



Technion-Israel Institute of Technology



THE SAMUEL NEAMAN INSTITUTE
FOR
ADVANCED STUDIES IN SCIENCE
AND TECHNOLOGY

**DIRECTORS' REPORTS
1978-1994**

DECEMBER 1994

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INTRODUCTION

This publication includes the S. Neaman Institute's Directors Reports for the years 1978-1994 as presented in the Institute's Annual Reports*, and in the Technion Presidents' Reports relating to the S. Neaman Institute.

The aim of the publication is to document the development of the Institute from its foundation year to the present date. The S. Neaman Institute for Advanced Studies in Science and Technology was founded at the Technion according to Senate Resolution of February 5, 1978, and according to the agreement signed between its founder and initiator, Mr. Samuel Neaman, the American Technion Society and the Technion, Israel Institute of Technology.

The Institute, which operates as a "think-tank" within the framework of the Technion, was established for the purpose of assisting in the search for solutions to national problems in the fields of economic, scientific and social development in the State of Israel.

A detailed index is enclosed including the Institute's goals, research projects, researchers and clients of the Institute mentioned in the Reports.

* SNI Annual Reports were published for the years 1978/79, 1979/80, 1983/84, 1984/85, 1985/86, 1988/89 through 1993/94.

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Part A: From SNI Annual Reports

Year: 1978/79

Director: Professor Jacob Bear

This is the first Annual Report of the Samuel Neaman Institute. It is an attempt to begin a tradition of reporting annually to the Neaman Institute Board of Governors, the President of the Technion, the Technion governing bodies and to the public at large about the research carried out at the Neaman Institute, about the problems the Institute has been facing and about its future plans. Another objective of this report is to introduce the Neaman Institute to those who are as yet unfamiliar with it. Hence, this Annual report presents both a summary of the Institute's activities as well as its plans and problems during its first year.

The report contains three parts. The first part summarizes the objectives of the Institute, its mode of operation, and the role it intends, and in fact has begun, to play. This section also summarizes some of the difficulties encountered by the Neaman Institute as it has begun to implement its plans.

In the second part, a brief summary is presented of all the research projects and of other activities currently underway at the Institute.

Only projects which have been approved and usually also have started, are listed. As this report goes to press, negotiations continue on such projects as Applied Mathematics in the Service of Industry, Housing in Israel, the Future Structure of Israel's Industry and others. We hope to report their progress in the next Annual Report.

The third part contains information on the Institute's research staff, a list of Institute's publications and some documentation of the Institute's visibility in the Israeli press. This last part is intended not just to show that the Neaman Institute has started to establish its special position among research institutes in Israel. As explained in the description of the Institute objectives and modes of operation in the following section, one of the Institute's objectives is to make the public aware of problems and the proposed policies for solving them. Hence, a good press coverage also indicates the achievement of the one of the Institute's goals.

As can be seen from the brief reports of the various research projects, the Institute's research activities cover most of the fundamental problems of existence and development facing Israel today .- problems of slum rehabilitation, labor relations, resource management, energy, education, industrial development, etc. An encouraging fact is that to each of these topics, a team of dedicated experts was found, who devote to the solution of the problems entrusted to them, not only their brains, but also their hearts. They deserve our thanks and appreciation.

To advise the Board of Governors of the Neaman Institute and its Director, an Advisory Board was appointed by the Institute's Director. Its assistance and advice are acknowledged and highly appreciated.

We hope that the Institute's research activities will indeed contribute to development in Israel and to the improvement of the quality of life in it.

Before describing the various research projects currently underway at the Institute, a few words of introduction seem appropriate.

The Samuel Neaman Institute for Advanced Studies in Science and Technology, was established at the Technion as a result of the initiative of Mr. Samuel Neaman, a New York Jewish businessman. Following a resolution adopted by the Senate of the Technion, on February 5, 1978, and in accordance with an agreement signed by Mr. Neaman, the Noon Foundation and the American Technion Society, the Institute started its operation on March 1, 1978. Professor Jacob Bear, of the Faculty of Civil Engineering of the Technion, was appointed Director of the Institute.

The Institute operates within the framework of the Technion as a combination of a THINK TANK and an INSTITUTE FOR ADVANCED STUDIES. The Technion was considered a natural environment for such an institute ,because of the scientific and technological resources - both in terms of skilled personnel as well as in the form of libraries, computers, laboratories and other research facilities which can readily be drawn upon.

It was also envisaged that the policy-oriented research, often related to societal problems to be undertaken by the Institute, will supplement the academic and research activities already taking place at the Technion.

OBJECTIVES OF THE INSTITUTE

Briefly stated, the objectives of the Institute is to serve the State of Israel through advanced research in science and technology specifically, the objectives of the institute are:

- * To assist, through research and advanced studies in science and technology, in the search for solutions to national problems related to both Israel's economic and social development, as well as the health, welfare, environment and quality of life of Israel's inhabitants.
- * To see ways of contributing to cooperation in science and technology between Israel and her neighbors, thereby aiding Israel's integration in the Middle East and advancing peace in the region.
- * To provide facilities and an organizational framework and to create an environment and atmosphere in which prestigious scientists and experts in technology, from the Technion, from Israel and from all parts of the world, will conduct such research as may advance the objectives stated above.

In each case, the Institute's contribution will be to identify the problem, its structure, its interdisciplinary nature, its boundary and its interaction with other problems. This is followed by formulating proposed solutions or policies for achieving solutions. In some cases, the development of tools or methods of solution will also be necessary. It can be said that the formulation and analysis of alternative policies is one of the major roles of the institute.

Sometimes, the Institute's contribution will be in the advancement of knowledge in specific areas in science and technology in order to enable the solution of problems of national interest. The Institute will also make a continuous effort to contribute, directly or indirectly, through the results of its research and studies to the improvement of public decision-making and policy-formulation processes in various areas. By publicizing the results of its activities, the Institute hopes to make the public more aware and better informed of the problems. This is also one of the Institute's objectives.

MEANS AND METHODS OF OPERATION

The Neaman Institute, operating with complete independence, intends to achieve its objectives by initiating and executing projects in the forms of research, study groups and workshops at an advanced level. Typically, the topics for its projects will come from the areas in which the Technion is active. These include natural sciences, all branches of engineering, management and economics, certain aspects of the social sciences, architecture, medicine and biomedical engineering.

The first step is always the identification of a problem which requires a solution through research at an advanced level. The initiative may come from the Institute, from researchers, from Government officials, or from others. Following a preliminary study which often involves negotiating and interacting with the administration, a detailed research proposal is prepared by a team of investigators, who may later serve as the nucleus of a larger team that will carry out the research itself. At this stage, the Advisory Council of the Neaman Institute is consulted.

Following the approval by the Institute's Governing Board, a project coordinator and a team of researchers is appointed to carry out the research. They are given appropriate resources.

Researchers come from the academic staff, including visiting academic staff at the Technion, or other institutes of higher learning in Israel and abroad. Experts from various fields, may also be appointed as researchers. All non-Technion staff are appointed for the duration of the research. This is usually a joint appointment of one of the Technions' academic units in addition to the Neaman Institute.

FUNDS

The American Technion Society has created a fund which, at this stage amounts to over three million U.S. dollars, from the income of which the Institute's activities are financed. This mode of financing guarantees the Institute's independence from the constraints to which sponsored research is often subjected. The Institute may also enter into contractual relations with external bodies for the sake of financing a project wholly or partially. It may engage in joint projects, so long as the principle of complete independence of the Institute is not violated.

RESEARCH

In general, research is based at the Neaman Institute. However, when several researchers belong to the same academic unit, and the unit provides space and other facilities, a research project may be conducted in one or more of the Technion's academic units.

The term "research" employed here, is to be interpreted in a broad sense. As is commonly understood, it includes laboratory and/or theoretical investigations, aimed at creating new basic knowledge, or applying available knowledge to the solution of problems, when, in general, most researchers and the knowledge they use, belong to a specified scientific, or technological field. However, the term research here includes also the attempt to solve a problem recognized as a system associated with a relatively large number of different scientific and technological disciplines, employing such techniques as modeling, systems analysis, operations research, etc. The result will be a policy or several alternative policies, which will deal with and lead to the solution of a specified problem. The emphasis in this case is on reaching a solution, or a policy, by making use of scientific methodology in dealing with a complex problem, involving technological, societal, economic and other components.

The following criteria, usually guide the Institute in selecting projects for research and study groups:

- * Projects which are aimed at a well-defined contribution to the advancement of the State of Israel and its inhabitants;
- * Projects of a high scientific and technological level;
- * Projects that require a team of experts in a certain field, or in different disciplines, attacking together a multi-disciplinary problem.
- * Long-term and large scope projects, requiring a number of research man-years;
- * Projects for which it is necessary (and possible) to assemble a highly-qualified scientific and technological team, both from within the Technion and from elsewhere, in Israel and abroad;
- * Projects that aim at well-defined targets that can be achieved.

WORKSHOPS

A workshop is a relatively small team of experts, academicians, public figures or others, convened for a relatively short period, usually a day or more, to discuss a well-defined topic. The Institute will sponsor workshops devoted to the following purposes:

- * The analysis of a problem or a situation in order to obtain a clearer picture of it, to define the elements that deserve special attention and those which require solutions;
- * To discuss a well-defined problem in order to propose research which will lead to its solution;
- * To discuss interim or final results of a research dealing with a specific problem, conducted at the Institute, in order to evaluate the results and conclusions and to indicate modes of implementing them;
- * To enable exchange of information and ideas between the highest level of decision makers in the country, and experts in science and technology. The participants in such workshops will be invited from both groups.

Topics for workshops will be selected from among those which are of importance to the development of Israel and to the solution of her problems. Emphasis will be placed on maintaining a high scientific and technological level, on a multi-disciplinary approach and on an exchange of ideas between practitioners, decision makers and scholars in science and technology.

An effort is made to have all participants in the workshops well prepared in advance so that definite results and conclusions may be reached.

INSTITUTE PUBLICATIONS

The Institute will place the results of its activities at the disposal of the public, through its publications, public lectures, etc. A special effort will be made, using various modes of communication, to bring the results of its activities to the attention of individuals at the decision-making level as well as private and public authorities associated with the subject under consideration.

ORGANIZATION OF THE INSTITUTE

Board of Governors - This body, composed of five members, supervises the activities of the Neaman Institute. Its function is to oversee the Institute's activities, formulate its policy, approve its annual and long term programs and approve the Institute's budget.

Director - A Director, appointed by the President of the Technion from after consultation with the Institute, for preparing detailed programs for projects and for the preparation of annual and long term plans of the Institute. He is also responsible for the recruitment and appointment of manpower for projects, and for communication and liaison between the Neaman Institute and outside bodies.

Once a year the Director submits a report summarizing the activities of the Institute to the Board of Governors and to the President of the Technion and through him to the Senate and Board of Governors of the Technion.

Advisory Council- The functions of the Advisory Council, whose members are appointed by the Director, to advise the Director and assist him in carrying out his duties, especially those concerning orientation of the activities of the Institute and the selection of projects to be included in the long-term and annual programs. The Council will also recommend ways for implementing the results and conclusions of completed projects.

SOME PROBLEMS FACING THE INSTITUTE

Only a little over a year has passed since the Neaman Institute began its operations. Yet it has succeeded in initiating a number of research projects which address themselves to some of Israel's most fundamental issues.

It has started to carve for itself a unique niche among research institutes in Israel; it is gradually becoming known to the public and the administration as an independent think tank ready to serve the State of Israel; it has re-emphasized the Technion's role as a research institution of enormous breath and depth.

From the beginning, its mode of operation has been as flexible as possible. Rather than waiting until administrative rules and regulations had been prepared, the Institute began conducting research learning and establishing the rules as they became necessary. It is too early still to summarize even this beginning phase. An additional period of 2-3 years is needed before preliminary conclusions may be reached. Yet it seems that some basic problems facing the Institute may be mentioned already at this stage.

One of the main problems is the lack of sufficient number of qualified full time research staff who will work at the Neaman Institute because of its high research level, because of the challenge in dealing with fundamental societal problems and because of the opportunity of serving the State of Israel. Part of the problem may be attributed to the fact that the Institute does not grant tenure to its research staff. In the Israeli environment, this is, to a certain degree, an obstacle. Nevertheless, recent negotiations with candidates indicate that this obstacle can be overcome. We are in touch with a number of potential new immigrants and Israelis who plan to return to Israel soon. It is important to establish a small nucleus of researchers who understand the spirit and direction of the Institute and who would stay for a number of years.

A second problem is the lack of researchers, who have experience in interdisciplinary policy research and can become project leaders.

Another problem is the lack of interaction, so far, between the researchers engaged in the various projects. Such interaction will enable exchange of ideas, which is vital to interdisciplinary research carried out at the Institute.

Another area which requires attention is the contact with Government and the administration. On the one hand, the Institute is making every effort to cooperate with the administration in order to make those responsible for different areas more involved in what the Institute does. In this way it increases the chance for implementation of research results. On the other hand, every effort is made to maintain the independence of the Institute and its researchers.

This is just a brief review of what the Institute does and of some of the problems facing it. Comments and suggestions would be welcome.

Year: 1979/80

Director: Professor Uri Shamir

In its second year of operation, the Samuel Neaman Institute for Advanced Studies in Science and Technology has expanded its activities, added new studies to its research program and engaged many more researchers. The selection of research topics has been aimed at serving the State of Israel through the search for solutions to national problems, related to the State's economic, technological and social development, and to the health and welfare of its citizens.

This report is directed to the Neaman Institute's Board of Governors', the Technion's President and governing bodies, to the professional community, and to the public at large, as a means of outlining the Institute's overall program and providing some information on specific research. The first part of the report is an overview of the Institute, its objectives and mode of operation. Brief summaries of the research projects and other activities are given in the second part. Only fully active projects are reported herein. Several others are in various phases of preparation or negotiation with sponsoring and/or participating agencies. The third part of the report contains information about the research staff.

The research projects cover a wide range of problems which face the State of Israel. Among them are: resources management, energy, wate, industrial development, slum rehabilitation, labor relations, vocational education, etc. Interdisciplinary teams work on each study, and the Institute has in most projects been successful in securing the cooperation and participation of the relevant Ministry and public bodies.

The Institute is seeking to recruit the support and participation of top experts in Israel and from abroad. Visits by several foreign experts have been sponsored, to enable their participation in workshops and for more extended periods of time, to work on research projects.

The Neaman Institute enters its third year with an active a wide-ranging research program. it will continue to contribute to the development of Israel and to its welfare and quality of life.

Year: 1983/84

Director: Professor Gad Hetsroni

The Samuel Neaman Institute for Advanced Studies in Science and Technology was founded at the Technion according to an agreement between the initiator, Mr. Samuel Neaman, the Noon Foundation, the American Society for the Technion and the Technion - Israel Institute of Technology, on February 7, 1975. This agreement was ratified by the Senate of the Technion on February 5, 1978. The Institute was registered as a company limited by guarantee and not having a share capital, with the Registrar of Companies, on May 4, 1979.

The objectives for which the the Samuel Neaman Institute was incorporated are:

- (1) To assist in the search for solutions to national problems in the fields of economic, scientific and social development in the State of Israel, the raising of the standard of living of its citizens, and the search for methods of facilitating Israel's integration into the Middle East by the following means:
 - (a) Providing aid for the enhancement of advanced research in subjects that will be chosen from those areas in which the Technion - Israel Institute of Technology maintains academic activity.
 - (b) The organizing of scientific and academic meetings on an international scale and appropriate level in whose frameworks scientists from the Technion will collaborate with academic visitors from Israel and abroad for the advancement of human knowledge and with a view to implementing this knowledge in the interests of the State of Israel.
 - (c) Providing the means and creating the atmosphere in which scientists from outside, together with those from the Technion, will conduct research and contribute towards Israeli society, economy and industry.
- (2) To search for medium and long-term solutions to the problems of the State of Israel while utilizing the resources of scientific and technological personnel at the Technion and mobilizing teams composed of Technion personnel and personnel from outside the Technion for limited periods of time, who will devote their efforts to the subjects selected.

- (3) To organize workshops on topics of significance for the development of the State of Israel and the solution to its problems, in which both scientists, technologists and businessmen will be invited to participate and to utilize these workshops, inter alia, as aids to formulate research projects with which the Neaman Institute will deal.
- (4) To do research in all fields of science, technology, economics and social sciences.
- (5) To facilitate the absorption and integration into the academic community of the Technion of scientists and technologists from all parts of the world.

By publication of the results of its activities, the Institute hopes to make both state officials and the general public, more aware and better informed of the problems and of the proposed solutions.

The Institute's activities are financed from the fruits of the Samuel Neaman Fund which is administered by the American Society for the Technion. This guarantees the Institute's freedom and independence. The Institute also enters into contractual relations for financing projects as long as the principle of independence of the Institute is not violated. During the period 1978 to 1984 the Institute's total budget was about 2.3 million U.S. dollars, of which about 1.8 million came from the Samuel Neaman Fund.

Year: 1984/85

Director: Professor Gad Hetsroni

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Year: 1985/86

Director: Professor Gad Hetsroni

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Year: 1988/89

Director: Professor Zehev Tadmor

The S. Neaman Institute (SNI) is an interdisciplinary center for research and Policy studies. During 1988-89, SNI projects, workshops and publications further strengthened its emerging role in both basic research and policy studies, in Israel and abroad.

