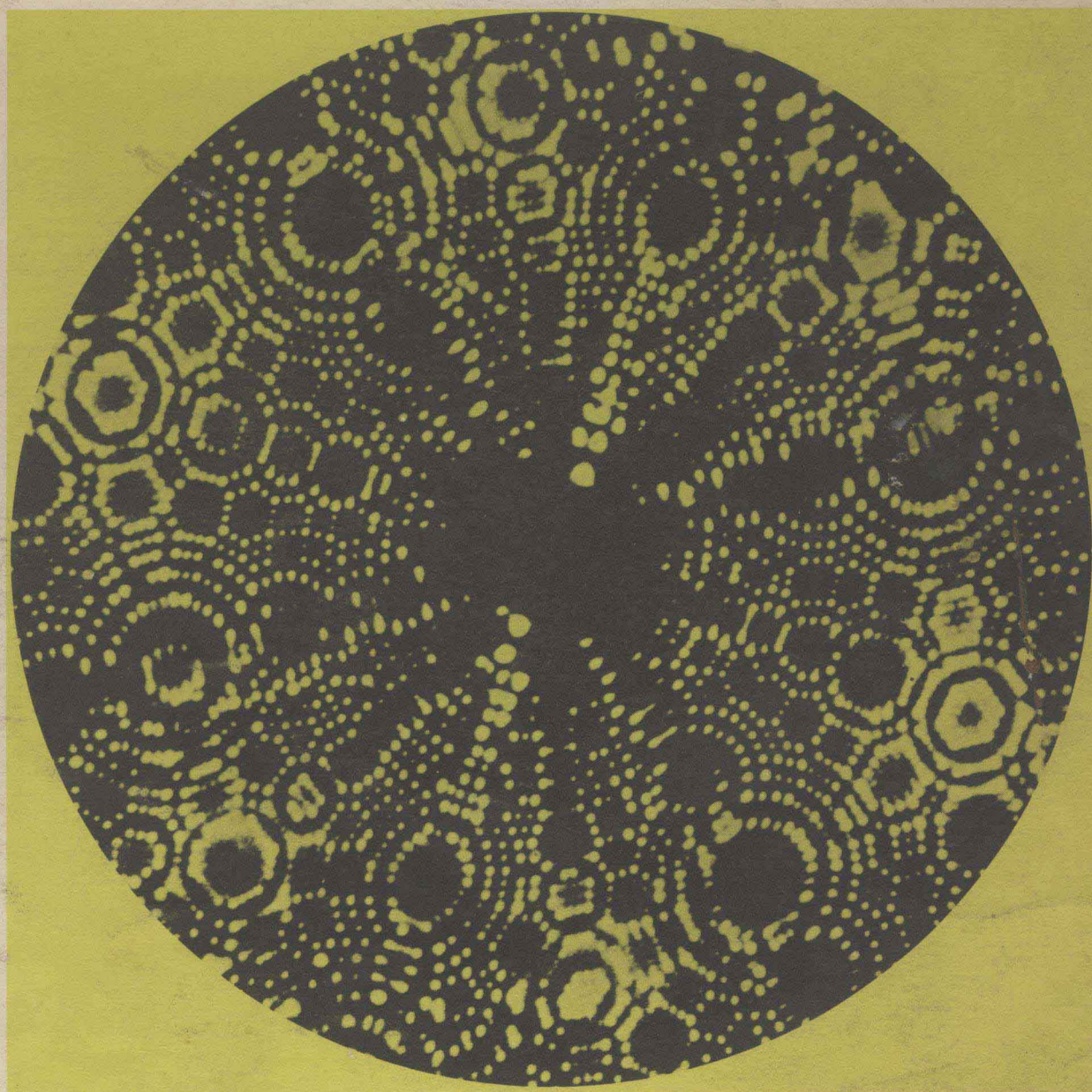


No.19

# National science policy and organization of research in Israel

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# **National science policy and organization of research in Israel**

**Unesco**

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The Unesco series "Science policy studies and documents" forms part of a programme "to collect, analyse and disseminate information concerning the organization of scientific research in Member States and the policies of Member States in this respect", authorized by resolution 2.1131 b., adopted by the General Conference of Unesco at its eleventh session in 1960, and confirmed by similar resolutions at each subsequent session.

