

Trip report E.W.Dijkstra, USA, 20 May 1982 - 14 June 1982

On Ascension Day I left my country with flight KL641, and until New York all went well. The delay at immigration/customs at JFK was considerable; in addition the customs officer taught me how rude, impolite, and unhelpful New Yorkers can be. It was so late that the "Interline Luggage Transfer" in the customs area no longer accepted my suitcase for the flight to Boston. The coach was too crowded, I had to walk to the TWA domestic terminal as fast as I could. Usually I travel light, but this time I was carrying books and the walk was no fun. At my destination I fell - I had exhausted myself - but I broke nothing and just caught my connection.

Still panting I sank in the cushions of my seat, but though the flying time to Boston is only 35 minutes, I had plenty of time for recovery: it was more than 2½ hours later when I arrived in Boston. First we had to wait until a thunderstorm had passed, but then the captain announced that he could not get the nr.1 engine going; after replacement of its start motor we took off. So much for TWA's preventive maintenance. During those 2½ hours we were offered 1 glass of 7-up. (After arrival the stewardess told us that she hoped we had enjoyed our flight and that it had been a pleasure to serve us.)

At Logan Airport I was collected by the Boston Chapter of the ACM in the person of Jacqueline Masloff who took me to the Marriott Hotel in Newton. After I had checked in, she told me that she would be back Saturday morning 8 a.m. and left. That Saturday I had to give a one-day seminar for the Boston Chapter.

The famous slogan "There is no place like Hilton" evokes with me the reaction "Thank goodness!". The Marriott Hotel taught that Hilton's slogan is a lie: until well past midnight the "live entertainment" in the bar vibrates in your room. (And for all that vulgarity one has to pay more than \$100 per night!) Fortunately I was so tired I did not suffer too much.

The next day I wrote a letter before breakfast. After breakfast I established by telephone - 50 ct. per local call! - that there

was no point in visiting Harvard: Michael O. Rabin was in Israel and Tom Cheatham left at noon for a trip. So I went to MIT.

After lunch I interrupted my visit to MIT to fulfill my moral duties towards The American Academy of Arts and Sciences. At the occasion of the opening of its new home it had asked all its Fellows and its Foreign Honorary Members to offer copies of their works for its new library. The new home of the AAAS surprised me: I had only read about it in terms of architectural superlatives, but once in the building I realized that the superlatives were fully deserved! I was received by a charming lady, who told me that she was particularly touched by my attention because Dutch members were so rare; I was glad to be able to offer, besides the books you can still buy, a copy of my thesis, which by now is a collector's item. (This is independent of the fact that it is by far the most boring thing I ever wrote.) We drank tea, I dedicated my gifts, was pleased to see "Elements of Style" by Strunk and White on the shelves and returned to MIT (with a markedly lighter briefcase).

I had hoped to meet Joe Stoy (of Oxford), who is visiting MIT this year, but he was not in and I could not get him on the phone since his line was engaged. Telling Corbató that I feared that Joe was sitting at his terminal in his home, Corbató typed in a message, which evidently appeared on Joe's screen. For a few minutes later Joe called. It was a nice demonstration of how technology can undo some of its own harm. Corbató being Joe's neighbour, he was glad to offer me a lift to Joe's home at the end of the day. I had a nice evening with Joe and Gabrielle Stoy, who lived near my hotel. I went to bed at half past ten.

Having to perform the whole day, I took only a light breakfast on Saturday morning. I was collected at 8:03 and after a half-hour drive we were at the college in whose auditorium the seminar was organized. I had a reasonable blackboard, but very little chalk and three whiteboards on which it is hard to write big enough for an audience of 170. The sound system was excellent. The morning session lasted from 9:00 till 12:20 with a fifteen-minutes break; the afternoon session was

from 14:00 till 17:15, again with a 15-minutes break. (I spent those breaks signing copies of my book.) Lunch was very substantial and in view of the fact that at least one person had to stay awake, I skipped it.

It was a very nice audience to work with. In my opening address I had asked them to regulate the speed of my presentation, and they did so admirably for the rest of the day. The last 45 minutes were devoted to discussion; I got no silly questions! In my innocence I had thought that the day would end with a dinner with the organizers, but all the officials of the Boston ACM Chapter left, with the exception of Jacqueline Masloff and her boyfriend, who asked where I would like to be dropped. I was dropped at the home of Barbara Liskov who gave an end-of-semester party to some colleagues and a number of graduate students. There was food as well.