SNI concentrates its efforts in four main areas: universities and education; industry, technology and science; national resource management; and health and quality of life. There are 31 active project now underway in these four areas. Some thirty senior Technion faculty members from ten different departments are actively engaged in SNI research, and ten Technion faculty members serve on various research advisory committees. Together with them, there are six professors and senior researchers from institutions outside the Technion - Hebrew University, Weizmann Institute, Ben-Gurion University and RAPHAEL (Armament Development Authority) - engaged in SNI research, aided by eight part-time SNI assistants. From abroad, three visiting professors spent time at SNI, researching various projects. All in all, 46 senior researchers were at work on a wide range of SNI projects.

Total research expenditures in 1988 amounted to approximately \$668,000. About 60 percent of that sum came from accrued interest from the Neaman Fund principal, while the remainder came from client participation.

Along with its intensive research program, SNI sponsored and organized three international workshops:

- * Civilian Space Applications (March 1988).
- * Innovation at the Crossroads between Science and Technology (May 1988).
- * Reintroducing Design into the Engineering curriculum (June 1989).

Several national workshops were also held, among them one on Basic and Applied Research in Plastics and Polymers in February 1989.

The Samuel Neaman Press continued its publishing program. Two books, eight extensive reports and three issues of the biannual SNI bulletin were published.

SNI is involved in both national and international collaborative programs. On the national scene, close cooperation exists in specific projects with the Dayan Institute at Tel Aviv University, the Jerusalem Institute for Israel Studies, and the Van Leer Jerusalem Institute. Internationally, SNI has reached an agreement with the Fraunhofer Society for System Techniques, in Karlsruhe, Federal Republic of Germany, to conduct a joint project on technology policy issues. A joint research proposal was submitted to the German-Israel Binational Fund. An agreement for cooperation also exists with the Ecole Polytechnique of Paris for a joint project on "The Future Structure, Role and Management of Technological Universities"; Two of their students have spent a month at SNI working on this topic. In addition, two graduate students from Nijenrode Netherlands School of Business - are conducting their final project on Israeli competitive strategy with respect to European Economic Integration in 1992, at SNI.

During this academic year, Dr. Z. Bonen, former Director-General of RAPHAEL, joins SNI as a research fellow. He heads a major research Project on "Images of Israeli Technology in the 21st Century". Professor William Resnick is coordinating SNI continuing education programs, and Professor S. Maital has undertaken the editing of the SNI Bulletin as well as participating in several other research projects.

Mr. Y. Lederfeind, Deputy Director of the Haifa Oil Refineries, was appointed by Mr. Samuel Neaman as one of his representatives on the SNI Board of Directors. Mr. Neaman himself continues his close and active involvement in the daily affairs of the Institute, helping the Director of the Institute in charting its policies and future course. Finally, SNI associates achieved awards and other distinctions during the past year. Professor S. Eisenstadt, one of Israel's foremost sociologists and director of the SNI Project on "The Creation and Survival of Centers of Scientific Excellence", was awarded the prestigious Balzan Foundation Award for Sociology for 1988. The Institute Director, Professor Zehev Tadmor, was promoted by the Technion to Distinguished Professor of Chemical Engineering. SNI Researcher Dr. Y. Shiftan was awarded first prize by the "Sah-Sah" Foundation for Transportation Pioneers for his work on the SNI project "Police Intervention in Congested Intersections..

Finally, the SNI project on "Crisis Intervention in a Hospital Setting" by Dr. C. Tadmor and Professor J. Brandes, conducted at the Rambam Medical Center, was selected by the American Psychological Association as a 'model intervention and

prevention project'. There were 14 such model programs selected out of a total of 900 examined. The programs were presented to members of the U.S. Congress and health Policy administrators at a special conference in Washington D.C.

Year: 1989/90

Director: Professor Zehev Tadmor

The Samuel Neaman Institute, as conceived by its founder, in its continuing drive to contribute to informed public policy decision making in Israel, has strengthened its direction, focus and operations. Based on the Institute's experience accumulated since its establishment in 1978, it has formulated and supported a pro-active and strategic approach to its research activities.

Under the guidance and direction of the Institute's Board of Directors, and supported by input from members of the Advisory Committee, faculty, researchers and staff, SNI has identified the broad areas of industry and technology as central to Israel's economic independence, if not its economic survival. The Institute has set as its main objective a significant contribution to a national industrial vision for the future.

Such a vision, with its technological, economic and social implications for Israel, requires the constant participation, contribution and involvement of Technion faculty. This faculty forms an unmatched knowledge resource in Israel which spans the key areas of technology and science essential to creating an industrial vision for the 21st century. Technion's charter specifically calls for its faculty to make such contributions, and the Samuel Neaman Institute was designed as an ideal framework and organization to bring this mission to fruition.

A vision of technology based industries of the future cannot be developed, however, without deep involvement in and intimate knowledge of science policies and educational policies. The policy areas of industry and technology, science, education and national resources and quality-of-life when taken separately, highlight aspects of national planning in which innovative policy studies, are, of course, badly needed and each has profound significance in its own right. But, when taken together they provide a rich synergy upon which the Institute hopes to capitalize. At SNI, these four research areas are integrated and provide a unique base for development of a national industrial-technological vision for the future.

This year, 28 Technion professors from 10 departments have been involved in SNI research. In addition, six professors from other universities in Israel, four visiting professors from the U.S. and 13 other researchers were involved in these projects.

The total cost of the research was approximately US \$500,000, of which US \$ 320,000 came from the Samuel Neaman Research Fund in the United States. The results of these studies are summarized in the research reports in this volume.

Highlights of SNI's research results this year include, in the area of **industry and technology**, the formulation of an extensive research plan for a study of the Future of Israeli Industry. The project will relate to other industry oriented research activities undertaken at SNI, including Automation in Israeli Industry, Technometric Indices (a joint project with the Institut fur Systemforschung in Germany), and a comprehensive research program on the Israeli Plastics Industry. The study of the Plastics industry will also serve as a model study of an industrial sector for use by several similar SNI research projects.

In the area of **science and scientific research**, the Israeli Academy of Sciences and Humanities has added its sponsorship to the SNI study of Trends and Effects of Israeli Science. Also the Council of Higher Education's Planning and Grants Committee has commissioned special SNI studies in this field. SNI's research project Trends in Science and Technology in the Middle East is concentrating on the issues of the technological 'gap' between Israel and the Arab countries in education, science, computers and aerospace, resulting in significant insights relating to an understanding of these trends.

The third area of focus at SNI is **education**. The Ministry of Education has requested that SNI conduct an extensive study of pre-university scientific and technological education. The project on the Teaching of High-School Science and Mathematics by video, conducted jointly with the Unit for the Improvement of Learning at Technion, has been very successful. As a result, the Ministry of Education decided to extend the project to all high-schools and pre-academic educational systems. A joint steering committee of the Ministry of Education and SNI has been established in order to implement this project on a national basis.

Continuing its ongoing exploration of Engineering Education in the 21st Century, the Institute has also concentrated on two major aspects of engineering education. The first was the Place of Design in Engineering and the second, the Impact of Computer Technology on the Content and Methods of Teaching mathematics.

SNI's work on **national resources and quality-of-life** issues currently involves two studies. One ongoing project is the study of oil pricing policies in Israel, which has special significance in view of the imminent sweeping national policy reforms in this segment of the economy. Also, a study of the Law Enforcement System in Israel in the 21st Century has just been approved by the Ministry of Police. The Ministry of Police, the Police Department itself, the Ministry of Justice, and other think-tanks, will participate in this study.

In addition to these studies, the President of Technion requested that SNI engage in a policy study and formulate a plan of action for Technion to deal with the absorption of new immigrants from the Soviet Union. The absorption of the new immigrants has become the most important and urgent item on Israel's national agenda. The relevant issues cut across all four of SNI's research areas and they demand a multidisciplinary approach. SNI's study was adopted by Technion and adapted into an operational plan. SNI has now begun a more detailed study of the professional backgrounds and needs of new immigrant engineers and scientists.

The Institute has also focused on strengthening the administrative support it gives to its researchers. SNI staff are committed to providing each research team with computer, library and data-base management services, as well as coordination of the publication and dissemination of SNI project reports. Over the past several years the quality and sophistication of these services has improved dramatically.

In the area of computer and data-base management, the Institute has embarked upon a state-of-the-art program to provide computers for managing the complex and intersecting data-bases which are built and maintained for the many SNI research projects. These systems will also support the dissemination of research results, the management of the Institute itself, improvement of the quality and frequency of public and inter-institute communications, and the interface between SNI and Technion faculty and staff.

Another area of continuing improvement in SNI's capability is planning and implementing international workshops. Several world-class events related to SNI projects have been held and several others are in the planning stages. These workshops and the publications arising from them, have served to strengthen the work done at the Institute and ensure up-to-date results and conclusions. The number of publications distributed by the Institute has risen by 30% over last year.

For the future, the main challenge the Institute faces, is continuing its course leading to the ability to deliver meaningful research, provide alternatives to decision makers, and be recognized as Israel's pre-eminent public policy think-tank. It is hoped that the Institute will continue to successfully involve Technion faculty and researchers in the policy development process.

Finally, I would like to recognize the steady and continuing commitment to the Institute by Sam Neaman. He gives not only of his time and not only of his resources, but he gives of his experience and vision. His dedication to the Institute embodies the kind of involvement that serves as a model of the collaboration that is possible within the world Jewish community. It is a pleasure working with him and the entire SNI staff, and I am grateful for the opportunity of serving as SNI's Director.

Year: 1990/91

Director: Professor Daniel Weihs

This has been a year of dramatic events and changes all over the world, with special results and effects on Israel. The breaking up of the Soviet bloc and the opening of the gates for immigration to Israel of hundreds of thousands of Jews would have been enough to make this an exceptional year. Then came the Gulf War with Scud attacks on Israel and the following rearrangement of world and local priorities, to result in a complete conceptual change.

All of these events have influenced the activities of the S. Neaman Institute in its efforts to present Israeli decision-makers with well-researched recommendations on policy and scientific matters.

The main policy research areas of:

- i. industry and technology
- ii. science
- iii. education
- iv. national resources
- v. quality of life

have not changed, but the emphasis has shifted. As examples of these shifts the SNI has organized a national workshop on Alternate Energy Resources, in the light of the Gulf Crisis, which was initially planned for January 24, 1991 but was delayed to May because of the war. The study of the Trends in Science and Technology in the Middle East has also gained relevance and immediacy. In education, we have initiated a large-scale program for integrating Soviet-educated immigrant engineers into Israeli industry, as well as examining the possibility of adding a category of practical engineers, by developing a core curriculum for a three and a half year program, leading to an academic B.Tech. degree.

With the guidance of the Institute's Board of Directors, especially its Chairman and Founder, Mr. S. Neaman, and supported by technical advice from the Institute Advisory Committee, the SNI researchers and staff have continued the Institute's strategic approach to the definition and solution of problems in the subject areas above.

This year 68 researchers were active in SNI projects. These include 38 Technion professors from 14 departments, 6 professors from other universities, and 10 senior researchers from the industrial and business sectors. The total research activity increased by over 20% this year, as evidenced also by the budget.

Highlights of this year's research achievements by S. Neaman Institute people include, in the category of technology and industry, the initiation of a series of studies on industrial sectors, following previous formulation of a general research plan. The first sector examined in depth was the plastics industry, where a comprehensive mapping of research and development, production, marketing and ecological effects was produced. A similar study on the electronics industry has been started, and a study on the penetration of automation in Israeli industry was completed.

The Technometrics technique, a quantitative method of estimating an industry's international competitiveness, has been applied to the budding Israeli Biotechnology industry. A study of manpower projections for industry, comparing with OECD countries, was also completed.

A second focus of studies has to do with Israel's **scientific** prowess. Here we examine the relative impact of Israeli scientists and scientific research as obtained by rates of publication, and references to those publications. The trends in Israeli science and technology were also compared to those in Arab countries, especially in the fields of higher education, computers and aerospace science.

The third area of research deals with various aspects of education. These studies include a large program of teaching high-school mathematics and physics by video-tape - enabling teenagers in underprivileged areas to get this very important education from the best teachers of Technion. This program has, with the support and encouragement of the Ministry of Education, been extended to all high-schools and alternative pre-academic programs. A plan for educating for entrepreneurship has been developed at the S. Neaman Institute, in conjunction with the Ronson Foundation etc. A program defining the requirements for colleges which will grant a practical engineer's degree (the Bachelor of Technology) has been formulated for the Council of Higher Education and is under examination in the Knesset. A study of the conditions of employment and levels of satisfaction of university professors, is also underway, to examine the dangers of loss of scientific excellence.

The area of national resources has gained prominence this year. In addition to completing a five year study on oil-pricing policy in Israel, several energy-related studies were initiated. These include an overview on alternate energy sources as well as more specific studies on the ways to increase use of solar energy in industry and use of passive architectural design to save air-conditioning costs.

Quality of life is especially important in Israel, where the questions of survival are a daily concern. Several studies are being conducted in this area. First, a study of law-enforcement policies, in conjunction with the Ministry of Police has been started. A project on the reduction of deleterious effects of coal-based power-stations by using the coal-ash to "build" artificial islands in the Mediterranean has been initiated. Studies on trends in employment, both for new immigrants and long-term Israelis, some with the collaboration of the Histadrut have also been discussed, as gainful employment is now recognized to be a major factor in the quality of life.

This has been a year of both happy and sad events in the Neaman Institute family. Professor Zehev Tadmor resigned after almost four years as Director, to become President of Technion. His years as Director were highly successful and have helped bring the Institute to the public consciousness by means of several important and influential studies, in the industrial, academic and educational areas. Dr. Ze'ev Bonen, who was head of the Industrial studies group ended his contract, and is now a consultant for the Institute. Professor Robert R. Edelstein of New York, who was the American representative of the Neaman Institute for many years, passed away after a long illness, during which he continued to work tirelessly even while undergoing debilitating treatments. He will be fondly remembered.

Year: 1991/92

Director: Professor Daniel Weihs

1992 is a year of new alignments, and stock-taking in many areas, after the Gulf War of 1991 and the dissolution of the Soviet Empire, with their direct effects on the political and demographic situation in Israel. The start of the peace process, the changes in Europe and the global recession in 1992 require new thinking and fresh approaches, and the S. Neaman Institute has been adapting rapidly.

The changing circumstances include all spheres of life. The population of Israel has grown by over 10% by immigration in the last two years, with very large numbers of scientists, engineers and medical personnel predominating. A large part of the Institute's efforts has therefore been directed to taking advantage of this "windfall" in human assets so as to best benefit both the State of Israel and the immigrants themselves.

The vanishing of the Soviet influence has resulted in a global decrease in defense-related spending, both in research and development, and in procurement. This, in conjunction with the ongoing unification of Europe has a serious effect on Israel's high-tech industries, requiring a hard look into the future to promise continuing success for these important components of our economy. Here again, the Institute is working together with industry to establish policies for such developments.

Under the guidance of the Institute's Board of Directors, especially its Chairman and Founder, Mr. S. Neaman, and supported by technical advice from the Institute Advisory Committee, the SNI researchers and staff have followed the Institute's strategic approach to the definition and solution of problems in five main areas:

- a. Industry and technology
- b. Science
- c. Education
- d. Natural resources
- e. Quality of life

This year over 80 researchers were active in SNI projects. These include about 50 Technion professors from 14 departments, about 10 professors from other universities and some 20 senior researchers from the industrial and business sectors. The total research activity increased by over 20% for the second year running.

In the category of **technology and industry**, highlights of this year's research achievements include the initiation of a series of studies on industrial sectors, following previous formulation of a general research plan. The first sector examined in depth was the plastics industry, where a comprehensive mapping of research and development, production, marketing and ecological effects was produced.

A comprehensive study of the electronics industry is at an advanced stage. A survey of the world situation and possible Israeli niches has been made, a poll of senior industrialists to identify possible joint projects, and a study of changes in curricula for engineers have been completed.

The Technometrics technique, a quantitative method of estimating an industry's international competitiveness, having been previously applied to the Israeli Biotechnology industry has now also been used to study the Sensor industry.

A second focus of studies has to do with Israel's **scientific** prowess. Here we examine the relative impact of Israeli scientists and scientific research as obtained by rates of publication, and references to those publications. The trends in Israeli science and technology were also compared to those in Arab countries, especially in the fields of higher education, computers and aerospace science.

A new study, of career expectations and needs of Israeli Ph.D. graduates has been initiated. This is especially important now that a large increase in the amount of available scientific manpower has occurred due to immigration.

The third area of focus at SNI is **education**. These studies include a large program of Teaching of High-School Science and Mathematics by video, enabling teenagers in underprivileged areas to get this very important education from the best teachers at Technion. This program has, with the support and encouragement of the Ministry of Education, been extended to all high-schools and alternative pre-academic programs. Chemistry has been added to the program this year.

A study of the conditions of employment and levels of satisfaction of university professors is also underway, to examine the dangers of loss of scientific excellence.

Two new projects started this year, examining the later career of pupils who were identified as gifted, when starting primary school, and a project to teach technology (as distinct from science) at Junior High School level.

