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NATO and Science

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To almost everyone the label 'NATO and Science' must mean science in the service of weapons and war. And it is true that NATO members do cooperate on a wide range of defence-related aspects of science and technology. But 'NATO and Science' also means something very different. Unknown to many, NATO has a third dimension in addition to the military and political ones, and that is the NATO Science Programme. I represented Norway on the NATO Science Committee from 1992 to 2004. Here, I give an account of the programme, how it came about, how it has been implemented, how it changed after the end of the Cold War, and how it is still changing post 9/11. The NATO Science Programme operates in a very specific political context, and I shall try to highlight some aspects of the complex interplay between science and politics in my account.

NATO and Science in the time of the Cold War

In January 1957, 'three wise men', the foreign ministers of Italy, Norway and Canada, delivered their report to NATO on 'ways and means to improve and extend NATO cooperation in non-military fields and to develop greater unity within the Atlantic Community'. The non-military aspect of security had always been part of the mandate of NATO as expressed in Article 2 of the North Atlantic Treaty, and changing political and military circumstances in the mid-1950s highlighted the need to strengthen 'the third dimension' of the NATO cooperation.

The 'three wise men' based their report on several pertinent observations. They stressed that the nuclear stalemate of the 1950s meant that the cold war confrontations would shift in nature from purely military objectives to other non-military ones, and that responding to this new situation would make it necessary to create a stronger feeling within the Alliance of belonging to a common Atlantic partnership. They pointed out that a feeling of partnership had strong historical roots. And, indeed, when NATO was established in 1949, it was grounded on common cultural traditions and a shared history of democratic development that now needed to be protected. The report of the 'three wise men'

pointed out that science and technology was an important part of this tradition and, moreover, now needed to be strengthened in view of the current development in the Soviet Union. They concluded that there was 'an especially urgent need to improve the quality and increase the number of scientists, engineers and technicians in NATO countries.'

The report of the 'three wise men' was of importance in identifying and analysing the problem, but it was short on which specific actions to take as part of the Alliance's day-to-day work. But the challenges in the report were urgent enough to be followed up. Senator H. Jackson of the United States was asked to Chair a Special Committee on Scientific and Technical Personnel and professor J.B. Koepfli of Caltech, who was a science advisor in the US State Department in the early 1950s, was asked to plan a conference on scientific and technological cooperation within NATO. The Jackson report 'Trained Manpower for Freedom' proved to have great impact, but it was the report of the Koepfli work group that really broke new ground. Instead of a mere conference they proposed that NATO establish a science committee and appoint a special science advisor.

The Jackson and Koepfli reports were delivered to NATO by November 1957 just after the 'Sputnik shock' of October the same year. So when the NATO Council met in London in December 1957, it was no surprise that the main recommendations were adopted. The Council established both a NATO Science Committee and a position of science advisor, later brought at the level of Assistant Secretary General.

The establishment of the NATO Science Committee and the history of its activities through the 1960s, including an analysis of the relationship between civilian and military science, is the topic of an excellent study by John Krige,[1] and I have followed his account so far. I have something to add, though. I am not a historian, but I have been a participant in NATO science activities on many levels over a number of years. In the 1970s and early 1980s I was on several occasions a user of the programme; in the late 1980s I was a member of the panel for Advanced Study Institutes (ASI) and Advanced Research Workshops (ARW); and for 12 years from 1992 to 2004 I was a member of the NATO Science Committee. Based on this experience I will first add something to the history of the 'classical' programme as sketched above, before turning to an account of the evolution of the programme following the end of the Cold War and of the radical changes after the events of 9/11.

