



Technion - Israel Institute of Technology

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



ANNUAL REPORT  
1991-1992

# Annual Report 1991-1992

Technion - Israel Institute of Technology

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For Advanced Studies in Science and Technology

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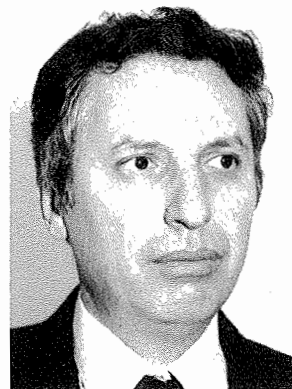
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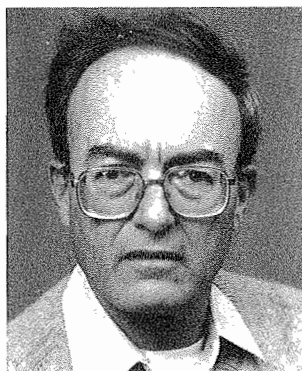
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Sima Nadler



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FOR ADVANCED STUDIES IN SCIENCE AND TECHNOLOGY

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## 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

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:

- i. industry and technology
- ii. science
- iii. education
- iv. national resources
- v. 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 research deals with various aspects of **education**. These studies include a large program of teaching high-school science and mathematics by video-tape - 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 examine 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.

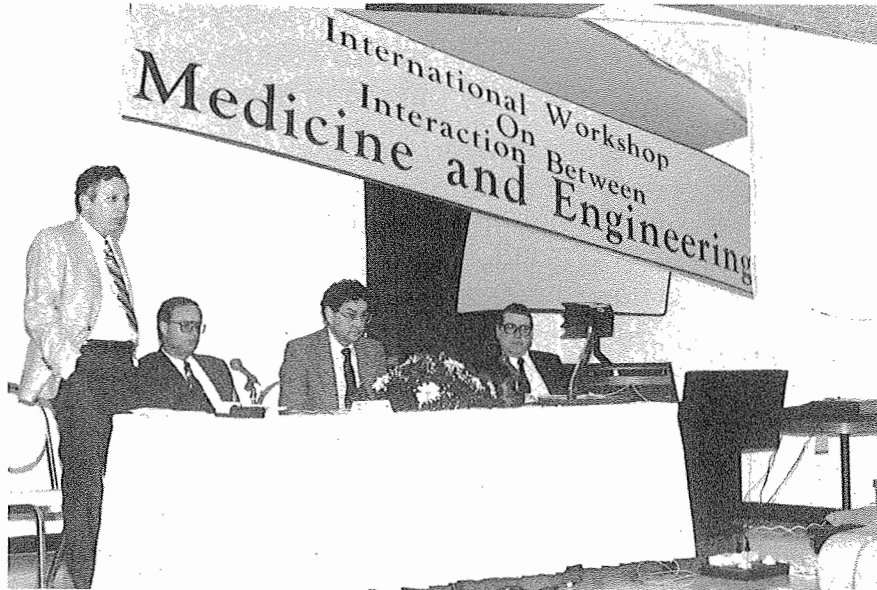
Of special interest are a series of conferences on Ethics and Technology which will be held annually, under the joint auspices of the Whizin Foundation, together with the University of Judaism (Los Angeles, Ca.). The first of these will be held June 1992 at the Technion.

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.