The area of **national resources** is of continued national importance. Several energy-related studies were initiated. These include an overview on alternate energy sources as well as more specific studies on the ways to increase use of solar energy in industry and use of passive architectural design to save air-conditioning costs in dwellings.

A multifaceted study aimed at defining ways of recycling solid waste in a manner that will be popular and gain cooperation of non-professionals has begun.

Establishment of a Water Research Institute to improve efficiency of water-related studies by bringing them into a common framework was recommended by a Neaman Institute working group.

Quality of life is especially important in Israel, where the questions of survival are a daily concern. Several studies are being conducted in this area. First a study of law-enforcement policies, in conjunction with the Ministry of Police has been started. A project on the reduction of deleterious effects of coal-based power-stations by using the coal-ash to "build" artificial islands in the Mediterranean is at an advanced stage.

Of special interest are a series of conferences on Ethics and Technology which will be held annually, under the joint auspices of the Whizin Foundation, together with the University of Judaism (Los Angeles, Ca.). The first of these will be held June 1992 at the Technion.

On the personal level, two of the Institute's veteran researchers passed away this year. Professor Micha Yadin, and Professor Eliezer Rosenstein, both of Technion's Department of Industrial Engineering and Management who were involved in various Institute activities over the years, passed away after long illnesses. They will be sorely missed.

The Institute's Management Information Services Manager, Aner Shoham, left, to start a career in industry, and Dr. David Reti, a new immigrant from Hungary joined the Institute staff.

Year: 1992/93

Director: Professor Daniel Weihs

The last year has been a year of political change in Israel, the U.S. and the European countries, with significant effects on policy making, and thus on policy research. A greater emphasis on peace, in the Middle East specifically, and all over the world has strongly affected all defence-related industries. As these are among the biggest, and most export oriented in Israel, the economic impact is enormous. On the other hand, environmental issues have gained in importance. These and other changes, resulting from immigration, have required new looks at both the educational and employment agencies. The Neaman Institute is working together with government and industry to help in turning these events into opportunities for growth and greater well-being for Israel's population.

Under the guidance of the Institute's Board of Directors, especially its Chairman and Founder, Mr. S. Neaman, and supported by technical advice from the Institute Advisory Committee, the SNI researchers and staff have followed the Institute's strategic approach to the definition and solution of problems in the following main areas:

- a. Industry and technology
- b. Science
- c. Education
- d. Quality of life and natural resources

In the area of industry and technology the institute has continued the in-depth study of various sectors of industry. This was done in cooperation with the relevant industry associations and government ministries, in order to formulate strategies for industrial development and ensure continuity of competitiveness. This year we completed the study of the Electronics Industry, which included 4 stages: mapping the industry in Israel and abroad, as well as market trends, location of potentially feasible areas for the Israeli industry, requirements of curricular changes from the higher education institutions educating engineers, in order to be able to meet these challenges, and also an effort to develop cooperation within industry in these areas. Lately a similar study was initiated for the Chemical Industry, in collaboration with the

Manufacturers' Association and the Ministry of Industry and Commerce. Also, a follow-up study of the impact of changes in the Electronics Industry on the type of research personnel needed has been started.

Together with 4 leading industrial corporations, the SNI has established the first consortium for generic R&D in the field of satellite communication, according to the Ministry of Commerce and Industry's new MAGNET Program. This is a new and promising direction for the SNI, which enables development of new industrial areas. With massive governmental support a large (9 senior researchers) group, mainly from Technion's Electrical Engineering Department are involved in this study. Negotiations are under way for the establishment of other consortia in various areas of advanced technology.

Another workshop on the subject of improving R&D efficiency was held at the SNI, and the research for measurement of performance parameters in the Israeli industry was completed.

In the area of science we have continued analysis of our database of publications of Israeli scientists and citations thereof for individual searches, as well as evaluation of departments and research areas in Israel, compared to the rest of the world. We have completed a study of the plans and expectations of Ph.D's from Israel, depending on professional discipline. The translation of the first scientific book of a series of books by Nobel Prize Laureates was completed, and the book is scheduled to appear shortly in the SNI Press.

The first SNI Scientific Conference was held this year on Distributed Algorithms. The conference was a great success. The second conference is scheduled for Spring 1994.

In the area of education the Institute has continued the production of video courses for science in high schools and preparation for matriculation examinations. The series of lectures in high schools and academic preparatory units has also continued, in order to encourage pupils to take high level science courses and continue their studies.

The SNI has also supported the preparation of two Hebrew teaching textbooks with an technological-scientific emphasis, for new immigrant scientists and engineers. These books were very well received and even won Dori Award given by the Haifa Municipality. The SNI has also carried out a background study for the development of

courses for the solution of technical and technological problems for high school intermediary level (ages 13-15) in 5 experimental schools. A study was also undertaken to follow up young adults found at an early age to be especially gifted, to determine the effect of the special education they had received.

In the area of quality of life and natural resources the study of use of coal ash for artificial islands has continued. Several locations were defined and cooperation with Dutch authorities has begun in this area.

The study of the effect of technological and social development on the Israeli law enforcement system has continued. Also, we have continued the study of alternatives for municipal solid waste recycling and have initiated a new study on the recycling of wastewater.

The SNI has undertaken to formulate a national emergency plan for dealing with marine ecological disasters. Cooperation has also begun with the Society for Protection of Nature in Israel, to undertake studies on policy for the conservation of plants and animals in Israel.

This year about 90 researchers were involved in SNI projects (two thirds of whom were senior Technion faculty). The Institute has published over 20 books, reports and publications and organized seven conferences and workshops. A number of conferences organized by other Technion groups were partially supported by SNI.

This year the SNI celebrates its 15th anniversary. During these years about 300 reports, books and other publications, half in Hebrew, appeared, as the result of the various projects performed.

Year: 1993/94

Director: Professor Daniel Weihs

This has been an exciting and eventful year for us. The S. Neaman Institute celebrated its 15th Anniversary this year, and commemorated this milestone by laying the cornerstone for the permanent home of the Institute, to be built next to the new Faculty Club near the center of the Technion campus. This building will more than double the Institute's working space and will allow the concentration of all researchers and equipment under one roof. It will also have a facility for holding small to medium-sized meetings and symposia.

External events, mainly due to the developing peace process, resulted in a need to rethink many of the concepts basic to Israeli public policy. The Neaman Institute is joining government and other sectors to maximize the emerging opportunities to improve the economic and general well-being of Israel's population. This caused a change in emphasis towards increasing our interaction with industry, which will play a leading role in determining Israel's future position in the world economy; requiring high added value products to compete with cheap labor costs elsewhere.

For the past few years, our main areas of activity have been:

- Industry and Technology
- Science Policy
- Education and Culture
- Quality of Life and Natural Resources

In addition, we have added a special division dealing with **University-Industry Consortia**, in which the Neaman Institute is the academic center for pre-competitive, generic research into specific areas of interest, in close interaction with a group of companies. Two such consortia are already active, and two more are undergoing a preliminary feasibility study. The two existing consortia are in the fields of:

i) Ground stations for satellite communication: in which four leading industrial groups and the Neaman Institute are starting the second year of a planned five-year program.

ii) Digital communication receivers: in which there are eight companies involved. This consortium began activity in January, 1994, and is scheduled to last up to four years.

These consortia are supported by the firms involved and the Ministry of Industry and Trade, as part of its Magnet program to enhance the competitiveness of Israeli industry by overcoming the limitations of Israel's size and small local market. We see this as a promising new way to increase interaction between the Technion and other university professors and local industry. It will benefit both the industrial partners and the quality and relevance of teaching at both undergraduate and graduate levels.

In the area of **Industry and Technology**, the Institute continued its multi-year program of in-depth examinations of various sectors of industry, in cooperation with the relevant government ministries and industrial associations. The purpose of these studies is to define long-term development strategies on a sectorial level. This year, we completed a follow-up study of the manpower requirements for the electronics and communications sector. The original investigation, completed last year, was the impetus for both this study and the founding of the digital communication consortium mentioned earlier. The first stages of a similar study - examining the chemical industry - were completed, in collaboration with the Manufacturers Association and the Ministry of Industry and Trade. A new study of future manpower requirements of software development companies began recently.

A four-year project on Technometric benchmarking of industrial products was concluded this year. A technique originally proposed by the ISI Fraunhofer Institute in Karlsruhe, Germany, was developed and used to test various industrial sectors. Over 10 technical publications resulted from this project, several of which appeared in leading journals.

The Ministry of Industry and Trade asked the Institute to formulate a method for examining the efficacy of its industrial research institutes (there are seven such organizations), and to apply it to them. As a first step, the Ceramics Research Institute is being monitored.

A third workshop on the subject of improving R&D efficiency, with the participation of leaders of R&D groups, was held at the Institute.

In the field of **Science Policy** studies, the Neaman Institute received a contract from the Ministry of Science and Arts to formulate a national program for research into space science and technology. This two-year project includes cost-effectiveness studies of the satellite programs already active and the formulation of new programs.

In collaboration with the Council for Higher Education, a study was completed on the effectiveness of selecting post-doctoral fellows through publication and citation analysis. A study of career patterns of Technion's medical school graduates and their level of satisfaction was undertaken jointly with the Faculty of Medicine.

The second annual SNI scientific conference on Signal and Image Representation in Combined Spaces was scheduled for May 1994; and two symposia, one on the next generation of information systems and technologies (NGITS 95), and the other on Hyperlipidemia in Israel (community, economic and research aspects) were selected and will be held in 1995.

The subject of **education** includes the continued production of videotaped science courses, adapted to current matriculation requirements at high-school level. This year, a new course on Vector analysis was distributed. The second, updated issue of our textbook-workbook combination - to teach technical Hebrew to newly immigrated scientists and engineers - has appeared. The first edition was awarded the Dori Prize by the Haifa Municipality last year.

A study of the progress of student candidates identified as "specially gifted" was completed, in order to determine the effectiveness of their training. It was found to be mainly useful for gifted children who took up scientific and engineering careers, and less so for other professions.

Following recommendations made by the Technion's Board of Governors, the Institute set up a select committee of five Technion faculty members - considered among the best teachers - to find ways of improving the teaching process to the satisfaction of both students and faculty.

As part of our effort to raise public awareness and interest in the environment, we initiated an exhibition of paintings by Haifa artists on the theme of air and water pollution. This falls under the heading of **Quality of Life and Natural Resources**. In this area, the examination of the feasibility of using coal ash from Israel's power stations to form artificial islands continues successfully, in a joint project with the Dutch government and the Israel Electric Corporation. Also in progress is the four-year project on the future development of law enforcement agencies; and the project on solid waste recycling, which is funded jointly with the Ministry of the Environment.

A study has been initiated of the medical histories of immigrants who came to Israel from the Chernobyl area in the Ukraine, where an accident in a large nuclear power station emitted severe radiation. A project was also begun on possible recycling and reuse of urban wastewater; and several proposals on improving the quality of life were submitted.

Over 120 researchers were involved in the Institute's activities (of which about 50 are Technion professors). This year the Institute published over 30 books, reports and articles and organized nine symposia and meetings. We also sponsored several conferences in subjects of interest held at the Technion by other groups.

I would like to end this report by mentioning that this year marked the 80th birthday of the Institute's founder and chairman, Samuel Neaman. We wish him many more years of fruitful work with the Institute.

Part B: From Technion Presidents' Reports

Year: 1978/79

Director: Prof. Jacob Bear

The Neaman Institute for Advanced Studies in Science and Technology completed its first year of operation on March 1, 1979. The establishment of the Institute was announced at the last meeting of the Technion's Board of Governors and discussions took place in the Academic Committee and in the Plenum as to the Institute's objectives, modes of operation and contribution to the development of the State of Israel.

As the Institute's research activities are initiated and carried out, its role and its mode of operation are gradually crystallizing. Briefly, the Institute seems to shape into a combination of primarily a Think Tank and (to some extent) an institute of Advanced Studies. It identifies problems of vital importance to the State of Israel and engages in action oriented research aimed at solving them. It is especially interested in research of medium and long term problems in the border zone between science and technology and societal problems, leading to policy objectives and alternatives. Most of its research is multi-disciplinary. The institute also seeks and achieves cooperation with the State authorities of ministerial and lower levels, and with industry and public organizations. However, measures are always taken to insure the independence of the researchers.

Research

Rehabilitation of slum areas and the prevention of neighborhood deterioration in Israel. The objective of the research is to investigate the problem as a comprehensive multi-disciplinary one, taking into account physical, economic, social psychological, environmental and educational aspects, and to propose a national policy that will solve the problem. A team of ten researchers of all the above disciplines is attacking the subject. The first stage of the research, leading to a detailed definition of the problem, its structure, the interrelationships among the various components and to a 2 year research programme has recently been completed and reported. The report served as a basis for a two days workshop, with the participation of some 40 government officials, social workers from the field, people from academia

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etc. Deputy Prime Minister Yadin also addressed the workshop. The research is continuing into its second year.

National Energy Policy Objectives and Alternatives. The approach is comprehensive, taking into account diversification of sources, transportation, storage, industry, petrochemical industry, economic aspects, environmental aspects, reliability of supply, demand growth, etc. A research programme was prepared with the aid of Prof. Martin Greenberger of the Johns Hopkins University and in cooperation with the Ministry of Energy and Infrastructure, Electric Company, the Atomic Energy Commission and others. A team of researchers is now being assembled.

Development of a Methodology for Preventive Intervention in Labor Relations - Phase I, which included the development of the methodology has been completed and reported. The report served as a basis for a two day workshop to discuss the proposed methodology and the programme for the continuation of the research in the form of field experiments and their analysis. Some 30 government officials' including the Commissioner of Public Service' Histadrut Union members, and academicians participated in the deliberations. Mr. Wayne Horvits, the Director of the U.S. Federal Mediation and Conciliation Service' was invited to review the work done and participate in the workshop. The second phase will include field implementation of the developed methodology in industry.

The Use of Coal as a substitute for Oil in Industry. This project is jointly sponsored by the Institute and the Ministry of Energy and Infrastructure. The objective is to study the technological, environmental and economic aspects of using coal in industry. This is a preliminary research to be completed in June. If the results indicate the feasibility of using coal, a more detailed research aiming at proposing policy alternatives will be launched.

A workshop on the implications of Peace for Israel. Six working groups were established to deal with: social and welfare problems, economic problems, science and higher education, the decision-making process, Israeli Arabs and relations with world Jewry. Each group prepared a written report with specific conclusions and recommendations for action or further research. A two-day workshop was convened in which all the papers were presented and discussed in plenum and group sessions. The final report is to be issued also in English, and presented to the Government and Knesset Members.

Institutional Feeding. This includes comprehensive approach to the problem which is of interest to health authorities, army, education authorities, industry etc. Aspects include: health, nutrition, transportation and storage, economy, industry, etc. The project is under way.

Miscellaneous. Other projects in advanced phases of preparation, for inclusion in the 1979/80 programme, are: Water policy objectives and alternatives for Israeli Decision-making planning systems for policy formulation in the public administration in Israeli Vocational education in Israel; Workshop on Hemoperfusion; Natural Resources in the future of Israel.

All these activities received good coverage in the press. This helped to achieve yet another institute objective which is to make the public (and officials) better informed and more aware of the problems. It also informed the public of yet another contribution in the area of public policy made by the Technion' through the Neaman institute, to the development and welfare of the State of Israel.

The major problem of the institute is the lack of a sufficient number of good researchers. Altogether, some 40 researchers, mostly part-time, are engaged in the above research activities. The institute is making every effort to recruit good people from the Technion, from the other institutes of higher learning in Israel and abroad, from amongst new immigrants and Israeli's residing presently abroad.

Year: 1979/80

Director: Prof. Uri Shamir, Acting Director

The Samuel Neaman Institute for Advanced Studies in Science and Technology completed its second year of operation on March 1, 1980. A main direction of the Institute's activity is dealing with issues and problems of national policy, in which science and technology have a major role. Initiative for projects may come from the researchers, from the Institute, or from a public or government body. Interdisciplinary research teams are set up, as needed. The Institute seeks to obtain the cooperation of the appropriate Ministry or public body, including participation in funding, while carefully maintaining independence of the research team.

The following list of activities demonstrates the scope of the Institute's activities.

Rehabilitation of Slum Neighborhoods - A team of 10 researchers from various disciplines, among them experts from other countries who are visitors at the Technion, is investigating this problem, looking at all aspects: physical, economic, social, psychological, educational and environmental. The report summarizing the first year's activity was put out after a workshop in which professionals and decision makers participated. The report is being translated into English, to facilitate interaction and exchange of information with research teams in other countries. In its second year the research concentrates on administrative aspects of a rehabilitation project, public participation, care for the aged and young families. Partial funding has been received from the Ministry of Welfare for the research on care for the aged, and negotiations are under way for funding by the National Rehabilitation project.

National Energy Policy - A team of five researchers is preparing a methodology for developing and assessing a national energy policy, following consultations with experts from abroad and discussions with the Ministry of Energy and Infrastructure.

Improving Government Administration in Israel - The purpose of this research is to identify the cardinal problems of government and public administration in Israel and to propose ways for overcoming them.

