



Technion-Israel Institute of Technology
The Samuel Neaman Institute
for advanced studies in science and technology



ANNUAL REPORT 1998-1999



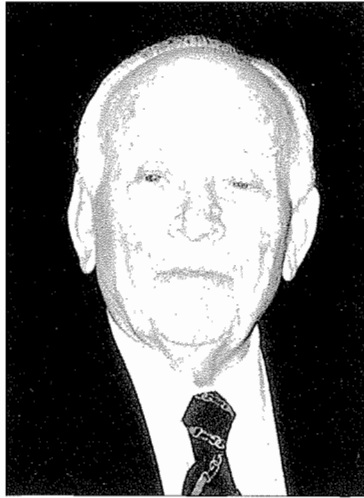


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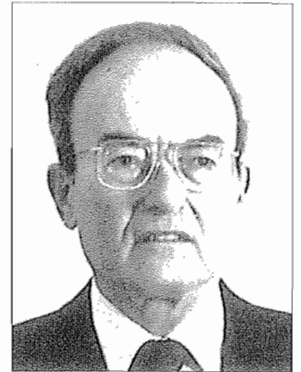
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Prof. Zehev Tadmor
Chairman



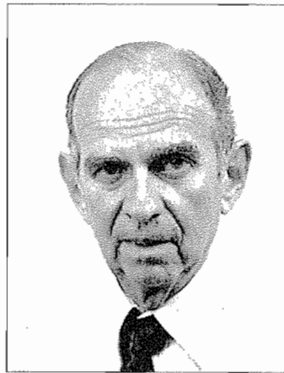
Samuel Neaman
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Director



Prof. Daniel Weihs



Prof. Alex Keynan



Prof. Nadav Liron



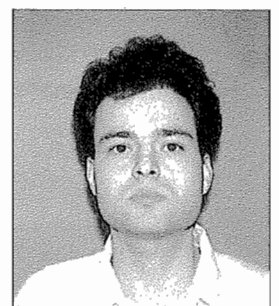
Ing. David Kohn



Ruth Rivkind, B.A.



Sima Nadler



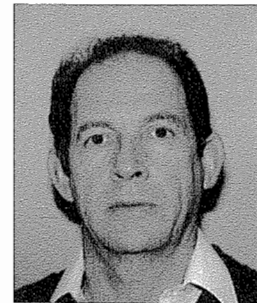
Miron Rozenkranz



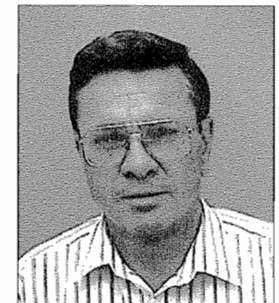
Dr. Amnon Frenkel



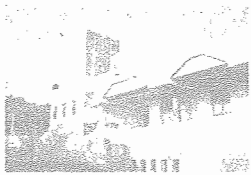
Dr. Daphne Getz



Joseph Linhart



Dr. Abraham Rotem



The Samuel Neaman Institute for Advanced Studies in Science and Technology

Board of Directors

Samuel Neaman, Founder, Oceanside, CA., U.S.A

Zehev Tadmor, Chairman, Distinguished Technion Professor of Chemical Engineering

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Ezra Zeheb, Professor of Electrical Engineering, Technion

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Staff

Project and Workshop Coordinator: David Kohn, M.Sc., M.Phil

Administrative Assistant: Mrs. Ruth Rivkind, B.A.

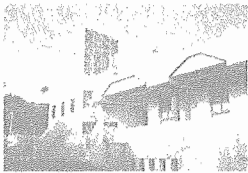
Book-Keeping: Mrs. Sima Nadler

Information Coordinator: Miron Rozenkranz, B.A.

Consortium Coordinator: Dr. Daphne Getz

Consortium Coordinator: Joseph Linhart, M.Sc.