Prof. Daniel Weihs

**International Workshop on the Interaction between Medicine and Engineering**



Prof. D. Welhs, Prof. Z. Tadmor, Mr. Y. Ofek, Prof. M. Sheinfeld



Mr. E. Hurvitz, President of Teva



Prof. S. Sideman and Prof. M. Silberman

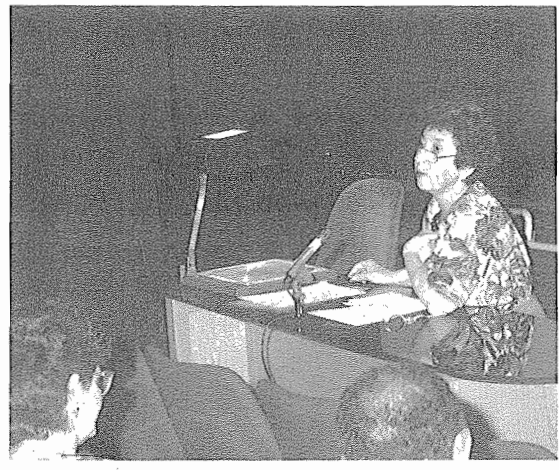
## ONGOING SNI RESEARCH PROJECTS

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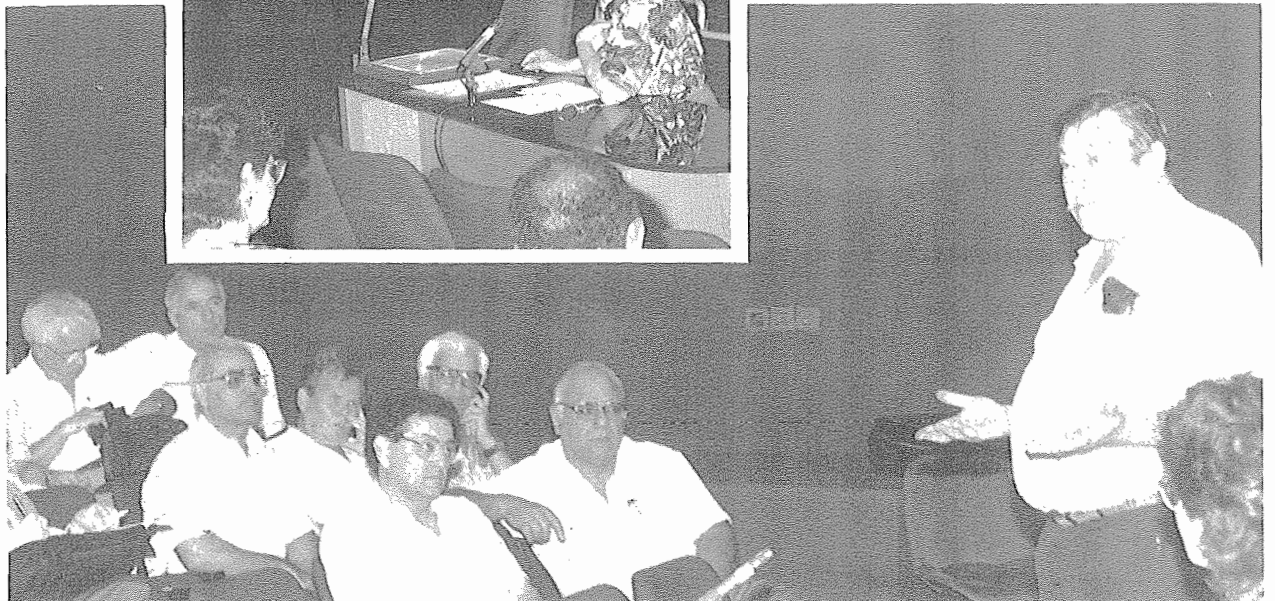
**Workshop on Recycling of Glass**



**Prof. B. Mannheim**



**Mr. U. Agami**



**Workshop on Trade Unions and the Industries of the Future**

## 1820 The Israeli Plastics Industry

The objective of the research program was to analyse the current status and future alternatives of the Israel Polymer and Plastics Industry (IPPI).

Current IPPI and world polymer and plastics industries were mapped and analysed with regard to technological, economic and marketing aspects. An interdisciplinary analysis on future scenarios was outlined, taking into account macro-economics in Israel in addition to the immigration from the Eastern European countries and market development world-wide. Finally, future needs regarding human resources, education, R&D, marketing and raw-materials were defined and recommended.

During the year the following publications were issued:

- \* Applications and development trends in plastics for packaging agriculture and construction.
- \* Agroplastics - Marketing aspects
- \* The Plastics Industry in Israel - Current economic status and future alternative economic outlooks.
- \* The polymer and plastics industry in Israel - Current status and future alternatives.