Hemoperfusion - Following an international conference in Israel on the removal of toxins from the blood a workshop on the same topic was conducted under

the auspices of the Neaman Institute, in which 15 of the top experts in the world participated. A final report was prepared, which outlines ways of future experimental and clinical work for treating ailments of the kidney and liver, and of blood poisoning victims.

Vocational Education in Israel - A team of three researchers has carried out a preliminary analysis and a workshop was then conducted which identified the main problems and indicated ways for addressing them. The Ministries of Education and of Labor have indicated their intention to cooperate in the following phases of the research.

Water Policy for Israel - The Water Commissioner is participating in funding of this research, which is carried out by a team of six researchers who include the Water Commissioner's Economic Advisor. A comprehensive framework for policy assessment has been developed, and several supporting investigations are under way, among them: law, administration, allocations, prices, water quality, development and operation policies, economics of water use, energy, desalination.

Natural Resources in Israel's Future - The objective is to investigate alternatives for development in the next few decades, in view of the availability of resources, especially minerals, and of environmental aspects of their development. The research takes into consideration interrelationships with other resources, such as land, water and energy. Partial funding has been secured from the National Council for Research and Development.

Workshop on the Theory of Approximations - This topic, which is of practical importance in industry, will be the subject of a workshop with some of the top experts in the world. The workshop has been granted sponsorship of the National Academy of Sciences.

Schedule of Daily Activities in Israel - The Economic Cabinet of the Government has decided to investigate the feasibility and desirability of staggering the hours of daily activity of the various sectors. The purpose would be to make better and more balanced use of resources such as the transportation systems, electricity and communications networks, while improving the coordination of activities among the various sectors and convenience for the individual. The Neaman Institute has undertaken this research.

The Housing Problem - A preliminary investigation was aimed at identifying the major problems in this field. A research team is now preparing a detailed working plan and discussions on cooperation with the Ministry of Housing and Construction are being continued.

Short Course on Policy Analysis - Professor Richard Zeckhauser, an expert from Harvard University, has been invited to conduct a short course on policy analysis. One part was given to researchers at the Neaman Institute, using their own research topics as example. Another was for policy analysts in the government and public sectors.

Development of a Methodology for Preventive Intervention in Labor Disputes - The methodology has been developed, and efforts are continuing to locate a plant or plants in which it can be effectively tested.

Institutional Feeding - Preliminary preparations have been made for this applied research, and efforts are under way to secure the cooperation of government bodies who should be responsible for implementation.

Study Group on Social, Economic and National Issues - A group of experts in these fields is involved in identification of the cardinal issues in these areas. The first to be studied was the problem of land use planning and the relevant law. Next the group will discuss national policy for development of industries.

Income Policy in Israel - An inter-disciplinary research team is investigating the idea of setting up a forum for government, labor and the employers to negotiate an income policy. Patterned after similar bodies in other countries, and adapted to Israel conditions, this should be the arena for a process of arriving at a balanced income policy which will aid in combatting inflation.

Other topics under consideration include the prevention of road accidents, underground cemeteries, cancer diagnosis and treatment, remote controlled aircraft for agricultural tasks.

Year: 1980/81

Director: Prof. Ehud Lenz, Acting Director

During the third year of operation, the Neaman Institute has concentrated its efforts on subjects of policy research and has dealt with problems the solution of which is of cardinal importance to the State of Israel.

The following list of activities illustrates the scope of the Institute's operation:

Regulation of Activity Times - The main purpose of this research was to provide advice and guidance in the improvement of activity times of the infrastructure services (transportation, electricity, telephone, water etc.) and of the recreation services (shops, banks, various institutions, etc.). This research was commissioned by the Ministry of Energy and Infrastructure.

The main findings of the research are:

- The infrastructure services in Israel are provided, during peak hours, at a cost lower than their peak value, and during low-demand hours at a cost higher than their value, so that the low-demand hour customers carry the burden of the peak hour demand.
- Most of the Israeli population would have benefited from shopping and banking services open at later hours than is customary today.

The findings of this research and its recommendations are now studied by an inter-ministerial steering committee, after which the final report will be published. The team of this research was interdisciplinary and consisted of engineers (civil, transportation, communication), sociologists, labor relations experts etc.

Productivity Measurements at the Plant Level - The purpose of this research is to develop a model to measure the productivity level of a plant, comparing the actual situation with an external 'standard'. This method of measurement may serve as a means for comparison between plants which may be very different in their inputs and modes of operation.

Data was gathered at a plant which agreed to be the model's 'subject'. A linear model was developed, taking into account the various production ratios and specific conditions of the above mentioned plant. These data provided the basis for the local standard. Data is being gathered now for determining an 'external' standard to which the local one may be compared. At a later stage a system for analyzing the differences between the actual productivity level and the achievable standard, will be developed.

Alternatives for Energy Policy in Israel - This research aims at developing a methodology destined to assist in the decision-making process of the energy economy in Israel. This will be achieved by formulating objectively policy alternatives and testing their implications on the achievement of the goals set for the energy economy.

This research is financed jointly by the Neaman Institute and the Ministry of Energy and Infrastructure. Within the general framework of the research certain separate research works are carried out. The aim of each sub-project is to offer policy alternatives for the relevant subject. Such sub-projects include the implications of the energy considerations on the national economy; forecasting of energy prices; solar energy; energy conservation; Substitution of coal for oil in industrial plants; decision making processes and the institutional framework, etc. The first stage of the above research deals with the description of the current state of affairs, data gathering and comparisons with other places in the world, definition of the energy system boundaries, formulation of goals and criteria for their achievement. The research deals also with determining policy subjects and their implications. The second stage will deal with in-depth research of the above, completion of the sub-projects and testing each alternative of the overall policy within the general framework of the criteria.

Workshops and discussion groups gather every now and again to deal with the issues, including the research team and people in charge of day-to-day decision-making in the energy area.

Neighborhood Rehabilitation in Israel - During its second year the research has concentrated on five areas of research:

- a. Physical rehabilitation of neighborhoods, combined with social rehabilitation: Self-rehabilitation of dwellings in distressed areas; mobility of households in the Tel-Aviv rehabilitation neighborhoods; Open-area development in rehabilitation neighborhoods.
- b. Public-participation in the rehabilitation project.
- c. Dealing with social groups within the rehabilitation neighborhoods; Housing and services for the elderly in rehabilitation neighborhoods; Young families in rehabilitation neighborhoods.

- d. Organization and management of Project Renewal: Neighborhoods rehabilitation in Israel - the Administrative-Institutional context.
- e. Evaluation of the results of Project Renewal.

Two workshops were carried out, together with the relevant ministries; one dealt with the institutional aspects and the other with public participation in the rehabilitation project.

Two guests were invited within the framework of the research - Prof. B. Frieden from M.I.T. who contributed to the Project Renewal Evaluation aspect, and Prof. Charles Leven, from Washington University, who dealt with the implications of rehabilitation in the Israel context.

Income Policy for Israel - The main purpose of this research is to create new means for discussion between the three major factors of the Israel economy the employers, the union (Histadrut) and the Government. Similar experiences were studied in Norway, Holland, Sweden, Austria and the Federal Republic of Germany, together with the relevant literature. The research team carried out extensive discussions with representatives of the three factors in order to check their attitude in principle to such an approach.

Lately certain econometric models have been examined which may serve as a basis for collecting economic data for the establishment of such an institute which will serve for discussions and talks among the three factors. A joint workshop is planned in the near future.

Improvement of Public Policy in Israel. The relevant literature in Israel on this subject has been studied and analyzed. The final report is scheduled to appear shortly before the June 1981. elections. The final draft of the report will be sent to professionals and politicians for remarks and reactions. A workshop for the policy-making people will be convened in order to discuss the conclusions of the research and means for implementations.

Mineral resources in the Israel economy - This research deals with the contribution of mineral resources to the growth potential of the Israel economy till the end of the 20th century. Conclusions will be drawn, relevant to the national material policy. The materials currently studied include metals, mineral raw materials for the basic chemical industry, and minerals for the building industry.

The research consists of the study of interrelationships between the various minerals and the other production branches of the Israel economy. A detailed study of certain minerals is also carried out (cement, phosphates and building materials). The problem of recycling of materials and minerals is also studied in depth.

The next stage of the research will deal with imported minerals, the dependence on these raw materials and the damages foreseen in case these minerals are not available. The research is financed by the Neaman Institute together with the National Council for Research and Development.

Water Policy Alternatives for Israel - This research is carried out by an interdisciplinary team including researchers from the Technion and from other academic institutions, people from the water industry, the Water Commissioner's Office, The National Water Planning Co. etc. This stage of the research is financed jointly by the Neaman Institute and the Water Commissioner's Office. A general model for public management of resources has been developed within the framework of this research. This methodology was developed in relation to the water industry, but with a wider view as to the more general aspects. The methodology consists mainly of:

- a. Definition of the limits of the water system and the relationships with other systems.
- b. Identification and definition of the Israel water industry goals.
- c. Formulation of criteria for measuring the achievement of the above goals as a result of the implementation of several policies;
- d. Identification of policy subjects;
- e. Identification of the components of the policy in each domain;
- f. Formulation of several alternatives for each component;
- g. Formulation of several reasonable alternatives for each policy subject;
- h. Choice of several alternatives for an overall policy, each consisting of one alternative from each subject;
- i. The relations between the policy subjects and the criteria;
- j. Method for analysis of the results of implementing various policies;
- k. Implementation of the choice system on the selected policy alternatives;

- I. Summary of the suggested alternatives in a way which may serve the decision-makers.

Within the framework of the overall research, certain sub-projects are carried out, which formulate parts of the main methodology. These deal, among others, with: water distribution; pricing policy; costs; organization, law and decision making processes; water quality; aquifer management; desalination; the water industry and the agricultural sector; water systems management; geopolitical aspects etc.

Advanced systems in Agricultural Aviation - The research team is studying the state-of the art in order to:

- a. Improve security and precision in agricultural aviation, by means of control and display instruments which are meant to reduce the pressures on the pilot;
- b. Improve the spraying systems in order to achieve better uniformity.
- c. Improvement of the external form of the agricultural planes in order to reduce fuel consumption.

The first stage includes development of research techniques and preliminary experiments. During the second stage laboratory simulations will be carried out, together with analytical and computational work. The third stage includes formulation of practical solutions in order to achieve the desired improvements.

Future Plans - Certain other projects have already begun within the framework of the Neaman Institute, such as: Policy for national encouragement of industry in Israel, New techniques for artificial respiration etc.

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Year: 1981/82

Director: Prof. Gad Hetsroni

During the fourth year since its establishment, the Neaman Institute for Advanced Studies in Science and Technology has continued several projects which were initiated in the past, and has developed several new projects. Several projects are scheduled to end toward the end of the current year. The research teams operating within the framework of the Neaman Institute include about 100 researchers from various disciplines representing most of the Technion's departments, as well as researchers employed by the Neaman Institute on a full time basis.

Among the major projects currently carried out at the Neaman Institute are:

1. Neighborhood Rehabilitation in Israel - The research team is currently engaged in summing up the various research aspects investigated since the beginning of this Project. Special emphasis is put on the aspect of self-help housing rehabilitation in distressed neighborhoods. This aspect is jointly funded by the Ministry of Housing and the Neaman Institute. Some of the final research reports have already been published, describing various aspects, such as: the organizational-institutional aspect, public participation in neighborhood rehabilitation etc. The data gathered for the second stage of the research project is being analyzed. This stage deals with comparing processes and results of two types of housing solutions: self-help versus institutional rehabilitation. The research project is expected to terminate toward the end of this year, when final report will be issued.

2. Evaluation study of Project Renewal - The research team has undertaken an evaluation study of ten neighborhoods under rehabilitation. This project is financed by the Jewish Agency and the Neaman Institute and is sponsored by the International Steering Committee of Project Renewal. This research is now in its initial stages and is expected to continue for two to three years. A suitable research team is being recruited, and a selection process has begun to choose the 10 neighborhoods most suitable for evaluation. The choice is done in coordination with the Ministry of Housing, the Ministries of Labor and Welfare and the Ministry of Education, as well as the Jewish Agency. The research tools, such as methods for evaluation of public participation etc. are also being finalized.

3. *Advanced Methods in Agricultural Aviation* - This is the second stage of the above research project. The team concentrates mainly on three aspects: flight control and safety, aerodynamics of low flying application of pesticides, and optimization of an agricultural plane model. The relevant computer programs and calculations have been completed in order to enable the model development during the third stage of the program.

4. *Application of Mathematics to Industry* - This is an initial survey intended to locate areas where the use of mathematics is useful for solving certain industrial problems. The research team visited a number of key industrial plants and major companies, and located certain subjects which may be of interest. It is still necessary to examine these problems thoroughly in order to determine the usefulness of the mathematical models.

5. *Water Policy Alternatives For Israel*. This is the final stage of the above research project. During the initial stages the methodology was defined and a series of supporting studies was undertaken to cover various aspects of the water policy. These supporting studies are now being completed, on subjects such as: operation of water resources, water quality, political aspects of the water system, research and development, the organizational aspect of the water system. A workshop is scheduled on each of these aspects to discuss the subject with public officials, people operating within the water system and other specialists and interested parties.

Simultaneously, the research project is finalizing the division of the overall policy into various subjects, locating the components of each subject and forming alternatives for each component. A method for policy evaluation is also being developed, based on the Saati-de Graan method. The final report is expected to appear towards the end of the current year.

6. *Productivity Measurement at the Plant Level* - The initial stage of the research project was finished and a report published. The research team has also organized a one-day workshop on the subject, in which public officials, people from industry and various government agencies participated. The team intends to apply the model developed to certain industries, and compare the results to national and international criteria.

7. Energy Policy Alternatives for Israel - The first stage of the project was finished and the interim report published and handed over to the Ministry of Energy and Infrastructure. There was also a workshop on the subject, in which officials from the Ministry of Energy and Infrastructure and other interested parties participated. An agreement is being negotiated between the Neaman Institute and the Ministry for the final stage of the research program.

Administration - The Institute is now an independent administrative unit, and the follow-up for each research project is up-dated at least twice a month.

The new offices of the Institute at the Technion Industrial Park are being renovated and the Institute is expected to move there shortly.

Year: 1982/83

Director: Prof. Gad Hetsroni

During the current year the Samuel Neaman Institute for Advanced Studies in Science and Technology has moved to the Gutwirth building on the Technion campus.

The major research projects undertaken, such as water policy alternatives for Israel, energy policy alternatives for Israel, Project Renewal evaluation etc. continued during this year which will be the final year for most of them, and final research reports are expected toward the end of the current year. A number of new projects have now been initiated, including transport management, public health, land-use and communication, blood substitutes etc. These projects have just begun and the first interim report is expected toward the end of the year. All the reports which were published by the Institute are available on request. The following is a brief review of major projects.

Water Policy for Israel In its third year the research concentrated on several policy areas: overall extraction of water from all sources and management of the main reservoir-water quality in the sources and in the supply systems; pricing and allocations for agriculture, the institutional structure of the water sector. At the same time, overall alternative policies for the entire sector were formulated. In each policy topic its components were defined, alternatives for each selected, measures of effectiveness identified, and alternative policies formulated for evaluation. Analyses were conducted of the effect various policies have on the measures, to aid in the decision making process.

Discussions and workshops were conducted, in which decision makers, interest groups and experts participated. This formed the continuation of our interaction with all segments of the water sector. Work continued on the final report, a draft of which was completed in summer 1982.

Comprehensive Evaluation of Project Renewal (1982-1984). The research was initiated by the International Committee for the Evaluation of Project Renewal which was established in 1981 by the Government of Israel and the Jewish Agency. It is funded equally by the S. Neaman Institute and the Jewish Agency. The goals of the research are to identify the inputs, the outputs and outcomes of Project

Renewal and to evaluate the degree to which these conform to the goals of the project and to guidelines for implementation. The research uses the Integrated Evaluation methodology developed by the research directors which consists of six evaluation tasks: process evaluation, cost monitoring, implementation monitoring, evaluation of the outcomes, analysis of the neighborhood context, and an overview.

The study is based upon a sample of 10 neighborhoods containing about 80,000 people from among the 69 Project Renewal neighborhoods with about 500,000 people. An interim report has recently been published which includes a comparative analysis of the following aspects: description of the neighborhoods, the local organization of Project Renewal, budget of the fiscal year 1980/81 and initial analysis of the residents' participation in rehabilitation of their residential areas.

Alternative Energy Policies For Israel. Research is proceeding along four parallel courses: formulation of methodology; development of policy actions, alternatives and clusters in the various energy policy areas; ranking of goals and alternative policy themes in selected areas; and organization of workshops (attended by researchers, of the Ministry of Energy and Infrastructure and others in the energy field). Methodologies for ranking goals, grading policy alternatives and ranking policy alternatives - in a single policy area - have been formalized and tested. An approach to the clustering of several policy areas, in order to account for interdependencies, is being developed. Thirteen out of the eighteen policy areas have been fully researched and most polls and questionnaires handed out at the workshops and distributed by mail. Workshops continue to be held on a regular basis, and encompass the current research in the three other areas of activity.