The next morning Marriott's restaurant was too crowded to get a breakfast, but John Guttag came to fetch me around 11:45. In his home I had an excellent breakfast while he and Olga were having lunch. At 15:00, he drove me to the airport.

MIT used to be very much technology-driven and absorbed in systems of its own making. I was therefore not amazed when, upon my arrival at the 5th floor of 545 Technology Square, I witnessed a heated discussion about blanks in column 1. When none of those students could tell me where Joe Stoy's office was, I was amazed. ("If he is in Theory he must be on floor 8." After nine months they were still unaware of his presence! He had his room on the same floor as they, but at the other side of the elevators. So much for intellectual parochialism.) When, one hour later, I observed that they were still discussing blanks in column 1, I got very depressed. Later I learned that that "systems" subculture is generally regarded as a relic from the sixties, kept alive by some of the aging faculty but no longer an attraction for the brighter students, who prefer a more scientific approach to computing. So there is a little hope for the Department — not much, for at the same time it is being snowed under by equipment.

On Sunday evening I arrived half an hour late in Austin, where I was met at the airport by my host, Dr. Hamilton Richards Jr. of Burroughs Corporation. We rented a car from National, which could provide me with an American Rabbit with a four-speed stick shift. I preferred that over the originally reserved Toyota (which, of course, was already a great improvement compared with last year's pimpmobile). The Rabbit was more expensive than the Toyota, but I don't think that by selecting a Rabbit I can be accused of extravagance.

The next five days I went to the lab. On Tuesday evening I attended a party given in a large 100-year old house. I guess it is called "Colonial style": large rooms, high ceilings and all wood. The acoustics were so marvelous that I played for almost an hour Mozart sonatas on a Steinway. On Wednesday and on Friday, K. Mani Chandi and Jayadev Misra from the University of Texas collected me around noon for lunch, after which they took me to the University. On Wednesday we discussed my recent work, on Friday theirs. We started working together and I probably showed them the way in which a hunch of theirs can be turned into a certainty. They had a beautiful paradigm to start with. At the lab I lectured and started to collect programs with the intention of studying their structure, their development, and their presentation. My first observations have strengthened all my prejudices against terminals: absence of helpful and relevant comments was explained by "if I had added comments, it would not have fitted on the screen".

Because of Memorial Day we had a long weekend. My host and his family had gone to the coast; I stayed in his home and fed his fish and his cats. And I wrote about 10,000 words. On Saturday evening I had dinner with Misra, Chandy Boyer, Moore, and their wives.

It had been warm when I arrived in Austin, but now it became really hot and humid. As a result my wrist began to hurt and writing was often painful. During my second week at the lab I devoted a larger fraction of my time to learning what people were doing. It was instructive and became very interesting when Mark Scheevel carried out a number of small experiments on my behalf.

One of the things I learned from those experiments was that in combination with lazy evaluation the dichotomy of "strict" versus "nonstrict" is really much too coarse. (I learned this the hard way when, to my great surprise, the interpreter refused one of my programs.)

During my second weekend in Austin I wrote EWD827. On the one hand it was a standard exercise: prove $p=q$ by showing that p satisfies the defining equation for q . The defining equations for p and q were, however, of so different a structure that the exercise was not completely trivial. The example being very simple, that nontriviality came somewhat as a surprise.

I had cooked up that example on the preceding Friday afternoon during an informal discussion about recursion equations that took place at South West Texas State University, just before I gave a lecture there. I had to decline the invitation for dinner after my lecture for, that evening, my host had arranged my farewell party in Austin.

On Wednesday afternoon I flew to Los Angeles with Continental. Its magazine contained an article about the explosion of the number of vice-presidents in American business, in particular in the world of finance. And, sure enough, two days later I saw an office of a bank equipped with an "assistant vice-president".

All of Thursday I spent at CalTech, discussing recent work and the problem of finding competent faculty. I ended that day by giving a lecture. Earlier that afternoon the review of the so-called Silicon Structures Project by its sponsors had ended, and as a result of that coincidence I had representatives of a number of those sponsors in my audience, which was nice because my topic was most appropriate for such an audience.

