

Tripreport E.W.Dijkstra, USA 19-30 October 1977.

The immediate cause for this visit was an invitation from Professor Michael Dertouzos, director of MIT's Laboratory for Computer Science, to perform in the course of the academic year 1977/78 in their "Distinguished Lecturer Series". As he had offered to reimburse my travel expenses, it gave me an opportunity of earning the crossing of the Atlantic. By leaving on Wednesday, I could make it an eleven-day trip, while missing only one Tuesday at the University.

For lack of direct flights from Amsterdam, the trip from Nuenen to Boston took a long time: I left Nuenen after breakfast and arrived in Boston in the middle of the evening (local time). I had to change flights in New York with (according to the time table) four hours to do so. As this seemed plenty of time, the one-hour delay of the KLM flight to New York was no reason for any alarm. During the flight, however, I did not feel comfortable: I had made the mistake of buying Wednesday morning's issue of the International Herald Tribune, which described in vivid terms the ordeal of the just rescued hostages from the hijacked Lufthansa plane, and fate would have it that we had a handful of youngish Arabs on board. Two hours before landing I learned that one of them --the only one who spoke some English-- was an American citizen and that the others were immigrating into the USA. Thereafter, but for no good reason, I felt safer. The meal was exceptionally good; apart from that the flight (with a completely filled Jumbo) was no fun. I shared a three-seat row with an American couple with an incredible amount of cabin luggage and I could hardly move; and (evidently) some Arabian languages have to be spoken at the top of one's voice.

Three cheers for J.F.Kennedy Airport! After dismal experiences in the past I have successfully avoided it for many years; this time it was a marvel of efficiency! We could land without any circling and 40 (!) minutes after we had touched the ground, the plane had taxied to the building, we had left it, passed Immigration and Customs, and I had checked in for my connecting flight in the TWA building. And all this in spite of the almost simultaneous arrival of at least two other Jumbos from Europe. It was quite amazing and impressive. The TWA flight was a little bit late, I took a taxi to my hotel and at 22.00 local time I was in my room, more tired than sleepy. The night was of the usual kind, but not too bad: I slept more than I had feared. *

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The next day I had to perform at 15.00. After bath and breakfast I called and was picked up by an MIT car, was introduced to my host and talked from 11.15 to 12.00 with Barbara Liskov, upon her request about what I had been doing lately. Lunch at 12.00 with seven people; I was pleasantly surprised to find myself sitting opposite to Professor Michael Rabin, of whom I did not know that he had a sabbatical. (His wife would arrive the next day from Jerusalem.) From 13.00 to 13.30 at talk with five or six people in Dertouzos's office, a talk that was too short to amount to very much, but then I had to dash off in order to prepare the blackboard. It was a good thing that we came early: inside the lecture hall it was as hot as hell! While Marsha E. Baker, Dertouzos's administrative assistant, went to get the heating switched off, I started preparing the blackboard. One hour later --I didn't have too much space and had to arrange my material carefully-- I was soaking: I was wet all over my body. And the lecture hadn't started yet! In the meantime the defective amplifier of the PA system had been replaced. We were all set and I had still 30 minutes for cooling off in the corridors. As those minutes went by, Dertouzos, who had publicized the event widely, learned that the

lecture hall was too small. It was an amphitheatre; first the steps in the aisles were occupied; eventually we ended up with about 50 people on or leaning against the podium. It was not my problem!

The aims of Dertouzos and myself were slightly different. His primary wish was to show me to his students, to provide them with "a role model", and his lengthy introduction, extolling my virtues and achievements, was almost painful: not only did I feel as an article on exhibit, many in the audience realized that I had to feel that way. The title of my talk was "The Interplay between Mathematics and Programming", and my purpose was to show the correctness proof of a (multi)program in what --after many experiments-- now seems to me the most promising style. As neither the average mathematician, nor the average computing scientist is familiar with that style, there was the severe danger that the example would baffle both. In view of the space/time limitations to be expected I had pruned my example severely, reducing it to its bare essentials. I think that I got my message across the limelight and reached a sufficiently large fraction of the audience to consider in retrospect the effort as having been worthwhile. (The next day I learned that I had pruned a little bit too much: this was an example for which an operational proof was still feasible. Rabin discovered the operational proof that I had rejected so radically five months ago, that I had forgotten it completely!) That evening I had a quiet dinner in Dertouzos's home without any further guests; it was a pleasant evening. I felt relaxed and went to sleep at 23.00 .