Productivity Measurements at the Plant Level. Productivity measurements were undertaken in various industrial plants in Israel, such as textile factories, Electric Cables, Ashdod Port, Tnuva Dairies etc. A report is being written summarizing the results of these measurements. The results of the study obtained so far have been presented at international conferences. Negotiations are underway with York University in Canada for a joint research on the subject. The research team is considering further applications of the model in the Israel Electric Corporation and various other plants.

The Use Of Mathematics In Industry. The research team conducted a research in the amount of saving to be gained by central storage. This was done using the game theory methods. At the same time preparations were made for centralizing the storing at the Technion chemical store and the electronic parts store. Reports have been prepared including existing computer programs for inventories, description of the existing ordering procedures and discussion of possible improvements.

Self Help Housing Rehabilitation In Distressed Neighborhoods. The study was initiated by the researchers of the Samuel Neaman Institute and was funded equally by the Institute and the Ministry of Housing and Construction. Its goals were to analyze a wide-spread phenomenon in older public housing projects in Israel - self-help housing rehabilitation, and to evaluate its potential as an action strategy for Project Renewal, the current national project of neighborhood rehabilitation. It also compared this spontaneous ameliorative process with the institutional solution of housing problems of poor families: removing them into improved apartments by a public housing company.

The analysis was based on an empirical study of 300 households in two distressed neighborhoods. It provided a description of the population and of the two processes of housing improvement, studied the factors which encouraged or prevented each process, evaluated them from the physical point of view and investigated the economic costs and the social implications of the two different housing solutions. The major conclusion was that the self-help housing improvements was superior from both an economic and a social point of view. Hence, a series of recommendations regarding the encouragement of this process in Project Renewal neighborhoods was formulated and submitted to the Ministry of Housing and Construction.

Agricultural Aviation.

1. Flight Safety and Control. A. Simulation experiments.

A series of flight control experiments was carried out with the purpose of determining the relation between "vision narrowing" or "tunnel vision" and the difficulty of the control task in the low-altitude agricultural flight. The "conus of attention" was measured by means of a secondary task in which the pilot subject had to react on events which were randomly appearing in the visual field.

In order to create a realistic impression of flight, a wide-angle visual simulation system was developed, which presented the visual scene at an angle, identical to the actual visual field in flight. For this purpose a screen was used of dimensions 2.40x2.40 meters. The simulation set-up included the original components of the agricultural aircraft, such as pilot seat, control stick, rudder pedals and throttle lever. Four subjects are presently participating in the experimental program, among which two subjects had actual flight experience. Results obtained so far clearly show the existence of the "conus of attention" and the narrowing of the conus with increased task difficulty.

B. Estimation of altitude angles and state variables by low cost sensors. A novel technique has been developed for determining which attitude angles and other state variables by means of relatively low-cost sensors. The technique utilizes a-priori knowledge of the vehicle dynamics and facilitates to estimate the angles and other variables with adequate accuracy, provided the parameters of the vehicle are known exactly. Presently, the sensitivity of the estimation errors to variations in the vehicle parameters is investigated. Preliminary results show that the technique meets the requirements of accuracy and cost for control or display systems to be implemented in the agricultural aircraft.

2. Preliminary Design of Advanced Agricultural Aircraft. A data base of the aerodynamic characteristics of advanced General Aviation airfoils and advanced propulsion systems has been compiled. A sizing routine that matches the weights and size of an agricultural airplane to the required mission and performance has been developed. The routine uses the above mentioned data bases. The code is used for parametric studies.

3. A parametric study of the effect of droplet characteristics and size as well as flight path altitude on the efficiency of spray spreading and uniformity was carried out. This was done under the assumption that the aircraft wake is fully developed. Significant results were achieved, showing that spray droplets originating from a large part of the aircraft wing span (30%-50%) does not reach the ground in the required path. This enables the design of spraying systems that will cover only part of the wing span (thus reducing aircraft drag and increasing efficiency). Also, the effectiveness of various add-on kits, presently available can be assessed with our program.

Year: 1983/84

Director: Prof. Gad Hetsroni

The Samuel Neaman Institute, founded at the Technion, Israel Institute of Technology in 1978 by Mr. Samuel Neaman, deals primarily with Public policy issues. Its Purpose is to provide assistance and information to Israeli decision makers in areas of national importance.

There are three participants in the Policy formulating process: The decision maker himself, who has been entrusted by the public to formulate and carry out policies: the policy analysis and the professional expert in the area. Of these, The Samuel Neaman Institute aims to provide the larger two. Its teams formulate and analyze alternative policies. Presenting them to the decision makers.

The Samuel Neaman Institute is located within the Technion. This enables scientists and researchers from the Technion to be involved in the processes of national decision making, and the decision makers to rely on the technological and scientific expertise found within the Technion.

The following is a description of current Projects.

Self-help housing rehabilitation - The research deals with Publicly constructed housing which accounts for about half of the housing supply in the country. It investigates alternative Policies to the adaptation of old housing to the changing needs of residents and their changing preferences over the year - the alternative of self-help rehabilitation. The investigation considers the interests of national housing policy on the one hand, and the interests of the resident families on the other.

The following stages of the research were carried out during the past year: Conclusion of the comparative analysis of the customary policy alternatives for the rehabilitation of Publicly constructed housing in Israel. Self-help rehabilitation versus institutionalized rehabilitation. The research report on this topic that was Published in 1982 has been summarized in Hebrew and has been submitted to those decision-makers who are responsible for housing policy in Israel. A paper on the subject in English has also been completed and has been submitted for publication to a scientific journal.

Analysis of the personal-family factors that increase the likelihood that households, particularly low-income ones, will enter into the self-help housing rehabilitation process. In order to carry out the analysis, data was collected from a sample of 500 households, 100 in each of 5 neighborhoods composed of publicly constructed housing.

Analysis of the institutional-organizational factors that increase the likelihood that the number of households in a particular neighborhood which enter into the self-help rehabilitation process will increase. 10 public housing neighborhoods chosen for investigation. Local officials and those involved in housing and in rehabilitation at the regional and national levels were interviewed in this regard.

Investigation of different levels of realization of self-help housing rehabilitation processes in low-rise housing (1-2 floors) as compared with middle-rise housing (1-4 floors). The above two samples have been chosen in order to compare these differences and arrive at conclusions concerning the potential for self-help rehabilitation and its encouragement both in low-rise housing and in middle-rise housing.

The research project was supported jointly with the the Ministry of Construction and Housing.

The evaluation of Project Renewal in Israel - The study is being carried out in a sample of 10 neighborhoods out of the 70 neighborhoods in which Project Renewal is in process. Recently the collection of data on the following aspects has been completed:

- Description of neighborhoods prior to the inception of Project Renewal.
- Analysis of inputs - financial allocations for various activities and order of priority among these, analysis of cost-effectiveness of selected programs and analysis of characteristics of beneficiaries of Project Renewal.
- Analysis of outputs - measurement of outputs; comparison between planned and actual outputs; displacement (negative and positive) of outputs.
- Institutional structure and planning and implementation processes - evaluation of these in terms of criteria such as: consistency with national directives, rationality and comprehensiveness, extent of decentralization of power, capacity for coordination and communication capacity for continuation (after the phasing out of Project Renewal).

Description and evaluation of public participation in Project Renewal. Participation in decision-making processes and implementation and operation of the program, evaluation of effect of residents on functioning of the program.

- Changes that have occurred in the neighborhood during the period that Project Renewal has been in progress - aggregate changes, as expressed in the migration balance and in the prices of apartments in the neighborhood; specific changes that are expressed in various aspects of the quality of life of the residents and in the personal improvement of neighborhood residents, young and old.

- Evaluation of changes in the neighborhoods in the light of the objectives of those responsible for the program of residents in the neighborhoods.

The research team is now drafting their findings towards the publication of the final report in the summer of 1984. The report is being prepared in consultation with the international committee for the evaluation of Project Renewal, set up by the Israeli government and the Jewish Agency. Parallel to the writing of the report the research team is reviewing the relevant literature in preparation for writing a book on the findings of the research on Neighborhood Rehabilitation within the framework of the Samuel Neaman Institute.

The research was supported jointly with the Ministry of Housing and the Jewish Agency.

Energy Policy Alternatives for Israel. The research team is engaged in the following:

- Further development of the methodology to classify policy alternatives. In addition to the Saaty method implemented last year to classify the alternatives, the research team has added the Electre method based on a different methodology.

- Development of a methodology to evaluate the precision of ranking of policy alternatives. This methodology is destined to check the extent in which the grades given to the different alternatives reflect actual ranking. It is based on statistical computation of errors in ranking the goals.

- Development of a methodology for ranking policy alternatives in case of doubt when grading - often it is not possible to give an accurate rank to policy achievement. It is only possible to state a range of grades.

Quantitative methods to evaluate energy pricing policy - It has been decided to use two quantitative models, the Eta-Macro model developed in Stanford and the "OMER" model developed in the Technion. The EtaMacro model is already ready for use.

Updating the 'OMER' model. The 'OMER' model was developed at the Technion in 1977-80. Since 1981 no use was made of the model, and the data is now being updated (input-output data etc.)

Water Policy Alternatives for Israel. The research team is engaged in the following:

Total production and management of the main reservoirs - the material gathered was sent to the Committee for Policy Formation of the Water Commission. The team is following the discussions in the committee. Water quality in the sources and in the main systems - discussions were held on the subject and a draft of the final chapter prepared. It is now under review by the Committee for Policy Formation of the Water Commission.

Organizational structure of the water system in Israel. the team is studying the role of the non-governmental agencies within the water sector. A detailed questionnaire was prepared for data gathering.

Cooperation with the Committee for Policy Formation of the Water Commission, established by the Water Commissioner, composed of public officials and experts. It was agreed that the research team of the Samuel Neaman Institute will assist this Committee by preparing material and participating in its discussions. It was nevertheless emphasized that the research team will maintain its complete independence and the initiative in the choice of subjects for research, and direct advice to the Water Commissioner.

On Nov. 9, 1983 a Press Conference was held in Tel Aviv to outline the project and cooperation with the Water Commission. The Water Commissioner described his views on the assistance of the team work on decision making.

On Nov. 17, 1983 a joint Workshop was held with Resources for the Future, in Washington D.C. The team also gave a lecture in the U.S. Senate Building, at the invitation of senators and the National Water Alliance.

The research project is supported jointly with the Water Commission.

Communication and Industrial Location Study. This study is designed to look into the influence of advanced communication systems on the location of high-technology industries. A list of about 300 plants has been compiled the distribution of which has been examined. A questionnaire has been prepared to gather data on the effect of advanced communication systems on the location of these plants, on everyday operation and on the future patterns of spatial distribution. The questionnaire is in the process of being administered to a sample of these firms.

This research project is supported jointly with the Ministry of Communication.

Transportation Management. The aim of this project is to offer low-cost alternatives for transportation management in city centers and methods for their evaluation. Data was gathered on the usage of public transportation in Haifa in 1982 and on the changes between 1972 and 1982, and a survey of night parking was carried out. The methodology is based on a two-stage model. A detailed net of the area of interest will be analyzed in order to gather data on parking problems, road and intersection capacities and travel times. In the next stage the central model which describes the whole city will be activated in order to analyze relationships of the center with the rest of the region.

The central model's formulation is completed and its programming is now underway.

This project is also supported jointly with the Ministry of Transportation.

Blood substitutes. The main goal of the research program is the preparation of an oxygen-transporting material which is intended to be used as blood substitute in emergencies, mainly in the field. The target product is a derivative of stroma-depleted hemoglobin (SDH), chemically bound to a polymeric carrier. An additional goal is the preparation of a polymeric material for use as blood plasma substitute.

Stroma-depleted hemoglobin was prepared from whole blood and from packed red blood cells using various procedures. The product obtained is rather pure and the yield was 50-60%. Using a different procedure the yield can be increased to 90% but the product will be less pure. This can nevertheless be used as part of the production process.

Quantitative determination of phospholipids in solution containing hemoglobin and inorganic phosphate. The results of this determination are used as yardstick for estimating the extent of removal of stromal materials from the product.

Preliminary experiments have been carried out for binding hemoglobin to polymeric carriers. Approaches have been selected for the continuation of this research.

Procedures were studied for preparation of SDH in the freeze-dried form. This particular form is most convenient for storage and avoids the need for sterilization of the products at this stage. The preservative material used in the process is most effective in preventing oxidation of hemoglobin to methemoglobin.

A series of analytical methods were set up, and used in order to follow the binding of hemoglobin to polymeric carriers as well as to assess the quality of the products.

The research is supported jointly with the Ministry of Defence and the Israel Defence Forces Medical Corps.

Energy pricing. This research aims at providing an overall updated picture of the trends in energy pricing according to energy types (crude oil, petroleum products and electricity) in Israel as compared with other countries during the period 1958-1983. The research program includes:

Data gathering and analysis of trends of crude oil and by-products prices in Israel and abroad.

Data gathering and processing of trends of electricity prices in Israel and abroad.

The research team will publish two brochures:

"Energy in Israel - key data (1970-1983)" to be published in June 1984.

"Energy prices in Israel and abroad - major trends" to be published in November 1984.

Industrial research and Development Policy. The first part of the research reviewed the theoretical literature on R&D policy and surveyed the experience of a number of industrial countries regarding their policies of supporting industrial R & D, especially in "high technology" industries. The principal conclusion was that there is no theoretical consensus about the issue, and therefore one cannot reach a unique policy recommendation. The various national programs exhibit great diversity and inconsistency regarding both ends and means.

There are blatant contradictions between the theoretical depiction of the product development process on the one hand, and the actual goals selected by various policy programs on the other. In general, a number of "high technology" sectors are selected a priori as policy targets while completely ignoring market forces. Private sector reaction to these choices has often been less than favorable. Entrepreneurs seem to generally prefer non-intervention at the micro level rather than discretionary support.

Retrospective analysis of a group of gifted pupils, currently aged 25 -30: Review of their studying, military and professional achievements. The question of whether to invest special effort in the education of gifted pupils has been a subject for research both in Israel and abroad. Israel has not yet performed a follow-up on these gifted pupils. The primary aim of this research is to check whether these pupils use the high intellectual potential evident in their youth, and whether their professional and intellectual achievements correlate with those of the research carried out abroad. Four other subjects will be examined: (a) whether these pupils are still interested in the same areas as when they were young; (b) what is the opinion of "gifted adults" on the education which should be given to gifted youth; (c) their development within their professions; (c) the extent of their readiness to express social or professional leadership besides their personal careers, that is, become a "serving elite".

The study will review the achievements of 230 students who studied in Technion's special courses for the gifted, during 1968-1971 and who are now beginning their professional careers (ages 25-30).

Study group for Future Targets in Higher Technological Education and Means for their Realization - The group held five working sessions. It was decided to set an intermediate target date (June 15, 1984), for a Preliminary report which will set targets for future Prolonged study.

It was decided to hold two open discussions. The first, to take place on April 20, 1984, will be with a group of faculty members, in order to get some preliminary feedback and reactions on the directions that the study group should take. The second will be held in May in Tel-Aviv with the participation of representatives from industry.

This study group is supported jointly with the Technion, Israel Institute of Technology.

In conclusion: The Samuel Neaman Institute will continue to deal with policy research and decision making processes on the national level such as technological and scientific R & D, preparing engineers for the future industries, public policy on allocation of resources, physical planning etc. The Institute will attempt to gather teams to deal with forecasting of future industries and the required means to supply their needs in terms of manpower and R&D. In all these the Institute will maintain the high academic standard which characterizes the Technion.

Year: 1984/85

Director: Prof. Gad Hetsroni

Founded at the Technion in 1978 by Mr. Samuel Neaman, the Institute deals primarily with public policy issues. Its purpose is to provide assistance and information to Israeli decision makers in areas of national importance.

There are three participants in the policy formulating process: The decision maker himself, who has been entrusted by the public to formulate and carry out policies; the policy analyst; and the professional expert in the area. Of these, the Neaman Institute aims to provide the latter two. Its teams formulate and analyze alternative policies, presenting them to the decision makers.

As the Neaman Institute is located within the Technion, it enables its scientists and researchers to participate in the process of national decision making, and the decision makers to rely on the technological and scientific expertise found within the Technion.

The following are several major projects carried out within the framework of the Institute.

Evaluation of Project Renewal in Israel. The study project aims at providing a comprehensive evaluation of the National Project Renewal which has been carried out by the Government of Israel and the Jewish Agency since 1977. The researchers are engaged in identifying the inputs, outputs and results of Project Renewal, and evaluate their compliance with the project's goals and guidelines.

The research uses the Integrative Evaluation method, developed by the project coordinators. This method encompasses the following evaluation tasks:

- process evaluation - description of the planning and decision making processes in Project Renewal, and their evaluation especially with regard to public participation in planning, performance and administrative effectiveness.

- Performance evaluation - description of activities carried out in various areas: Housing, education, welfare services, etc. Follow-up of execution of approved programs and the extent to which they reach their target population.

- Evaluation of costs and benefits - identification of the project's cost, cost-effectiveness analysis and analysis of who enjoy the benefits and who bear the costs.

- Impact evaluation - evaluation of the planned and non-planned outcomes of Project Renewal in the light of the professed goals, the inhabitants' goals and the overall social goal: Minimization of gaps within the Israeli society.

The researchers gather data in ten neighborhoods, which represent the 80 neighborhoods included in Project Renewal.

