Dave Walden

Dave Walden coordinates the TUG Interview Corner. This interview of him is intended to provide an answer to the question some readers may have: "Who is this guy and why is he interviewing TEX luminaries?"

[Interview completed 30 September 2006.]

Karl Berry, interviewer: Please tell me a bit about your personal history independent of TEX.

Dave Walden, interviewee: I grew up on the edge of the San Joaquin River Delta in California. I had some trouble finding a college major I was both interested in and good at; I went to three schools and had four majors before I graduated from San Francisco State College with a degree in math but a weak understanding of the subject. Fortunately, I had found the campus IBM 1620 computer center in my junior year at San Francisco State and quickly became captivated by computer programming. One of the students working in the computer center (Stan Mazor, who later was co-inventor of Intel's first 4-bit micro-computer) helped me learn to program and recommended me for a part-time job in the computer center during my senior year. I spent so many hours playing with the computer (to the further detriment of my math studies) that I kept a sleeping bag in the computer center for when I was there too late to bother going back to my apartment for the remainder of the night.

As my senior year was ending, I applied for jobs as a computer programmer, was hired by MIT Lincoln Laboratory, and moved to Cambridge, Massachusetts. At Lincoln Laboratory I was assigned to help a brilliant computer programmer (Will Crowther) with the major real-time system implementation he was leading. I shared an office with Will, and he gave me (initially small) assignments of my own to work on. I stayed at Will's side as he integrated the various software components from several programmers into a working system. Will was always available to help me when I was struggling with an algorithm or the programming of the algorithm, and over the next couple of years I became a pretty experienced programmer with good insight into overall design, implementation, and debugging of substantial real-time systems.

After three years at Lincoln Laboratory, I followed my group leader, Frank Heart, to Bolt Beranek and Newman Inc. (BBN) in Cambridge. In those long-ago days, a computer programmer was a lower rank employee at Lincoln Laboratory than the engineering and physics graduates who held the first class rank. When I eventually complained about this to my new group leader (after Frank left), he told me that I could get to be a first class staff member after I finished the Masters degree in computer science I was working on

at MIT. This was unsatisfying to me, so I visited Frank at BBN and asked if he had a job for me. (In the end I didn't turn in the Masters thesis and received no degree from MIT, but I greatly enjoyed taking all those computer science courses.)

Will Crowther joined us at BBN about 18 months later after I got there. In 1968 Frank, Will, and I and a handful of other engineers and scientists wrote a competitive proposal to U.S. Advanced Research Projects Agency (ARPA) to participate in the ARPANET development. Our proposal won the competition and BBN was awarded the contract to develop the packet switches for the ARPANET, the first operational packet switching network and the precursor of the Internet ("The Interface Message Processor for the ARPA Computer Network", F.E. Heart, R.E. Kahn, S.M. Ornstein, W.R. Crowther, and D.C. Walden, *AFIPS Conference Proceedings* 36, June 1970, pp. 551–567). Will, Bernie Cosell, and I wrote the software as part of a seven-person team led by Frank (Bob Kahn, Severo Ornstein, and Ben Barker were the other initial team members). I feel very fortunate to have been at the right place at the right time.

KB: Very neat, to be in at the beginnings of the Internet. Did you have a sense you were participating in something that would grow to be as ubiquitous as it has, or was it just another development project?

DW: I don't know what other members of our initial team, or people at other institutions who participated in the initial development of the Internet, would say. For my part, it was initially an interesting development project for which I was invited to help write the proposal. As I learned about what the government was asking for, I began to believe we were working on something very important — a big change from circuit switching and message switching, the technologies then in use for data communications, and particularly a change from time-and-distance charging for service. The more I heard the phone companies talk dismissively about the ARPANET, even after we had demonstrated it actually working, the more important our effort seemed. (A good rule of thumb may be that the more current entrenched interests denigrate something as impractical the more important it probably is. Of course, now, 35 years later, the phone companies have themselves acquired much of the packet switching infrastructure.)