Consortium Coordinator: Dr. Abraham Rotem



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, on scientists from other institutions in Israel, and on specialists abroad. The Institute serves as a bridge between academia and decision makers in government, public institutions, or industry, 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 research, organises invitational workshops and implements continuing education activities on topics of significance for the development of the State of Israel, and maintains a publication 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

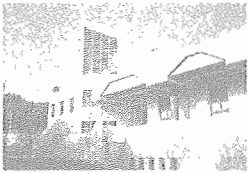
The initiative for establishing this Institute in Israel was undertaken by Mr. Samuel Neaman. He nurtured the concept to fruition with an agreement signed in 1975 between himself, the Noon Foundation, the American Society for Technion, and Technion. It was ratified in 1978 by the Senate of the Technion. 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 by the Chairman of the Institute Board, is responsible for formulating and coordinating policies, recommending projects and appointing staff. 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 income from 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 it is in accordance with Institute goals and objectives.



D irector's report

This is my last annual report as director of the Samuel Neaman Institute, as my term of Directorship has expired at the end of February 1999, and has not been extended. I therefore allow myself to indulge in summing up the three years of my term, rather than just the last year, 1998/9.

For three years I followed a consistent program of enlargement, within the constraints imposed on the Institute by the bylaws and regulations decreed by the Senate of the Technion. Although named as an institute for advanced studies in science and technology, the Institute is prohibited by its charter from conducting research in hard science and technology, so as not to compete with research conducted at the Technion R&D Foundation. Rather, the Institute was established to conduct policy research, not an easy task in the environment of a technological university like the Technion. Furthermore, the subjects of the policy research must be limited to areas that the Technion is active in.

Within these constraints the Institute, under the former Director, Professor Daniel Weihs, was instrumental in developing the MAGNET program together with the Chief Scientist's Office of the Ministry of Industry and Trade. In this program consortia of hi-tech industries and academic research institutes develop together new pre-competitive, generic technologies. By devising and promoting this program, the Samuel Neaman Institute achieved one of its major objectives of creating industry-academia collaboration and technology transfer from the universities to the industry for the benefit of Israel's economy.

This program at SNI increased from year to year and in 1998/9 SNI's involvement in this program increased again. The Institute is now a member of ten consortia:

1. Ground-stations for satellite communications;
2. Digital communication;
3. Quarter-micron technology;
4. Multimedia on-line services technology;
5. Magnesium technologies;

6. CONSIST - Industrial Software Tools;
7. Digital printing
8. Wafer Fabs Cluster Management (WFCM);
9. Information highway in space;
10. Software radio.

The research programs in these consortia were conducted for SNI by about 100 researchers from the Technion, the Hebrew University, the Weizmann Institute for Science, the Tel-Aviv University, the Ben-Gurion University of the Negev and the Holon School of Engineering. The turnover of these programs, including the management of the information center for some of these consortia, increased to about 3 million US Dollars, from 0.6 million Dollars in 1995. Recently SNI, with Netvision Ltd. as a subcontractor, successfully finished running in a fully computerized system that offers digital information services through the Internet to the consortia members. These services will also be offered to industries that cannot afford their own information departments.

The second largest activity this year is the overall activity of SNI's Israel Center for Negotiation and Conflict Management (ICN). Dedicated to academic and professional research, training and facilitation in the field of dispute resolution, ICN expanded its activities and services across the country, to a stage where SNI is now a synonym for Mediation. In 1998, ICN has conducted:

1. Four mediation workshops for judges in Labor Courts, Magistrate Courts and Family Courts;
2. Two mediation workshops for lawyers of the Attorney General's Office;
3. Five workshops for the Police Academy and one course for the top echelon of the Police;
4. 30 courses for mediators, offered to select audiences and for the general public;
5. Several courses in Labor Law, Family Law, etc.;
6. Two negotiation classes for MBA students;
7. An international conference on "Mediation in Business' and Labor Disputes";
8. A training program for the Israeli and Palestinian border personnel of the Israel-Palestinian Authority check points;
9. A program for young negotiators in the school systems, together with the Ministry of Education.

SNI continued its collaboration with the Epidemiology and Public Health Department of the Carmel Medical Center (a joint Kupat-Holim Technion Hospital), in several public-health and health-services programs, the largest among them being the USAID supported study of the effects of radiation from the Chernobyl disaster on the irradiated population.

On the other hand, another program of technology-related health effects, the Center of electromagnetic-radiation effects on human health, hardly got off the ground, because the promised Government funding did not materialize.

