



Technion - Israel Institute of Technology

The S. Neaman Institute  
for Advanced Studies in Science and Technology



ANNUAL REPORT  
1990-1991

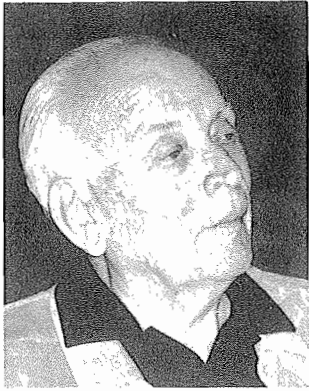
# Annual Report 1990-1991

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For Advanced Studies in Science and Technology

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Samuel Neaman  
Chairman



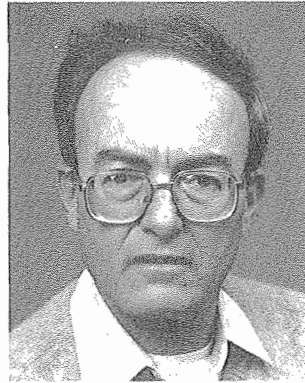
Professor Zehev Tadmor  
Vice-Chairman



Professor Daniel Weihs  
Director



Professor Paul Singer



Professor Arnan Seginer



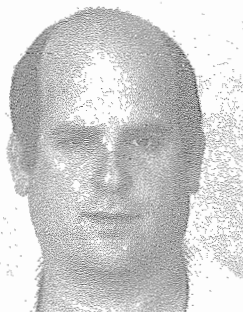
Ing. David Kohn



Ruth Rivkind



Sima Nadler



Aner Shoham



Amnon Frenkel

**THE SAMUEL NEAMAN INSTITUTE**  
**FOR ADVANCED STUDIES IN SCIENCE AND TECHNOLOGY**

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Book-keeping: Mrs. Sima Nadler  
MIS Manager: Aner Shoham, B.Sc.  
Senior Researcher: Amnon Frenkel, M.Sc.

## ABOUT THE INSTITUTE

The Samuel Neaman Institute for Advanced Studies in Science and Technology is an independent public-policy research institute, established in 1978 to assist in the search for solutions to national problems in science and technology, education, economy and industry, and social development. As an interdisciplinary think-tank, the Institute draws on the faculty and staff of Technion, other institutions and scientists in Israel, and specialists abroad. The Institute serves as a bridge between academia and decision makers through research, workshops and publications.

The Institute pursues a policy of inquiry and analysis designed to identify significant public policy problems, to determine possible courses of action to deal with the problems, and to evaluate the consequences of the identified courses of action.

As an independent not-for-profit research organization, the Institute does not advocate any specific policy or embrace any particular social philosophy. As befits a democratic society, the choices among policy alternatives are the prerogative and responsibility of the elected representatives of the citizenry. The Samuel Neaman Institute endeavors to contribute to a climate of informed choice.

The Institute undertakes sponsored advanced research, formulates invitational workshops, implements continuing education activities on topics of significance for the development of the State of Israel, and maintains a publications program for the dissemination of research and workshop findings. Specific topics for research may be initiated by the Institute, researchers, government agencies, foundations, industry or other concerned institutions. Each research program undertaken by the Institute is designed to be a significant scholarly study worthy of publication and public attention.

## Origins

The initiative for establishing this Institute in Israel was undertaken by Mr. Samuel Neaman. He nurtured the concept to fruition with an agreement signed in 1975 between himself, the Noon Foundation, the American Society for Technion, and Technion. It was ratified in 1978 by the Senate of the Technion. Mr. Neaman, a prominent U.S. businessman noted for his insightful managerial concepts and innovative thinking, as well as for his success in bringing struggling enterprises to positions of fiscal and marketing strength, has since retirement devoted his time to the activities of the Institute.

## Organization

The Director of the Neaman Institute, appointed jointly by the President of the Technion and the Chairman of the Institute Board, is responsible for formulating and coordinating policies, recommending projects and selecting staff. The Institute Board is chaired by Mr. Samuel Neaman and includes ex officio Technion Vice-President for Development and Vice-President for Research. The Board is responsible for general supervision of the Institute, including overall policy, approval of research programs, and overseeing financial affairs. An Advisory Council made up of members of the Technion Senate and distinguished public representatives reviews research proposals and consults on program development.