The project was concluded and a final report was issued.

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

## 1870 Technometric Analysis of Industrial Products

This research project, funded by a three-year grant from the German-Israel Foundation, focuses on the use of a new approach to the quantitative measurement of technological sophistication and quality known as technometrics. The basis of this method is construction of a technometric index is a (0,1) metric that reflects the level of a firm's, industry's or country's "best- practice" technology, relative to the prevailing highest standard. Use of the (0,1) metric permits aggregation across product groups, specifications, etc. The project uses technometrics to compare high-tech Israeli product with those of other countries, particularly Germany, and to derive resulting policy implications.

The research in 1991 was concentrated in three main areas:

1. Technometric evaluation of Israel's biodiagnostic industry, through analysis of data collected in 1990;
2. Collection and preliminary analysis of detailed technometric data on 19 firms in Israel's sensor industry, in comparison with sensors in Germany and other countries; and
3. Development and extension of the technometric model as a tool for guiding public policy and managerial decision-making.



## 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

This workshop provided the first forum ever (in Israel) for R&D scientists to interact with one another over common problems.

A second follow-up workshop was held at the S. Neaman Institute on May 12, 1992.

2020

## Measurement of Performance Parameters for the Israeli Industry

Encouraging industrial investment is of special interest to Israel. For investments to be successful in the long run they require a sound return to the investors.

In deciding on new investment the predicted economic return rate generated by the investment is often used as a measurement for its attractiveness. However, there is a lack of data for the actual inflation adjusted return on investment for industrial companies.

In this research program the actual return on investment for selected Israeli companies is evaluated for as far backwards as data from the yearly reports are available. These rates of return are independent of the source of the capital applied. As such they are of special interest in Israel where government support is significant.

Inflation adjusted results were obtained for eight major industries in the chemical, electrical, pharmaceutical, textile and aerospace sectors, with emphasis on the export oriented industries. The rates of returns in major Israel industries are on the average similar to their U.S.A. equivalents but the fluctuation of the returns for the Israeli industry are bigger. The method was shown to give robust results despite the large inflation rate in Israel. This could be of great importance for management in monitoring the performance of Israeli industrial companies.

The research project is composed of three stages:

- a. Mapping the electronics industry in Israel and the world.
- b. High education in Israel and the world in the field of electronics and computers.
- c. In-depth study of selected technologies, establishing discussion groups including representatives from industry, government and academia.

The first stage of the study was completed and a final report was presented, including the study of trends of development in production and electronic marketing in the world - Europe, U.S.A., Japan and the rest of the world.

The second stage is now underway.

The objective of the third stage of the research program is to identify and evaluate options for joint generic R&D programs and technological infrastructure.

Here, a survey was first made to obtain the preferences of the industry. Based on this survey, it was decided to establish steering committees to focus and define in detail three options:

- \* ASIC Center
- \* Fast, small processor
- \* Digital receiver and other communications problems.

These committees have recently started their work.

In addition, two other areas for consortia have been located before our work, namely

- \* GaAs components
- \* Superconducting components

The project is carried out in conjunction with the Electronic Industry Association.

## 2110 Medicine and Engineering: New Horizons for Advanced Technology

The rapidly growing contribution of modern technology to medicine and health care can hardly be overemphasized. The Technion has long been working to integrate the engineering sciences within medical practice. The Julius Silver Institute of Medical and Biological Engineering was established at the Technion as early as 1968, and the Technion is unique in the Western world in incorporating, in 1975, the Faculty of Medicine in an engineering and science oriented university.

A workshop on new horizons for advanced technology in medical practice was held in December 1991. The workshop was aimed at stimulating new interactions between the science and practice of medicine, the engineering sciences and, last but not most important, economic and industrial ingenuity.