But honestly, I had little idea in 1969 how pervasive our technology would become. However, in 1971 when another BBNer, Ray Tomlinson, demonstrated networked email, and its use immediately "took off", I then began to imagine a world where every toaster and doorknob contained a miniature packet switch (or router) and every domain of life worldwide was connected. My big surprise was that the explosive Internet popularity we saw with the spread of the World Wide Web in the mid-1990s did not happen 15 years earlier. Networked email, ethernet, routers, FTP, TCP/IP, etc., had all been around for years. I guess the average person needed to wait for availability of the point-and-click GUI interface, HTML formatting (versus plain text email), and HTTP and URLs which could access individual files in a remote computer system without explicit use of FTP. Of course also by that time, the computer vendors' efforts to ignore the Internet and promote their own proprietary networking protocols were increasingly being rejected by the big companies buying computer networks who were insisting on capabilities to interconnect with the Internet. In any case, some kind of "tipping point" (as Malcolm Gladwell calls it in his book of that name) happened in the mid-1990s, and it hadn't happened back in 1980 when I thought it would happen.

KB: I heard you had something to do with inventing Telnet. Could you briefly tell us the story?

DW: I became involved with Telnet a couple of years later. But first, after the ARPANET

was up and running for about nine months, I spent a year (1970–1971) working for Norsk Data Elektronikk in Oslo where I influenced the development of the second packet switching network ("Remembering the LFK Network", Nils J. Liaaen and David C. Walden, *IEEE Annals of Computing*, Vol. 24, No. 3, July–September 2002, pp. 79–81; preprint available online (`http://www.walden-family.com/dave/archive/net-history/lfk.pdf`)). In 1971 I returned to BBN and rejoined the ARPANET team there. By this time the focus of effort of the fledgling ARPANET community had moved from the basic connection of computers at user sites to the backbone network of packet switches to communication among the user computers across the backbone network. This meant work on Telnet, FTP, email, etc. In no way did I invent Telnet: it had been conceived by some Network Working Group participants from 1969 or so as a way for dissimilar physical and virtual terminals to connect to the variety of operating systems running on the various user computers. However, as different options had to be handled (e.g., line-at-a-time terminals versus character-at-a-time terminals, and local echoing of characters versus remote echoing of characters, etc.), a method was needed to find a common set of capabilities between a (virtual) terminal and the host operating system to which the terminal was communicating at that moment. Bernie Cosell invented Telnet's `will/won't/do/don't` negotiated options scheme. I helped by listening to his ideas and asking "but what about this?" and "what about that?"; the initial design session was done on cocktail napkins on an airplane flying from Boston and to an ARPANET meeting in Los Angeles. In Los Angeles, Bernie presented the scheme, people liked it, and I promised we would write it up and circulate the appropriate RFC, which ended up as number 435 (`http://www.faqs.org/rfc/rfc435.txt`). Later I drafted the modification to the Telnet spec to include this capability.

I've had a lot of good fortune in my life. In addition to being at the right place at the right time at the beginning of the Internet and working on a variety of early Internet technologies (for example, the first distributed dynamic routing implementation (`http://www.walden-family.com/public/bf-history.pdf`)), I was also fortunate to work beside several programmers with skills far greater than mine. I already mentioned Will Crowther. Bernie Cosell was another. Of course, I wrote a lot of code too and had a number of good ideas of my own, but often part of my contribution was being aggressive about documenting (`http://www.walden-family.com/public/whole-paper.pdf`) what we had done or were about to do.

KB: Will Crowther was one of the very first names I came across after encountering computers (long before I'd heard of Knuth). You can probably guess why — because of Adventure, well, Advent, since names were limited to 6 characters on the Dartmouth mainframe I had access to. I spent many hours exploring Colossal Cave. Did you work on Adventure?

DW: At BBN Will and I had adjacent offices, and he, Bernie, and I and several others played in a weekly Dungeons and Dragons game that often took place on the living room floor of my home. After playing in this D&D game for a long time, Will wrote Adventure. I had nothing to do with it except to have it demonstrated to me, but I like to tell people that I was there while Will Crowther was creating the first computer adventure game.

