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# DISCUSSION REMARKS

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Response to **John Holmfeld's**

## POLICY CONSEQUENCES OF THE LIMITS OF SCIENCE

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COMMENTS (*) ON JOHN D. HOLMFELD'S PAPER:

# THE POLICY CONSEQUENCES OF THE LIMITS OF SCIENCE

by

C. le Pair

*Incoherence of politics*

Holmfeld feeds back to us, namely the science community, the thoughts and feelings of the political part of society. The problem is that the thoughts of non-scientists and particularly of policy-makers are often vague and ambiguous and the definintions such people use are not precise or clear-cut. Politicians tend to keep things vague deliberately and manipulate words and meanings. Two words that are frequently confused and lumped together are science and technology. As a scientist I prefer precise definitions: to me science is reliable public knowledge, whereas technology is practicable knowledge. A technician only practices techniques that are already known.

According to Holmfeld certain techniques like experiments on human beings in Nazi Germany, the use of the atomic bomb in World War II and the wide-scale application of certain pesticides in the post-war era, made politicians and scientists realize that there were limits to science. In my view, however, we should make a distinction between the pursuit of science and the use of techniques derived from science. Although policymakers perceived the need for restraints in exceptional matters, the prevailing ida in the 50s and 60s was that scientists

should be free to pursue whatever they wanted and that all science should be supported.

Holmfeld then considers whether this dominant perception is now changing. He notes that politicians already perceive the limits of technology and he sees signs that science too will soon be subject to more and more limits. He draws our attention to the dramatic shift that has already occurred with regard to the military, particularly in the US: complete support has become selective support. However, I think it is advisable to distinguish between dominant perceptions and undercurrent perceptions. Sympathy with the military after World War II was a dominant perception in the west. But the Indian liberation movement of Gandhi held other beliefs. In my own country, even during the war, a very effective part of the resistance was directed along pacifist lines. The anti-military way of thinking was always there as an undercurrent.

Holmfeld mentions three rationales for the support of scientific research: culture, advanced training for young scientists and society's need for scientific advance and new technology. These are all deserving causes of course, but the headache for governments and for funding agencies is how to distribute money fairly over these different areas. The danger is that politicians are often required to make decisions about science without having adequate insight into the matters they are dealing with.

Furthermore, politicians have little understanding of the impact of science and technology on society - another factor that may lead to

wrong decisions. In general, the role of S&T in society has been neglected, by political scientists as well as by historians. The latter tend to focus on the development of S&T, not on its impact on society.

Holmfeld gives an overview of science policy from the end of World War II up till the present. I am going to go even futher back into history; I think science policy has lessons to learn from what happened centuries ago in continental Europe. In military competition the advantage goes to the country that commands the latest technology, be it in terms of weapon systems or logistics. This truth did not simply emerge during or after World War II. The 16th century empire of Charles V was built by the Burgundians on the basis of the best weapon technology in the world. The manufacturers were to be found in the Low Countries. The bulk of the empire's income was raised there too. Mind you, even then the area was short of natural resources. The wealth came from advanced technology. The Dutch subsequently used their technological advantage to shake off the burden of the empire by waging war against the biggest power on earth: Spain. The ultimate victory of the mini-state over the superpower, however, did not teach historians or politicians a lesson. We were for instance taught at school that later, at the end of the 17th century we could no longer contain the big powers around us, because of their sheer size. In view of what had been accomplished a century earlier against Spain, this was a rather surprising lesson! The truth is that the British continued to improve their ships and the training of their crews, the French improved their military skills and we concentrated on counting dividends ....

If it were only a matter of size, where would the US be with respect to the People's Republic of China?
Holmfeld predicts that owing to budgetary constraints there will be increasing selectivity in the allocation of funding. This happened in history too; the 14th century can provide another interesting lesson for science policy. I have here a slide showing the distribution of universities in 14th century Europe.

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map of distribution of universities in 14th century Europe

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As you can see, the technologically most advanced part of Europe was devoid of universities. This however does not imply that there was no strong effort in basic research, or in education!
In recent years we have seen a more or less analogous development in Japan: strong technological development leading to an impressive economic imperium, without too much emphasis on university science.
These cases from history support Holmfeld's contention that only about 5 - 10% of basic research can be justified as 'cultural activity'.

Holmfeld suggests that there will soon have to be quantitative analysis of the financial support needed for the training and education of scientists and the financial support required for research. I would word this crucial issue slightly differently: what fraction of the GNP should go to R&D, or more specifically to science for training and

education purposes? In my view the answer will be time dependent. Holmfeld mentions the problem of trying to predict what science will 'pay off' and in how short or long a time. It seems to me however, that we are moving towards a world without labor! Before long, all production will be automated, computerized and robotized. In such a world the only thing to do - appart from fighting, leisure and taking care of others - will be to deal with knowledge. Of course, research is only a part of the knowledge trade, but its share of the total activity could grow appreciably. A few years ago the econometrist and Nobel Prizewinner, Jan Tinbergen, estimated that The Netherlands could afford to spend about 10% of its GNP on R&D. Actually we are spending about 2%. If we want to continue to produce better and cheaper goods that have less destructive effects on the environment, we will have no alternative but to put more emphasis on the creation, acquisiton and utilization of new and better knowledge.

With reference to Weinberg's paper, one could envisage giving financial support to all able scientists. Since they make up only a small fraction of the population, the natural limit might not be too far from Tinbergen's limit.

If Holmfeld's politicians decide to stabilize the current budget for R&D, they will be acting against the megatrends in society, which will prove them wrong. If politicians think that education and R&D are expensive, they might do as the Dutch did in the 18th century, namely count their dividends. Neglecting education might lead to an

interesting shift in the balance between the developed and less developed nations!

* Discussant contribution to the International Conference on the Unity of the Sciences, August 1991, Seoul, Korea.