The classical NATO Science Programme

The shape of the Science Programme was to a large extent determined by the relationship between science and society in the United States in the early post Second World War years. I quote from an article I wrote some years ago:

> Science emerged from the war with almost universal respect. In the post-war years this respect was turned into a belief in the ability of science to solve or at

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> least to contribute significantly to the solutions of the major problems facing the nation. Science seemed worthy of this trust. The wealth of nations increased, medical research led to improved health, and scientists were essential in building a security system in the Cold War years. But welfare, health and security are not without costs; society responded with a generous and long-term economic support of basic science.[2]

It is important to note the emphasis on basic science. What science was supposed to supply was knowledge and highly trained manpower. Products, i.e. hardware and systems, were the responsibility of the industrial-military complex. And how do you train people and at the same time acquire new knowledge? At that particular time the answer was obvious, namely by supporting science and research training at the best universities. And the trust in science meant that as long as the expected number of trained people was forthcoming, the research system was given great freedom in choosing the actual topics for research. The freedom in setting research priorities was obviously important in getting the support of the science community. We have here a case of shared interests between science and politics. I must confess that to me it is not particularly important to discuss who is using whom and for what purpose. But, as we shall later see, for some this posed a real dilemma.

In this context it is easy to see the importance of the Jackson report 'Trained Manpower for Freedom' as an argument for a special NATO Science Programme. It is equally easy to understand why the Science Programme was structured in the way it was. The original programme had two basic parts. One part was a Fellowship scheme, which over the years played an important role in strengthening scientific standards in the Alliance countries. The other part was a collection of 'mechanisms', a programme to finance Advanced Study Institutes (ASI), Advanced Research Workshops (ARW), and Collaborative Research Grants linking researchers from several member countries. To begin with, the programme was restricted to the natural science and basic technology, with a bias toward the physical sciences. Later this expanded, with the addition of biology and the environmental sciences, and even with some topics from the social sciences. In the 'classical period' some so-called 'special programmes' were created with a short-term focus on some particularly 'hot' or important topic, e.g. in non-linear science, nanotechnology, environment, and supra-molecular chemistry. But these programmes used the same mechanisms as the main part of the programme, and they differed little from similar programmes run by national research councils.

The classical Science Programme was a success and had an impact far beyond its limited budget. It was, with few exceptions, supported by the science community, and the reasons are not hard to see. It had the right kind of support mechanisms, it was run by very competent people in a very un-bureaucratic

manner. And, most importantly, it was the only programme with a formal link across the Atlantic. This is a feature of the programme that is well worth emphasizing. The programme had its own budget, not very generous, but large enough to support first class science. It was more than a meeting point to promote joint activities. It could act independently, and no national body on either side of the Atlantic could overrule its decisions in scientific matters. Thus, in many fields of research, the NATO ASIs became a major meeting place, with the participation of both the established and the young from all countries of the Alliance. The annual Les Houches physics ASIs is a prime example; see Ref. 1, p. 204. Also well worth mentioning is the bi-annual ASIs in statistical physics, which took place in Geilo in Norway for a period of more than twenty years. It was jointly led by physicists from Norway and the non-NATO country Sweden and was the premier meeting place for this particular branch of physics. All of this had a long lasting effect on the development of science in NATO countries. But there is also another long lasting effect, which is not always taken into account, namely the impact of the returning Fellowship grantees. Those who returned from the US brought back home a 'lived' experience of the best of science and research training. Many of these people later came into leading positions in science and education in their home countries, and there can be no doubt that their fellowship experiences during some very important formative years were a strong driving force for reform. This is not easy to document in hard data, I can only offer my own experience. As a young graduate student I returned from Berkeley in 1960 and soon became active in the reform of research training at home. Several stays as a post-doc and visiting professor from the late 1960s onwards served to strengthen this conviction. But academic reforms take time. Almost 30 years later, as 'Pro-Rektor' of the University of Oslo, I was finally in a position to oversee a national reform of research training. We should be careful to note that this effect of a fellowship programme is not unique to the NATO scheme; another example is the Fulbright Programme, which had exactly the same long lasting beneficial effects.

