Twenty-eight years

Twenty-eight years ago I wrote EWD0.

It was during a kind of scientific interregnum: my thesis and the basic software for the X1 had been completed and I could not start on the ALGOL compiler because ALGOL 60 had not been defined yet. I did all sorts of unrelated things. It was, for instance, the year that I published -at last!- my algorithms for the shortest path and the shortest spanning tree. It was also a time of explorations. At a given moment I was working on four or five different manuscripts. Of course, the pages of each manuscript were numbered; after I had mixed up pages between manuscripts for the second time, I decided that I had better end that confusion, and numbered the manuscripts as well: EWD0, EWD1, EWD3, EWD4 . And that is how it started.

I don't remember their topics, nor whether they have been completed. The oldest EWD of which I remember the topic is EWD6, on which I worked in Paterswolde in the "Familiehotel", where, in the early summer, I spent a holiday with my young family. It was on my discovery how to implement recursion. I vividly remember my conscious search for a good name for the device, good in the sense that it would yield both a noun and a verb.

1

At the time, I worked in Dutch and came up with the noun "stapel" and the verb "stapelen", which I subsequently translated into "a stack" and "to stack". (Evidently, the term was fortunate, for within a few years after I had used it in my article "Recursive programming", it had established itself in the working vocabulary of the computing community.)

I then allowed myself the luxury of a portable typewriter, which I still have. [It had square brackets.] {It had braces too.} I could also type → and ⇒ . In early 1960 I used it for, say, a dozen EWD's, which were working documents for our ALGOL compiler and recorded all sorts of conventions and interfaces. This was prior to Xerox machines, but by typing on rice paper with a piece of carbon paper at the back, one could make an original from which copies could be made at a modest cost.   The machine was a Hermes Media, the type fount Techno Elite.   It was a luxury indeed: I was poor and the machine was very expensive. But it was worth its money, for after many years of intensive use it is still in excellent condition.

Around May 1961, in something like EWD31, I introduced the P- and V-operations on semaphores. By the time I went to the Technological University of Eindhoven _ Sept. 1962_ I was an expert typist. Asked whether I had any special wishes _in those days new professors were supposed to have special wishes_ I shocked my future colleagues by asking an electric Hermes Ambassador with the Techno Elite type fount and special characters according to my specifications. (I shocked them because in those days, professors were not supposed to do their own typing.) I mention my request for an electric typewriter because it shows that already in those days I viewed writing as a major component of working.

2

EWD123, "Cooperating Sequential Processes" was written in 1965 and served as lecture notes for my course in the fall semester of that year. (The problem of The Dining Quintuple – later dubbed "The Dining Philosophers" by Tony Hoare – was the examination problem at the end of that semester.) The rate with which the EWD-numbers increased was in those days not a measure of my productivity: I assigned numbers when I started on manuscripts and many of them were not completed. (My first year in Eindhoven I suffered from a writer's block. Everything I wrote disappeared before completion into the wastepaper basket, until I discovered the cause: if I geared my text to my former colleagues of the Mathematical Centre in Amsterdam, I realized halfway that my new colleagues in Eindhoven would not understand it, and if I geared my text to my new colleagues, my former ones would think it insipid. I only freed myself from that writer's block by the conscious decision not to write for a target audience but to write primarily to please myself.)

A next milestone was EWD249 "Notes on Structured Programming" written primarily for therapeutic reasons – and partly while I was in hospital – in 1969. In response to the completion of the THE Multiprogramming System – and, I am afraid, in response to its success – the Department

of Mathematics had disbanded the group I had built up. My degradation from esteemed colleague to dangerous competitor caused me to suffer from a depression that lasted more than half a year. EWD249 marked my recovery.

The fate of EWD249 revealed that the by then ubiquitous copying machine had profoundedly changed the pattern of scientific communication. I had mailed only 20 copies to friends in Europe and the USA, but it spread around the world like wildfire to the extent that only a few years later IBM felt forced to steal the term. People from far-away places have later told me that in, say, 1971 they had a 6th- or 7th- generation copy! No future history of science can ignore the change the advent of the copying machine has made.

In the mean time I privately owned a second Hermes Ambassador and, but for the copying machine, I was fully equipped for my life as Burroughs Research Fellow, which started in August 1973 around EWD375. Prior to that, primarily my trip reports —in Dutch— were distributed among my colleagues. (I got the idea of writing trip reports from Brian Randell, who had acquired the habit in the years he worked at IBM, Yorktown Heights. It seemed such a good habit that I immediately adopted it.)