This series aims at making available to those responsible for scientific research and development throughout the world factual information concerning the science policies of various Member States of the Organization as well as normative studies of a general character.

The country studies are carried out by the governmental authorities responsible for policy making in the field of science in the Member States concerned.

The selection of the countries in which studies on the national scientific policy are undertaken is made in accordance with the following criteria: the originality of the methods used in the planning and execution of the national science policy, the extent of the practical experience acquired in such fields and the level of economic and social development attained. The geographical coverage of the studies published in the series is also taken into account.

The normative studies cover planning of science policy, organization and administration of scientific and technological research and other questions relating to science policy.

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As a general rule, the country studies are published in one language only, either English or French, whereas the normative studies and the reports of meetings are published in both languages.

The present study on the national science policy and organization of research in Israel has been pre-

pared under a contract, signed in November 1965, with Unesco by the National Council for Research and development of Israel. Professor Zvi Tabor, Director of the National Physical Laboratory of Israel, was entrusted with the task of co-ordinating the various parts of the study, which deals in turn with the following subjects:

Part one describes the historical background and the development of the organization of science. The influence of Israel's highly individual national evolution is traced.

Part two deals with the organizational structure for science policy. The responsibilities and functions of the principal bodies dealing with science policy and research activities are described. An addendum outlines pending proposals for the re-organization of the national science policy machinery.

Part three presents information on the financing of scientific and technical research, and indicates the financing channels for research activities, including those in the higher education sector.

Part four relates to the training of academic and scientific personnel. This Part deals also with career aspects and with the significance of higher education for national development.

Part five is concerned with the principal aims of science policy. Research subjects of primary interest, and integration of science policy into the national plan are described.

Part six gives a succinct account of the structure and machinery of government and of the main economic features relevant to science policy.

Statistical data are presented in tables and charts, and an Annex gives an especially comprehensive list of research institutes and laboratories. The Bibliography covers mainly official Israel publications on plans for the development of research and inventories of scientific and technical potential.

The sole responsibility for statements of fact and expressions of opinion contained in this study lies with the authors.



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HISTORICAL BACKGROUND - DEVELOPMENT  
OF THE ORGANIZATION OF SCIENCE

I. GENERAL INTRODUCTION

To understand science policy in Israel, to to appreciate the difficulties in obtaining a unified policy, a clear understanding of the historical background of the development of the State both from the scientific and social points of view is necessary.

Israel became a sovereign independent State in 1948, almost exactly 50 years after the first Zionist Congress that had postulated the political ideas of the return of the dispersed Jewish people to its own homeland and thereby its transformation into a "normal" people. It was a characteristic of the Zionist ideology that it stressed manual work and in particular agricultural activity, from which Jews had largely been barred in the Diaspora. At the same time, in addition to political activity and practical pioneering there were always those who pursued spiritual and cultural values: the tradition of scholarship is very deep in the Jewish people, who are often described as the "people of the Book". It is thus not surprising to find that the initial steps in scientific development in Israel were taken long before the State came into being(1).

Thus we find that the corner-stone of the Institute of Technology (Technion) was laid in 1912, that of the Hebrew University in Jerusalem six years later(2). Agricultural research started even earlier.

The early immigrants to the country set up farming villages and communal agricultural settlements (kibbutzim). Many of these immigrants were intellectuals who had "returned to the land" and this explains why, as shown later, there was an unusually easy dialogue between farmers and agricultural research men, leading to Israel having, probably, the most modern agriculture in the Middle East.

In 1921 the Zionist Congress decided to set up a group of agricultural stations, which culminated in the Central Agricultural Institute in Rehovoth in 1932; but even before that time much successful -

though not very systematic - research had been going on in breeding new types of plants and animals and in the control of pests. In 1934 a fully-fledged agricultural research centre - the Daniel Sieff Research Institute - was founded in Rehovoth by Chaim Weizmann, himself a research scientist and later first President of the State of Israel. The Sieff Institute became the first part of a larger complex, now known as the Weizmann Institute of Science(3), which was officially opened in 1949.

Three fish research groups - dealing respectively with fish culture, sea fish and fish diseases were set up between 1942 and 1948.

Parallel with agricultural research there had developed an intensive medical research activity that tackled the problem of tropical diseases in the country and effectively eradicated them.

