

HIGH TECH - THE NEW GOLD RUSH

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"Is not scientific management largely a state of mind ?" (Frederick
Winslow Taylor, 1917)

"Research may acquire an unstoppable momentum of its own, even
though the case for stopping may strengthen with the passage of years.
Prevention may be better than later attempts at a cure." (Sir Geoffrey
Howe, British Foreign Secretary, 1985)

1 The 26 Billion Dollar Temptation

In the last days the Israeli press started to discuss - or rather praise - the US invitation to join the "star wars project". In an editorial of this paper (10.4.85) the state of mind of our political elite concerning this invitation is well presented. For one we are supposed to be flattered by this invitation because it recognizes the potentially unlimited ingenuity of the Jewish People. It shows how this small country has become a serious partner to the US (never mind for what purpose). It is conceded, however, that the whole project may turn out to be the ultimate madness of the western technological society and that both in the US and in Europe the political wisdom of "star wars" is questioned. One argument, however, is omitted. That the possible counter measures against this "defense system" cost probably only a very small fraction of the money to be invested in "star wars", but that the likelihood of their working is much bigger.

"These are all weighty arguments. But it need not be expected that the cabinet will spend too much time thrashing them out in trying to decide whether or not to accept the US offer." Who has ever heard of a heroin addict in search for money for his next push objecting to any kind of prostitution ? Israel is run down economically for what ever reasons, and the mere chance to be part in a 26 billion dollar project is reason enough to rush after the money. "Independence-minded Israelis will bemoan the virtual loss of the Jewish State's freedom of choice when it comes to such issues ... as getting involved in a controversial foreign arms research programme. But that is all they can do in the circumstances". The potential benefits of this programme for Israel outweigh all doubts, we are told. Our industry, both military and other, will profit from it. The country will finally recover from all its illnesses by the new magic cure High Tech.

I do not want to discuss all these political questions here. We do not have all the information to do so. But I do want to discuss what is needed to turn High

Tech into a cure, if at all this should be possible. High Tech is the new gold, but those who built a future on the gold rush were not the gold diggers but those who were able to build a lasting infrastructure: the bankers and saloon owners first of all. "It remains to be seen how well fitted Israel's scientific infrastructure is, in its present somewhat neglected state, for the far-out research contemplated by the Americans. But this is a practical question that need not concern the cabinet." But it should concern the cabinet very much, indeed, for the cabinet also decides about our education budget, the university funding and finally will have to decide also on how to manage this Faustian endeavor. One reason the US invited 17 Western allies to participate is that the US precisely does neither have the human resources nor the money needed for it. Various committees have investigated whether the educational system of the US is sufficient for the demands on technical intelligence as forecasted for the next twenty years. Their almost unanimous answer was no. And the present flow of capital to - not from - the US made the US already now to the world's biggest debtor. If our government is invited to join the US project on government level it may not leave considerations for "practical questions" totally aside.

2 Political vs technical expertise

What has been left out so far in the public discussion of the "star wars project" is its impact on research and development as a *social process in itself*. I can illustrate this in the field I work myself: Computer Science. Computer Science plays an important part in the "star wars project" since both in its development and in its ultimate functioning computers play a vital role. But Computer Science is a young science and therefore its scientific community may be particularly temptable. At a recent conference (West Berlin, March 25-29 1985) on the "Theory and Practice of Software Development" a special evening session was scheduled to discuss "Our Responsibility as Computer Professionals". About 200 hundred of the ca. 500 participants of the conference took part in this discussion, among which most of the invited speakers, many of which have made historical contributions to Computer Science. The "star wars project" was the focus of the discussion.

There was a remarkable consensus on technical aspects of the project. It was widely agreed that the requirements the "star wars project" imposes on software development are unrealistic and beyond feasibility. It was pointed that out we are still very far from producing reliable programs without extensive testing in real situations. It was also universally agreed on that by just multiplying the current research efforts by a big number would not yield the breakthrough expected by the non-experts. Software development is a human activity which grows like a cultural process. Progress in software development is therefore inherently slower and more limited than progress in hardware development.