Seven leaders in biomedical science programs and some 15 invited Israeli experts in the biomedical sciences, engineering and industry, described new developments in technology, information transfer and commercial application. The presentations at this workshop represented an important step toward this multidisciplinary goal by exploring and highlighting the mutual benefits of this interaction. The conference was open to those interested in the progress of the Medical and Biomedical sciences and Health care Technology. The response justified the expectation, and it is hoped that this interdisciplinary incubation will foster new questions, new ideas and new collaborations.

The Workshop was co-sponsored by The Julius Silver Institute of Biomedical Engineering; The Bruce Rappaport Faculty of Medicine; The Technion R&D Foundation Ltd.; The Kupat Holim Health Insurance Institution and The Israel Export Institute.

## 2180      Civilian Space Applications

The subject of space had been identified as one of the most promising areas for development of Israel's high-technology industrial sector. A 2-day symposium held at the Neaman Institute in 1988 projected a growing international market and a good prognosis for Israeli involvement.

1992 was declared the International Space Year, and coupled with recent developments in the Israeli space sector lead to the decision to hold a 2nd Symposium in 1992 to assess progress and suggest future decisions. This was held in conjunction with the 32nd Annual Israel Conference on Aviation and Astronautics, as a separate "Space Day". The main plenary talk was given by Mr. J-M Luton, Director General of the European Space Agency - on European Space projects. 16 other presentations, including a full evaluation of the OFEQ-2 satellite and descriptions of future Israeli satellite missions such as Techsat and Amos were included. An audience of over 500 attended the parallel sessions and it was suggested to turn this into a regular event.

## 1520 Science Indicators

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 the Planning and Grants Committee of Israel's Council for Higher Education (CHE), the National Academy for Sciences, the Ministry of Science and others.

Number of publications among Israeli universities and with foreign organizations did not increase during the 1985-1990 period. Only about 10% of publications were written in cooperation with another Israeli university, and the number of cooperations inside a university was even smaller. Less than 30% of publications were in cooperation with a foreign institute.

Another use of SNI processed data by the CHE is to trace the results of the Alon Grants, issued by the Council. Scientometric quantiles were used to evaluate and compare the quality of research of scientists who received the grant and scientists who were not selected. The quantiles were calculated in four areas of science - engineering, life science, mathematics and nature science - for the years period of grant-funded research and the period after.

Statistical T-tests showed higher productivity for those receiving the grant, especially in the first period of grant-funded research. Candidates who received the grant wrote more articles per year, and received more citations per author per year. The group of prolific scientists - top 25% - included mostly scientists who received the grant.

## Trends in Science and Technology in the Middle East

The purpose of the research program is to examine and compare scientific and technological development, including the higher education system, in the neighboring Arab countries and Iran, with trends in the same areas in Israel.

The motivation for this research is the realization that there is a government led effort in the Arab States to increase the level of technological and scientific development. This national policy, which led to accelerated investments in such development, has been also motivated by the position of Arab governments that "Strategic Balance" between the Arabs and Israel depends on closing the scientific and technological gap.

The study this year was focused on several areas which were selected as indicators of the level of development of science and technology. The selected areas were:

- A. Higher education system
- B. Aeronautical and Space technology.

The number of students in Arab Universities in 1990 is more than 1.6 millions compared to about 90,000 students in Israel. Parallel to the expansion of the student population there is also significant growth of the faculty so as to reduce the number of students per faculty member. There is a growth of basic research activity in the Arab universities as indicated by the steady growth of scientific research and publications of Arab scientists

A report on the development of the aeronautical infrastructure and industrial products in Arab countries especially Egypt, Syria, Iraq and Saudi Arabia was published. The reports presents the organization of these Industries and describes the various projects under production and development in these countries. Special attention was given to the international cooperation between Arab government industries and European, North American and South American companies.

2120 Career Patterns of Ph.D. University Graduates  
in Israel

Ph.D. university graduates stand at the top of the education echelon. They are known to have a high level of ability, academic achievement, and needs for personal growth. Consequently, they develop high levels of career expectations.

In parallel, the cost of high education is increasing, and it is accompanied by high expectations for return on investment. It is, therefore, important to examine the extent to which those high expectations are fulfilled from the point of view of the individual as well as that of the social system.