The early immigrants were, on the whole, politically active; they created many institutions such as the powerful trade union movement, political parties, cultural institutions, newspapers, etc. The later waves of immigrants (from Central and

1. "Altneuland" by Theodore Herzl, written in 1902, describes an imaginary Jewish State of the future. It is historically interesting to compare the author's vision of the part to be played by science and technology with today's reality. (The book has since been republished in many languages, including an English illustrated edition, 1960, by the Haifa Publishing Co.).
2. Owing to the intervention of the First World War and other factors, the first Technion buildings were completed only in 1923, and the first courses were given in 1929. The University was officially opened in 1925, and became a research institute with a full teaching faculty in 1934.
3. Originally the Institute was exclusively a research institute, but in later years it has also undertaken teaching duties at post-graduate level.

Western Europe and from America) brought commerce and banking, and included many professionally trained people.

The mandatory Government prior to independence had also added some useful institutions such as a meteorological service (which later engaged in research as well as routine), a forestry station, a veterinary institute and a hydrological institute. They encouraged the creation of a Building Testing Station which later (1945) became the Standards Institution of Israel<sup>(1)</sup>, covering a wide range of testing and standardization activities and subsequently engaging to some extent in applied industrial research. In 1942 the mandatory Government established the Board of Scientific and Industrial Research (BSIR) to deal with problems related to the war effort; in 1945 they expanded the terms of reference to include matters such as citrus, quarrying and building materials. This Board provided the background for the Israel Research Council set up shortly after Independence.

Private initiative also took a hand. Novomeyski, an engineer and entrepreneur, saw the significance of the Dead Sea as the basis of a large chemical industry and in 1930 established the Palestine Potash Co.<sup>(2)</sup>, which supported a research programme conducted in conjunction with the Department of Physical Chemistry of the Hebrew University.

In summary we see that the new State of Israel started its existence with a strong scientific and technological background in agriculture, medicine, physical sciences and engineering. In addition it had numerous well-founded socio-political bodies. All this might appear to augur well for a strong science policy, but the negative aspect of the same background should not be underestimated: the new State started with well-established scientific and educational institutions highly jealous of their hard-won autonomous status, and with many well-established economic and political groupings.

As an example, the General Federation of Labour (Histadruth) was - and still is - not only a powerful and comprehensive trade union, including medical services to its members and numerous cultural activities, but is also, through its numerous Histadruth-owned industries, the largest employer of labour in the country.

The result is that any form of centralized planning is beset with great difficulties; and this includes the planning of science. When we add the effects of the Israel electoral system, that have invariably resulted in coalition governments with the ministries divided amongst several political parties, the problem of centralized planning - or more correctly the implementation of such planning - is patently clear.

Two other factors must be taken into account. The early years of the new State were faced with many pressing problems, such as the absorption of large numbers of immigrants who had to be housed and employed at all costs. The second factor - and this has been recognized by sociologists - was

the great optimism and faith of that period, when it was believed that anything was possible, combined with an extraordinary ability to improvise in solving current problems. Such a psychology is not conducive to quiet, long-term planning.

Nevertheless, as will be seen, much progress has been made in the direction of science planning as the country's leadership has become more mature and a cadre of trained and dedicated senior civil servants has been created.

#### A. Post-Independence History

In January 1949, less than a year after taking office, the first Israel Government set up the Research Council of Israel.

The Council originally comprised twelve leading scientists under the chairmanship of Prime Minister Ben Gurion; it was later enlarged to include senior executives of three major institutions of higher education<sup>(3)</sup>. A small staff of professionals, under a scientific executive secretary, was responsible for the execution of policy laid down by the Council, which used advisory committees to consider different branches of science and of the economy.

The Council fostered scientific research for the development of the economy, mainly by creating some basic institutions. Thus it set up the Geological Institute in 1949, drawing heavily on the Department of Geology of the Hebrew University, as a prerequisite to an appraisal of the country's mineral resources<sup>(4)</sup>; a Dead Sea research laboratory to conduct research on the valuable chemical resources of the Dead Sea during a number of years following the War of Independence, when the Dead Sea Company was inoperative; the National Physical Laboratory in 1950, to standardize instruments, provide metrology services and conduct research in applied science; the Institute for Fibres and Forest Products, 1953<sup>(5)</sup>, for research related to textiles and the utilization of natural fibres; and the Negev Institute for Arid Zone Research, 1956 (in co-operation with Unesco).

