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Voor: Minerva
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SCIENTIFIC POLICY IN THE NETHERLANDS

H.W. Julius

Introduction

The evolution of science policy in any country is practically incomparable with that of another country. Where it started half a century ago, it will be quite different from where it is in actual development. This means that it is extremely difficult to understand the overall situation in any country other than one's own. However, from comparison some lesson may be drawn, whether the balance of such a comparison is positive or negative. By definition, the evolution of scientific policy in the Netherlands can only be understood against the country's historical background and its nationally characteristic way of thinking.

The Netherlands have been largely wrested from the sea. No doubt this has caused the Dutch character to be very conservative on the one hand, and progressive and enterprising on the other. As a result, it is common in the Netherlands to found new institutions while the old ones are left to work unchanged. Frequently old and new institutions will be found running parallel. The outcome is usually a structure of great complexity.

It should be added that seafaring experience moulded the tradition of the Netherlands as a commercial country. The commercial mentality rules the national style, and it will be found underlying many aspects of science and science policy. In addition to this, there is the country's love of liberty. It has historical roots in the Reformation, Lutheran as well as Calvinist. The older religions (especially the Roman Catholic) however have continued to exist. This has resulted in great mutual tolerance which is expressed in the deep respect one finds in the Netherlands for many different styles, opinions, solutions and approaches to most problems, even the problems of scientific policy!

History and Philosophy

In 1878, when the population of the Netherlands totalled about 4.5 million (it is now 12.5 million) and the country was still agricultural throughout, the nation was severely struck by what is called "The Great Depression 1873 - 1896". Grain prices began to decline and consequently poverty became the rule with the peasants. In 1880 it was Government that took action in a manner which has ever since been a model for the development of science policy, although the very term "science policy" was invented only about three-quarters of a century later. Some private initiative had been taken to call in the help of science to improve the efficacy of farming. Artificial fertilizers had just appeared, and scientifically conducted experiments showed a favourable relationship to exist between soil improvement, yield per acre and costs of production. The government, in collaboration with private initiative, next undertook the education, instruction and guidance of farmers and farmhands, basing the effort on the results of scientific research. When it soon became clear that effective instruction and information should be founded on very solid measures, the driving power of the government induces the establishment of a number of soil analysis stations, partly laboratories of a mainly chemical type, partly experimental plots on arable land.

This may well be considered the first deliberate application of scientific research, and as such it ushered in a new era. Even up to the present, the main assumption has been that, in Holland, the responsibility for cultivating science lies with the government. The activity and frequently the initiative come from the very close co-operation of ministerial officials, private interests and scientists in the relevant field. In many other countries, this government participation in the inception of scientific research is looked upon less favourably. In the Netherlands, however, public responsibility for matters of public interest (e.g., science, social welfare, health,

education, recreation, etc.) is generally readily accepted. There is a good reason for this: it has always been part of the authorities' policy not to suppress private initiative. Subsidy and stimulation have been used to activate general interest and action, much more than a display of power and dirigism. This does not mean that these procedures are used in every case, but there is no doubt that they have prevailed to the present day. 1)

Since 1815 the Universities of Leiden, Groningen and Utrecht, and since 1905 the Technological University of Delft, have been the full financial and organizational responsibility of the government. The same now holds true for the University of Amsterdam (until 1959, it had been entirely the responsibility of the Amsterdam municipal authorities; since 1960, it is dependent on the state for 95% of its income). The free universities (Catholic and Calvinist) have gradually become predominantly dependent on government support. The Royal Academy of Sciences, the highest scientific body in the Netherlands, which is the advisory body to the government and the managing authority of many scientific funds and institutions in the country, is fully supported by the government.

The scientific community in Holland has become used to turning to the government when it needs money for the execution of research. This, of course, does not hold good for one branch of scientific research, namely that performed by the industrial enterprise for the sake of its own commercial advantage. It must be added, though, that for many decades, the government, just as it did in the 'eighties for agriculture, has felt an unmistakable responsibility even for the scientific servicing of private industrial enterprises.