KB: From what you've said, and from some of the articles you've given me, it seems BBN was one of the major contractors in what used to be called the "military-industrial complex". Did the fact that so much funding for cutting-edge research and development came from the military ever seem odd to you, or be of concern?

DW: Having graduated from college in 1964, working on Department of Defense con-

tracts, first at MIT Lincoln Laboratory and later at BBN, provided me with a deferment from being drafted for the Viet Nam War. So there was some hypocrisy on my part in being against the war and avoiding it by working on DoD contracts; on the other hand, I believe a strong *defense* is essential for national security. Also, much of the work we did for ARPA was not inherently military. In some sense, ARPA at the time was like a ministry of industry in the computer area (even though the United States has no such institution as an explicit part of the government). ARPA was funding research in time-sharing systems, programming languages, artificial intelligence, speech recognition, natural language understanding, networked data communications, computer user interfaces, database management systems, and so forth. With J.C.R. Licklider as the first director of the ARPA Information Processing Techniques Office (IPTO), ARPA was funding Lick's famous vision of "Man-Computer Symbiosis" based on the paper of that name (`http://memex.org/licklider.pdf`) he wrote while at BBN before founding ARPA IPTO. Of course, all of these technologies have military uses, but the impact on the larger world has been much greater than any military use. Still, there was a certain ambivalence around BBN about working on defense contracts. I remember one time BBN was scheduled to be picketed by some anti-establishment group, and a dozen or so BBN employees marched out the front door of BBN to join the picketers. (Then one of the BBN vice presidents invited all the picketers to move onto BBN's front lawn — private property rather than the public street — the police didn't have to arrest anyone, and the demonstration did not become a cause celebre.)

Returning to your original question about my personal history, after returning to BBN from Norway I was at BBN for another 24 years in a series of technical, technical management, and general management positions.

When I retired from BBN in 1995, I spent several years working part time for a nonprofit industry consortium (mostly developing and teaching management courses) and part time for the MIT Sloan School of Management (teaching a business improvement course I helped develop). About 2000 I retired completely from paid work.

Over the roughly four decades since I first got involved in computers, I have spent roughly a quarter of the years on each of computer programming, technical management, general management, and teaching and writing.

I have been married for over 40 years, and we have one child, and his wife and he gave us a granddaughter in 2007. We live primarily on Cape Cod but spend a good bit of time in Boston which is only an hour away.

KB: When and how did you first get involved with TEX and its friends?

DW: Even before I wrote my first published book (in the early 1990s), I had always written a lot — technical papers and documents both for publication and for internal use. I had also helped my wife self-publish an oral history of my mother (I did the typesetting, such as it was, with MS Word). By the late 1990s I had become fed up with MS Word, its data incompatibilities and major changes of the user interface from version to version, its hidden, proprietary and undocumented markup, its weak editor, the inconsistency between WYSIWYG editing and what gets printed, and Microsoft's apparent strategy for forcing users to buy an upgrade every few years. I made a vow that from then on I would write significant documents using a powerful editor working on plain text files. I had long known of the existence of TEX and I admired Knuth from my years in the computer world, so I decided to try TEX. I had previously used RUNOFF, MRUNOFF, nroff/troff, and WordStar, so command-based "word processing" versus WYSIWYG was no worry for me.

I found a version of TEX somewhere on the Internet and bought a copy of *The*

TEXbook. As I almost always do when I try to learn something new, I looked around for "the organization", found TUG, joined, and began looking at the issues of *TUGboat*. I quickly became aware of LaTeX, bought some more books, switched to learning LaTeX, began to watch `comp.text.tex`, and began to develop a major revision and expansion of my first book in LaTeX. The book was eventually retypeset using QuarkExpress by the publisher's compositor, but I was pleased with the process and experience of writing a book using LaTeX and was glad to have the LaTeX-based manuscript in hand.

KB: I remember your paper based on that experience which Barbara and I edited for *TUGboat*.