The Council also attempted to encourage research associations on the United Kingdom pattern of 50-50 participation with industry in the costs of such associations, but industry at the time was not very research-minded and only a very small

1. Incorporated by Act of Knesset in 1953.
2. In Israel this became the Dead Sea Works Ltd., a company of the Ministry of Development.
3. The Hebrew University of Jerusalem, the Hebrew Institute of Technology (Technion), Haifa, and the Weizmann Institute, Rehovoth.
4. The Geological Institute was later transferred from the Research Council to the Ministry of Development.
5. The Fibres Institute is at present part of the Ministry of Commerce and Industry.

number of associations were established (rubber, ceramics and glass, paint). The Council had some funds available for sponsoring or supporting research activities in the existing university-type institutions, but these sums were too small to make a serious impact on over-all science and research policy.

In 1959 the Research Council of Israel was replaced by the National Council for Research and Development (NCRD), still within the Prime Minister's Office. The new Council was enlarged to 25 members and included senior civil servants from the Treasury and ministries concerned with scientific and research activities. Its executive arm included economists, and its terms of reference were wider than those of the original Council. Institutes set up by the new Council include the Pharmacological Institute, the Fermentation Unit<sup>(1)</sup>, the new Industrial Research Centre (in co-operation with the UN), a Bureau of Scientific Liaison, the Centre for Scientific and Technological Information, and the Oceanographic and Limnological Agency.

The Atomic Energy Commission (AEC) is also located in the Prime Minister's Office. Its aims are discussed in Part Five below; its activities include research on the physics and engineering of reactors, desalination by means of nuclear energy, and the use of isotopes. The budget and manpower of the AEC could not be included in the tables of this Study, since the first figures available are for the year 1967-68.

Apart from the Prime Minister's Office, other ministries set up research facilities related to their activities. Thus the Ministry of Agriculture set up the Volcani Agricultural Research Station in Rehovoth, by far the largest applied research centre in the country, which works in close co-operation with the Faculty of Agriculture of the Hebrew University and is based on the pre-State Central Agricultural Institute of the Jewish Agency; a Veterinary Institute; a Sea Fisheries Institute; and a Fishpond Institute.

The Ministry of Development, to which the large national companies dealing with chemicals and minerals are attached, operates within these companies research laboratories for the mining industries, the chemical, fertilizer and phosphate industry and the Dead Sea Works.

In 1957, with support from the United Nations Technical Assistance Programme, the Technical Advisory Board (TAB) was set up. This was a top-level policy advisory body meeting once or twice a year, comprising both international and local experts, and dealing with over-all policy for the exploitation of the basic natural resources and the creation of basic industries based on these resources. Naturally, it had to advise on research programmes and policy. To ensure full co-ordination with over-all national science planning, the NCRD was represented on the TAB. The TAB was formally terminated in 1965, when it was felt that it had adequately achieved its objectives in laying

down and initiating the operations for which it was set up.

The Ministry of Health has research laboratories in the larger Government hospitals and a special laboratory dealing with radio-isotopes in medicine. The larger non-government hospitals also engage in medical research.

The general acceptance of planning and the recognition of its importance have been growing in Government circles, so that a number of planning instruments have been created. These include the Manpower Planning Authority of the Ministry of Labour, the Centre for Agricultural and Settlement Planning (Ministry of Agriculture) and the Economic Planning Authority (Prime Minister's Office) which receives its directives from the Ministerial Economic Committee.

The problem of higher education is closely related to that of scientific manpower and ultimately to scientific planning. The Government, therefore, in 1965 set up a top-level *ad hoc* committee to study higher education (usually referred to as the Shareff Committee, after the name of the chairman). Its terms of reference were "to clarify and make recommendations on the governmental or national instrument in which such matters as the progress, co-ordination, direction and planning of higher education would be lodged". This Committee recommended the establishment of a Higher Education Authority which, amongst other things, would have to prepare a master plan for higher education for the succeeding ten years. The Authority would establish the principles governing the allocation of Government funds for higher education<sup>(2)</sup>. The Committee also made recommendations concerning scientific research and technology. These included:

- (a) that the place for the planning of science and technology was in the Prime Minister's Office. If the Prime Minister himself was unable to devote attention to this matter, the responsibility should be transferred to another minister in his office, the handling of science to be his major preoccupation;
- (b) a number of other recommendations concerning closer ties between scientific research and industry and between the different ministries involved in research and development.