Prewar Development

When the First World War came to an end - the Netherlands were at that moment still neutral - it had become clear that science and research were about to acquire a decisive influence in the total structure of society, in all its aspects. It was

due to the foresight of the Nobel laureate Lorentz - at that time Chairman of the Royal Academy of Sciences and in that capacity also chairman of a committee studying how science could be best organised to ensure that research might be used for the nation's prosperity - that it was suggested to the government that it create a special body to deal with this task. This was a rather revolutionary proposal - the year was 1918 - and so it did not find acceptance easily or rapidly. The idea, even when worked out by a second committee and presented in a more elaborate form in 1927, met with little enthusiasm and much antagonism. Both the government of the day and ministerial officials, and the scientific world as represented by the universities, including the technological universities, were rather suspicious of an independent body assigned to foster - under a special mandate - applied scientific research. In the meantime, science continued to have an increasing effect on human life, and so those who had foreseen this development finally succeeded. In October 1930, a bill passed the parliament to become an Act by which a body corporate was created: the Central Organization for Applied Scientific Research, "the aims of which will be to ensure that such research is put at the service of the community in the most efficient manner possible." It was the original intention that all existing governmental research laboratories, experimental stations and technical services should be taken up in this organization. The reluctance which was the response to the original proposals has prevented the integral fulfilment of this intention right up to the present.

The Act of October 1930 finally came into effect in 1932. The new body was called the Netherlands Central Organization for Applied Scientific Research (Nederlandsche Centrale Organisatie voor Toegepast-Natuurwetenschappelijk Onderzoek), for which soon the abbreviation TNO was generally accepted.

To understand the consequences of this rather significant step in the nation's science policy - a term which came into general acceptance only thirty years later - one should know a few characteristic features of the organization's genesis.

Firstly, it was neither the community nor commerce and industry which had asked science for help or service; it was science itself that had offered to serve the community.

Secondly, the conception of applied scientific (Toegepast-Natuurwetenschappelijk) research had to be interpreted to define TNO's domain of activities. It is clear that the humanities are excluded and so are, more or less, the behavioural sciences.

For the rest TNO has interpreted its terms of reference as science in the broadest sense, with "applied" as an essential qualification. Accordingly, TNO covers technology as well as biology, medicine and health as well as defence, agriculture as well as traffic, and hydrology as well as air pollution: service to the community is the essential criterion. Very few organizations for applied research believe in such a comprehensive jurisdiction, but it has been the Dutch approach from the very start.

Thirdly, TNO, being a body corporate, has a clear-cut autonomy. It has always been deliberately intended that it should not be run by civil servants. Scientists with administrative experience share responsibility for its policy and direction with outstanding persons from the private sector and with civil servants. In the aforsaid Act of October 30, 1930 on the regulation of applied scientific research in the Netherlands (statutes and orders no, 416) this has been laid down in a very flexible, but nevertheless unequivocal, manner. Nonetheless, the government explicitly has not renounced its powers. On the contrary, these have been safeguarded through some provisions in the law to the effect that the delegates of the different ministers, appointed to the board, possess the right to suspend for later verdict by the minister(s) any decisions taken by the TNO Board to which the said delegates object ("right of veto").

In order to deal adequately with the different branches of research, the Central Organization and any particular ministry (Defence, Economic Affairs, Health and Social Affairs a.s.o.), has been given the powers in the Act to establish special TNO organizations. The names of those created up till now are indicative of the fields in which these special organizations operate:

Organization for Industrial Research TNO (Nijverheidsorganisatie TNO)	1934
Organization for Nutrition and Food Research TNO (Voedingsorganisatie TNO)	1940
National Defence Research Organization TNO (Rijksverdedigingsorganisatie TNO)	1946
Organization for Health Research TNO (Gezondheidsorganisatie TNO)	1949

These special TNO bodies are bodies corporate like the parent organization. They are all linked together through the membership of all chairmen of the various organizations in the executive committee of the Central Organization, which meets very frequently, and through the unification of the budgets of all these organizations in the integrated budget of the Central Organization.