In addition to fellowships and 'bottom-up' support mechanisms, another component was later added. The Science Programme was always intended to be part of the larger NATO strategy. There was an obvious need for 'trained manpower for freedom', but solidarity and stability were also key concepts in the larger scheme. A support of science and education was seen to be essential both for creating a stronger feeling of belonging to a common partnership (the solidarity argument) and for helping to create the right conditions for the development of a 'free' society (the stability argument). There was, however, a widespread feeling, perhaps justified, inside the Alliance that not all members were equally to be trusted as to their ability to build a society conforming to Western democratic ideals. This is, as I understand, the context for the introduction of the 'Science for Stability Programme' in 1981.

The description of the programme is, of course, couched in somewhat more neutral terms. It is

> directed towards Greece, Portugal and Turkey in an effort to enhance their scientific and technological infrastructure in co-operation with other members of the Alliance. In addition to sound scientific results, the aim of the program is to strengthen technological management and scientific infrastructures through well-defined applied R&D projects which respond to the national priorities of the countries concerned.

The programme went through three phases and lasted from 1981 to 1997, when it was replaced by a 'Science for Peace Programme' with similar aims, but now directed towards the republics of the former Soviet Union.

The Science for Stability Programme covered a wide range of topics in R&D, including projects in information and communication technologies, agriculture and food technologies, and environment. National teams, often including industrial partners, were linked to top research groups in other NATO countries, and extended use was made of external consultants and expert visits. Measured in relation to national economies the effort was 'small scale.' It set, however, certain benchmarks and achieved a noteworthy success. But it was definitely a programme very different from other parts of the Science Programme.

With the Science for Stability Programme we have moved a small but significant step from basic or 'pure' science toward science in the service of larger political aims. But it is not easy to draw an exact boundary line between 'pure' and 'political'. There were always critical voices in the West who argued that science in NATO only served a political purpose, and that scientists participating in the programme were either naïve, or willing participants in a political game. And the participation became particularly sinister if you believed that NATO was an aggressive instrument of American Cold War policy. Let me recount an episode from the time when I was a client of the programme.

My original field in science is mathematical logic. It may sound esoteric, but the logic community is of some importance, existing, as it does, at the intersection of philosophy, mathematics, computer science and linguistics. We have proud traditions in founders such as B. Russell, K. Gödel and A.M. Turing. There are several international organizations, the premier one being the Association for Symbolic Logic. And we are the logic part of the International Union of the History and Philosophy of Science, which itself is a member of the ICSU (International Council of Science) family. As other science disciplines, we too have an extensive system of congresses and summer schools. Perhaps the most important one used to be the European Summer School in Logic. In the 1960s this was always arranged as a NATO ASI. It took place every second year in the UK. In the Proceeding from Leeds in 1967 the Summer School is identified as a NATO ASI on the title page, without qualms or protest. In 1969, NATO has

disappeared from the title page from the Proceedings from Manchester. Instead, there is the following footnote to the Preface: 'We record here that 36 of the participants signed a declaration dissociating themselves from NATO's aims and expressing their conviction that scientific conferences "should not be linked with organizations of this character".' Two years later, in the 1971 Proceedings from Cambridge, there is no similar footnote, but an acknowledgement in the Preface of NATO support. This does not mean that the opposition to NATO has disappeared. The protesters from 1969 arranged their own counter-conference in Denmark, the Bertrand Russell Memorial Logic Conference. The Proceedings of this conference consist of two parts. One is critical and philosophical. The other is strictly mathematical. In the critical part we read a history and an analysis of NATO and NATO science rather different from this account. I shall just take note of this, my point has been to acknowledge that 'NATO and Science' is also a political issue, and no account that tells just one part of the story is a complete or 'true' account. But let me also note that the Cambridge NATO ASI had a significant number of participants from Warsaw Pact countries. Several first-class mathematicians from Poland and Hungary feature in the list of speakers and participants.