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The next day was less successful. Dertouzos had written to me that undoubtedly a number of people would like to speak to me; in view of the fact that they were paying my transatlantic crossing I felt that being the full Friday at their disposal was about the minimum I could do in return. My host's intention, however, had been to give me a quiet, relaxed day and the fact that I would be at the Laboratory on Friday as well had not been publicized. I had a few discussions which, now, were unprepared from both sides. The previous night had been bad, I had woken up much too early and at the end of the Friday afternoon I was very tired. I talked with Carl Hewitt and had dinner with him; the really fruitful discussion with Carl I had the next day, late at night, when he had seen me back to my hotel after a dinner at Jack Dennis's place.

On Saturday morning I studied a new paper by David Harel that he had given me the previous day. It was clearly written and I think that I have now a good picture of what seems to me to be the central part of his work with Pratt on modal logic. As most logicians he doesn't like the postulational method, and he expresses his dislike in very strong terms and "accuses" me of confining my attention to only one quarter of what he is talking about. (Was it narrow-mindedness on my side that I focussed my attention entirely on a programming language that could be implemented without backtracking? As programming has been described as the art of avoiding backtracking, I am not so sure that I would like to see the need for it as a feature of the implementation!) His synthesis is nice, but his pronounced operational, mechanical view strikes me as rather old-fashioned --as if he were an electrical engineer, almost!-- .

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MIT is still the confusing (and inbred!) place it used to be. I find American universities confusing in general: the whole business of grants and contracts makes most Americans besides scientists salesmen as well, and only

too often these two capacities are not clearly separated from each other. At MIT this confusion and complexity is aggravated by their strong ties with industry and government (ARPA!), and quite often the role of the political entrepreneur is so predominant that one begins to wonder whether the scientist is still there. All these different interests are so entangled that, at least by European standards of academic integrity --possibly by American standards too-- the whole situation becomes almost fraudulent. Many things are better understood if MIT is also seen as a centre of power.

On Sunday I was left to my own devices; it was somewhat uncomfortable that I had to check out at noon, although my plane to Philadelphia only left at 18.00 .

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The next three days I was the guest of Burroughs, Paoli. I was again in the Stouffer's Hotel, where I had been before and that I liked. (At less than half the price that had to be paid --by MIT, I am glad to say: it was their choice!-- for a less comfortable room in the Cambridge Hyatt Regency: more than \$ 68.00 a night I consider as excessive, at least in Oct. 1977.) I liked my stay in Paoli much better than my stay at MIT: at Burroughs they made me work harder, but, also, they seemed to care more. (I was expressly shown the colours of the trees in autumn, the so-called Indian Summer. It was unbelievably beautiful: I think that "gorgeous" is the only right word for it.)

It was interesting and instructive in many ways. I met, for instance, someone who had recently joined Burroughs after five years with IBM, and it was about the closest exposure I have ever had to an IBM-man. (I have, of course, worked together with Jerry Blaauw, but that was more than twenty years ago and before Jerry went to IBM, so I don't think that that really counts.) It was quite amazing to meet someone who could write and talk --believe me, I am quoting literally!-- about a "function management data function manager" without batting an eye.