It would be beyond the scope of the present paper to go into more details; the principle itself may suffice for understanding what follows.

The difficult birth of the TNO organization made itself felt for the first few years thereafter. Originally, it was a one-man office with a budget of a few thousands of guilders from government subvention; this increased slightly until the Second World War submerged the country under a harshly repressive enemy occupation.

Postwar Development

The dark war period saw Dutch science reduced to straitened circumstances. University scientists were especially hard pressed. It was then that they discovered that the TNO organization, which was not particularly noticed by the occupying authority, appeared to be a rather safe and benevolent refuge for the oppressed. By the time the war was over, the TNO organization had acquired a

much higher appreciation; as it had taken up a number of younger scientists, TNO had also developed a good deal. Recovery from the damage caused by war and occupation necessitated a rapid industrialization of the Netherlands, the more so because the country had lost its former colonies.

Evidently science had to lead the way, and could not be disregarded as a factor in economic reconstruction. This gave a new impetus and prominence to TNO.

In the twenty postwar years the organization has grown about thirty-fold. At this moment it is the biggest research unit in the country, apart from the very considerable industrial research departments of the Shell, Philips, and Unilever concerns. If we add the AKU and the State Mines these five biggest Dutch international firms, as a whole, have built up a research capacity which is about equal to that of the governmentally sponsored scientific research of the country. It means that this rather small country has to feed a total research capacity that exceeds by far the governmental effort in behalf of science. Generally speaking this situation has not hampered the government's attitude towards the financial demands of its own sponsored research, but as regards manpower, the situation is more complicated.

At the moment such a heavy demand for scientific and auxiliary research personnel is exerted everywhere, and salaries have risen to such an extent, that in many sectors and many respects government controlled research seems to be unfavourably affected. The amount of research work to be done is frequently too big for the number of scientists available; this limits selection for special requirements and, at the top, it is difficult for subsidized research (Universities, technological universities and organizations) to compete for scientists of the highest quality.

The postwar scientific reconstruction had also to deal with other problems no less important than applied research. Applied science is not a self-sufficient undertaking. It lives from pure science. Hence pure research must be cultivated to produce new basic scientific knowledge and to train future

scientists. Besides, pure science, as one of the keystones of culture and civilization, has an urgent claim of its own. In 1950 another Act created the Organization for Pure Scientific Research (Nederlandse Organisatie voor Zuiver Wetenschappelijk Onderzoek), abbreviated as ZWO. This body promotes and supports scientific research in the broadest sense, i.e. natural sciences, humanities, and social sciences. Its funds are supplied by the government. It has close relations with the universities, with special foundations for pure research, and with individual workers. It has one big foundation for fundamental research in its financial keeping: The Foundation for fundamental Research on Matter (F.O.M.) and a limited number of smaller foundations; e.g. for fundamental research in medicine, advancement of tropical research, and fundamental chemical research. Its influence on the scope and development of pure science in the Netherlands has reached considerable dimensions.

Training for science as a career - apart from education for professions for which a scientific background is essential (e.g., engineer, medical practitioner, lawyer) - is the proper task of the universities. University teachers who do no research of their own with their own minds and hands may perhaps be good teachers, but they will not inspire their pupils to become creative. The structure of the universities was, however, even after the Second World War, a remnant of the past. A period of serious reconsideration of the situation in the universities which required deep reflection, much courage for innovation and no less self-criticism, eventually led to the new Scientific Education Act (1960) (Wet op het Wetenschappelijk Onderwijs van 22 december 1960, stb. 559). This act has created an Academic Council (Academische Raad), a body of university representatives working together under the guidance of an executive council on all different university-bound problems and specially concerned with scientific development in the universities. This is not an easy matter, because academic freedom is a precious cultural value. However, this freedom is sometimes interpreted in such a way that the academic profession will refuse to accept purely

organizational changes intended to promote the effectiveness of academic performance because it sees in them a violation of academic freedom. Nevertheless, through this Academic Council, a beginning has been made. It is at present certainly no more than a careful exploration of each other's ways of thinking; but there can be no doubt that something, which was quite unimaginable in the past, is in process of growing. It might well turn into something which is of extreme value for academic science and scholarship.