## Funding

The Institute's activities are partly financed by the fruits of the Samuel Neaman Research Fund, located at the American Society for the Technion. This ensures freedom and independence. At the same time, contract research is undertaken for government, public and private organizations, provided they are in accordance with Institute goals and objectives.

## THE DIRECTOR'S REPORT

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.

Prof. Daniel Weihs

## INCOME AND EXPENDITURES

for Fiscal Years 1988 to 1990

U.S. \$

Category	1.1.88 to 31.12.88	1.1.89 to 31.12.89	1.1.90 to 31.12.90
Income:			
From the Neaman Fund	320,000	320,000	320,000
Other sources	327,178	192,489	324,910
<b>Total Income</b>	<b>647,178</b>	<b>512,489</b>	<b>644,910</b>
Expenditures:			
Research Projects	366,952	372,386	526,600
Institute Administration	177,176*	131,929	134,200
<b>Total Expenditures</b>	<b>544,128</b>	<b>504,315</b>	<b>660,800</b>

\* Including \$ 64,955 for office renovation

**Minister of Finance, Y. Modai visits S. Neaman Institute**



Mr. S. Neaman and Mr. Y. Modai

## ONGOING SNI RESEARCH PROJECTS

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Workshop on Alternate Energy Sources

ניצול אנרגיות חלופיות- לאור המשבר במפרץ הפרסי



Prof. D. Weihs, Prof.A. Burcat, Prof. Z. Tadmor



The objective of the research program is to identify and evaluate future policy alternatives for the Israel Polymer and Plastics Industry (IPPI), in order to increase exports and achieve stable economic growth. A systems approach has been adopted. In the first stage the polymer and plastics industry in Israel and the world was examined and mapped with respect to technological, economic and marketing aspects. In the second stage an interdisciplinary analysis regarding the future state of the IPPI will be carried out, and alternative scenarios will be outlined. Finally, future needs regarding human resources, R&D, marketing, raw-materials, machinery, technology and investments will be defined and recommended.

Last year two workshops were held. The first was dedicated to the current state of the IPPI and future trends abroad with emphasis on the packaging, construction and agricultural market segments. Special attention was attributed to the unification of the European market by 1992 and the ecology.

The second workshop dealt with R&D in the IPPI. It was concluded that the central Plastics Institute sponsored by the IPPI should be strengthened and that special efforts should be exercised to integrate the experts among the new Russian immigrants and their know-how in the IPPI.

During the year the following publications appeared:

- \* Plastics materials: Markets and Technology - World Mapping
- \* The Plastics Industry in Israel - Current State
- \* The Polymer Industry in Israel and the World - Present Status and Future Prospectives
- \* Plastics and the Environment - Ecology

The project is carried out in conjunction with the Society of Israeli Plastics Industries, the Israel Industrial R & D Center, Chief Scientist's Office - Ministry of Industry and Commerce.

Technometrics is the quantitative measurement of the technical specifications of products and processes. The method measures the level of "best-practice" technology in the country in relation to that of other countries regarded as technological leaders. For specified areas, industries, or products. This level is computed by weighted aggregation of individual technological aspects. The accumulated data which can be processed by using the model, may simplify the findings and indicate general weak points existing in the industrial field being tested.

The Israeli Biodiagnostic industry was examined, as a first example. The evaluation of this industry's technological level has shown that, as a rule, it is not of inferior standing. On the contrary, even if the various parameters do not point to her being a technological leader, they definitely do place her in the same category as the other Western countries (which are considered to be economic superpowers). Recalling that this industry is extremely young, most of the firms being established in the 80's with the products generally making their first appearance in the market only after 1985 we see an impressive achievement of technological progress, self education and self made development. Another finding from our research indicates that the reasons for the difficulties in the conversion of technological success to market segments and export marketing development on a large scale are the lack of risk capital and marketing means. There is no doubt that Israel's advantage in this field is closely connected to the wide scientific knowledge and creative thinking that exist in Israel in this field. Without diverting financial resources and support in the transition stage to production and marketing, the fear exists that know-how will move abroad through the acquisition of Israeli firms or of their technological knowledge.

The research is performed in collaboration with the Fraunhofer Institut - I.S.I., Karlsruhe, Germany and funded by GIF - The German-Israeli Foundation for Scientific Research and Development.