Two interesting environmental programs will be finished in 1999:

1. National priorities in environmental issues, together with the Israel Economic Forum for the Environment;
2. The reduction of the emission of greenhouse gases for the Ministry of the Environment

Last but not least, two programs are conducted jointly with the Tel-Aviv University's Interdisciplinary Center for Technology Assessment and Forecasting. These are a DELPHI survey for the Ministries of Science, and Industry and Trade, to determine priorities for technological R&D, and an Israeli Branch of the European OPET network to promote the use of advanced energy technologies.

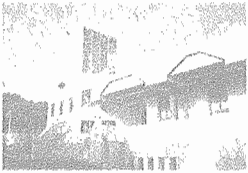
On this occasion I wish to thank the loyal staff of the Institute who supported me and gave their best for the Institute.

Thanks go also to all the researchers, the members of the Advisory Council and the Directors of the Institute.

I wish success to the new Chairman of the Board, Professor Zehev Tadmor and to the new Director, Professor Arnon Bentur.

Professor Arnan Seginer, Director

February 28, 1999



List of ongoing SNI projects

1. UNIVERSITY-INDUSTRY GENERIC RESEARCH CONSORTIA

- 10 - Ground Stations for Satellite Communication Consortium
- 11 - Digital Communication Consortium
- 12 - Quarter Micron Technology Consortium
- 13 - Multimedia On-Line Services Technology Consortium
- 15 - Digital Printing Consortium (D.P.I.)
- 17 - Development of Magnesium Technology Consortium

2. RESEARCH PROJECTS

- 18 - Spatial diffusion of industrial innovation
- 20 - Technometric Benchmarking
- 21 - Follow-up of the immigrant population from the Chernobyl area
- 23 - Technion-graduates' role in the Israeli economy
- 24 - The Contribution of Science to Israel's Industry & Defense
- 26 - Determination of National Environmental Priorities
- 27 - Identification of the Major Sources of Greenhouse Gases and Recommendations for their Reduction
- 28 - OPET Israel (Organization for the Promotion of Energy Technologies)
- 29 - Delphi Survey on Technology Forecasting
- 30 - Remote sensing of Air Pollutants in Industrial Areas
- 32 - Israel Center for Negotiation and Conflict Management (ICN)



Ground Stations for Satellite Communication Consortium

ACADEMIC RESEARCHERS:

Prof. I. Bar-David

Dr. Y. Birk

Dr. R. Cohen

Prof. M. Feder

Prof. Y. Leviatan

Prof. D. Malah

A/Prof. N. Merhav

Dr. A. Orda

Dr. E. Plotnik

Prof. A. Segall

Prof. S. Shamai

Dr. R. Shavit

Prof. M. Sidi

Distinguished Prof. Y. Ziv

ACADEMIC COORDINATOR:

J. Linhart, M.Sc

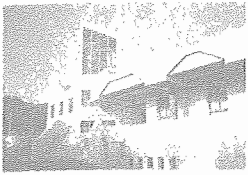
Communication via satellites has grown rapidly in recent years, as technological developments have broadened its accessibility. The trend in satellite communication is to provide a variety of low cost and efficient world-wide services. To provide the market growing needs new systems based on Low Earth Orbit (LEO) satellites are proposed, in addition to the more traditional Geosynchronous Earth Orbit (GEO). In the ground segment of this industry a variety of ground stations or terminals are under development. They will provide the end users with mobile and fixed wide-band and narrow-band two-way channels for various applications.

The consortium of Ground Stations for Satellite Communication was founded in 1993 and terminated its six years of activity at the end of 1998. The vision was to establish a generic R&D joint venture supported by academic research that will enable the members to penetrate and compete in this market. The consortium operated within the framework of the "Generic Pre-Competitive Technologies R&D Program" supported and managed by the Chief Scientist's Office in the Israeli Ministry for Industry and Trade. The total multi-annual budget of 25M\$ was invested by the Chief Scientist's Office and the companies involved.

The Consortium consists of six Israeli companies, Gilat, Galram/Rafael, Stellar(Elisra), Orbit, Elta, MBT(IAI) and the S. Neaman Institute. Eighteen generic projects were conducted in the companies' R&D facilities. In some of the projects feasibility tests were performed in Israel and abroad to demonstrate the technologies performances. Fourteen academic teams in the Technion, Tel-Aviv University and Ben-Gurion University in the Negev share a multi-annual budget of 2.2M\$ to conduct 14 researches related to satellite communications. The S. Neaman Institute represents the academic institutes and administers the consortium information center.