The gap between expectations and reality may serve as an important criterion for evaluating the success of the Ph.D. programs in Israel.

The purpose of the present research is to investigate the career patterns of Ph.D. graduates, in particular in light of the potential competition in the labor market with the immigrants from the Soviet-Union, holding Ph.D. degrees.



## 2290 Hebrew for Technology and the Sciences

Survey data show that the number of scientists, engineers, and persons trained in technical fields that have already immigrated to Israel from the former Soviet Union exceeds forty five thousand. Seventy eight percent come with no knowledge of Hebrew whatsoever. Obviously, without the ability to communicate in Hebrew about their respective fields, it is unlikely that these immigrants will find employment in areas related to their professional specialization, be it in research, teaching, industry or commerce.

Prior to the work described below, there were no instructional texts in Hebrew that were designed for the immigrant who needed to learn scientific and technical terms. Additionally, due to the large number of immigrants requiring this type of Hebrew language instruction, Hebrew teachers with inadequate scientific or technical backgrounds frequently had to be recruited; these teachers operated under a double handicap.

The Hebrew teaching staff of the Department of General Studies at the Technion, which for many years has specialized in this type of instruction for immigrant students, was motivated to collaborate in the development of new teaching materials. These materials were designed to meet the needs of this specific group of professional scientists as well as those of immigrant students.

The 1992 publication of two textbooks, "Hebrew for Technology and the Sciences: Intermediate Level" and "Hebrew for Technology and the Sciences: Advanced Level" was the result of this collaborative effort. These books are already being used both within the Technion and in learning centers nationwide.

Educational systems in countries around the world seek to identify gifted children as early as possible. The assumption underlying this desire is that, if nurtured from an early age, these children will eventually achieve excellence and make significant contributions to society.

The SNI sponsored a study to follow up the progress of some 400 children who took part in the Enrichment Courses for the Gifted, held at the Technion between the years 1968-1974. Today, at the end of the third decade of their lives, they are at the height of their careers.

Among the findings of the project: In high school, some 83% of the students in the survey were in the academic option, compared to 18% of the general population. Their grade averages were between 0.8-1.3 points higher than those achieved by the general public. They had impressive contributions upon reaching draft age. 58 percent of the men and 38 percent of the women do extended army service, as regulars, mostly in the framework of the academic reserves. Some 48 percent of the men and 31 percent of the women are officers, compared to 7% of the general population. Thirty-nine percent of the men succeeded in pilot training courses, compared to 10% of the general population. Only 7% of those in the Technion's gifted children program did not go on to some kind of studies after high school. Of the 93% who did, 90% studied in an academic framework, 56% of these at the Technion, and 44% at various universities. 63% of these academics are in scientific and engineering courses, mostly electronics and computers. A full 72% of those at Technion from this group graduated with honors, compared to 27-33% of the general student body. Some 16% chose to pursue an academic career.

## Teaching of Science and Mathematics by Video

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 three 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 twenty pre-academic colleges.
- (2) The program in mathematics has been expanded and it now includes vectors and trigonometry.
- (3) A course in Chemistry is being prepared and will be ready for the 1992/93 academic year.
- (4) A number of workshop for teachers, principals, supervisors and students have been organized, in which the program has been presented by The S. Neaman Institute.

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

## 2160 Follow-Up study on Scholastically Gifted Young Adults

The S. Neaman Institute and the National Institute for Testing and Evaluation (NITE) initiated a joint study on giftedness in young adults. Following the results of a previous project (1250, p. 26).

The definition of giftedness, adopted in this study, is based on the upper one percent of the population of applications to higher-education in Israel on the total score on the Inter-university Psychometric Entrance Examination (constructed and administered by NITE), scores on each of its sub-scales, and the average score on the matriculation exams, given at the end of high-school.