DW: I like to summarize a major development experience in writing to consolidate my thinking about what actually happened and to help me think about how to do it better next time. Coming from a technical world where there is personal and business benefit for publishing, my natural inclination was to submit my draft for possible publication somewhere; aiming for publication also improves my motivation to actually do the write-up I know I should do and want to do. I found an invitation from *TUGboat* editor Barbara Beeton in the *TUGboat* area of the TUG web site inviting papers from non-expert TeX users; so I submitted my write-up, and it was accepted (and I learned some new things about LaTeX from the editing changes Barbara and you made to my source file).

KB: My memory is that you then asked if TUG could use some low-level volunteer labor.

DW: Yes, my thought was that by getting more involved with TUG I could perhaps connect up with people who really knew TeX and LaTeX which could result in me learning more and in time perhaps actually become a useful resource. *The PracTEX Journal* (TPJ) on-line journal was just being formulated at the time (August 2004), and you and the editorial board invited me to participate in that, perhaps contributing content on basic, nitty-gritty use of LaTeX such as I had described in my *TUGboat* paper. I had been the editor of an on-line journal (*Center for Quality of Management Journal*), and had lots of ideas about how an on-line journal might be better "published" than the approach we used with the CQM journal. In particular, I had ideas about writing a program to generate the web site for an on-line journal that the TPJ editorial board eventually embraced, which led me to volunteer to write such a program. I previously had written some little Perl programs (my professional programming days were over by the time I began hacking with Perl); and when I learned that you knew a lot about Perl, I became excited about writing a more substantial Perl program with someone knowledgeable around from whom I could learn.

My general view of learning any new subject is that the more I put into it the more I will learn. For me volunteer work is not so altruistic; I don't volunteer for things unless I really want to know more (or I already know a lot and can help without much work). If I feel the need to contribute to an area I am not interested in learning, I give money rather than time.

In any case, we wrote the TPJ web site generation program over the course of a couple of months although the job was much more substantial than I anticipated because you kept suggesting things the program should do (such as creating author and title indexes) that I hadn't imagined being part of the job when I volunteered.

KB: I had a great time working with you on that project, and am very glad you had enough desire to know more about TeX that you joined TUG and pitched in to help in various ways. Are there particular areas of TeX that you are interested in delving into more? Do you think your next book will have much different needs than its predecessors,

or have you reached a sort of steady state by now?

DW: Today I use LaTeX and pdfTeX from the proTeXt distribution, WinEdt, and various packages, macros, and techniques I have found useful (described in *The PracTeX Journal* 2006-2 (`http://tug.org/pracjourn/2006-2/walden`) and 2006-3 (`http://tug.org/pracjourn/2006-3/walden/`)), but I am sure I will slowly keep expanding my TeX capabilities. Probably I will use more or less what I know now for my next book as I want to get it done relatively quickly. I will probably try ConTeXt for the book after that, and relatively immediately now I may try doing my own indexing for the first time, perhaps using an Eplain-based technique for creating a non-embedded index that John Culleton described to me in the Yahoo self-publishing discussion group.

KB: One TeX/TUG project you initiated and have been steadily involved with is this interview series. Have you done anything similar before? What impelled you to start the project? Have you gotten what you hoped for out of it?

DW: As I suggested earlier, I like projects where I also can benefit from what I am doing. I also prefer projects that can be done incrementally so I am not under too much pressure to finish too much too soon; one of my rules of thumb is to avoid trying things that are so hard or have such near term deadlines that it becomes stressful or an unpleasant burden to work on them. Thus, this Interview Corner project was a natural for me: I get to learn about various well known TeX people and gain perspective on how the various parts of the TeX world fit together and why, I only have to finish an interview every month or so to feel I am making good progress, and — with good input from the interviewees — organizing and formatting the interviews is a very achievable job.