The research team is now completing the final report, which will include neighborhood reports and an overall comparative report.

The project was initiated by the Government of Israel (Office of the Deputy Prime Minister) and the Jewish Agency through the "International Committee for Project Renewal Evaluation". The researchers maintain constant touch with these agencies. At their request a summarizing workshop will be organized after submission of the final report.

On the basis of the research study, two books are being prepared for publication. One of these will focus on the administrative structure and the planning and decision-making processes in Project Renewal. The other will focus on the successes and failures of Project Renewal as an innovative program for neighborhood rehabilitation.

The Impact of Advanced Communications on Industrial Location in Israel. This project is intended to test empirically the degree to which the nature of availability of advanced communications systems affects the choice of location of industries in Israel. Public policy has long encouraged industry to locate in development areas, away from major urban centers. In order to induce industries to locate in development areas, the Government established a program of subsidies to capital, infrastructure and sometimes to labor as well. Recently, there has been a growth in interest of the so-called high technology or science based industries to locate in development areas. These industries are known to be heavy consumers of communications services, suggesting that the extension of the communications network into rural areas and small towns has in fact helped to overcome their traditional disadvantages.

In order to test this hypothesis, the study will investigate the history of locational decisions of firms in Israel. In particular, it will look at the pattern of the establishment of manufacturing concern and branch plants (including relocation# of existing plants) with regard to their locational choice of particular geographic zone (center vs. periphery on both the metropolitan and national scales), branch of industry and year of establishment. Concomitantly, a sample of firms from the high technology industry has been drawn. This sample represents the universe of Israeli firms in these industries. The firm will be interviewed in detail to determine the practical effect that the availability of various factors, including advanced communications, had on the choice of their location. Current assessments of the needs of the firms for additional or alternative forms of communications have also been obtained. About sixty firms were interviewed. The data and information collected in the interviews were coded and entered as a data file for statistical analysis. This analysis is currently being carried out.

Blood Substitutes. The main goal of the research group is the preparation of an oxygen transporting material, which is intended to be used as blood substitute in emergencies, mainly in the field. The target product is derivative of stroma-depleted hemoglobin (SDH).

Earlier efforts were directed at preparing SDH (from whole blood) and its chemical modifications. Procedures were developed for the preparation of polymeric carriers of hemoglobin, and for chemically attaching hemoglobin (and its derivatives) to these carriers. In parallel, a quality control setup was established for assessing the chemical characteristics and physiological functionality of SDH and its derivatives.

The main efforts during the last period were directed at the optimization of the procedures for the preparation of SDH derivatives. Particular emphasis was given to preservation of hemoglobin functionality (i.e. oxygen binding characteristics), and to preventing the formation of undesired side products (mainly methemoglobin). Two groups of compounds were retained for the continuation of this study.

The research activities will concentrate on the newly identified compounds, and will involve mainly: a) the scaling-up of the preparation procedures; b) assessment of the blood compatibility and biodegradability of these products, under physiological conditions.

Planning Transportation for City Centers. The issues of what should be the goals of transportation planning in city centers; what are the actions and policies which will help in reaching those goals; and the selection of criteria for evaluating proposed actions by public and private bodies continue to be of prime concern to planners. They are particularly critical in existing cities where rapid growth in automobile ownership endangers the character of the center.

Evidence from cities in developed countries indicates that highway systems around city centers provide a given standard level of service and that transit usage is determined primarily by employment density and not by level of service variations.

The implications of these indications on the planning process are explored. It is shown that meaningful planning must be concerned with the effect of transportation supply on the level and types of activities in city centers; that system's capacity, rather than level of service, must be the primary measure of the system's performance; and that capacity and bottleneck allocation are potentially effective planning tools.

The report presents and analyzes this approach and describes a planning process which uses it. The process is demonstrated in a detailed analysis of low cost alternatives for improving the management of transportation in and around the Hadar region in Haifa, Israel.

Primary Community Health Services. The primary health service is the service provided a person when he first requires medical assistance. This service is mainly provided by local community clinics. Although secondary and tertiary facilities are well developed, they are an expensive alternative to efficient primary care services. The purpose of this community project is to improve the health of the community by increasing the efficiency of local community clinics and enlarging the scope of the services provided.

A computer will be installed in each of the project clinics and data will be collected on an on-going basis. Computerizing the data will allow for controlled follow-up of chronic patients, as well as for inviting specific sub-groups of population for certain routine examinations. The data collected will be used for planning community interventions, such as patient education and screening programs, as well as for determining the health status of the community as a whole.

Two community programs have already begun. Door-to-door screening for hypertension is in progress in one neighborhood, and all newly detected cases are referred to the clinic. A questionnaire on women's health is ready for distribution, and routine check-ups for all adult women in one clinic will be initiated in the coming months. The project is also supported by Kupat Holim.

Data Center for Energy. A comprehensive study, "Israel energy economy in an international perspective - key data (1970-1983)", was completed, and a multi-colored booklet was published. This booklet presents the main characteristics of Israel's energy economy development, including macroeconomic and energy consumption indicators, energy intensity and elasticity indices, Israel energy balances and flow-charts, representative fuel and electricity prices in Israel vs. selected industrial and developing countries, government expenditure on energy and selected financial indicators, world energy production by sources and estimated reserves of mineral fuels, etc.

A special research, intended to display and analyze the trends and structure of energy prices in Israel and abroad in the years 1978-1985, is now conducted. This research requires the up-dating and broadening of the related information on a monthly and quarterly basis and is supposed to be completed at the end of March, 1985.

Alternative Energy Policies for Israel. In the earlier stages of the research, a methodology was developed by which alternative energy policies on a national level were evaluated and a preferred policy could be chosen. The selection of a preferred policy is based on the ranking of the aggregate achievement levels of national goals, resulting from the various policies. Such a ranking was carried out by assigning qualitative measures and weights to the achievement levels and goals, respectively.

This year the research concentrated on a quantitative evaluation of three types of pricing policies for liquid fuels, coal and electricity: (a) Prices of liquid fuels, coal and electricity affecting costs; (b) Imposing a 20% tax on prices as in (a) above; (c) Providing a 20% government subsidy on prices as in (a) above.

In order to evaluate the effects of these policies on national goals two energy-economic models were employed. The first model is ETA-MACRO, developed by A. Manne of Stanford University, and the second is OMER, developed by Avriel, Breiner and Karni at the Technion. Each model had to be adjusted to the purposes of the present research and has subsequently run several times, under different scenarios concerning future energy-related events. Output of the models provided numerical values for nine measures of goal achievements. Selection of a preferred pricing policy can be accomplished by a subjective ranking of the measures by policy makers. This was the approach of the Director-General of the Ministry of Energy and Infrastructure.

The results of the project were presented at:

1. International Conference on Operations Research in Resources and Requirements in South Africa, Pretoria, April 1984.
2. International Conference Energy - 1984: Energy for Small and Medium Size Countries, Tel Aviv, Israel, May 1984.

Study group on targets in engineering education for the year 2001.

The study group started operating in February 1984. Its activities were carried out during two distinct periods of time.

(a) During the first period February-June 1984, a preliminary study was undertaken with the objective of proposing a strategy for defining the aims and means in higher technological education in view of the expected role of the engineer of the year 2001, and the steps to be taken by the Technion to fulfill its appropriate role. The group held frequent working sessions in which the available material from Israel and abroad on the problem at hand was also analyzed. In addition it held two consultation meetings, the first with faculty members and the second, in Tel Aviv, with leading people from the industry.

The work of this period resulted in a Neaman Institute report dated July 1984, entitled "Future Targets of Technion Educational Policy - a Preliminary Study." The report suggests focussing continuation of the study on the following topics: (1) Lifelong engineering education and liaison with industry; (2) Profiles of the future engineer; (3) Engineering faculty role, availability and standing; (4) The status of engineering and engineers in Israel.

The report includes four sections, which contain a fairly detailed analysis as well as recommendations for future action on each of these topics. A concise synopsis of these recommendations is as follows:

* A Technion professor should be appointed at the level of Vice-President in order to initiate and coordinate the Technion effort in establishing the framework for Continuing Education, which should become a major activity. The Technion should also initiate the establishment of a Continuing Education and Congress Center, in cooperation with Haifa University and Haifa Municipality. This should become the site of summer schools and international workshops and conferences on technological and scientific subjects, in addition to providing the facilities for the diverse activities in Continuing Education.

* In order to strengthen ties between the Technion and industry, a Technological Forum should be established, with the participation of leading figures from industry, to meet a few times a year to discuss topics of mutual interest. It is also proposed to establish, from time to time, small study groups in order to carry out studies on well-defined technological subjects, which will be integrated into an R & D policy.

* A long-term working party should be formed in order to study in depth the requirements of future engineering education and its implications for various aspects of undergraduate and graduate programs.

* A study based on detailed surveys should be initiated on the status of engineering and engineering faculty in Israeli society.

(b) Following discussions with -the Technion President and Vice-Presidents and the Director of the Neaman Institute on the above-mentioned report, the working group renewed its activity in November 1984, the active members during this academic year being P. Singer, Y. Ziv and D. Kohn (the others are on sabbatical leave). It has been agreed that the group will embark upon a long-term study of future Technion targets in engineering education along the lines suggested in the July 1984 report. The group will determine, from time to time, the subjects of the study and will initiate the establishment of working groups as the need arises and will guide their activities, as well as itself serving as a working group on some of the subjects.

From November 1984 till now the following activities were undertaken:

* Planning the commission of the research on the status of engineers and engineering faculty in Israel. A working group of experts will help in this task. As a starting point a one-day symposium on this subject is being prepared.

* Work has started on the professional profile of the future engineer and measures to be taken by the Technion towards reaching the suggested goals. In this connection, we have contacted institutions abroad which have undertaken similar studies. To receive the input of engineers active in industry, an in-depth questionnaire has been formulated which is being distributed to the engineers of three companies. The results will determine the continuation of this approach.

Crisis Intervention Model for High Risk Populations. The purpose of the research is prevention of emotional dysfunction.

The research focused on the following populations who risk encountering emotional dysfunction: (a) Caesarean birth population; (b) Women who deliver prematurely; (c) Women who deal with pregnancy loss; (d) Children undergoing elective surgery; (e) Medical staff dealing with haematology oncology patients, and (f) Haematology oncology patients. For each of these populations a crisis intervention model geared to answer their specific psychological needs was formulated and implemented by their respective medical advisers. Teaching aids such as audio-visual aids, booklets and pamphlets were prepared for each of the various target populations, as well as manuals and protocols for the respective medical advisers.

The research evaluating the effects of the crisis intervention model on children undergoing elective surgery was completed, the data subjected to statistical analysis and policy changes introduced in the pediatric surgery and anesthesiology departments of Rambam Medical Center in line with the implications of the research.

Various other projects are carried out at the Neaman Institute and progress reports are expected shortly on these. Among them are: Effect of gaseous intoxicants on the lung; Lower limbs functional neuromuscular stimulation in paraplegics; Long-range program for improving public transportation in Israel, and others. Other projects which were executed at the Institute have reached their final stage, and final reports are being issued, i.e. Water policy alternatives for Israel, the choice of policy towards industrial R & D in Israel, etc.

Year: 1985/86

Director: Prof. Gad Hetsroni

The S. Neaman Institute for Advanced Studies in Science and Technology was founded at the Technion according to the Senate resolution of February 5, 1978, and according to the agreement signed between the initiator, Mr. Samuel Neaman, and the American Society for the Technion.

The Institute, which operates within the framework of the Technion was established for the purpose of assisting in the search for solutions to national problems in the fields of economic, scientific and social development in the State of Israel, the raising of the standard of living of its citizens, and the search for methods of facilitating Israel's integration into the Middle East by the following means:

- * Providing aid for the enhancement of advanced research in subjects that are chosen from those areas in which the Technion maintains its academic activity.

- * The organizing of scientific and academic meetings on an international scale and appropriate level in whose frameworks scientists from the Technion will collaborate with academic visitors from Israel and abroad for the advancement of human knowledge and with a view to implementing this in the interests of the State of Israel.

- * Providing the means and creating the atmosphere in which scientists from outside, together with those from the Technion, conduct research and contribute towards Israeli society, economy and industry.

The Institute operates by adopting such fields of activity as determined from time to time. The selection of these fields of activity are guided by the aspiration to find medium and long term solutions to the problems of the State, while utilizing the resources of scientific and technological personnel at the Technion and mobilizing teams composed of Technion personnel and personnel from outside the Technion for limited periods of time, who devote their efforts to the subjects selected.

From time to time the Institute organizes workshops on topics of significance for the development of the State and the solution to its problems, in which both scientists, technologists and businessmen are invited to participate. These workshops serve as aids to formulate research projects with which the Institute deals.

The Institute's activities are financed from the fruits of the Samuel Neaman Fund which is administered by the American Society for the Technion. This guarantees the Institute's freedom and independence. The Institute may also enter into contractual relations for financing projects as long as the principle of independence of the Institute is not violated.

By publication of the results of its activities, the Institute hopes to make both state officials and the public at large, more aware and better informed of the problems and of the proposed solutions.

This year the Institute has conducted the following research programs:

- Health Policy
- Policy for use of methanol in diesel engines
- Primary health services
- Energy policy alternatives
- Extension of the OMER model
- Technological education and Technion's profile towards 2001
- Technological education policy towards the nineties
- Robotics in agriculture
- Electric sensor for the handicapped
- Retrospective study of gifted children
- The effect of gaseous toxicants on lungs
- Wound healing
- Computer aided instruction
- Electric vehicles - feasibility study
- Robotics in the building industry
- Introduction of microcomputers to an industrial organization - Crude oil prices.

In addition, the Institute has organized a number of workshops:

- Workshop on the organizational aspects of the water sector - Joint workshop with MIT on research, development and technology-based innovation
- Joint workshop with MIT on Neighborhood policy: the state of the art - Workshops on prices and changes in the energy sector.

The model developed within the framework of the Institute's study on crisis intervention model has been selected by the American Psychological Association, together with two additional models, to serve as an exemplary model for practitioners in this field.

Year: 1986/87

Director: Prof. Zehev Tadmor

The S. Neaman Institute for Advanced Studies in Science and Technology was founded at the Technion according to the Senate resolution of February 5, 1978, and according to the agreement signed between the initiator, Mr. Samuel Neaman, and the American Society for the Technion.

The Institute is a private, non-profit organization which operates within the framework of the Technion, devoted to research, and dissemination of knowledge in technology, science, economics and the health and social sciences in general. Its principle purpose is to apply knowledge and scholarship to consideration of Israel's national public policy problems. The Institute serves to bridge between academia and the decision makers, bringing better insight on public policy issues to the former and relevant knowledge to the latter, in particular making him aware of the implications of alternative actions. It has established itself as Technion's Think Tank in public policy, drawing upon the rich human resources of the Technion, other institutions and scientists in Israel and prominent scientists abroad.

A five member board headed by Mr. S. Neaman is responsible for the general supervision of the Institute. An advisory council of five members of the Technion Senate and five distinguished public representatives help the Director in formulating Institute policy and forward recommendations on specific projects. The director of the Institute, appointed jointly by the President of the Technion and the Chairman of the Institute's Board, is responsible for formulating and coordinating policies, recommending projects and selecting staff. Most researchers are faculty members of the Technion and other universities although from time to time full time researchers and visiting scientists are active in the Institute.

Each research project adopted by the Institute is expected to be competent, scholarly study worthy of publication and public attention, but of course the Institute itself does not take a position on policy, issues.

The Institute's activities are financed largely from the fruits of the Samuel Neaman Research Fund, at the American Technion Society. This ensures its freedom and independence. Contract studies by governmental, public and private organizations are also undertaken, provided they match the Institute's goals, and do not violate its independence.

The following organizations sponsor research projects at the Institute:

Kupat Holim Health Service	Israel Police
Ministry of Economics	Ford Foundation
Ministry of Education	Jewish Agency
Ministry of Labor	Van Leer Institute
Ministry of Energy and Infrastructure	Technion - I.I.T.
Dor Chemicals	Ministry of Police

Some of the research programs and studies conducted this year are listed below:

Education

Engineering Education 2001
 Technological Education Policy
 Computer-Aided Instruction
 Follow-up of Gifted Children

Science and Technology

R&D strategy & Policy
 (with Jerusalem Institute)
 Civilian Applications of Space
 Science Indicators
 Robotics in the Building Industry
 Robotics in Agriculture

Economics & Social Sciences

Policy of Economic Relations Israel-USA
 Socio-Economic alternatives for Developing Towns
 Sewage in the Arab Sector
 Evaluation of project Renewal

Health

Primary Community Health
 Blood Substitutes
 Crises Intervention in Hospitals
 Wound Healing

Resources & Transportation

Energy Policy
 Extension of the OMER model
 Hydrogen and Hydrogen Storage
 Transportation in City Centers

Most of the research at the Institute is carried out by Technion Faculty. There are 30 senior Technion staff employed part-time by the Institute, from most of the major faculties.

In December 1986 a very successful workshop on engineering education took place at the Technion. This first International S. Neaman Workshop has received world-wide attention, and additional workshops are planned for the future. It was the conclusion of a three-year long study on the future of engineering education, commissioned by the Technion, and carried out jointly with it. Later in January a special Senate meeting chaired by Professor Z. Tadmor was devoted to the subject of engineering education in 2001.