The forecast of the companies is for a potential sales of 700M\$ of products based on those generic projects. The companies already started to develop several such products.

The achievements and the results of the academic research and the companies projects are available to all members. Members from the industry and academia participate in several workshops devoted to presenting and discussing the projects and research done during the consortium activity period. All the researches and projects reports were distributed to the members by the information center.



Digital Communication Consortium

ACADEMIC RESEARCHERS:

Prof. I. Bar-David

Prof. Y. Be'eri

Prof. B.Z. Bobrovski

Prof. M. Feder

Prof. D. Raphaeli

Prof. S. Shamai

Prof. I. Sneiders

Prof. D. Wolich

ACADEMIC COORDINATOR:

D. Kohn, M.Phil.

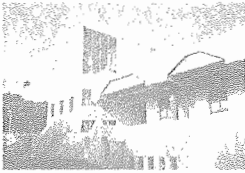
The objectives of this Industry-University consortium were to develop pre-competitive generic technologies that will contribute to a variety of products in the rapidly increasing digital communications market and in particular in the private communication market. The Consortium is now in its last year of operation. At the end of 1998 the program was extended for additional three months.

The S. Neaman Institute played an important role in the process, which led to the establishment of the consortium. The program was approved and first funded in 1994 by the Chief Scientist's Office in the Ministry of Industry and Trade. The consortium included eight companies: Elta, Tadiran, Rafael/Galram, Gilat, Shiron, Microkim, Elisra and DSPC, and two research institutions: the S. Neaman Institute and Ramot.

The program included six research projects that were performed by project teams of the member companies. Each project involved the cooperation of several companies working closely together, and was supported by several academic research programs conducted by Technion and Tel Aviv University researchers.

The direct and indirect spin-off of the projects performed by the consortium members are evaluated at 240M\$ for the years 1999-2003.

The S. Neaman Institute's role included responsibility for the academic research, organization of workshops and management of the Consortium's information center which accumulated both relevant external information and all the R&D results generated by the consortium members.



Quarter-micron Technology Consortium

ACADEMIC RESEARCHERS:

Dr. S. Berger

Dr. R. Edrei

Prof. E. Finkman

Prof. A. Fruchtman

Prof. D. Gershoni

Prof. Y. Haas

Prof. A. Hoffman

Prof. Y. Nemirovski

Prof. J. Salzman

Prof. Y. Shacham

Prof. J. Shappir

Dr. I. Shechter

Dr. D. Spector

Prof. Y. Yacoby

Prof. A. Ziegler

ACADEMIC COORDINATOR:

Dr. Daphne Getz

The technologies of QUARTER MICRON are a milestone in the production of integrated circuits, paving the way to the production of circuits in Ultra-Scale-Integration (ULSI) technology at quarter micron and smaller scale. The Integrated Circuit industry development is limited by performance of the equipment for processing and for inspection.

The consortium for $\leq 0.25\mu\text{m}$ technology was established to answer the need for R&D pre-competitive, generic technologies for integrating industry and academia in order to build an infrastructure that will support both existing and future IC processing and inspection equipment manufacturers in Israel. Another objective of the consortium is the successful commercialization of future products resulting from the development programs of the consortium.

The members of the consortium, AGI, Jordan Valley Applied Radiation, Ricor, Tower, and 3T, and the Technion, the Hebrew University, Tel-Aviv University and The Center for Technological Education, Holon, under the umbrella of the Neaman Institute, all join in the effort to develop the desired generic technologies.

1998 was the third year of the consortium activity, during this year the joint central laboratory of the Consortium was established at the Tel-Aviv University and new research projects were started in the academia. The central lab will serve all the researchers in the consortium and support the members' research and development activities. Both MAGNET and the industrial members fund the central lab.

Joint projects of the industries and the academia were originated and the close industry-academia R&D ties resulted in technological achievements. The Consortium's information center, managed by the Neaman Institute, has been fully computerized to enable the sharing of consortium-generated information and know-how, as well as the supplying of technological and business information services by the Neaman team to the consortium members via a private network.