Wanting to know more about various TeX people (and suspecting that others might also want to know more), I remembered the *Mathematical People* and *More Mathematical People* books edited by Donald Albers, Gerald Alexanderson, and Constance Reid (the second book only) based on a series in the *College Mathematics Journal* of interviews of well known mathematicians. The best extant interview of Knuth, in my view, is in the first of these volumes. Thus, I thought, why not have a similar interview series for TeX people? I have done lots of interviewing of customers that resulted in detailed write-ups of what they said, and as a journal editor I have done some interviews for publication (one example is at `http://www.walden-family.com/public/cqm-journal/rp07900.pdf` and I have interviewed authors in order to help them create first drafts of papers they later took command of and made their own.

I'm very pleased with how the interview series is turning out, and hope someone is reading them besides me.

In general I try to twist jobs I volunteer for so they are not so hard to do that I soon will stop wanting to do them. This is the main reason my "Travels in TeX Land" column for *The PracTeX Journal* mostly describes something I did rather than claiming to be a tutorial on a subject that I would then have to really become expert about. It would be hard to become an expert, but it's relatively easy to describe what I did. (By the way, the title of my column is a paraphrase of the title — *Narrow Roads of Gene Land* — of the three books of the collected papers of William Hamilton, the amazing evolutionary biologist. I was deeply moved by his introductions to the papers when I read volume 1.)

KB: By the end of your tenure at BBN, I gather you were ultimately responsible for major budgets and a whole division of workers. Despite TUG being perhaps the direct antithesis of a large corporation, do you have any thoughts on or improvements for TUG as an organization, pro or con, from your experience and study of management?

DW: At various times at BBN I was responsible for a division or a subsidiary. The largest

was a contract research and development organization with approaching 1,000 people. One was a start-up that failed (we created the first multi-platform networked email system, InfoMail, much before there was a market for it), one was a turn-around, and one involved shutting down a "mature" product line. All were quite small activities in Fortune 500 terms (total annual revenue of all divisions and subsidiaries only reached about 300 million in circa 1990 dollars while I was with the company).

I think there are more similarities between a modest sized for-profit corporation like BBN and a modest sized non-profit organization like TUG than there are differences. Both have to serve some sort of "customer" or there is no reason for existing. Both have to adapt to a changing competitive environment and changing customer desires. Both have to have good financial controls and remain solvent. Both need to develop new products or services from time to time, produce and deliver existing products and services reliably and efficiently, and communicate with existing and potential customers. Of course, an obvious difference is that an organization like TUG depends primarily on volunteer labor, but I'm not sure this needs to make as much practical difference as most people assume it does; there are also resource conflicts in for-profit organizations and the same principles for creating viable business processes apply to both types of organizations. (My co-author Shoji Shiba and I talk about this in our book *Four Practical Revolutions in Management* (`http://www.walden-family.com/4prim/`).

KB: Although you are something of a relative newcomer in the TEX world, do you have any opinions about how it should be moving?

DW: I think TUG and the other user groups should continually work to make sure potential new users are aware of the availability of TEX but should not waste much time worrying about why people like "inferior Word" better than "superior TEX". Concentrate on making TEX better, more available, and easier to use for the people who are already inclined to its use; help them learn to use TEX and then help them stay users. One thing I wish I'd had when I was starting out with LATEX was documentation that assumed and described the beginning use of LATEX in the context of a whole environment (operating system, TEX distribution, editor, major format/package, etc.) and was prescriptive ("this is how you should do *whatever*") rather than a reference work ("here are some capabilities that will let you construct *whatever*"). ProTEXt with its WinEdt option and installation script seems like one good base for such documentation for Windows users. Also, the more documentation that is written in terms of programming-by-example the better, I think — more documentation like chapter 3 of *TEX for the Impatient* (`http://www.ctan.org/tex-archive/info/impatient/`).

KB: It's been a pleasure to get to know and work with you over the last several years, Dave. Thanks for making this interview series happen, and all your other work for TEX and TUG.

[Endnote: After this interview was completed, a follow-up interview for *MAPS* (`http://www.ntg.nl/maps/34/16.pdf`) was conducted by Frans Goddjin.]