The research into the introduction and adoption of advanced manufacturing and automation systems by Israeli industry has two aspects: the implementation of such technology at the shop floor level; and, the optimal strategy based on this technology by management. This project integrates these two aspects. Its major objective is to determine practical measures to facilitate the introduction of automation equipment, in part by identifying obstacles to its widespread diffusion.

A survey was conducted in the metal and electronics industries. Visits to plants in various stages of automation were conducted, including Carmel Forge Ltd., I.M.I. "P" plants, Israel Aircraft Industries' Shahal Plant, Chromagen Ltd., (Kibbutz Shaar HaAmakim), Telrad Ltd. and ISCAR Ltd. plants at Tefen and Maalot. The survey emphasizes the depth of implementation and the degree of systems integration of advanced manufacturing technologies, automation and computer integrated manufacturing. The survey team is interdisciplinary in nature.

The survey results indicate that the introduction of automation equipment is hampered by lack of investment funds and by problems related to technical assistance by the manufacturers.

## 1950 Raising R&D Productivity

This study is based on a one-day workshop on "Raising R & D Productivity" that was held in January 1991, involving 17 representatives from nine Science-based Israeli companies. The workshop was organized by Professor Ezey Dar-El of the Faculty of Industrial Engineering and Management, together with Doron Meyersdorf and Dr. Zeev Bonen. Participants were split into two active working teams whose tasks were to identify and define the factors that both enhance and depress R&D productivity, as well as in identifying the more effective cost-benefit approaches for its advancement.

Factors identified as being crucial for promoting R&D productivity included the following:

- \* Exact statements of the product specifications
- \* Effective management of the R&D process
- \* Effective planning and monitoring of projects
- \* Effective selection of R&D personnel
- \* Effective professional development of R&D personnel
- \* Effective incentive rewards for R&D personnel

Judging from the comments made, this workshop provided the first forum ever (in Israel) for R&D scientists to interact with one another over common problems. Several expressed the hope that the S. Neaman Institute would continue in this endeavor by including other R&D issues for consideration, such as, the R&D link with Quality, Financial rewards for R&D employees, and so on.

R&D personnel from all companies are encouraged to register their interest for participating in this research, and in being kept informed of all new developments.

1980

## Trends in R&D Manpower Planning in OECD countries

The study reviews techniques employed by OECD countries to predict the future supply and demand of research manpower. Manpower planning involves forecasting of both supply and demand for human resources. The techniques used by OECD countries demonstrate the difficulties involved in predicting the supply and demand. The report indicates that there is a wide variety of techniques which are being used by OECD countries to improve the match between supply and demand of technological manpower. The present situation with respect to the demand and supply of research manpower is that there are shortages of suitably qualified people in some fields but an over-supply in some other fields. The expectation in most OECD countries is that demand for scientists and engineers will increase during the next decade. Contrary to this trend Israel faces an over-supply of scientists and engineers due to the mass immigration from the USSR. The final report includes a detailed annotated bibliography on the subject.

The study was performed in collaboration with the Jerusalem Institute for Israel Studies and partially funded by the Ministry of Science and Technology.

## Absorption of Technologically Trained Immigrants in Israeli Industry

The productive absorption of the mass of trained immigrants from the Soviet Union will be a determining factor in their personal integration and well being as well as in the future development and prosperity of the State of Israel. The majority of these immigrants are highly trained individuals, covering a wide range of engineering and technological vocations.

The Technion, as the leading technological institute in Israel, has the duty, as well as the opportunity to play a major role in the process of adapting the skills and training of these Olim to the specific needs of the Israeli industry and economy.

The aims of this project are to achieve the following goals:

- \* Establish a vehicle for the transition of the professional Oleh into a productive engineer or scientist in an existing enterprise.
- \* Provide direction and training towards the establishment of new economic ventures.
- \* Establish a framework for retraining of professionals whose current specialties do not match the capacity and needs of the Israeli economy.
- \* Establish a framework for orientation and personal guidance for the professional new Oleh to assist in planning his or her future in Israel.
- \* Act as a clearinghouse for new technological ventures initiated by the Olim themselves or jointly with others, in which the Olim will play a central role.

As a first step in achieving the above goals, a pilot project, in the form of a retraining program is being formulated jointly with leading hi-tech industries.

Utilizing a variety of statistical and computerized data processing tools, the Science Indicators Project attempts to quantify the scale of operation and quality of Israeli scientific research. The processed data are supplied to several science policy decision making, such as the Planning and Grants Committee of Israel's Council for Higher Education (CHE), the Israel Academy for Sciences and Humanities, the Ministry of Science and others.

