

Dick Sites Story, Part Two

(As published in The Oak Ridger's Historically Speaking column the week of March 15, 2021)

Continuing Benita Albert's story about Dick Sites as recommended by Mike COveyou.

"When I finally graduated from twenty-two years of school (Pre-school to PhD). I needed a real break. So, I went hitchhiking across Canada and back for nine months."

Dick Sites, 1965 Oak Ridge High School (ORHS) alumnus, had not only immersed himself in academia, he had amassed an impressive, hands-on work resume' in computer science.

Equally important, he had collected a network of computer science friends from his job stints and academic studies that Dick honored in his work overview memories for his children: "With the exception of Intel in 1992, I had never started a job search through the front door—sending a resume' cold to the Human Resources Department. Helping friends are everything." (Side note: Dick interviewed with Intel during which he asked to be permitted to visit for a day in the lab and with the work group to which he would be assigned. When he was told that security and proprietary issues prevented his visit, he chose another corporation's offer.)

Dick's well-deserved respite (his Canadian trek) came after completion of a PhD program in computer science from Stanford University in 1974. He recounted an undergraduate electrical engineering lab at MIT in circuit design, a course that whetted his desire to learn more about computer design. He knew that the University of North Carolina (UNC) had a strong computer architecture course taught by Fred Brooks, one of the three System/360 architects.

Dick described his next actions: "My idea was to either complete the Master's in 1.5 years, or transfer to a PhD program somewhere, if I got my energy back (and did well enough to get in)." Midway through his first year at UNC, Dick applied to Stanford University's PhD program. He believes it was Fred Brooks' letter of recommendation that made the transition possible, recalling: "Fred Brooks wrote a strong letter that basically said, 'Take this guy.' ...At Stanford I had a combination of teaching and research assistantships."

His dissertation advisor was Don Knuth, who in 1974 received the ACM (Association for Computing Machinery) Turing Award, informally considered the Nobel Prize of computer science. Alongside numerous pioneering works and honors, Knuth is also well known to innumerable students of computer science as the best-selling author of multi-volumes of textbooks, generally titled: "The Art of Computer Programming."

I asked Dick to overview his career specializations by providing me a broad work journey description. He responded: "I have been interested in computer performance—making hardware and software faster—since the late 1960s. After graduate school, I taught for four years at the University of California in San Diego, then went to Digital Equipment Corporation (DEC) outside Boston. In 1992, I was co-architect of the fastest computer CPU chip in the world. A few thousand of those chips were installed in a Cray T3D supercomputer at X-10 (Oak Ridge National Lab) a few years later."

"After leaving DEC in late 1995, I worked at Adobe Systems for seven years (Acrobat and Photoshop groups) and then at Google for twelve, retiring in 2016. Since then I have been teaching an occasional graduate class on understanding software performance and turning those class notes into the draft of a graduate textbook."

To view Dick's February 5, 2020 invited lecture for the Computer Systems Colloquium at Stanford go to the link: <https://www.youtube.com/watch?v=2HE7tSZGna0> His lecture starts with two fundamental queries: 1. To understand why things are slow? 2. How to build tools to get the data to explain why things are slow? Even if the total presentation might challenge those of us not privy to computer-speak and tech research, rest assured that we all depend on the work he is exploring, in our real-time, data-dependent tech lives.

Dick Sites, as of this writing, has sixty-six patents filed for his varied computer projects. I asked him to choose four of his patents to highlight as to their application and impact. I was curious to see if what he listed had affected my life, or perhaps yours?

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Before listing his four responses, Dick wrote, "Patents are often about arcane details, written in stylized and wordy language. But they sometimes have a commercial value of millions of dollars, so smart companies file lots of them." His four responses, including the patent numbers and titles, follow below.

#6,408,092: Handwritten input in a restricted area: "I liked this idea because I wanted our daughter, Fiona Louise Sites-Bowen, to be able to sign her full name digitally on the screen of a PalmPilot, even though it did not fit into a regular signature box on the small screen. Adobe shipped this. The idea could be used today on cell phones. (Impact: small)"

#8,326,602: Detecting writing systems and languages: "If you use the Chrome browser and sometimes get a message that the current page is in Romanian (e.g. <https://www.gov.ro/>) and you would like it translated, that is my code running on your computer to detect the language used in web-page texts (the translation is done on Google computers). More people in the world, about 100 million, use this every day than anything else I have done in a lifetime. (Impact: large)"

#8,644,794: Luggage locator: "This uses the cell phone network not for voice or text or internet but just to see which cell towers are nearest. That is enough to locate your luggage within about a mile, so you know which airport it went to by mistake. Never built. (Impact: small)"

#9,729,446: Protocol-independent packing routing: "This is purely a computer-geek idea. The problem is to decide which program gets an incoming message on an extremely high-speed network—100 gigabits per second. At that speed a new message can arrive every six nanoseconds: bam, bam, bam, which is the time *light* takes to travel the six feet between people who are social distancing. Much too fast for computer programs to do the decision, and ten times faster than most datacenter networks today. I came up with a general hardware design that will last much longer than ten years even as networks undergo rapid change. (Impact: medium. Heavily used at Google.)"

