.mi.us/~stewarca/reference.html

Unit conversion

Finally, a site I often use provides an automatic unit converter. (Maybe the Mars Climate Orbiter would still be with us if they'd had an editor noting that different parts of the

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Web sites (continued from page 6)

documentation used different units and politely offering converted values for them to check?) I often do that kind of work for the space teams here at the Lab, because many of the spacecraft engineers seem to think in English units, whereas the space scientists more often use metric. This web site makes the process a snap:


www.webcom.com/legacysy/convert2/convert2.html

Margaret Knox Morris is Technical Writer/Editor at the Johns Hopkins University Applied Physics Laboratory. **Ω**

Artists wanted

As you can tell from a brief perusal of this newsletter, I'm relying heavily on lightly modified clip art to keep the pages "colorful". It would be nicer to have graphics more closely related to the actual articles, so if you know of an artist who might be persuaded to help out, please ask them to contact me. Thanks!—Geoff

"Science is built with facts as a house is with stones—but a collection of facts is no more a science than a heap of stones is a house."
—Jules Henry Poincaré (1854–1912)

Job opportunity: scientific marketing specialist

Tripos, Inc., a leading provider of discovery research software and chemistry services to the pharmaceutical and biotechnology industries worldwide, seeks a scientific marketing specialist with excellent communication skills to join our team.

This individual will write and produce printed and electronic materials to support the sale of Tripos Discovery Software products and services. Located at the corporate headquarters in St. Louis, this position requires an MS or equivalent in Chemistry or Biology, two years experience in computational chemistry or medicinal chemistry, and proficiency in desktop publishing software.

We offer excellent opportunities for growth and career development for individuals eager to fully express and expand their capabilities. Tripos provides a competitive salary, benefits package, and a stimulating work environment.

Please send resumes in confidence to: Tripos, Inc. Human Resources, 1699 S. Hanley Rd., St. Louis, MO 63144, FAX: 314-647-9241, HR@tripos.com

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Join us on STC's Scientific Communication SIG mailing list!

STC runs an Internet-based e-mail discussion group for the Science SIG. It's a quiet, friendly place to turn for help if you've got questions concerning scientific communication. If you'd like to join, point your Web browser to http://lists.stc.org/cgi-bin/lyris.pl?enter=stcscsig-l

There's no cost to join, and you can expect a very low volume of mail. Of course, the more people join, the more traffic there'll be, so please join. It's a great way to make the SIG work for you.

Two other mailing lists of interest to Science SIG members:

Copyediting-l: discussions of editing in all its various forms. To subscribe, send the message "subscribe copyediting-l Your name" (with no quotes, and with your actual name instead of "Your name") to Listserv@listserv.indiana.edu

Techwr-l: discussions of the tools and travails of the technical writer. To subscribe, send the message "subscribe techwr-l Your name" (with no quotes, and with your actual name instead of "Your name") to Lyris@lists.raycomm.com

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Society for Technical Communication
901 North Stuart St., Suite 904
Arlington, Virginia
22203-1822 U.S.A.