The Council for Higher Education is using the SNI data to evaluate the productivity trend of the major Israeli universities on a departmental level, and to determine the extent of research cooperation inside the university, among Israeli universities and with foreign research institutions. Another use of the data by the CHE is to trace the results of the Alon Grants, issued by the council.

In order to keep the principal SNI database effective and attractive, it has been updated for the years 1980-1990. A new set of files was purchased from the ISI, including a total of about 500,000 published items from Israel, Arab countries and several leading universities around the world.

The Science Indicators Project in the SNI has become a national leader in the field of bibliometric study and statistical analysis of the quantity and quality of science. Many of the methods developed at the SNI during the last few years of activity are innovative and unique. These methods enable the Science Indicators Project to make use of large quantities of computerized data, as an important tool in science policy decision making.

## Cooperation Between Israeli and Foreign Scientists

The cooperation between Israeli and foreign scientists has increased substantially in the past few years. A clear trend of growth has been detected in the completion of research abroad by Israeli scientists.

The research was based on a field survey which encompassed ten faculties in the fields of exact and engineering sciences at the Technion and at the Hebrew University. The survey viewed 6,000 papers by 250 staff members of the above faculties, published in the period 1974-1983.

Most of the research activities performed abroad are carried out during sabbaticals or summer vacations. 58% of the papers in the survey were carried out in those frameworks. In more than half the works surveyed, the primary reason stated for executing the works abroad was true cooperation. Only 14% of the studies were performed abroad due to lack of equipment. About half the research covered by the survey was performed without external sources of finance, e.g. from the internal budgets of the researchers. This finding is extremely surprising in view of the heavy cut-backs in internal research budgets granted to researchers by the Israeli research institutions. About 40% of the works were financed by different bodies abroad and the bi-national funds. A further 15% were financed by Israeli sources such as governmental institutes and local industry.

There was some international cooperation in almost 30 percent of the works. The foreign researchers they cooperated, seldom performed the main part of their research in Israel, a trend which has increased substantially over the years. This phenomenon may be influenced by the cut-backs in research facilities that the Israeli institutes put at their disposal. The research was partly financed by the Ministry of Science and Technology.

## Trends in Science and Technology in the Middle East

The purpose of the research program is to examine the development of science and technology in neighboring Arab countries and Iran, and to compare it to the trends in the same areas in Israel.

The two main areas of focus for the study this year were: A) higher education; B) computers and computing.

The studies outlined below are independent, but related topics, each having a contribution to make to the understanding of the dynamics of the "gap" in science and technology between Israel and the Arab countries and Iran.

The first aspect of the project involved the collection and analysis of basic demographic and statistical data on the Arab countries and data on the quantitative aspects of the structure of higher education. Particular emphasis was placed on the number and quality of students at Arab universities, and trends in the "brain drain" from these countries to the West.

Computing and computer applications in Arab countries, especially in Egypt, Saudi Arabia and Jordan, have undergone intense development since the 1970s in four major fields: "Arabization" of computer software, utilization of computing systems, science and computer engineering education, and a growing number of publications. Further fast development is to be expected in the future, mainly due to the growing awareness in the Arab States of the importance of computing. The recent crisis in the Gulf, the war against Iraq and on the other hand, the alignment of Egypt, Syria and Saudi Arabia with the West, may have long range effects on future technological developments in these Arab countries and will affect the computer developments in these countries.

It is partially funded by Israel's Ministry of Science and Technology and Ministry of Defence.

There is a shortage of physics and mathematics teachers in Israel in general, and good teachers in particular. We initiated this project, with the intent of helping to improve the quality of the teaching of these subjects in high-schools. Our concept is to bring to the schools the best teachers at the university level to present the course material. The most practical way to achieve this goal is to video-tape an entire course in high school physics and mathematics, using the best teachers of the Technion and to use the video-taped lectures in high schools. The project started two years ago, and this academic year the following stages were accomplished:

(1) Complete sets of physics courses in Mechanics and Electricity and Magnetism have been distributed to about thirty high schools and a dozen preparatory schools.

(2) The program in mathematics has been expanded and it now includes the entire chapter on Vectors. Chapters in trigonometry are being prepared.