The main research questions are as follows:

1. What are the characteristics of Israeli gifted young adults (as defined by several scholastic aptitude definitions)?
2. Are there differences between gifted and other (non-gifted) young adults on the above mentioned variables?
3. Can giftedness be considered as a stable characteristic of the individual? What is the proportion of gifted young adults who were defined as such in their childhood? How many of those who were identified as gifted in their childhood can be considered as such in their early adulthood?
4. Can we differentiate among the gifted, between achievers and under-achievers? Is under-achievement correlated with the above mentioned variables?

2210

## Problem Solving in a Technological Environment

Teaching pupils problem solving in a technological environment, relating to a process or an operative system, requires planning, developing and evaluating. Though the technological problem can be presented as a configuration that bears resemblance either to science or mathematics, its solution must nevertheless include a practical purpose that goes beyond the theoretical solution "on paper" and beyond the "lab solution", offered by experiments, as made available by science.

By means of the technological project it is intended to impart to the students tools for thinking and skills conferred by technology which are seldom offered by learning other subjects.

In the framework of the research project, a course in "Problem Solving in a Technological Environment" is being developed for Junior High School students. Projects relevant to the students' environment will serve as the backbone of the curriculum, including the necessary theoretical, scientific and mathematical topics.

2010

## Solar Energy for Process Heat Generation in Industrial Buildings

The main objective of the project has been to investigate the possibility of using solar energy for generation of industrial process heat. In Israel, having the highest per capita use of solar energy in the world, most of the use is in domestic water heating. Given the technology to expand into the industrial application, the amount presently utilized can be increased significantly. However, the industrial user normally requires process heat at temperatures higher than those of residential applications. The common flat-plate collectors are inadequate for generating steam and concentrating collectors, which are usually more expensive, have to be employed.

The first question to be answered was how much heat, and at what daily profile, could be obtained from a unit area of the roof based on this concept, taking into consideration geometrical parameters, shading between adjacent modules at certain solar positions, and optimization, under typical Israeli climate conditions. To this end, a detailed simulation has been generated of the thermal performance of the solar-collecting roof as a function of the above parameters. While performing the calculations it was realized that a geometry involving a truncated spherical mirror may be advantageous in the overall optimization. Based on this data, a recommended design for a prototype will be produced.

In parallel with the simulations, the properties and cost of candidate materials for the system have been studied.

During the following months the simulation will be completed and an optimum design produced for a prototype roof module. A preliminary cost estimate and project energy output will be obtained.

2140

### Utilization of Coal Fly Ash for Land Reclamation from the Sea and Offshore Islands

The S. Neaman Institute has undertaken to study the various aspects involved in the use of coal ash for the creation of offshore islands for different purposes. Representatives from institutions and bodies concerned with this subject convened to discuss the necessity for an in-depth study of the problems involved from the economic, engineering, ecology and other points of view. Material was gathered from abroad, from the USA, Japan, the Netherlands and other countries where such endeavors have already been undertaken. Experts have been invited to lecture and advise on their experiences.

The project's goals have been determined and a preliminary study of the economic and engineering implications of various alternatives for an offshore island near Tel-Aviv are being examined.

The study is partially funded by the Israel Electric Corporation.

## 2150 Water Research Institute Study

A study to examine efficient ways of conducting and coordinating Water Research in Israel was conducted. A team from various Technion departments worked for three months and submitted a report at the end of February 1992.

The main findings and recommendations, based in part on a questionnaire circulated to all staff members active in water research, were:

There exists a substantial activity in water research at the Technion, for many years, in several departments.

Technion is and should remain a leader in the field of water research, concentrating on areas in which it has expertise and are important to Israel's water sector.

During the last 15-20 years there has been a serious decline in Technion's ability to conduct water research, due to shortage of resources.

The team recommended that a Water Research Institute (WRI) be set up, and provided a list of necessary facilities, equipment, staff, and budget, along with a draft of the recommended charter for the Water Research Institute. The report is to be discussed by the appropriate Technion bodies, leading to a decision by the Senate. In parallel, efforts are in progress to obtain the resources needed.



## 2190 Recycling 1992-2000

The study aims at the formulation of a national policy for recycling solid waste for the period 1992-2000.