Dick is now in semiretirement, but he is still quite busy. Of this new phase, he said, "I am working on a textbook on measuring software performance. It will be about 320 pages, of which I have draft versions of about 280 pages. I may teach one more graduate class somewhere next year—someplace in the world that my wife and I would like to live for six months and that would be willing to take me on."

Dick says his wife, Marjory Lucey Bowen, "...writes about food and does drawings and other art projects as well as serves as a docent for the San Francisco Asian Art Museum." Their son, Connor Sites-Bowen is an artist and writer in Pittsburgh, PA, and their daughter, Fiona Simpson, lives in Atlanta and is a Customer Success Consultant for software that schedules medical doctors.

Dick has seen enormous change in technology over the more than sixty years he can count of his computer history—from his first age-10 ORACLE program to the present. I asked him, "What astounds you the most of all that has developed?"

He replied: "Computers are a lot faster than then. Wikipedia is much more accurate than the Encyclopedia Britannica, and is in 100 languages and cultures. The worldwide web brings knowledge from all over, accumulated and posted by billions of individuals. It is the world's largest resource, even for tiny groups such as the Nigerian opera fans in Sweden (search for that)."

I asked Dick to share advice on the security of home/personal computing. He answered, "Get a cheap USB disk drive and back up every week or two. Then if you get infected with ransomware, ignore the payment request and restore your files. Pay attention to Apple, Microsoft, etc. security updates and install them whenever offered. Change (or have a family member change) the factory-set passwords on anything you buy, especially your Wi-Fi router."

"Add a login password/number/fingerprint to anything that has none, including your cell phone. For financial accounts, set up two-factor authorization: a cell phone app that the bank supplies, or a text message the bank sends, or a little keychain dangle—all of which generate an ever-changing code for each login. It is OK to have a paper notebook containing all your normal passwords—the larger danger is remote access from somewhere in the world, not from a thief breaking into your house."

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My question on the status of American education evoked his following comments: "The U. S. education system is largely failing us, and we are substantially behind other countries. Too many students are behind grade in reading, science, civics, and careful reasoning. When I was growing up, the Oak Ridge Schools were an exception to this, and I am eternally grateful. Not for any piece of history that I learned or failed to learn, but for the coming to understand how to pay attention to the world and how to think critically. Much of that comes by osmosis from excellent teachers with high expectations, not from textbooks *per se*."

And I asked for Dick's best advice to aspiring computer scientists. "Read. Read about other work, read about machine design, read about software techniques, read about new ideas."

Finally, I asked Dick how he (or aspiring computer scientists) should respond and/or adapt to such a rapidly changing field, the field of computer science. His candid observations follow: "Pretend you live five years into the future and build things that will be needed then, even if impractical now. At Adobe, when digital cameras and GPS were new, circa 1998, I did a side project of putting GPS coordinates into picture data and showing them on digital maps. Adobe wasn't very interested: *sigh*."

"Today with cell phones, that is so common we never think about it. I did another side project looking at optical character recognition and indexing all the patent text back to George Washington. Today, patent text is available in many places on the Web. At DEC, one group built an electronic book with a crappy screen that was bigger than, and weighed more than, a real book. But now iPads and tablets are used to read books and newspapers and anything else. Impractical starts can inspire later products. Everyone can think of things that will be useful in five years, and some of those will become great inventions."

On adapting to changes, Dick wrote: "At DEC I was a computer architect. In 1996 I saw that the Intel x86 architecture had won, and I guessed that it would dominate for a human generation of twenty-five years. So, I got out of computer architecture and moved back into software performance. The field has largely played out that way, and computer architecture is now getting interesting again."

It was my great honor to write Dick's story. However, it was impossible to give all the credit he richly deserves. His broad-based body of work; problem solving genius; significant network with past, present, and future computer scientists; and his humor and unassuming nature are all part of his amazing life story.

Fortunately, you may learn much more by searching Dick's name online as well as viewing a three-hour interview with Dick for the Computer History Museum in Mountain View, CA. That comprehensive profile takes a tour of the evolution of computer science through a litany of people, machines, languages, and applications Dick has known.

<https://www.youtube.com/watch?v=A47a6Nga2aM>

Lastly, for the serious student of computer science, you may enjoy a deep dive into his *acmqueue* published paper from November 6, 2018, entitled "Benchmarking 'Hello World.'" <https://queue.acm.org/detail.cfm?id=3291278>

You have just been exposed to an intriguing story of an amazing individual well told by Benita Albert. Dick Sites is unique. He is brilliant and has been on an amazing life journey at the leading edge of computing. He recognizes the value of his early education at Oak Ridge Schools and his experience at age 10 that launched that life journey.

He remains abreast of the computing world and sees the future clearly as anyone can. Dick Sites truly does deserve all the recognition we can give him and I am thankful to Mike Coveyou for brining this amazing story to us and for Benita for compiling it.

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Dick Sites



Dick Sites at the Secret City Commemorative Walk pointing to the plaque with his father's name on it