There was also a remarkable consensus on the bearings of over-ambitious multi billion dollar projects on the scientific community. When too many people and too much money is involved the consensus of technical expertise tends

to break down. The honest scientist's voice calling for more modest goals and caution gets lost in the noise of the charlatans who are willing to try the impossible. Ultimately highly hazardous products are released and handed over to users not aware of their inherent dangers. Examples from the recent past, such as the ADA programming language project and A. Hoare's Turing award lecture, or the Japanese 5th generation computing project were quoted. Hoare was honored with the Turing award (the highest recognition in Computer Science) for his contribution in program language development. In his Turing award lecture he gave a frightening account of his failure to influence the ADA language project and to reduce it from its megalomaniac design to a safely usable programming language. ADA is the programming language to be used in all American Department of Defense projects, including "star wars". The Japanese 5th generation computing project promises the ultimate breakthrough of Artificial Intelligence within the next 10 years. In a panel discussion at the 4th Jerusalem Conference on Information Technology in May 1984 this project was suspected of being widely exaggerated and now in Berlin the experts were even more sceptical. While a more modest version of the Japanese project is universally considered feasible, the grand version and the resulting international "computing race" were considered harmful.

The only real controversy in Berlin was around action to be taken. One side recommended a strict separation of technical expertise and political discussion. It was argued that if scientists refrain from political opinion when consulting on technical matters, their influence can only gain. But this side conceded that this was only possible when the scientific community in question acts as a common body. A draft resolution of the Council of the ACM (Association of Computing Machinery) to this effect was read at the end of the discussion. The other side claimed that a separation between technical expertise and political impact was rarely possible and recommended more political action. But both sides agreed that the public had to be informed and not only the politicians, since the advice of the builders of the first atomic bomb not to use the bomb remained without effect.

I assume that similar phenomena will occur also in the other scientific communities, be it Laser Research or Satellite Engineering, even if the limits of the feasible in Physics are more common knowledge than those of Computer Science. It needs a lot of intellectual and moral force to remain sane once the dance around the golden calf has started. Overfunded research is like heroin, it makes addicted, weakens the mind and furthers prostitution.

3 Consequences for the Scientific Infrastructure

These harsh statements are not meant to discourage concerted efforts of improving Israel's research capabilities. But they are meant to warn Mr. Peres, Rabin and Patai (and our silent education minister) that the "practical questions" of how research can and should be organized have to be addressed before a final answer is given to the US. What Israel needs are indeed research conditions

which allow our best scientists to work here, and less in foreign laboratories, to have fully qualified research assistants and technicians, and not only unattended equipment, to have an environment where craftsmanship, scientific patience and work discipline are not eroded by bad working conditions, low salaries, over taxation and stiff competition for better jobs. Our students should have the best possible education, not abroad where they tend to stay, but here, at our universities. Industry, rather than luring away half educated High Tech engineers, should develop a sense for long range planning and support university laboratories not only with equipment but also with manpower. The benefits of such a policy would show off only after some years, but they would manifest themselves in lower turnover and lower failure in hiring scientific personal. Industry pressures the universities now to lower their standards by demanding more throughput, rather than mature engineers. The academic teachers not only teach too large classes, but have to perform many of the tasks which should be delegated, from secretarial work, technicians jobs to mastering the intricacies of the bureaucracy when applying for research grants. As a matter of fact many of the existing grants are not appropriately used because they overspecify for what the money is not to be used and the money allocated can not be administered directly by the researchers and their staff.

If some of the 26 billion dollars of the "star wars project" should help Israel's research capabilities those "practical questions" have to be addressed by the politicians and scientists together. Otherwise the money injected will disappear either in unusable hardware or new bureaucratic structures without any positive long range effects on science and technology.

But what worries me most in the present state of higher education is indeed the "acquiescence in mediocrity", as Shlomo Gazit put it in his recent interview with Yosef Goell in this paper (April 5, 1985). One might add, though, that the undergraduate curricula at our universities offer too much sophisticated technical knowledge and neglect the education of the human being who is to use this technology. It is our needs as humans which should determine the use of technological progress. If the technically possible becomes our only criteria in its use our Jewish heritage is irrevocably lost. If we had any right of putting Eichmann on trial, we have a holy duty to teach our students a sense of responsibility.