To complete the background picture, mention must be made of the Academy of Sciences and Humanities, set up by Act of the Knesset in 1961. The Act calls on the Academy to advance science and scientific activity, to represent Israel science in the various international organizations such as The International Council of Scientific Unions (ICSU),

1. Administered jointly with the Microbiological Institute of the Hebrew University.
2. The Institutions of higher education all have in addition considerable non-governmental sources of income.

and to advise the Government on matters concerning research and scientific planning. This last point might seem to clash with the terms of reference of the NCRD, but a satisfactory working arrangement has been found: in practice the Academy concerns itself with strictly academic activities and basic research, rather than the fields covered by the NCRD, which is interested essentially in the applications of science.

Mention must also be made of defence research. Prior to Independence there was some defence research but this was, understandably, an underground activity. With the creation of the State, the Government had to put defence research on a proper footing and this is organized within the Ministry of Defence. Whilst this research draws, to some extent, on the other science institutions, it is largely a closed activity, hence no statistics are available.

## II. UNIVERSITIES AND HIGHER EDUCATION

The three major University-type institutions - the Hebrew University of Jerusalem, the Hebrew Institute of Technology (Technion), Haifa, and the Weizmann Institute, Rehovoth - created long before the State, have been joined since Independence by two more fully developed universities - the University of Tel Aviv and Bar Ilan University, both founded in the middle fifties; by the Negev Institute

for Higher Education (1965), which is at present under the academic supervision of the Technion, the Weizmann Institute and the Hebrew University; and by the University Institute of Haifa, which has only humanities and social science faculties.

In the present context, and throughout the report, "higher education" refers to education in these university-type institutions, characterized by being education at the third level and leading to a recognized degree.

In the early years the institutions themselves controlled the awarding of degrees: with the growth in the number of universities the Government set up, under the Minister of Education, a standing Public Council for Higher Education which decides, on the basis of curricula and teaching standards, which newly created faculties may or may not award degrees.

The faculties in each institute are indicated in Table 8, and the total regular<sup>(1)</sup> budgets in Table 14: the Government grants to the separate institutions for years 1963/64, 1964/65 and 1965/66 are shown in Table 15. The financing of research in the institutions is dealt with in Part Three whilst Part Four gives details of staff and students.

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1. i.e. excluding development budgets for buildings, etc.



ORGANIZATIONAL STRUCTURE FOR SCIENCE  
POLICY

I. THE NCRD AND THE MINISTERIAL COMMITTEE FOR SCIENCE AND TECHNOLOGY

The function of the NCRD has already been indicated briefly: because of its importance in the over-all picture of science planning, its terms of reference are now given in full. The relevant Cabinet decision of 15 November 1959, amended on 21 February 1960 and 30 May 1962, reads: "Resolved:

- "1. There shall be established a National Council for Research and Development, which shall carry out the following tasks:
- (a) Advise the Government on action relating to scientific research and planning, and technological development of national significance;
  - (b) Make recommendations to the Government as to an over-all policy for directed<sup>(1)</sup> scientific research;
  - (c) Make recommendations to the Government as to the total amount to be allotted in the State Budget for directed research and for development;
  - (d) Make decisions as to the apportionment and utilization of the funds for research and development at the disposal of the Government and its agencies;
  - (e) Keep under review and supervise the implementation of research projects, as above;
  - (f) Initiate programmes for scientific research and technological development projects;
  - (g) Co-ordinate, within the framework of an over-all policy of research and development, between the agencies carrying out directed research and those who avail themselves of their services;
  - (h) Conduct a survey of the resources available for the implementation of the overall policy, from the point of view of (1) organization; (2) funds; (3) scientific and technological personnel; (4) ancillary services.