The first one-and-a-half day were very tiring as I was ruthlessly exposed to an incredible amount of detail. (As a result I found it easier to lecture the remaining time in Paoli.) In a peculiar way the exposure to this (still tentative) project was fascinating: it was of a mixed management/technology flavour that would never work in Europe --and whether this one will work in the USA still remains to be seen-- . Until Paoli I had travelled light; when I left Paoli I could only pray that in Santa Barbara and Pasadena I wouldn't be given similar amounts of documentation (a prayer that has been answered). The third day in Paoli I saw a B7700 built with the newest technology, and the comparison with an older one further down in the machine room was interesting. I also met a man confessing to me that he was annoyed and shocked by the discovery that recently he had experienced in his own work a primary store of a quarter of a million words as a constraint, and that confession was refreshing.

On Wednesday we never saw the sun, there was even some fear that I might find myself fogged-in at the Airport. But the plane to Los Angeles left dead on time. It was an uncomfortable flight on a Lockheed 1011 ; the main attraction of the bottom cushion of my seat was that it could also be used for flotation. In Los Angeles I had no problem catching my connection to Santa Barbara; neither had my luggage. * * *

Upon my arrival I was met by two Santa Barbarans (not Santa Barbarians) from Burroughs with whom I had two drinks in not too noisy a bar before I

went to bed and had a beautiful night. (I slept in the local Holiday Inn, which means that we didn't have the drink in the bar of my hotel: the bars of the American Holiday Inns distinguish themselves invariably by absolutely deafening music which makes conversation absolutely impossible. It is called "entertainment".) Thursday was devoted to a discussion partly to a specific design they were considering, partly to machine architecture in general. In the morning and the first half of the afternoon, my hosts did most of the talking, at the end of the day I have given my comments. It seemed to me a well-spent day. As in Paoli I have urged the people I met not to hesitate to write to me whenever they wanted to show or to ask me something. At 19.00 I flew with Golden West in a small plane back to Los Angeles, where I was met at the airport by four people from the Burroughs Pasadena plant. That evening the five of us had a very American dinner in a steakhouse. (I don't think I had ever been in a steakhouse before. I could manage the steak, somewhat to my amazement.)

Friday morning I had an informal discussion with Bob Creech and Michael Mahon, in the afternoon I addressed "the troops" in the cafeteria, and that was fun. Apart from the fact that I had to keep the microphone in my hand, the PA system was perfect and I had a large "whiteboard" that gave me plenty of space.

In between I admired the library. A good library is, of course, essential, but I don't believe that all plants have one. Has the plant in Santa Barbara a library? I found the people there reasonably well-read and aware of relevant academic work; another possible explanation could be the presence of youngsters that have left the university not too long ago. Also in Pasadena quite a few people seemed "to be aware". That was refreshing and encouraging.

Many years ago I learned already that the communication channel from the university to the industry is in general regrettably weak and is mainly provided by the graduates going into industry, and that, as a result, it takes a very long time before the results of academic research, no matter how relevant, penetrate into the industrial world. (In Montebello, 1975, Harlan Mills went even further, when he made the outrageous suggestion that computing science departments should not occupy themselves with machine architecture, because in the IBM hierarchy "design was not an entry-level responsibility".) Industry is just hard to penetrate and over the last years I got the impression that Burroughs as a whole was in this respect no exception. Recent observations are different: either my first impression has been too pessimistic, or things are improving. It may be a bit of both; in any case it is, as I said, refreshing and encouraging.

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The last 24 hours I was the guest of Martin and Ellen Rem. Without any scheming from my side, Burroughs had arranged my trip so that it ended in Pasadena, where Martin is working this year at CalTech. I was finished with Burroughs on Friday afternoon, my plane left Los Angeles on Saturday evening. The Rems were healthy and happy, and I spent a most enjoyable Saturday with them. Following Wim Feijen's suggestion, Martin and I shall submit a joint article, and Martin is going to do the writing. (After all I gave him a European golfball for his typewriter!) I returned with the non-stop Lufthansa flight; the safety precautions were considerably more elaborate than usual.

Plataanstraat 5
5671 AL NUENEN
The Netherlands

prof.dr.Edsger W.Dijkstra
Burroughs Research Fellow