After lunch I had heard the sponsors' reactions to what they had seen of SSP. They were sobering. During the last year the main emphasis of the project had changed from "correctness by construction" to the more traditional approaches of "simulation", "line extraction", etc. My impres-

sion was that during the last year the project had sunk a good deal towards the average level of inadequate engineering. But the sponsors now felt much more "at home" with the project! It was frightening. It is well-known that the scope of the technical problems faced by industry are, in general, underestimated on the Campus; it now seemed that in industry itself that scope is still more seriously underestimated.

I was struck that evening by an Editorial Commentary by Paul Davis in the March 1982 issue of SIAM News: "The decline in math skills is no longer a joking matter", of which Alain Martin handed me a copy. I quote

"Japanese industry is now turning its attention to computing software, firmware, and hardware. If they deliver it as well constructed as their cameras and their cars, we will soon lose control of industrial process control, small business applications, local communication networks, and a multitude of other small machine and chip applications. If the newspaper and trade journal accounts of samurai software are accurate, reliability and precision will triumph.

Part of our country's vulnerability to such an assault lies in our failure to teach habits of precise thought and analysis. We are graduating too many sloppy scientists and engineers, and the fault lies in large measure in the decline of the quality and quantity of mathematics instruction at all levels, grade one through post-graduate."

I was struck, but not amazed. I had read (in the International Herald Tribune, May 20, 1982) the article by Paul Dettard Hurt (of Stanford) with the somewhat catchy title "America's Schools Are Flunking Science and Technology". He compares science and mathematics education in the United States with that in the Soviet Union, East Germany, China and Japan, and the numbers he gives speak for themselves.

I did not know how closely connected CalTech itself is con-

ned to the "brain drain": a first count showed that between 40 and 50% of its faculty is of foreign origin and has received a major part of its higher education abroad. I knew that the brain drain has caused very uneasy feelings in the countries drained: they felt they were losing their best people. I now sense that it also causes uneasy feelings in the draining country: there is the worry that the American educational system is not self-supporting. Life is very difficult.

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After the above had been written I saw (also from SIAM) a commentary by Derek C. Bok on current federal policy towards the NSF. I quote:

"Too few of us realize how much the success of American science has depended on the wealth of outstanding talent that came to us from Europe during the decades that surrounded World War II. Today that source of talent has largely disappeared. If we cannot replace it with exceptional, young investigators of our own, the quality of our universities and the vitality of our scientific work is bound to diminish."

That is a very explicit expression of the worry I had sensed.

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On Saturday afternoon I made my ritual visit to Huntington's Desert Garden, where the cactuses impressed me as much as ever. If you are ever in Pasadena, don't miss it! It is of an absolutely unique, impressive beauty.

On Sunday I prepared my departure. With KL 602 Martin Rem and I left Los Angeles in the evening for Amsterdam, where we arrived the next day at 16:00. In Pasadena's cooler climate the pain in my wrist had already begun to subside, and in the Netherlands I was glad to observe that the heatwave, of which we had heard, was over. At 19:00 I was home, at 20:30 in bed. I slept until noon.

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I found my fear confirmed that, in the West, Artificial Intelligence would be taken more seriously since the Japanese seemed to do so. A series of three articles on "Thinking Machines" (by Tom Alexander) has recently appeared in "Fortune". They were shown to me by Professor Jayadev Misra, and I shared his sense of alarm about this symptom.

Stronger than at previous occasions, it seemed to me, the use of computing equipment is regarded as a condition for progress and the use of more equipment as a sign of more progress. A remark by Misra about the quality of the Department of Computer Science at Austin encountered strong disbelief from the side of a colleague (of the Department of Electrical Engineering): impossible, for the Austin Department had only 1 VAX, whereas Stanford had 15! The recent books by Gries and Reynolds have been criticized - be it in a rather unfair review - for their "non-technological" or "anti-technological" view of programming, i.e. for their lack of attention paid to "modern" - i.e. mechanized - verification; proof systems are discussed "but not in a realistic or useful fashion". (The reviewer has a vested interest in mechanical program verification.) In the review of the Silicon Structures Project all the sponsors praised the project for its development of the graphics! (Here, however, I heard one rare critical note: one of the sponsors had asked himself whether the project dealt with the design of chips or with the design of posters.)

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