One more feature: The most important scientific conquest of the 1940-1945 period had been the release of nuclear energy. In this field, Holland was considerably handicapped by the war in that it had been completely deprived of the progress of physics in the free world.

After extensive deliberations a foundation called Reactor Centrum Nederland (R.C.N.) was brought about in 1955; it is sponsored by the Government according to the usual Dutch pattern. This foundation is managed by a fairly big Board of Governors. On this Board serve: government officials (in this respect TNO and ZWO were taken as models), representatives of scientific organizations, of industry branches and of some big research organizations (e.g. TNO and ZWO).

There is a Scientific Advisory Council and a Board of Directors, each consisting of a more limited number of members than the Board of Governors.

R.C.N. works in close co-operation with Euratom. As the foundation has the disposal of a reactor meant to enable Dutch research workers to acquire experience in reactor techniques, a number of industries was asked to participate. These industries were the most important financiers originally, but today government subsidies surpass industrial contributions considerably (ratio 9 : 1).

The reactor is surrounded by laboratories where routine work as well as fundamental research is done.

The Present Situation

The actual institutional system of research in the Netherlands comprises, then, the following bodies which are actively involved in and (or) sponsoring research.

a) The universities (three state universities, one municipal university, two free (i.e., confessional) universities, three technical universities, two economic universities, one agricultural university; two more are in course of preparation.

b) The family of TNO organizations, closely co-operating with a considerable number of applied agricultural research institutes.

c) The ZWO organization, subsidising a great number of specific research projects and sponsoring a number of pure scientific research foundations.

d) The - private - industrial research establishments.

e) A number of very specialized research institutes, some rather big, others small and not affiliated with any of the bodies mentioned above: the State servicing Institute for Public Health, the Research Laboratory of the Netherlands Postal and Telecommunications Services; the governmental institute for research on Sewage Purification; the governmental laboratory for Road Construction Research and a few others.

Next to these executive bodies there are a number of advisory councils which assist the Dutch Government. Mostly there is a liaison between a certain ministry and one of these councils.

So, the Ministry of Education and Sciences is advised by:

(a) the Royal Academy of Sciences and Letters, being the oldest scientific council in the Netherlands; it dates from 1808. Its members are appointed for their personal merit for science.

In the last twenty years or so the Academy has achieved several reforms and enlargements in its own structure; its advisory task, greatly needed in view of present developments in science, can now be carried out much better. The Academy has moreover set up a number of sub-councils, namely the Socio-Scientific Council, the Biological Council and the Medical Council together with some other specialized committees. Further provisions are under preparation.

(b) The Academic Council foots on the 1960 Act on Scientific Education (Wet op het Wetenschappelijk Onderwijs, december 1960, statutes and orders no. 416) prescribing that representatives of the Boards of Trustees and the senates of all universities (general, technological, economic and agricultural) shall constitute an Academic Council. This council forms a link between the universities mutually, and between the academic world and society. Representatives of the Academy of Sciences, TNO and ZWO are on the council as special members. It shall be an advisory body to the Minister of Education and Sciences as well.

(c) The ZWO organization, apart from its active subsidizing task, is meant to be an advisory body to the Minister of Education and Sciences. As such it also covers the behavioural sciences and the humanities.

Certain bodies advise not only the Ministry of Education and Sciences but also most of the other ministries. In addition, there exist a wide range of various committees, councils, advisory bodies and foundations established as the result of private initiative in specialized fields or created by financially powerful patrons, possibly industries.

Official status in this respect have:

(a) The TNO organizations;

(b) The Central Council for Nuclear Energy. It originated in 1961 (September) as a precursor to the Nuclear Energy Act (21 February 1963, statutes and orders no. 82) and is officially incorporated in this act under its chapter II.