The purpose of the study was to outline the problems related to recycling. These have to be examined on several levels:

1. Production level - which industries or plants can recycle and what products may be manufactured from the recycled materials.
2. The municipal-organizational level -Who will collect the materials and recycle them. It is clear that a recycling program requires an initial investment (special collecting vessels, trucks, publication and public education). Who will finance this?
3. On the private citizen level - How will the individual divide recyclable products?
  - Will he have to have several bins at home (for paper, plastic, glass etc).
  - Will each house have two bins - a "wet" one for organic wet waste and a "dry" one for recyclable material.
  - Will there be neighborhood collection centers?
  - Will there be a deposit on bottles and wrappings which will be returned upon their return to the supermarket?

Several workshops are planned to summarise different aspects of the problem. The first workshop, on glass recycling, was held on February 6, 1992.

## 1560 Law Enforcement System in the 21st Century

This research seeks to define the objectives and expectations of the law enforcement system in the 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 the 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 agencies.

## 2170 Unionization in Future Industries

This project included two workshops - on April 2 and on July 2, 1991 on the subject of unionization in industries of the future, organized in conjunction with the Haifa District of the Histadrut.

The workshops included a framework lecture on future Israeli industries, stressing the fact that Israel's future lies in science based industries. Experts in industrial relations exposed the dilemma faced by the trade unions as the "union free" ideology is dominant in these industries. Another topic presented in the workshops was the proper use of free time at longer weekends as the result of the five-day working week. In the discussions that followed, the speakers agreed that the trade unions have to seriously reconsider their future policy regarding the subjects raised. The lectures and discussions were published in a special SNI report entitled "The Trade Unions and Industries of the Future".

2090

### Absorption of Technologically Trained Immigrants in Israeli Industry

As part of the efforts to absorb immigrant scientists, it was suggested to place mathematicians in the insurance sector, after suitable training in actuarial techniques.

Selecting candidates was done from the database files at the Ministry of Labor all over the country. After preliminary sorting, some 100 mathematicians were summoned for a preliminary interview, 25 of whom attended the first training course. These people had at least an M.Sc. in mathematics, some had a Ph.D. and a few even served as professors in the USSR.

During the seven months of the course the new immigrants studied five days a week, six hours per day, and exercised for three hours each day after classes in the computer laboratory. Part of the Hebrew studies took place in a concentrated Ulpan at the beginning of the course, and some during the regular studies and language lab during the course.

The subjects studied included introductory lectures on capital, insurance market, saving, economy and accounting. Another group of subjects included probability and statistics, and computer studies. The practical side of the mathematics of financing, the actuary basics of insurance and pension programs was emphasized.

20 students graduated at the end of January, three cum laude. Most have since been employed in their new field of expertise.

The study analyzes Technion's activities in absorbing immigrant students, scientists, research engineers, the Centre for Pre-University Studies, special courses carried out by the S. Neaman Institute, the Division of Continuing Education and External Studies and the entrepreneurial projects already in progress.

The report was prepared by the S. Neaman Institute, following its pioneering effort in presenting a plan for Technion's role in Immigrant Absorption (May 1990). It is based on interviews with Heads of Departments in charge of the different aspects of immigrant absorption at the Technion.

A significant proportion of the new immigrants from the Soviet Union are engineers, architects, scientists, physicians and students in engineering and sciences. Therefore, the Technion, as the major Israeli technological university, has a national focal role in the absorption process, in education, in retraining, in research and development, and in promoting entrepreneurial-job creation activities.

A chapter in the report describes the S. Neaman Institute activities in immigrant absorption. In an effort to pinpoint both the needs and potential of Soviet engineers an intensive survey was conducted throughout Israel. Then, a methodology for planning retraining courses was developed and applied in a course for Electronic Engineers. Finally, textbooks in Hebrew for Technology and Science for new immigrant students, engineers and scientists were published. (p. 25)

## 2220 Whizin International Symposia on Ethics and Technology

The ever-increasing rate of technological progress raises serious problems with which society is ill-equipped to cope. These can be properly understood only on the basis of an adequate background in science and technology, whereas their implications for the quality of life - in some cases for life itself - cannot be faced squarely except from an informed ethical perspective.