4

The major change was that now I tended to assign EWD-numbers to completed manuscripts. This was facilitated by the fact that uncompleted manuscripts became more rare. For the next five years or so I would decide for each EWD to whom I would send it and would make precisely that number of copies at the Eindhoven branch of Xerox. I still regarded the opportunity of making copies a luxury —many EWD's were typed at single spacing— ; I also prided myself at the low cost with which I ran my little research outfit. Early 1978 I privately bought a 3M copier, I charged the paper to Burroughs and began to maintain a regular mailing list.

The switch from typed to handwritten EWD's took place halfway EWD719-7 -29 Oct. 1979-, when my Hermes developed a technical trouble. The transition became more or less definite when my little 3M copier (which had been too cheap) got more and more problems with the sharp thin lines of the Hermes: Techno Elite was a very nice —distinguished and exclusive!— type fount, but it was hard on copying equipment. After having verified at Burroughs that the people there had not the slightest objection to handwritten EWD's, the transition became almost complete. I was, as said, an expert typist, but I still preferred writing over typing. (The large Hermes with its heavy carriage was very noisy.)

5

[The only advantage -if it is an advantage- of typing over writing is that typing enables me to cram almost twice as much text on a page. The gain in speed is ignorable. It makes some difference in re- laxed letter writing: 1000 words/h when typed, 750 words/h when handwritten. But technical EWD's are written -even after all the mathematics have been done- at a speed of 200 words/h , i.e. about 3 words/minute. The rest of the time is taken up by thinking. In that situation, mechanical aids for getting characters on paper are clearly irrelevant.]

Eventually Burroughs installed a Toshiba copier in my Nuenen office. When UT asked me whether I had any special wishes -occasionally, new pro- fessors are still asked that question!- I answered "a copier according to my specifications". A Toshiba now occupies the space originally intended for the washer and the dryer (which have been banished to the garage); by now it has made more than 32,000 copies.

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Well, that's how it all happened. Of course I have been blamed for all my deviations from average behaviour. (The touchy interpret it as implicit criticism.) I have been blamed for typing all my own stuff on a type- writer that was spectacularly different from all other machines in the department. But I really needed a

a distinction between the digit 0 and the capital letter O . (For that reason, all my Hermes machines had their ten digits from a different type fount.) And I did my own typing for the practical reason that it took me less time than the detour via a typist. I have been accused of showing off my productivity by numbering my manuscripts; I hope to have convinced you that, if you are in the business of writing, it is very practical to have a uniform way of identifying your manuscripts. Lately I have been accused of using my handwriting as a cheap trick to enhance my visibility; I hope to have convinced you that I use it for eminently practical reasons. (Getting a single daisy wheel with the appropriate special characters is not a simple operation; on my fountain pens I get them for free.) So much for some self-defence.

On a more contented note: I am reasonably pleased with life, about as pleased as we poor mortals may be allowed to be, and in this contentment the EWD-series plays a major rôle. If there is one "scientific" discovery I am proud of, it is the discovery of the habit of writing without publication in mind. I experience it as a liberating habit: without it, doing the work becomes one thing and writing it down becomes another one, which is often viewed as an unpleasant burden. When working and writing have merged, that burden has been taken away.

The habit is also liberating in a much more profound sense. I consider, for instance, EWD975 on the Theorem of Pythagoras - of all theorems! - a major achievement of last semester. It was an unadulterated pleasure to write it; one of its recipients called it "absolutely bloody marvellous". Had I only written with publication in mind, it would never have seen the light of day. Not only would aforementioned recipient have been denied his enjoyment, I would have been so too: what I sent out was Sunday's version, which I could only write after the discovery that I could still improve on Saturday's version. The only way to discover that a neglected or ignored topic is worth writing about is to write about it.

The EWD-series seems a little unusual. If it is sufficiently unusual to represent a novel style of doing science, the development of that style may be one of my major contributions. (In passing I note that among scientists of the next generation the style has become less unusual than among those of my own generation.)

In any case I thank the recipients of the EWD-series for their patience to bear with me. Without providing much feedback, they proved to be an inspiring audience. But, copying machines being what they are, I have not the foggiest notion

of whom I reach. I therefore have an

<u>Important Request</u>   Would everybody - and this
time I really mean <u>everybody</u> - who sees this
text be so kind as to inform me that he or she has
seen it? A postcard stating name (and affiliation)
suffices. (End of Important Request.)

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