Soon after the establishment of the Reactor Centrum Nederland it had become clear, that developments in nuclear physics were not at all confined to energy production by reactors, but that their consequences were widely ramified in science, finance, industry, politics, government policy, medicine, international relations, "big-science" projects, etc. The Central Council arches three independent advisory bodies: the Industrial Council for Nuclear Energy, the Scientific Council for Nuclear Energy and the - many decades older - Health Advisory Council. Again many combined personal memberships provide for the necessary streamlining.

Can this system - if it can be called a system at all - work satisfactorily?

It will not surprise anyone if some uneasiness about the present situation is generally felt. When each of the bodies, small or big, came into being, there was good reason for its emergence, as some gap had to be filled. But organizations expand and, when the gap to be filled had not been precisely defined, it easily means a resultant overlapping of activities and, in more serious cases, very obvious duplication. On the other hand, there will be a certain hesitation to enter new fields, even when they are recognized as not being covered. And thus uneasiness arises. Uneasiness is a rather universal phenomenon, however, and it seldom is accompanied by definite ideas as to corrective action.

Here two problems arise: first the question of "decision-making" as a technical procedure and secondly the timing of the decisions themselves. Frequently decisions are "too late". There is only one remedy, which I may try to indicate by the name of "wisdom". For the crucial point is the relationship between the persons concerned in a given situation.

Now, I must refer to my initial statement: Holland is a small country. Everyone knows everyone else, and thus it is not the system or its organizational perfection that counts,

but the relationships of individuals. When we look at science in the Netherlands, we see that this human factor is - no doubt - essential. A considerable number of independent learned societies help the research workers to meet, and the administrators (preferably scientists ab origine!) to listen.

This is such a significant factor that all the rest of what can be said about science policy in the Netherlands - including its sometimes unsatisfactory working - must be understood against this background. Any organization will work well if the players know how to play the game; it will fail if they do not. But there is a limit to this power of informal co-operation. For, when money is available, and execution of plans and projects is pretty well assured, the operation will be smooth. However, when money and manpower are scarce in relation to demands, informal co-operation runs up against its limits. It is because the limits of expansion are practically everywhere in sight that science policy is so much in the limelight these days. Policy is decision-making. With ample means, there is no more reason for choice than feasibility imposes. But when resources can no longer keep pace with the nearly explosive expansion of demands, some kind of authority or leading power will have to determine priorities.

International organizations (O.E.C.D. in particular) have considerably stimulated the establishment of national science policy councils. This, too, has happened in the Netherlands. A bill passed parliament to establish a central Science Policy Council in the Netherlands on 1st September 1966; it will be an advisory body to the Cabinet Council, with the Minister of Education and Sciences as its pivot. The council will be small, with no more than nine distinguished scientists as its members. They are to be appointed by the Queen on the recommendation of the Minister of Education and Sciences, the Royal Academy of Sciences having been consulted.

This is a new element in the world of science in the Netherlands. Though it is not being established as an experiment, it may best be considered as such. Its authority will have to be built up in the near future. If it succeeds in making itself

acceptable to the many agencies which are watching it and which all have their own expectations of it (the government, the ministries, the scientists, the public, the press, and last but not least, the parliamentarians), it will doubtless appear to have been the wisest measure legislators could have taken to deal with the growing, and daily more pressing, dilemmas of science policy. If, on the contrary, it fails to establish its authority, it will turn out to be one more obstacle in the already complicated organization of responsibility for the development of science in the Netherlands.

Drawing up the Account

Let there be no doubt whatsoever that - in the Netherlands as elsewhere - a decision on any scientific activity is complete only when the funds are actually awarded. Prior to this stage there is a rather long and complex procedure, differing from case to case and varying according to circumstances. Finding grounds for making decisions is the real problem in science policy everywhere and it is everybody's concern who has science at heart.