- "2. The National Council for Research and Development shall consist of 16 to 25<sup>(2)</sup> members (including the Chairman and Vice-Chairman) appointed personally by the Prime Minister for a period of three years. One-third of the appointments shall expire in every year. The composition of the Council shall be as follows:
- Chairman<sup>(3)</sup>;  
Vice-Chairman<sup>(3)</sup>;  
9-15 scientists, technologists and industrialists<sup>(4)</sup>;  
the Director-General of the Prime Minister's Office;  
the Director-General of the Ministry of Agriculture;  
the Director-General of the Ministry of Commerce and Industry;  
the Director-General of the Ministry of Development;  
a representative of the Ministry of Finance;  
a representative of the Ministry of Defence;  
a representative of the Ministry of Labour.
- "3. The Executive of the National Council for Research and Development shall decide on current allocations for research projects and the modes of implementing the latter. The Executive shall be appointed by the Prime Minister from among the members of the Council and shall include scientists, technologists and representatives of Ministries engaged in economic affairs. A majority of the members of the Executive shall be scientists and technologists. (The Executive shall be headed by the Chairman of the Council; the Vice-Chairman of the

1. Oriented and applied research.
2. This membership has since grown to 36.
3. To date these offices have been filled by scientists.
4. This group invariably includes key personnel from the major institutes of higher education.

Council shall act as Director-General of the Council and shall be responsible for the day-to-day work.)

"4. Upon the establishment of the National Council for Research and Development, the Research Council of Israel shall cease to function, and its powers shall pass to the National Council for Research and Development. Research work so far carried out by the Research Council of Israel shall henceforth be carried out under the supervision of the National Council for Research and Development which shall prescribe how it shall be carried out.

"5. All powers as to scientific research, other than secret defence research, which have hitherto been vested in Government Ministries shall pass to the National Council for Research and Development upon the establishment thereof. Specific research work by Ministries or Government enterprises shall require the approval of the Council."

The full NCRD meets once a year but the Executive, comprising about half the members, meets monthly.

A recent development in the organizational structure is the creation - at Cabinet level - of a Ministerial Committee for Science and Technology (MCST). This Committee comprises<sup>(1)</sup> the Ministers of Health, Education and Culture, Development, Commerce and Industry, Interior, Justice, Finance, the Minister without Portfolio, and the Prime Minister as chairman. The chairman of the NCRD acts as secretary to the MCST. The MCST meets twice a year and is aimed at creating more uniformity in science policy in the various Government departments. There is no separate budget item for "science policy", but in so far as funds may be needed, these come out of the general operational budget of the NCRD.

We now see how the NCRD fits into the general organizational structure. This is shown in Chart No. 1.

As indicated above, most of the Government departments are represented on the NCRD so that, whilst they are not ruled by that body, at least they know what is going on and what the thinking is. This applies to scientific manpower as well as other problems. The institutions of higher education are autonomous bodies and no central agency dictates how much science to do or how many of any particular kind of scientist to train. One reason, apart from the autonomy, is the very great difficulty in estimating the future demand for scientific manpower, though some efforts are made in this direction. In particular, the Technion (Institute of Technology) does try to estimate requirements in various technical fields in deciding its intake of students. Prior to Independence, the institutes of higher education obtained their entire budgets from non-governmental sources: with the increase in the size of these institutions and the recognition of their function in the community, the financial contribution from Government sources has grown to become a major part of the running budget. Since

the percentage of students in science has fallen greatly in recent years - though not the actual number - and this is due to a shortage of facilities, which are much more expensive for science students than for the arts and humanities, the Government has been able to exert some influence on science development by offering financial contributions to the development budgets of the institutions for new or enlarged science faculties.

Organizational links, in the form of joint committees between the NCRD and the various ministries, are not shown in full on the general Chart No. 1, but are shown on detailed Charts, 2, 3, 4, 5 and 6, and are described in II below.

The Treasury (Ministry of Finance), as the holder of the national purse, plays a considerable part in planning in addition to allocating funds and supervising their use. This intervention by the Treasury has the great advantage of being based on an over-all knowledge of what is going on in the various branches of the economy, in particular in economic planning.

Chart No. 1 also shows that scientific research is conducted in three sectors: the institutions of higher education, which are virtually autonomous, except in so far as they accept research funds from Government for specified projects; the research institutes of the various Government departments; the industrial research associations receiving Government support. Private industrial research is not shown on the Chart, as it is not part of any organizational scheme.

The part played by the institutions of higher education in research is very large: these institutions conduct over 60% of all the research carried out in the country and covered by this report. The research funds come from two sources, namely, the regular budget and special grants either from Israeli sources or from foreign foundations and contracting agencies. This research is nearly all fundamental.

The Government institutions, which carry out about 25% of the total research activity, engage mostly in applied research.