The Institute has organized one additional workshop: A joint workshop with MIT on research, development and technology-based innovation.

At the end of 1986 the appointment of Professor G. Hetsroni terminated and Professor Z. Tadmor was appointed as Director of the Institute for a period of 3 years. At the same time Professors U. Shamir and B. Silver, Vice Presidents of Technion were appointed to the Institute Board. Professors G. Herbert, D. Gershon, D. Hasson, S. Merhav, U. Passi, and E. Cohen were elected by the Senate to the S. Neaman Advisory Council. They were also joined by General (res.) I. Hoffi, Director of Israel Electric Corporation.

The new board convened for the first time on January 27, 1987 and the Advisory Board convened on March 16, 1987 and approved the Director's proposed long range development plan which concentrates efforts on the following five topics:

Issues of Technology and Policy

Trends in Science, Technology and Education in Israel

Education and Universities

Philosophy and Technology

Environment, Health and Quality of Life

Year: 1987/88

Director: Prof. Zehev Tadmor

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A five member board, headed by Mr. S. Neaman, is responsible for the general supervision of the Institute. An advisory council of five members of the Technion Senate and five distinguished public representatives help the Director in formulating Institute policy and in forwarding recommendations on specific projects. The director of the Institute, appointed jointly by the President of the Technion and the Chairman of the Institute's Board, is responsible for formulating and coordinating policies, recommending projects and selecting staff. Most researchers are faculty members of the Technion and other universities, although from time to time full time researchers and visiting scientists are active in the Institute.

Each research project adopted by the Institute is expected to be a competent, scholarly study worthy of publication and public attention, but of course the Institute itself does not take a position on policy, issues.

The Institute's activities are financed largely by the fruits of the Samuel Neaman Research Fund, (located at the American Technion Society). This ensures its freedom and independence. Contract studies by governmental, public and private organizations are also undertaken, provided they match the Institute's goals and do not violate its independence.

Research Programs

The Institute's activities are carried out through the following research program: Issues of Technology, Science and Policy; Education and Universities; Technology, Environment, Health and Quality of Life.

During the 1987/88 year, there were about 30 active research projects (as listed in Table 1) involving 23 Technion senior faculty members from 10 different departments, 6 faculty members from other universities; 2 senior researchers and 18 junior researchers.

Workshops and Seminars

The S. Neaman Institute conducts an active program of workshops. This year, two international workshops on "Civilian Applications of Space - Israel's Role" and two national workshops on "Science and Technology in Israel High Schools" and "Family and Community Health" were organized. In addition, a monthly seminar program was initiated in December 1987.

Professor W. Resnick of the Department of Chemical Engineering has been appointed Fellow of the Samuel Neaman Institute to coordinate workshops and seminar activities.

Students at the Institute

The S. Neaman Institute has invited eight undergraduate honor students to participate in the various research projects alongside the senior researchers.

Year: 1988/89

Director: Prof. Zehev Tadmor

During 1988-89, the Samuel Neaman Institute (SNI) continued to strive and make progress to become an interdisciplinary center for research and policy studies, both at the national and international levels.

SNI concentrates its efforts in four main areas: Universities and Education; Industry, Technology and Science; National Resource Management; and Health, Quality of Life and Public Policies. There are 31 active projects now underway in these four areas (see Table 1). Some 29 senior Technion faculty members from ten different departments are actively engaged in SNI research, together with ten Technion faculty members who serve on various advisory committees. Together with them, there are six professors and senior researchers from institutions outside the Technion - Hebrew University, Weizmann Institute, Ben-Gurion University and Raphael - engaged in research, aided by eight part-time SNI assistants. From abroad, three visiting professors spent time at the SNI, engaged in various research projects. All in all, 46 senior researchers are at work on a wide range of SNI projects.

Total research expenditures in 1988 amounted to \$544,128. One half of this sum came from earned interest from the Samuel Neaman Research Fund, while the other half came from client fees.

Along with intensive research programs, SNI sponsored and organized three international workshops:

Civilian Space Applications (March 1988)

Innovation at the Crossroads between Science and Technology (May 1988)

Reintroducing Design into the Engineering Curriculum (June 1989).

Several national workshops were held, among them one on Basic and Applied Research in Polymers, in February 1989.

The Samuel Neaman Press continued its full publishing program. Two books, eight long reports, and three issues of the biannual SNI bulletin were published.

The SNI is involved in both national and international collaborative programs. On the national scene, close collaboration exists in specific projects with the Dayan Institute at Tel-Aviv University, the Jerusalem Institute for Israel Studies and the Van Leer Jerusalem Institute.

Internationally, SNI has reached an agreement with the Fraunhofer Society for System Techniques in Karlsruhe, Federal Republic of Germany, to conduct a joint project on technology policy issues. A joint research proposal was submitted to the German-Israeli Binational Fund. An agreement for cooperation also exists with the celebrated Ecole Polytechnique of Paris for a joint project on "Technological Universities Organization and Their Management", two of their students will spend a month at the SNI working on this topic. In addition, two graduate students from the Nijenrode - Netherland School of Business will conduct their final project, on Israeli competitive strategy with respect to European Economic Integration in 1992, at the SNI.

During this academic year Dr. Z. Bonen, former Director-General of Raphael, joins the SNI as a research fellow. He heads a major research project on "Images of the Israeli Technology in the 21st Century", Prof. William Resnick is coordinating SNI continuing education programs, and Prof. Shlomo Maital has undertaken the editing of the SNI Bulletin as well as participating in several other research projects.

Mr. Y. Lederfeind, Deputy Director of the Haifa Oil Refineries, was appointed as one of the representatives of the Noon Foundation on the SNI Board of Directors. Mr. Neaman himself continues his active and close involvement in the daily affairs of the Institute, helping the director of the Institute in charting its policies and future course.

Finally, SNI associates achieved awards and other distinctions during the last year. Professor Shmuel Eisenstadt, Israel's foremost sociologist, and director of the SNI Project on "Scientific Excellence" was awarded the prestigious Balzan Foundation Award for Sociology for 1988. The Institute Director, Professor Zehev Tadmor was promoted by the Technion to Distinguished Professor of Chemical Engineering. SNI researcher, Dr. Y. Shifan was awarded first prize by the "Sah-Sah" Foundation for Transportation Pioneers for his work on the SNI project "Police Intervention in Congested Intersections".

Year: 1989/90

Director: Prof. Zehev Tadmor

The S. Neaman Institute concentrated on public policy research in the following areas: (a) industry and technology, (b) science and research, (c) education and the universities, (d) national resources and quality of life.

An extensive research plan was formulated for a study of the future of Israeli industry. The project will relate to other industry-related research projects, performed at the S. Neaman Institute such as automation in Israeli industry, technometric indices (a joint Project with the Institut für Systemforschung in Germany) and a comprehensive research program on the Israeli plastics industry. This last project is of importance not only because of the relative importance of the plastics industry to Israel's economy, but also as an example of a study of an industrial branch, to be followed by several similar research projects.

In the area of engineering education the Institute has concentrated on two major aspects. The first was the place of design in the engineering curriculum and the second - the impact of computer technology on the content and methods of teaching mathematics to engineers. A working paper was prepared for the design project and an international workshop was held. For the second project, a study group comprising four Technion professors was established. The group is now formulating its recommendations which include the establishment of a Technion Center for Advanced Multidisciplinary Calculations. In a third related study entitled, "The Role and Structure of Technological Universities", Professor Paul Singer summarizes the discussions and conclusions arrived at as a result of an extensive literature survey and meetings with key people all over the world. This document will serve as a basis for an international workshop. All these efforts were coordinated and arranged jointly with the Vice-President for Development.

In the area of education the S. Neaman Institute has accepted the Ministry of Education's request to conduct extensive research on scientific and technological education for high school. Two research teams were set up to carry out the study, conducting a number of workshops and seminars.

The project on the teaching of science and mathematics by video-cassette, headed by professor Mario Livio and conducted jointly with the Unit for the Improvement of Learning at the Technion, has been very successful. The Ministry of Education has decided to extend the project to all high school education and pre-academic systems. A joint steering committee of the Ministry of Education and the S. Neaman Institute was established to carry out this project.

In the area of science and scientific research: The Israel Academy of Sciences and Humanities has added its sponsorship to the study on the trends and effects of science in Israel, and is partially supporting this study. The data recovered will be included in the Academy's annual report on science in Israel. A special ethics committee established by the Academy will supervise the use of the information. The research on trends in science and technology in the Middle East is now headed by Gen. (Res.) Amos Gilboa, former advisor to the prime minister on Arab Affairs and has been promised support by the Ministry of Science and Technology. The conclusions of the work will be used by various governmental agencies.

All in all, 28 Technion professors from 10 departments have been involved in SNI research this year. In addition, six professors from other universities in Israel, four visiting professors from the U.S. and 13 other researchers were involved in these projects. The total cost of the research was approximately \$500,000 US, of which \$320,000 came from SNI resources.

SNI's research plan, formulated through discussions of its Advisory Committee and many Technion faculty members, is destined to enable the Technion, as Israel's foremost technological institution, to have a major impact on national policy formulation regarding industry, education and science. The fulfillment of this goal, however, depends upon the willingness of Technion faculty members to contribute their time and talent in these fields.

Prof. M. Heymann (Computer Science), Prof. G. Wiseman (Civil Engineering) and Prof. D. Adler (Mechanical Engineering) were appointed by the Senate as members of the Institute's Advisory Committee.

A number of new books and reports were published during this year. Among them:

Innovation at the Crossroads between Science and Technology.

Proceedings of the S. Neaman International Workshop, M. Kranzberg, Y. Elkana, Z. Tadmor, (Editors).

Naomi Carmon, ***Neighborhood Rehabilitation in Israel - Evaluation of Outcomes.*** (Hebrew).

Shlomo Maital, ***Personal Accounts, Economics Management in Israel and Abroad*** (Hebrew). Second anthology of columns from the business weekly - Jerusalem.

The Place of Design in the Engineering School. Proceedings of the S. Neaman International Workshop, R. Shinnar, Z. Tadmor, R. Karni, and D. Kohn, (Editors).

Gideon Czapski, Amnon Frenkel and Aner Shoham, ***Israeli Scientists' Research in Israel and Abroad*** (Hebrew).

S. Kenig and D. Kohn, ***Plastics and Polymers in Israel*** (Hebrew).

D. Shefer and A. Frenkel, ***Job Creation in Development Towns in Israel*** (Hebrew).

Ciporah S. Tadmor, ***Crisis Intervention Model*** (Hebrew).

J. Hagin & G. Segelman, ***Trends in Fertilizers and Fertilization - Intensive Greenhouse Tomato Production as a Model for Fertilizer Development Recommendations.***

The Institute has also sponsored the translation of the book entitled *Our Common Future* which is being published jointly with Oxford University Press.

A number of seminars, lectures and workshops were conducted:

Mathematics in High School Education

Developing Excellence in High School Education

Developing a Strategy for Sectorial Analysis of Industry

Mathematics and Science Teacher Training

The Place of Design in the Engineering School

Table 1: List of Research Projects - The S. Neaman Institute 1989-90

Research Topic	Researchers
<p><i>Education and Universities</i></p> <p>1. Role and structure of technological universities</p> <p>2. Design in engineering ourricula</p> <p>3. Mathematics in engineering education</p> <p>4. High school education in sciences and mathematics</p> <p>5. High school education in technology</p> <p>6. Teaching of science and mathcmatics by video</p>	<p>Prof.P.Singer,Prof.K.Keller(USA)</p> <p>Prof.R.Shinnar(USA),Dr.R.Karni</p> <p>Prof.M.Wolfshtein,Prof. Z. Ziegler</p> <p>Prof.N.Liron,Prof.L.Pismen</p> <p>Prof.G.Eylam,Prof.A.Berman</p> <p>Prof.E.Dubinsky (USA)</p> <p>Prof.A.Shitzer, Assoc. Prof. S. Waks</p> <p>Prof.M.Livio, Mrs.I. Adler</p>
<p><i>Industry and Technology</i></p> <p>1. Israeli industry in the 21st century</p> <p>2. The Israeli plastics industry</p> <p>3. Automation in industry</p> <p>4. Technometric analysis of industries in Israel</p> <p>5. Trends in fertilizers and fertilization</p>	<p>Assisted in preparation of the proposal: Prof.Z.Kohavi,Prof.E.Kehat, Prof.M.Avriel, Prof.E.Rosenstein (Dr.Z.Bonen, coordinator)</p> <p>Dr.S.Kenig, Prof.Z.Tadmor, Prof.D. Vofsi,Dr.D.Frenkel,Dr.R.Albalak</p> <p>Prof.A.Ram,Assoc.Prof. J. Miltz</p> <p>Prof.E.Lenz,Assoc.Prof.J.Rubinowicz, Prof.K.Preiss,Prof.N.Finger, (Dr.Z.Bonen, coordinator)</p> <p>Assoc.Prof.S.Maital,Mr.A.Frenkel</p> <p>Prof.J.Hagin,Mr.G.Segelman</p>
<p><i>Science</i></p> <p>1. Productivity and impact of Israeli science</p> <p>2. Trends in science and technology in the Middle East</p> <p>3. Centers for scientific excellence</p>	<p>Prof.G.Czapski,Mr.A.Frenkel, Ing.D.Kohn, Mr.A.Shoham</p> <p>Prof.A.Dar,Gen.A.Gilboa,Prof.G. Gilbar,Prof.M.Yoeli,Dr.M.Itzkowicz, Prof.A.Rosen,Prof.J.Rom,Dr.D.Frenkel</p> <p>Ms.M.Mavot</p> <p>Prof.S.M.Eisenstadt,Dr.S.Katz</p>
<p><i>National Resources and Quality of Life</i></p> <p>1. Law enforcement system in the 21st century</p> <p>2. Comparative study of oil prices</p> <p>3. Energy alternatives for Israel</p>	<p>Prof.M.Yadin</p> <p>Dr.A.Mandel</p> <p>Prof.A.Shavit</p>

In preparation

Year: 1990/91

Director: Prof. Daniel Weihs

This has been a year of dramatic events and changes all over the world, with special results and effects on Israel. The breaking up of the Soviet bloc and the opening of the gates for immigration to Israel of hundreds of thousands of Jews would have been enough to make this an exceptional year. Then came the Gulf War with Scud attacks on Israel and the following rearrangement of world and local priorities, to result in a complete conceptual change.

All of these events have influenced the activities of the S. Neaman Institute in its efforts to present Israeli decision-makers with well-researched recommendations on policy and scientific matters.

The main policy research areas of:

- i. industry and technology
- ii. science
- iii. education
- iv. national resources
- v. quality of life

have not changed, but the emphasis has shifted. As examples of these shifts the SNI has organized a national workshop on Alternate Energy Resources, in the light of the Gulf Crisis, which was initially planned for January 24, 1991 but was delayed to May because of the war. The study of the Trends in Science and Technology in the Middle East has also gained relevance and immediacy. In education, we have initiated a large-scale program for integrating Soviet-educated immigrant engineers into Israeli industry, as well as examining the possibility of adding a category of practical engineers, by developing a core curriculum for a three and a half year program, leading to an academic B.Tech. degree.

With the guidance of the Institute's Board of Directors, especially its Chairman and Founder, Mr. S. Neaman, and supported by technical advice from the Institute Advisory Committee, the SNI researchers and staff have continued the Institute's strategic approach to the definition and solution of problems in the subject areas above.

This year 68 researchers were active in SNI projects. These include 38 Technion professors from 14 departments, 6 professors from other universities, and 10 senior researchers from the industrial and business sectors. The total research activity increased by over 20% this year, as evidenced also by the budget.

Highlights of this year's research achievements by S. Neaman Institute people include, in the category of technology and industry, the initiation of a series of studies on industrial sectors, following previous formulation of a general research plan. The first sector examined in depth was the plastics industry, where a comprehensive mapping of research and development, production, marketing and ecological effects was produced. A similar study on the electronics industry has been started, and a study on the penetration of automation in Israeli industry was completed.

The Technometrics technique, a quantitative method of estimating an industry's international competitiveness, has been applied to the budding Israeli Biotechnology industry. A study of manpower projections for industry, comparing with OECD countries, was also completed.

A second focus of studies has to do with Israel's scientific prowess. Here we examine the relative impact of Israeli scientists and scientific research as obtained by rates of publication, and references to those publications. The trends in Israeli science and technology were also compared to those in Arab countries, especially in the fields of higher education, computers and aerospace science.

The third area of research deals with various aspects of education. These studies include a large program of teaching high-school mathematics and physics by video-tape - enabling teenagers in underprivileged areas to get this very important education from the best teachers of Technion. This program has, with the support and encouragement of the Ministry of Education, been extended to all high-schools and alternative pre-academic programs. A plan for educating for entrepreneurship has been developed at the S. Neaman Institute, in conjunction with the Ronson Foundation etc. A program defining the requirements for colleges which will grant a practical engineer's degree (the Bachelor of Technology) has been formulated for the Council of Higher Education and is under examination in the Knesset. A study of the conditions of employment and levels of satisfaction of university professors, is also underway, to examine the dangers of loss of scientific excellence.