NATO and Science at the end of the Cold War

The end of the cold war brought dramatic changes to many institutions. The NATO Science Programme was no exception. But the challenges to this programme did not only follow from a change in NATO objectives, but were part of a larger change in the relationship that had existed between science and politics in the Cold War years. I quote from my previously mentioned article in the *European Review*. I started there by asking a somewhat rhetorical question: can natural science survive in the post Cold War period? I then continued:

> Turning first to East-Europe and the former Soviet Union we see a reason for the question. In the climate of conflict during the Cold War period a certain equilibrium developed between, on the one side, a military-industrial complex and, on the other side, an educational and research system of high quality. With the end of the Cold War the military side of the industrial system collapsed, hence also the need for advanced research and development. The current somewhat primitive and brutal economic market has little use for the science and technology that was developed to serve the needs of the cold-war machine.

This was written in the mid-1990s, and the situation may have changed today, ten years later. But the mid-1990s analysis acted for some of us as a driving force in working for a changed strategy for the NATO Science Programme.

It was not at all obvious that the programme should continue under the new conditions. When in 1992, for the first time, I met the Norwegian Ambassador to NATO, he told me that it was now time to terminate the programme. He granted

that it had been very successful, but now the money was needed for other purposes. Let me note that the Science Programme was funded as part of the civilian budget of NATO. In fact, it was the largest item under that budget line. And now the money was needed for 'information' purposes, i.e. modern public relation activities in the former Warsaw Pact nations in order to sell the western democratic ideals.

Some scientists may be expert in using PR to promote their research, but they would be aghast to see their research enterprise be replaced by PR activities. This, some of us felt, seemed to be the fate of the NATO Science Programme, hence the need for a renewed foundation for science within NATO. This led to a lively discussion in the Science Committee, and gradually a new strategy emerged. Let me note that the Science Committee is somewhat atypical as far as diplomatic bodies go. There may occasionally be 'speaking notes' given to the delegates by their diplomatic missions, but then mostly on budget items. Otherwise the discussion flows freely. Thus, it was possible to come up with a consensus inside the committee and lay the foundation for a renewed science programme.

However, the diplomatic game demands more than a consensus within a committee. A High Level Review Group (HLRG) was set up to report to NATO on the future of the Science Programme, whether to continue or to terminate. In addition, if the recommendation of the HLRG was to continue the programme, how it should be restructured. Members of the HLRG were chosen on the recommendation of the Science Committee. It is thus no surprise that the consensus developed inside the committee came to be shared by the HLRG.

The new strategy took as its point of departure the extended argumentation of the 'Three Wise Men' from 1957. The Atlantic partnership of the 1950s, grounded in common cultural traditions and a shared history of democratic development, was now to be extended to the new 'partnership countries' of East-Europe and the former Soviet Union. Science and technology were an important part of this tradition and needed to be strengthened in view of then current developments in these countries. 'Stability' and 'solidarity' became two key concepts. I need not elaborate much on the solidarity issue. This solidarity was now to be redirected from a predominantly trans-Atlantic and North–South solidarity inside NATO to also include and, indeed, emphasize an East–West solidarity between NATO and Partner countries. This touches a strong sentiment within the scientific community and would almost certainly secure a strong commitment to a renewed basic science programme, both from NATO and Partner countries. Let me elaborate a bit on the stability part. We noted above the collapse of the military-industrial complex at the end of the Cold War and how this threatened a similar collapse of the research and educational systems. A collapse of this kind would introduce an element of instability in these societies. And we believed that the emphasis on civilian science in the NATO programme would help to counteract this development in two ways, directly by appropriate research grants and support of international cooperation, and

indirectly, by showing partner countries the importance of science and education in building and sustaining a democratic and open society, thus encouraging these countries to allocate sufficient resources to research and education. The NATO science budget could never replace national efforts, but the NATO emphasis on civilian science could act as a guide for partner countries when setting their own national priorities.