Industrial research, which is entirely applied, accounts for about 5-12% of the total<sup>(1)</sup>. Some 3-4% of the total is in other institutions, mainly medical research.

## II. OTHER MINISTRIES

It is now necessary to see how the research activities of the various ministries apart from the

1. The composition reflects a synthesis of technical and political-party coalition considerations.
2. Note that the basic industries - mines, chemicals, etc. - are operated by Government companies attached to the Ministry of Development: their research activities are included in this figure.

Prime Minister's Office are organized and fit into the general scheme.

For ministries such as those of Agriculture and of Commerce and Industry, with research on a broad scale, the links with the NCRD are very close: for other ministries - e.g. Health and Housing, where much of their research functions are rather specific to the ministry concerned - these tend not to be co-ordinated into any general plan. In actual fact the research officers of the NCRD make it their business to know what research is going on in these ministries, since this information is needed for the screening of research proposals (coming from any source) that might touch on the work of these ministries.

1. Ministry of Agriculture. Agricultural research, having preceded the State, has always been an important activity. The Ministry of Agriculture operates a number of research institutes, the largest of which - the Volcani Agricultural Research Institute - is actually the largest Government laboratory in the country. Research policy for these institutions is decided by the Specialists Committee of the Ministry. This Committee and the NCRD together have a Joint Agricultural Research Committee (JARC) (see Chart No. 2) which is advisory, the executive decisions as far as the Ministry of Agriculture research institutions are concerned remaining with the Specialists Committee. However, the JARC does decide on research projects pursued outside the Ministry in such matters as: long-term researches (with the NCRD allocating part of the funds); borderline cases such as food research that may encroach on other ministries, researches in the university-type institutes and other research centres not belonging to the Ministry of Agriculture but nevertheless related to agriculture (for example: plant breeding in the Hebrew University Department of Botany). It also screens agricultural research proposals submitted by Israel scientists to the U.S. Government PL480 research fund programme.

The JARC comprises 12-16 members appointed by agreement between the Ministry of Agriculture and the NCRD, the chairman being a public figure - a specialist, not a civil servant. The members include representatives of a wide spectrum of research and higher education institutions and staff members of the Ministry. The organizational structure is illustrated in Chart No. 2.

By its very existence, the JARC ensures the co-ordination needed for over-all planning of agricultural research in relation to research in general and national planning.

2. Ministry of Commerce and Industry. The Ministry of Commerce and Industry operates one research institute - the Institute for Fibres and Forest Products. Although this is a Government department, and therefore responsible to the Director-General of the Ministry, it has in the last few

years had a governing board (steering committee) comprising scientists, industrialists and representatives of the Ministry and of the NCRD. This board deals only with general policy; it cannot arrogate to itself the responsibilities of the Ministry.

The Ministry has in the past had a small budget for supporting R&D programmes in industry and for participation in a small number of co-operative research associations created and formerly supported by the NCRD. It also contributes to a small diamond research laboratory operated for the diamond industry by the Technion.

Very recently, the funds available in the Ministry for the execution of research in industry have been greatly increased and a Joint Research and Development Committee (JRDC) has been set up between this Ministry and the NCRD to allocate these funds. The NCRD is responsible for the scientific screening of research proposals, whilst the Ministry examines the possible impact on industry, exports, etc. The funds are administered by the Ministry. The JRDC was created for three main reasons: (i) the NCRD already had the machinery for scientific screening; (ii) the existence of the NCRD Fund for the Encouragement of Research<sup>(1)</sup> could result in overlapping; though, in practice, the NCRD Fund supports projects that are primarily in the research phase, whilst the JRDC supports projects in the development stage, clearly there are borderline cases where the joint committee is very helpful; (iii) through the JRDC the NCRD representatives obtain an intimate picture of the activities and policy of the Ministry of Commerce and Industry in the R&D field, thereby making over-all science policy planning more effective<sup>(2)</sup>.

The members of the JRDC comprise the Scientific Adviser to the Ministry of Commerce and Industry, who acts as chairman; the heads of the major divisions of the Ministry (chemicals and foodstuffs, metals and electronics, etc.); three representatives of the NCRD, including the head of the Fund for the Encouragement of Research; the Registrar of Patents or his representative; and the Executive Secretary (an official of the Ministry).