The Whizin family, generous donors to both the Technion and the University of Judaism in Los Angeles, suggested that the interface between ethics and technology might be profitably explored in a series of annual symposia under the joint sponsorship of the two institutions.

- \* The first Symposium in the series will be held in Haifa in June 1992. It will be an "in-house conference", the primary objective of which will be to familiarize the members of the two sponsoring institutions with the problems that have to be confronted and to map out a common frame of reference for dealing with them.
- \* The second Whizin Symposium, provisionally scheduled for August 1993 in Los Angeles, will be international in scope. Foremost authorities on the ethical problems arising out of technological - in particular biotechnological - developments will be invited to address the theme: *"The concept of life in biological, technological, philosophical and juridical perspectives"*.
- \* A successful outcome of the first two symposia will augur well for a continuing series of annual Whizin International Symposia devoted to different aspects of ethics and technology, that would alternate in venue between Los Angeles and Haifa.

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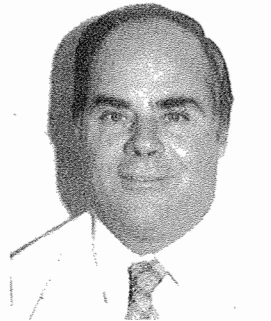
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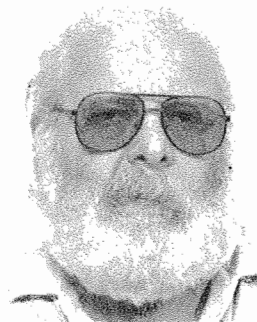
Prof. G. Czapski



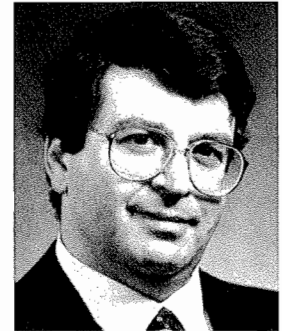
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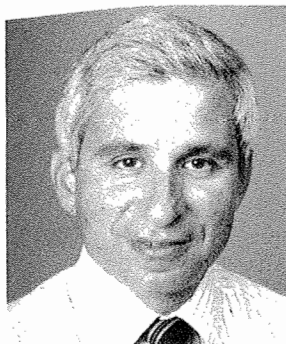
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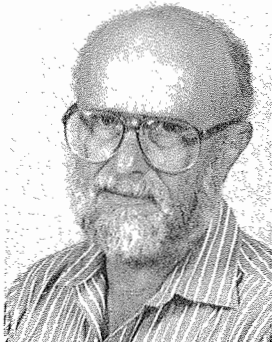
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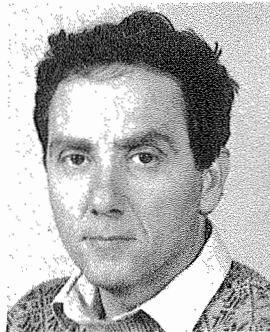
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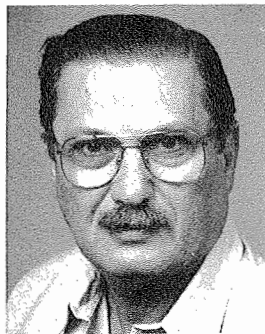
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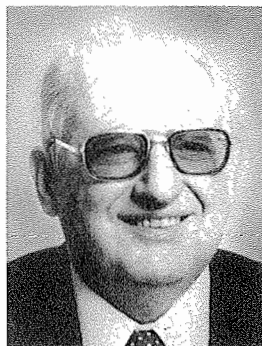
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5. Differential Calculus - Prof. Ron Aharoni
6. Trigonometry - Mr. Giora Harubi
7. Chemistry - Dr. Riva Bar-Shai

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