Hitherto, practically one method only has been used to deal with this problem, namely, judgment by peers. [2] This has been so from the beginning. When money is sought, the application for it must be accompanied by some well-founded exposé of the intention of the work to be undertaken, of the instruments, utensils, books, personnel and time wanted, and of the possible outcome of the undertaking. Then people of experience, common sense, wisdom and detachment, who are possibly experts in the field, brought together in a panel or committee, are consulted. The level depends on the level from which the proposal has arisen.

If it is a young worker's idea it may be put on the agenda of his nearest superior, and there might be no elaborate decision-making procedure.

If it is a university professor who has a field of research of his own interest, he will ask for money to run his institute and based on academic freedom he will be his own peer.

In the case however a university professor applies for a grant from, for example, the ZWO organization, his application will have the same form as all other applications and it will inevitably be subjected to the judgment of a board or council of the subsidizing body - a corps of peers - whether or not supported by a preliminary opinion of an expert.

This is all very important, because we have to realize that in the case of the highest scientific corps of a country, i.e. the University, the decisions have virtually been made at the moment that professors are appointed to existing or newly created chairs. Because the actual conception of academic freedom does not allow any real interference by permanent or even periodic re-judgment. Here we see an intrinsic contradiction between the fervent protection of academic freedom in the classical sense, with regard to the running of an institute by a professor, and the ease, with which the same professor is willing to submit an application for a special grant to the judgment by "peers" (here in the original meaning of the word (Latin: par).

The situation is completely different in the organizations attached to TNO. There the programmes are proposed by the scientific staff, culminating in the scientific director of the institute concerned. The list of proposed projects is, as and when required, presented to the advisory committee of the relevant institute and - whether or not revised - forwarded to the board of the specialized TNO organization. When accepted there it will be included in the budget and - exigencies apart - the budgetary recommendation will be implemented as well as possible. The difficulty of closing or suspending a current project is no different there from elsewhere.

I cannot describe the course of events in an industrial laboratory. The only thing to be said is that many of the larger Dutch industries have contributed greatly to fundamental research. Decision-making within their managing boards must, therefore, allow for a considerable amount of free creativity.

But the projects to be considered are no longer limited to what can be undertaken, continued or discarded in any single institute or centre. "Big Science" has come into the picture, and it now demands money in very large figures. National resources can become overburdened, especially in a small country with already large obligations to its own scientific community. Here policy and politics become inseparable, and the opinions of experts are likely to become subordinate to other than purely scientific considerations. This also happens when decisions have to take into account governmental responsibilities other than those for science. Defence, social welfare, road construction, land reclamation, etc., can thus become competitive with science.

In conclusion, one may ask: Should things go on just as they have, that is, must we persist in the system of judgment by peers? It is true that it works and that there will be no other modus operandi as long as we are not generally ~~skeptical~~ sceptic about the present one or as long as we believe that any improvement of the procedure is wishful thinking.

I for one am not of that opinion.

We must ask what goes on behind the walls of the science building. Science has its boundaries, it has a "physiology" of its own. Are we sure that it will have no "pathology"? Is science as a phenomenon indeed so inaccessible and unassessable as it claims itself to be? Let us realize that we have penetrated very deeply into the structure of matter, into the fundamentals of genetics, into the understanding of man's unconscious impulses and motives. Science has penetrated into everything, nothing is sacred to it. There is, it seems, one exception. That is science itself. It has declared itself sacrosanct, being utterly reluctant to be investigated by its own methods. But, under the penalty of disintegration, it can no longer abstain from selfexamination. We must accordingly welcome any progress in research on science as a phenomenon. Science policy is, at present, a product of unanalyzed ecological processes. To understand the product this ecology must be unravelled scientifically, which is to say, dispassionately.

N o t e s

1) It is a question of personal judgment whether this view will be considered essential or of secondary importance. Similarly, it may be questioned whether the picture thus drawn of the government's attitude is still valid or is ceasing to be so.

2) O.E.C.D. Report: "Fundamental Research and the Policies of Governments," p. 56.

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