The organizational structure is shown in Chart No. 3.

3. Ministry of Development. The major chemical and mining activities in the country are conducted by national companies controlled by this Ministry. There are both local and centralized laboratories,

1. See Part Five, II.1. for a description of this Fund.
2. The Ministry of Commerce and Industry is represented on the NCRD, but the full Council only meets once a year. The JRDC ensures co-ordination at the executive working level.

the largest of the latter being Israel Mining Laboratories (IML). IML receives its budget from the Ministry of Development, but being a company - as distinct from a Government department - it is controlled by a Board of Directors appointed by the Minister of Development and including scientists, industrialists and senior civil servants. Its policy, like that of the Ministry's other research laboratories, was until recently influenced by the Technical Advisory Board (TAB) of the Ministry (see Part One, 1.).

As might be expected, this Ministry, acting as a "holding company", decides its own research, which is mainly carried out in the company laboratories indicated. Thus paragraph 5 of the NCRD terms of reference quoted in Part Two, I. above is not effective. However, there is a joint Earth Sciences Committee between the Ministry and the NCRD, made up of Government officials and senior scientists, with a scientist as chairman; and this committee decides on research projects in earth sciences. The organizational structure is shown in Chart No. 4.

4. Ministry of Health. This Ministry conducts research in its own institutions, i.e. Government hospitals and laboratories and the Institute for Air Pollution Studies. A Joint Medical Research Committee between the Ministry and the NCRD, comprising mostly non-government experts, examines research projects in medicine and health carried out in non-governmental research establishments. This committee has advisory but no executive functions vis-à-vis the research in the Ministry institutions. The organizational structure is shown in Chart No. 5.

5. Ministry of Housing. This Ministry has no research facilities of its own, but commissions research in outside establishments. The Ministry has a Building Research Committee comprising Government officials and senior scientists, with representation of the NCRD. The chairman is an official of the Ministry. The organizational structure is shown in Chart No. 6.

6. Ministry of Transport. This Ministry also has no research facilities of its own. The main connexion with the NCRD is through an ad hoc joint committee set up to examine the needs of research in the sphere of shipping. There is another important connexion through the Oceanographic and Limnological Agency, which was set up by the NCRD in co-operation with the Ministries of Transport (harbours and fouling), Development (marine geology) and Agriculture (marine biology). The Agency operates as an independent Government-funded body with these Ministries represented on the governing board.

### III. LEARNED SOCIETIES

In addition to the National Academy of Sciences and Humanities referred to above, membership of which

is by co-option and for life, the various professions have professional societies, membership of which is limited to persons with academic qualifications satisfying certain minimum requirements.

### IV. RESEARCH LABORATORIES<sup>(1)</sup> AND SERVICES IN INDUSTRY

As indicated above, the heavy chemical industries are almost all Government companies under the Ministry of Development. They have local as well as centralized laboratories such as the Israel Mining Laboratories and the Geological Institute. Agriculture, in its broadest sense, is served by the Government laboratories and research institutions of the Ministry of Agriculture, such as the Volcani Institute, the Veterinary Institute and the Fisheries Institute, whilst the food industry is also served by research associations (Central Laboratories for Citrus Research) and by laboratories of the Standards Institution, the Food Technology Laboratory of the Technion and the Food Technology Institute of the Industrial Research Centre. The more sophisticated sectors of the optical and electronics industries are either associated with or owned by the Ministry of Defence and have their own laboratories. A few other industries - e.g. paint, rubber, ceramics - are served by research associations.

Research activities in the remainder of non-government industry are generally slight, and laboratories, where they exist, deal largely with quality control and trouble-shooting.

A more recent development has been the industrial research and development wings of the three major university-type institutions; these carry out industry-oriented research either on their own initiative or by contract from industry. Thus the largest of them - the Technion Research and Development Foundation - had in 1965-66 over 100 research contracts in hand for local industry, and by 1968 the number had risen to 200: the vast majority of these were initiated by Technion personnel.

### V. SCIENTIFIC AND TECHNICAL SUPPORT SERVICES

#### A. Information Services

The major university-type institutions and some of the professional societies have good scientific libraries, though they do not operate information services as normally defined.

In 1961 the NCRD set up a Centre for Scientific and Technological Information. Initially it concerned itself only with scientific documentation.

1. Annex IV lists the industrial laboratories.