The HLRG recommended the continuation of the Science Programme, but with a revised structure reflecting the needs of the Partner Countries. Much work was needed to translate these recommendations into a workable programme. I shall not enter into the details of this process, only report briefly on the final result as it emerged in the report from the Science Committee to the NATO Council in 1998. The report starts with the obligatory guarantee that 'the NATO Science Programme must be fully relevant to the new objectives of the Alliance by actively participating in the establishment of security and confidence in Europe.' Note how terms like 'stability' and 'solidarity' have been rephrased by using the politically more correct terms 'security' and 'confidence'. The report then continues by asserting that 'based on a bottom-up approach and on a strong selection of applications by peer-review in order to ensure the highest level of scientific quality, the new NATO Science Programme is aimed at achieving, through its main four sub-programmes, the following political objectives:

- creating communication in all civilian scientific and technological areas between Partner countries and NATO countries in establishing personal and confident links between scientists;
- opening and connecting the scientific communities of Partner countries to the international community in order to stabilize scientists in their own countries and facilitate re-conversion from defence to civilian activities;
- using science to solve security problems related to disarmament and to military environmental issues;
- developing concrete and applied research projects contributing to the industrial development and welfare of Partner countries;
- maintaining a small but significant intra-Alliance activity to strengthen solidarity between NATO countries, especially Turkey, Greece and the three new members (i.e. Poland, Hungary, and Czech Republic).

We see how the language is carefully crafted to appeal both to the diplomatic and the scientific communities. The first point expresses the solidarity argument, the next the stability concern. The third point gives voice to a goal that both diplomats and scientist can agree upon. And I remember a number of occasions when we were dealing with scientific challenges related to environmental issues such as the reclaiming of contaminated test areas in the republics of the former

Soviet Union. The fourth point deals with the new 'Science for Peace' programme, which was a direct continuation of the 'Science for Stability' programme, but is now directed toward Partner countries. And finally we needed to continue our support of some old and the new members. Gradually, this support could be taken over by various EU programmes, except in the case of Turkey, a country that always was and still is a central member of NATO.

The new programme was well received in Partner countries. In many of these countries the science budget had been severely cut in the years following the end of the Cold War, and the NATO support, even if very modest, was important both in direct cash terms and also as a not too subtle hint for setting 'sound' national priorities. I also note several successful environmental activities, often engaging partners who had political difficulties in direct bilateral cooperation, but could come together under the NATO label. I remember, in particular, a meeting in Tbilisi in Georgia, with full participation by scientists both from Armenia and Azerbaijan. We also supported several infrastructure projects, the major one being the 'Virtual Silk Highway' project, which aimed at bringing an effective, global Internet connectivity to eight Partner countries of the Caucasus and Central Asia regions. The new programme was also strongly supported by the Western scientific and technical community. As an example, take the scientific panel for the Virtual Silk Highway project, which could be read as a 'who's who' of leading Internet developers on both sides of the Atlantic.

But the old members of the Science Committee had a price to pay. The classical NATO Science Programme was remarkably un-bureaucratic. It had a small but highly qualified secretariat, and we felt that we at every level were close to actual science. Today there are 56 countries involved: 26 member countries, 23 Partner countries, and seven Mediterranean Dialogue countries. The Science Committee (26 members) meets twice a year. Once a year the committee meets in EAPC (Euro–Atlantic Partnership Council) format with 26 plus 23 participants. And twice a year the Science Committee meets in NRC (NATO–Russia Council) format. The old committee consisted mainly of scientists and our meetings, as mentioned above, were meetings of scientists, not bureaucrats. Today the committee meets with science administrators, politicians and bureaucrats from more than 50 nations. And old-timers must suffer through the endless reading of prepared speeches. But this is perhaps the price we have to pay to secure an 'effective' programme.