(3) A number of workshops for teachers, principals, supervisors and students have been organized, in which the program has been presented by Prof. M. Livio and Ing. D. Kohn.

The program is partly funded by the Association for the Advancement of Education.



The S. Neaman Institute has examined the scope and content of the mathematical foundations of engineering education, in the light of the anticipated impact of computer technology on mathematics applied to science and engineering instruction, and to define the software and hardware computing needs of Technion, both for research and teaching, as a result of this impact.

The study began with an in-depth analysis of Technion courses that have mathematical content, in order to determine whether changes are required in light of the widespread availability of computers. A survey of the literature and search for computer software was performed. A leading American expert on the subject, Professor Ed Dubinsky, visited SNI, and offered his perspective and introduced some software used at Purdue University for teaching undergraduate mathematics.

It was concluded that the time for a general revision of the curriculum has not yet arrived; the state of the art does not yet warrant sweeping changes. Computerization of the curriculum could best be achieved by individual Faculties; considerable progress along these lines has already been made.

It was recommended that a Center for Computer Applications in Science, Technology and Education be established, to serve as a catalyst for future developments in this area. It would coordinate development and application of software, serve as a forum for Technion faculty members concerned with computer uses, and facilitate activities related to software applications in mathematics and related fields.

## Training of Entrepreneurs in an Industrial Park Environment

The aim of this project was to develop a blueprint for establishing a college for entrepreneurship and exports at the Tefen Industrial Park. It focuses on a training process that combines practical project work in fields related to the performance of e activities before the current wave of immigration began and feel that this momentous development reinforces the relevance, timeliness and urgency of our project.

While entrepreneurship is based on knowledgeability - cognitive training - it is no less a state of mind - that is, internal motivation and attitudes that direct the individual towards entrepreneurial behaviour. The key question we addressed was whether it is possible to successfully educate entrepreneurs. The second question we faced was whether it is possible to identify individuals whose traits are compatible with successful entrepreneurship. Research indicates that the answer is positive on both counts. Furthermore, it is possible to encourage and develop entrepreneurial traits while transmitting relevant knowledge. This is the theme of our project, which is aimed at educating entrepreneurs in an intensive way.

We suggest setting up a boarding school program for 32 students. The study program covers 36 weeks, 40 hours a week. We expect that between a third to a half of the students will be new immigrants.

This study was funded by the Ronson Foundation.

The continuous growth of technological systems cause the appearance of new engineering professional profiles. As a result of the tremendous pressures caused by the accelerated development of science and technology theoretisation and scientification orientations in the engineering curricula of some leading technical universities, are increasingly intensified. This creates a gap between research engineering manpower and high level practical oriented engineering workforce. In order to provide appropriate realisation of engineering research efforts, as well as responding to economic and industrial needs, the Bachelor of Technology Degree (B. Tech.). or its equivalent, has been introduced in many countries (e.g., U.K., U.S.A., Germany, Taiwan). These practical oriented engineers are trained to carry out skillfully applicative tasks, involving state of the art existing technologies, such as production design and supervision, quality assurance, software management and maintenance of engineering setups.

The Israeli 2-year post high-school program, for training senior technicians ("Handasaim"), suffers from drawbacks in several domains: (a) it impedes continuing professional development; (b) it affiliates the "Handasai" to the non-academic blue collar working class, with its lower social status; (c) it causes national economic disadvantages by losing high-level human resources in the engineering and technology disciplines.

Proposals for curricula for B. Tech. Degrees in Mechanical and Electrical/Electronic Engineering; to be obtained within three and a half year program were presented. Handassaim can fulfill these requirements in approximately 2 years.

The study was presented to the Council for Higher Education which recommended its adoption.

The study is an update and extension of a comprehensive survey performed at the Samuel Neaman Institute in 1985. The findings of the current research definitely show the inefficiency of a closed, non-competitive government-controlled system in Israel and emphasizes the urgent need for further liberalization of the domestic oil economy.