The area of national resources has gained prominence this year. In addition to completing a five year study on oil-pricing policy in Israel, several energy-related studies were initiated. These include an overview on alternate energy sources as well as more specific studies on the ways to increase use of solar energy in industry and use of passive architectural design to save air-conditioning costs.

Quality of life is especially important in Israel, where the questions of survival are a daily concern. Several studies are being conducted in this area. First, a study of law-enforcement policies, in conjunction with the Ministry of Police has been started. A project on the reduction of deleterious effects of coal-based power-stations by using the

...al-ash to "build" artificial islands in the Mediterranean has been initiated. Studies on
...ends in employment, both for new immigrants and long-term Israelis, some with the
...ollaboration of the Histadrut have also been discussed, as gainful employment is now
...cognized to be a major factor in the quality of life.

This has been a year of both happy and sad events in the Neaman Institute
...family. Professor Zehev Tadmor resigned after almost four years as Director, to become
...resident of Technion. His years as Director were highly successful and have helped
...ring the Institute to the public consciousness by means of several important and
...influential studies, in the industrial, academic and educational areas. Dr. Ze'ev Bonen,
...who was head of the Industrial studies group ended his contract, and is now a
...consultant for the Institute. Professor Robert R. Edelstein of New York, who was the
...merican representative of the Neaman Institute for many years, passed away after a
...long illness, during which he continued to work tirelessly even while undergoing
...rehabilitating treatments. He will be fondly remembered.

Year: 1991/92

Director: Prof. Daniel Weihs

1992 is a year of new alignments, and stock-taking in many areas, after the Gulf War of 1991 and the dissolution of the Soviet Empire, with their direct effects on the political and demographic situation in Israel. The start of the peace process, and changes in Europe and the global recession in 1992 require new thinking and fresh approaches, and the S. Neaman Institute has been adapting rapidly.

The changing circumstances include all spheres of life. The population of Israel has grown by over 10% by immigration in the last two years, with very large numbers of scientists, engineers and medical personnel predominating. A large part of the Institute's efforts has therefore been directed to taking advantage of this "windfall" in human assets so as to best benefit both the State of Israel and the immigrants themselves.

The vanishing of the Soviet influence has resulted in a global decrease in defense-related spending, both in research and development, and in procurement. This, in conjunction with the ongoing unification of Europe has a serious effect on Israel's high-tech industries, requiring a hard look into the future to promise continuing success for these important components of our economy. Here again, the institute is working together with industry to establish policies for such developments.

Under the guidance of the Institute's Board of Directors, especially its Chairman and Founder, Mr. S. Neaman, and supported by technical advice from the Institute Advisory Committee, the SNI researchers and staff have followed the Institute's strategic approach to the definition and solution of problems in five main areas:

- i. industry and technology
- ii. science
- iii. education
- iv. national resources
- v. quality of life

This year 80 researchers were active in SNI projects. These include 50 Technion professors from 14 departments, 10 professors from other universities, and some 20 senior researchers from the industrial and business sectors. The total research activity increased by over 20% for the second year running.

In the category of technology and industry, highlights of this year's research achievements include the initiation of a series of studies on industrial sectors, following previous formulation of a general research plan. The first sector examined in depth was

the plastics industry, where a comprehensive mapping of research and development, production, marketing and ecological effects was produced.

A comprehensive study of the electronics industry is at an advanced stage. A survey of the world situation and possible Israeli niches has been made, a poll of senior industrialists to identify possible joint projects, and a study of changes in curricula for engineers have been completed.

The Technometrics technique, a quantitative method of estimating an industry's international competitiveness, having been previously applied to the Israeli Biotechnology industry, has now also been used to study the Sensor industry.

A second focus of studies has to do with Israel's scientific prowess. Here we examine the relative impact of Israeli scientists and scientific research as obtained by rates of publication, and references to those publications. The trends in Israeli science and technology were also compared to those in Arab countries, especially in the fields of higher education, computers and aerospace science.

A new study, of career expectations and needs of Israeli Ph.D. graduates has been initiated. This is especially important now that a large increase in the amount of available scientific manpower has occurred due to immigration.

The third area of research deals with various aspects of education. These studies include a large program of teaching high-school mathematics by video-tape - enabling teenagers in underprivileged areas to get this very important education from the best teachers of Technion. This program has, with the support and encouragement of the Ministry of Education, been extended to all high-schools and alternative pre-academic programs. Chemistry has been added to the program this year.

A study of the conditions of employment and levels of satisfaction of university professors, is also underway, to examine the dangers of loss of scientific excellence.

Two new projects started this year, examining the later career of pupils who were identified as gifted, when starting primary school, and a project to teach technology (as distinct from science) at Junior High School level.

The area of national resources is of continued national importance. Several energy-related studies were initiated. These include an overview on alternate energy sources as well as more specific studies on the ways to increase use of solar energy in industry and use of passive architectural design to save air-conditioning costs in dwellings.

A multifaceted study aimed at defining ways of recycling solid waste in a manner that will be popular and gain cooperation of non-professionals has begun.

Establishment of a Water Research Institute to improve efficiency of water-related studies by bringing them into a common framework was recommended by a

Neaman Institute working group.

Quality of life is especially important in Israel, where the questions of survival are a daily concern. Several studies are being conducted in this area. First, a study of law-enforcement policies, in conjunction with the Ministry of Police has been started. A project on the reduction of deleterious effects of coal-based power-stations by using the coal-ash to "build" artificial islands in the Mediterranean is at an advanced stage

Of special interest are a series of conferences on Ethics and Technology which will be held annually, under the joint auspices of the Whizin Foundation, together with the University of Judaism (Los Angeles, Ca.) The first of these will be held in June 1992 at the Technion.

On the personal level, two of the Institute's veteran researchers passed away this year. Professor Micha Yadin and Professor Eliezer Rosenstein, both of Technion's Department of Industrial Engineering and Management who were involved in various Institute activities over the years passed away after long illnesses. They will be sorely missed.

The Institute's Management Information Services Manager, Mr. Aner Shoham, left, to start a career in industry and Dr. David Reti, a new immigrant from Hungary joined the Institute staff.

Year: 1992/93

Director: Prof. Daniel Weihs

The S. Neaman Institute was established in order to conduct policy studies and research destined to help decision makers in various fields. As it is situated in Technion City, the Institute deals mainly in areas where Technion faculty is active.

The funding comes in part from the S. Neaman Fund and mainly from research foundations, public and governmental institutions in Israel and abroad.

The main areas of the Institute's activity are:

- a. Industry and technology
- b. Science
- c. Education
- d. Quality of life and natural resources

In the area of industry and technology the institute has continued the in-depth study of various sectors of industry. This was done in cooperation with the relevant industry associations and government ministries, in order to formulate strategies for industrial development and ensure continuity of competitiveness. This year we completed the study of the Electronic Industry, which included 4 stages: mapping the industry in Israel and abroad, as well as market trends, location of potentially feasible areas for the Israeli industry, requirements of curricular changes from the higher education institutions preparing engineers, in order to be able to meet these challenges, and also an effort to develop cooperation within industry in these areas. Lately a similar study was initiated in the sector of chemical industry.

Together with 4 leading industrial corporations, the SNI has established the first consortium for generic R&D in the field of satellite communication, according to the Ministry of Commerce and Industry's new MAGNET Program. This is a new and promising direction for the SNI, which enables development of new industrial areas, with massive governmental support. Negotiations are under way for the establishment of other consortia in various areas of advanced technology.

Another workshop on the subject of improving R&D efficiency was held at the SNI, and the research for measurement of performance parameters in the Israeli industry was completed.

In the area of science we have continued analysis of our database of publications of Israeli scientists and citations thereof for individual searches, as well as evaluation of departments and research areas in Israel, compared to the rest of the world. We have completed a study of the plans and expectations of Ph.D's from Israel, per professional discipline. The translation of the first scientific book of a series of books by Nobel Prize Laureates was completed, and the book is scheduled to appear shortly in the SNI Press.

The first SNI Scientific Conference was held this year on Distributed Algorithms. The conference was a great success. The second conference is scheduled for Spring 1994.

In the area of education the Institute has continued the production of video courses for science in high schools and preparation for matriculation examinations. The series of lectures in high schools and academic preparatory units has also continued, in order to encourage pupils to take high level science courses and continue their studies.

The SNI has also supported the preparation of two Hebrew teaching textbooks with an technological-scientific emphasis, for new immigrant scientists and engineers. These books were very well received and even won the Haifa Municipality Dori Award. The SNI has also carried out a research for the development of courses for the solution of technical and technological problems for high school intermediary level (ages 13-15) in 5 experimental schools. A study was also undertaken to follow up young adults determined at an early age as especially gifted, to determine the effect of the special education they had received.

In the area of quality of life and natural resources the study of use of coal ash for artificial islands has continued. Several locations were defined and cooperation with Dutch authorities has begun in this area.

The study of the effect of technological and social development on the Israeli law enforcement system has continued. Also, we have continued the study of alternatives for municipal solid waste recycling and have initiated a new study on the recycling of wastewater.

The SNI has undertaken to formulate a national emergency plan for dealing with marine ecological disasters. Work has also begun on studies on policy for the conservation of plants and animals in Israel.

The overall activity this year was about 1M \$, with 90 reseachers (two thirds of whom are senior Technion faculty). The Institute has published over 20 books, reports and publications and organized seven conferences and workshops. A number of other conferences were organized under SNI auspices.

Ongoing SNI Research Projects

Project description	Principal Investigators
INDUSTRY AND TECHNOLOGY	
Effects of Decrease in Defense Spending on Industrial Policy	Israel Dror
Technometric Analysis of Industrial Products	Shlomo Maital, Amnon Frenkel
Raising R&D Productivity	Ezey Dar-El
Measurement of Performance Parameters for the Israeli Industry	Reuel Shinnar, Gilead Fortuna
Consortium on Satellite Communication	Daniel Weihs, Israel Bar-David
Utilization of Coal Fly Ash for Land Reclamation from the Sea and Offshore Islands	Gedalia Shelef, Yoram Zimmels
SCIENCE	
Evaluation Methodology for Research Productivity of Universities	Ephraim Kehat
Distributed Algorithms	Adrian Segal, Shmuel Zaks
Science Indicators	David Kohn
Hebrew for Technology and Sciences	Nurit Ben-Bassat
EDUCATION	
Teaching of Science and Mathematics by Video	David Kohn
Career Patterns of Ph.D. University Graduates in Israel	Miriam Erez
Follow-Up Study on Scholastically Gifted Young Adults	Michal Beller
Problem Solving in a Technological Environment	Eliahu Eisenberg
QUALITY OF LIFE and NATIONAL RESOURCES	
International Regulations for Environmental Control	Yossi Erel
Water Research Institute Study	Uri Shamir
Policy Alternatives for Solid Waste Recycling	Mordecai Shechter, Yoram Avnimelech
Policy Alternatives for Municipal Wastewater Recycling	Israela Ravina, Dan Rom
Law Enforcement System in the 21st Century	Giora Rahav
Immigrant Integration: The Interface between Research and Policy Making	Naomi Carmon
Whizin International Symposia on Ethics and Technology	Amitai Halevi
Economic and Social Aspects of Layoffs in Israeli Industry	Bilha Mannheim
The Peace Process and the Jews of Egypt	Ada Aharoni

Year: 1993/94

Director: Prof. Daniel Weihs

The S. Neaman Institute celebrated its 15th Anniversary this year, and commemorated this milestone by holding a cornerstone laying ceremony for the permanent home of the Institute. This building will contain over twice the working space available to the Institute at present and enable concentrating all the researchers and the equipment under one roof. Also we will have a facility for holding small to medium meetings and symposia.

Our main areas of activity have been for the past few years:

- Industry and Technology
- Science Policy
- Education and Culture
- Quality of Life and Natural Resources

In addition to these we have added a special division dealing with - **University-Industry Consortia** where the Neaman Institute serves as the academic center for pre-competitive, generic research into specific areas of interest, in close interaction with a group of companies. Two such Consortia are presently active, and two more are undergoing a preliminary feasibility study. The two consortia that are already active are in the fields of

i) Ground stations for satellite communication, in which four leading industrial groups, together with the Neaman Institute are active.

ii) Digital communication receivers, in which there are eight companies involved.

This consortium started activity January 1994 and is scheduled to last for three to four years.

In the area of **Industry and Technology** the Institute has continued its multi-year program of in-depth examination of various sectors of industry, in cooperation with the relevant government ministries and industrial associations. The purpose of these studies is to define long term development strategies on a sectorial level. This year we completed a follow-up study of the manpower requirements for the Electronics and Communications sector. The first stages of a similar study, examining the chemical industry, have been completed, in collaboration with the Manufacturers Association and the Ministry of Industry and Trade. A new study of future manpower requirements of software development companies has been started recently.

The Neaman Institute was requested by the Ministry of Industry and Trade to formulate a method of examining the efficacy of its industrial research institutes (there are seven such organizations) and apply it to them. As a first step, the Ceramics Research Institute is being monitored.

In the field of **Science Policy** studies, the Neaman Institute received a contract from the Ministry of Science and Arts to formulate a national program for research into space science and technology.

The second annual SNI scientific conference on Signal and Image Representation in Combined Spaces was scheduled for May 1994, and two symposia, one on the next generation of information systems and technologies - NGITS 95, and the other on Hyperlipidemia in Israel - community, economic and research aspects were selected and will be held in 1995.

The subject of **education** includes the continuing production of videotaped courses of high-school level of science topics, adapted to current matriculation requirements.

A study following the progress of student candidates identified as specially gifted was completed, to determine the effectiveness of their training.

Following on recommendations of the Technion's Board of Governors, a select committee of five Technion professors, considered among the best teachers, was set up by the Institute to find ways of improving the teaching process to the satisfaction of both students and faculty.

We initiated an exhibition of paintings by Haifa artists on subjects of air and water pollution as part of our efforts to raise public awareness and interest. This ties in with the area of **Quality of Life and Natural Resources**. In this area the examination of the feasibility of using coal ash from Israel's power stations to form artificial islands continues successfully, in a joint project with the Dutch government and the Israel Electric Corporation.

A study of the medical histories of immigrants who came to Israel from the Chernobyl area in the Ukraine, where a large nuclear power station had a severe radiation emitting accident, has been initiated.

Over 100 researchers were involved in the Institute activities (of which over half are Technion faculty members). The Institute published over 29 books, reports and articles and organised 9 symposia and meetings. Also we participated in sponsoring several conferences in subjects of interest held at Technion by other groups.

SNI ONGOING PROJECTS

1. Industry and Technology

- Manpower Demand for the Software Industry - Ing. D. Kohn(2610)
- Assessment of Industrial Research Institutions - H. Kostiner, A. Frenkel (2590)
- The Chemical Industry 2000 - Prof. E. Kehat, Dr. R. Wachs (2380)
- Electronics 2000: Future Trends for the Electronics Industry- Dr. Z. Bonen, Ing. D. Kohn (2040,1)
- R&D Quality and Productivity - Prof. E. Dar-El, Dr. Z. Bonen, D. Meyersdorf (1950)
- Technometric Analysis of Industrial Products - Prof. S. Maital, A. Frenkel (1870)

II. University-Industry Generic Research Consortia

- Consortium on Digital Receivers (2410)
- Consortium on Earth Stations for Satellite Communication (2200)

III. Science Policy

- A Comparative Study of Israeli Universities Organization - E. Israeli (2570)
- National Space Program- Dr. M. Klajn (2550)
- Immigrant Absorption - The Interface between Research and Policy Making
- A/Prof. N. Carmon (2240)
- SNI Annual Scientific Conference - Prof. Y. Zeevi, Prof. S. Raz (2301)
- Hebrew Language for New Immigrants - Dr. N. Ben-Bassat (2290)
- Science Indicators - Ing. D. Kohn (1520)

IV. Education and Culture

- Survey of Graduates in the Faculty of Medicine - Ing. D. Kohn (2600)
- Committee for the Improvement of Teaching at Technion - Prof. A. Rosen, A/Prof. M. Perl,
A/Prof. N. Movshovitz-Hadar, A/Prof. S. Gepstein, Prof. D. Zilag (2580)
- Follow-up Study on Scholastically Gifted Young Adults - C. Oren (2160)
- Career Patterns of Ph.D. University Graduates in Israel - A/Prof. M. Erez (2120)
- Group Exhibition on the Environment - Prof. D. Weihs (Coordinator) (2061)
- Teaching of Science and Mathematics by Video - Ing. D. Kohn (1840)

V. Quality of Life and Natural Resources

- Evaluation of Congestion and Parking Toll on Travel Demand - A/Prof. D. Mahalel (2620)
- Health Aspects of Immigrants from the Chernobyl Area - Dr. G. Rennert (2490)
- Wastewater Recycling in Municipal Areas - A/Prof. D. Rom (2360)
- Identification and Evaluation of the Relationship between the Mean and the Variance of Travel Time on Urban Roads - A/Prof. D. Mahalel (2260)
- Policy Alternatives for Solid Waste Recycling - Prof. M. Shechter, O. Ayalon (2190)
- Utilization of Coal Fly Ash for Land Reclamation from the Sea and Offshore Islands - Prof. G. Shelef, Prof. Y. Zimmels (2140)
- Law Enforcement System in the 21st Century (1560)

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