Was the new Science Programme a success? It was well received in Partner countries, and it had strong support among scientists in NATO countries. Our diplomats seemed to agree that it was a success, but we were not always certain. The concepts of 'solidarity' and 'stability' did not necessarily have the same meaning for scientists and diplomats. The language quoted above was carefully crafted to paper over any possible differences in interpretation, but it was always clear that many diplomats did not view civilian science as a high NATO priority.

At one point Canada withdrew from the programme, much to the embarrassment of the Canadian member of the committee, who was a highly respected scientists and educator back home. Canada returned to the programme, but there were 'cost-cutters' and 'sceptics' in many missions. The reception of the programme and its positive public visibility guaranteed, however, its continued existence. Then came 9/11.

NATO and Science post 9/11

NATO changed dramatically after 9/11. It had in the post-war years been a remarkably stable defence alliance; now it should – almost overnight – be transformed into an active instrument for fighting a war against terrorism. This change did not leave the Science Programme unaffected. The relationship between NATO and science, as embodied both in the classical programme and in the Partnership programme, derived directly, as explained above, from the post Second World War pact between science and society. Now the political rhetoric changed: we were no longer in a 'post-war period', we were in a 'war situation', fighting a war against terrorism. And exactly as in the Second World War, science was called upon to be an active participant in this war.

It was not obvious that a traditional science programme should be part of the new NATO strategy. Science and technology have a prominent role to play in any conflict situation, so also in the war on terrorism. But the NATO Science Programme was not meant as an instrument for active conflict participation. You could argue, and some of us did, that the traditional programme was also an instrument in the fight against terrorism, but it operated on a much slower time scale than actual conflict participation. And it worked through mechanisms that seem far removed from other NATO activities, whether military or political ones.

The NATO Science Programme was still, at the time of 9/11, a civilian science programme, completely separated from NATO defence research. There was in NATO a certain amount of cooperation in defence research, but the main part of such research was under national control; see the discussion in the book by J. Krige referred to earlier. There was an attempt by the French, in the late 1950s, to direct part of the activities of the NATO Science Committee to areas of 'mission-oriented basic research of military significance', but this proposal was not accepted by the Science Committee, and the civilian profile was maintained.

However, cooperation between NATO countries was not always an inter-Alliance affair. As an example, I may mention that almost all of the allied support of defence structures in the north of Norway, which was of great importance in controlling Soviet access to the open sea, came directly from the United States. It was not a NATO project, but served, of course, NATO Alliance interests. This was in some sense balanced by a strong Norwegian defence research activity, with some NATO links, but with even stronger bilateral links with 'selected' NATO

countries, chiefly the UK and the United States. And the actors at that time knew how to play their roles. The Director of the Norwegian Defence Research Institute was for many years the Norwegian member of the NATO Science Committee, and he was scrupulous in maintaining the distinction between NATO cooperation within civilian science and NATO defence research cooperation.

But this 'scrupulous' attitude could not be maintained after 9/11. The traditional NATO Science Programme came to an end. This could also have meant an end to NATO support of science. But changing from a post-war to a war situation served to reactivate the old French proposal for a programme of 'mission-oriented basic research of military significance'. I became, in 1992, the successor to the Director of the Norwegian Defence Research Institute as Norwegian member of the NATO Science Committee, and I was active in the restructuring of the classical programme that led to the Partnership programme of the 1990s. I retired in 2004, partly because 12 years of service on any committee is long enough, and partly because I felt that I was not the right person to help shape and run a programme of mission-oriented basic research of military significance. 'NATO and Science' continued, albeit in a new sense; the 'will to survive' is a remarkable phenomenon, and it extends from organisms to organizations. You can now go to the NATO website and read about the new 'NATO for Peace and Security Program'. It is still labelled as a programme for cooperation in civil science, but it is driven by top-down priorities in areas such as defence against terrorism and other threats to security. This may be what is needed today in NATO, but it marks an end to the philosophy of the old programme. Whether just or not, the scientific community lost – post 9/11 – the battle for the soul of the NATO Science Programme. NATO today is something very different.

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