Among the study's main conclusions:

- \* In the last decade (excluding 1980) Israel purchased crude oil cheaper than Western Europe. Taking into account the quality differences of the crude oil basket (specific gravity and sulphur content) the crude oil imports prices in Israel were only slightly higher than in Western Europe.
- \* The prices of petroleum products at the refinery gate in Israel during the investigated period (1980-1988) were considerably higher than the prevailing alternative prices on the Mediterranean spot market. Especially large differences were observed for the ex-refinery prices of motor gasoline - 40\$ per ton on the average, in spite of the lower gasoline quality in Israel.
- \* The cumulative difference of the worth of representative petroleum products basket at the refinery gate in Israel vs. the value of the same basket on the Mediterranean spot market (FOB Italy) amounted to the sum of 1.3 billion dollars for the investigated period.
- \* After appropriate adjustments (owing to differences in the quality of crude oil and due to adopting of CIF Lavera instead FOB Italy as an alternative for ex-refinery prices in Israel), the cumulative difference is 750 million dollars.

## Solar Energy for Process Heat Generation in Industrial Buildings

One of the most promising and important applications of solar energy is in the area of process heat generation for industry. While the greater part of the effort in solar research has traditionally been spent on developing devices for domestic use, it has long been recognized that the industrial user has a far greater potential. In Israel, having the highest per capita utilization of solar energy in the world, most of the use is in domestic water heating. Given the proper technology to expand into the industrial application, the amount presently utilized could be easily increased by a factor of five.

The objective of the project is to test and evaluate a solar system incorporated in the roof of an industrial building to supply process heat from the sun to the plant so as to examine the feasibility of recommending statutory requirements for such installations.

It is intended to make use of a concentrating collector technology which has been under investigation at the Technion for the past eight years. The particular system involved (based on the SRTA concept) can supply steam at temperatures up to 300°C.

The particular feature of the SRTA collector is a stationary spherical mirror which focuses the solar rays on a small, cylindrical absorber tracking the sun. The mirror can thus be constructed as part of the roof, thereby reducing cost considerably and utilizing the available area effectively. The basis for the system is a modular element, containing in it the spherical mirror and equipped with the other parts of the collector. The entire roof will be made of such modular elements.

2012

## The Influence of Geometrical Design Parameters on the Energy Consumption and Thermal Performance of Buildings

The Israel Building Code 1045 for energy conscious design, deals with design parameters that influence heat conduction through the building's envelope and infiltration. This means that only the building materials and detailing are considered. Yet early decisions taken by architects about the geometry of the building, may have much greater influence on total energy consumption. In this research we concentrate mainly on four geometrical design parameters: building proportion, orientation, shading and area of walls and windows.

Key results of the study include:

- Understanding the importance of the various geometrical design parameters so that architects can devote more attention on those parameters that influence mostly the thermal performance of the building.
- Developing energy conscious design guidelines and rules of thumb, that can be used during the early conceptual design stages.
- The need to change the Israeli Code 1045 for energy conscious design has emerged. The Code should include the contribution of solar energy gain through southern windows to save energy in winter, and the contribution of window shading devices for summer energy saving. These two design parameters are at least as important as the building insulation and sealing, that have been included in the Code.

The study was funded by the Ministry of Housing.

## 2050 Energy Alternatives for Israel

A new study of the possibilities for use of alternate (other than oil and coal) energy sources in the Israeli economy was initiated. The first step was a review of current thinking on the subject, in the light of the Gulf crisis which was planned as a one-day symposium entitled "Alternate Energy Sources in the Light of the Gulf Crisis", which was scheduled for late January 1991. The ensuing war caused a delay, and the Symposium was delayed to the beginning of May 1991. Over 120 people attended the meeting which covered solar, nuclear, wind, shal, biomass and other alternate and largely environmentally friendly sources, as well as methods for reducing energy usage. Presentations were made both by researchers and by industrial developers, covering both the theoretical and practical aspects of moving to alternate energy sources.

The use of alternative, especially renewable energy sources is important also in the long-range, global view, as it is now clear that energy-related pollution has started to affect the ecosystem.

This research seeks to define the objectives and expectations of the law enforcement system in future, and to specify the tools required to achieve those objectives.

In our rapidly changing world, only an organization capable of adapting to change can function efficiently. Without proper forecasting of the environment within which the organization will operate in future, timely adaptation is impossible. Simply extrapolating past changes to the future is highly questionable.

This research seeks to analyze important trends in all aspects of Israel's society and technology that relate to the law enforcement system. Such trends will be explored in a series of workshops. The research will be carried out by a panel of experts from each of the participating agencies and from academia. Along with experts in law and criminology, leading scientists in all relevant areas of the social sciences, management sciences and technology will take part.

Cooperation of law enforcement agencies outside Israel, involved in similar research activities, is anticipated.

The study is funded jointly with the Ministry of Police and it is hoped to interest various other justice system agencies.



The massive Soviet immigration currently underway has already brought thousands of engineers to Israel. Many more are expected in the coming months. Out of every 100,000 Soviet newcomers, approximately 11,000 are engineers. This segment of the immigrant population has special needs and a unique potential to contribute to Israeli society.

In an effort to pinpoint both the needs, and potential of these Soviet engineers, an SNI team conducted an intensive survey throughout Israel.

As a result of the survey, more exact information is now available on the experience, strength and weaknesses of the Soviet engineers. Some 57% of the male engineers, and 23% of the females have some post-graduate education. Some 46% of the men, and 21% of the women, said they had managerial experience in positions such as director, chief engineer etc.

While 87% of the sample expressed a preference to find employment in their field of specialization, 88% said they were willing to switch fields if necessary. Computer studies was an especially popular field among the Soviet immigrants, and 38% of those who expressed interest in further training specifically mentioned this field. Some 63% of those surveyed had no familiarity with computers, with the remainder good familiarity. Knowledge of both English and Hebrew, a must in today's Israeli industrial environment was poor. 78% of the immigrant engineers questioned had no knowledge of Hebrew and 75% rated their knowledge of English as poor to non-existent.

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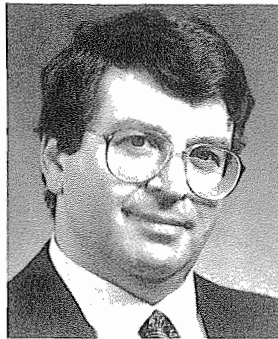
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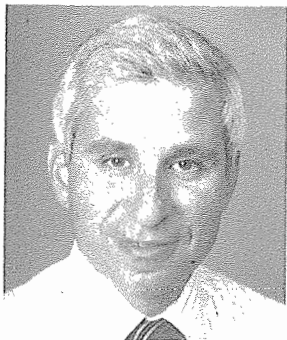
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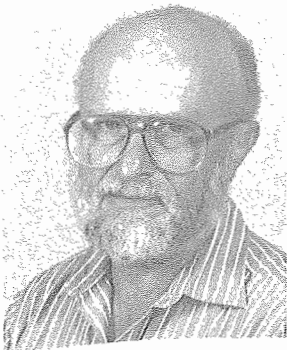


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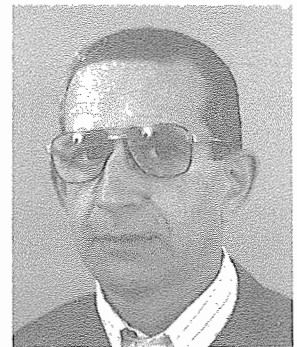
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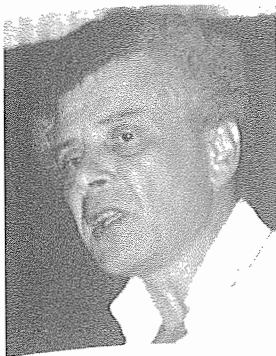
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Prof. M. Moore



Ms. M. Navot



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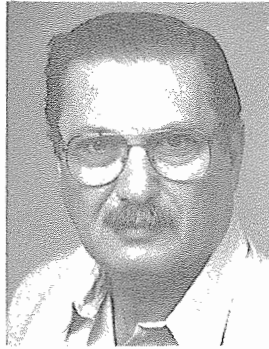


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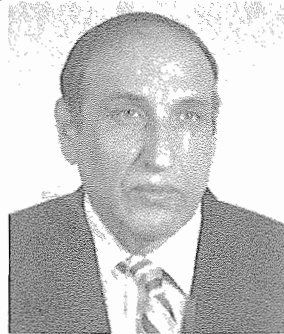
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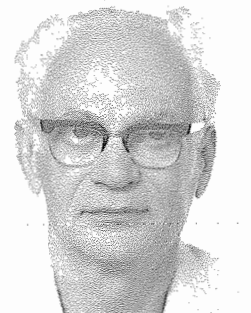
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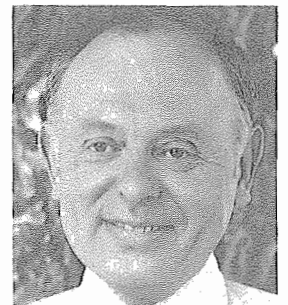
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