The consortium held a workshop and an annual conference, devoted to the presentation of results of the research work done within the framework of the consortium, both held at the Neaman Institute. A web site describing the consortium mission and activities can be found at the following address: <http://www.025micron.org.il>



Multimedia on-line Services Technology Consortium (MOST)

ACADEMIC RESEARCHERS:

Prof. A. Averbuch

Prof. A. Bar-Noi

Dr. I. Ben Shaul

Dr. Y. Birk

Prof. I. Cidon

Dr. R. Cohen

Prof. M. Heymann

Prof. M. Israeli

Dr. G. Kurtz

Dr. S. Kutten

Dr. M. Lindenbaum

Prof. S. Naor

Prof. D. Peleg

Prof. S. Peleg

Dr. E. Rivlin

Prof. A. Segal

Dr. I. Shimshoni

Prof. A. Sidi

Dr. A. Tal

Prof. S. Ullman

ACADEMIC COORDINATOR:

Dr. Daphne Getz

The MOST consortium is an organization of more than 20 Israeli hi-tech companies and about 20 academic research teams who cooperate to advance the state-of-the-art in Multimedia On-line Services Technology in Israel. With a total budget exceeding \$100 million and more than 350 developers on board, the MOST consortium is determined to deliver new levels of integration and breakthrough cost/performance ratios to the world of multimedia on-line services technology market.

Mission

"The MOST Consortium is developing technologies that will change the Internet from its current state of a huge text and graphics information repository into a real-time, collaborative multimedia tool"

Real-time: The Internet today is mainly a tool for storing information for later retrieval. MOST develops technologies for the next generation Internet, that will supports high quality live video, video and data conferencing and other types of real-time interactions in an affordable manner. Real-time also applies to information delivery, where push techniques combined with intelligent filtering, shorten the time between the creation of an information item and its being delivered to the interested user.

Internet-based collaboration: Tools and applications developed by MOST will support new types of interactivity among members of on-line communities. Live online technologies that automatically identify who is available on-line, direct voice and video chat among members and video-rich presentations and live broadcasts, are among the targets of the MOST Consortium R&D.

Multimedia-ready Infrastructure: MOST infrastructure technologies bring broadband, and continuous connectivity to homes and small businesses based on technologies such as ADSL, VSAT and Wireless Access Networks. From highly developed countries demanding Fast Internet to rural areas of developing countries, MOST can provide broadband connectivity at a truly competitive price.

Research Projects Conducted by MOST Members

MOST approaches the challenge of multimedia delivery over the WEB in a unique way, which combines infrastructure and software development under the same framework. Advanced implementations of communications and multimedia technologies, optimized for the future Internet, are being integrated to provide effortless system solutions that emphasize cost-effectiveness and ease of deployment.

Specific R&D efforts focus on the following themes:

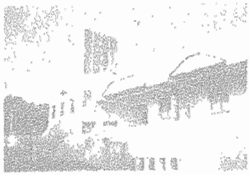
- Real-time streaming of audio and video content over broadband networks
- Advanced authoring and coding of 2D, video and 3D graphical information for Fast Internet environment PRIVATE
- Integration with virtual-community servers and efficient handling of security and navigation at Fast-Internet rates.

The MOST Consortium members represent a unique mix of innovative young startups, recent success stories of the Internet boom and some of the most experienced and powerful Israeli high-tech companies. The broad range of technological background of the members allows new prospective technologies to be developed with regards to market potential, associated problems and possible effective solutions. The consortium expanded from an initial structure of 6 high-tech companies to become one of the largest alliances in Israel's high-tech industry.

The MOST Lab and Demo Site

As part of its activities, the MOST consortium has established a state-of-the-art Internet Communications Center, that serves as a test lab and demo facility for the Consortium's and other Internet technologies. The Center hosts a range of application servers that connect several test communication infrastructures, via leased lines of fast IP or ATM backbone.

At the Lab, multimedia authoring workstations create demo content and control a range of applications, such as virtual community centers, multi-user games, auto-published multimedia databases, etc..



Digital Printing Consortium (DPI 2000+)

TECHNION RESEARCHERS:

Prof. A. Marmur

Prof. R Semiat

ACADEMIC COORDINATOR:

Dr. Daphne Getz

The printing market is valued today at approximately 450 billion US Dollars, and the equipment market for it at an additional 45 billion. 20 years ago Scitex has embarked on a technological revolution related to digital preparation of layouts and printing blocks. Rapid changes in computer technologies have brought about a communication revolution and made the world a "global village", whereas the user environment became more and more individual.

Mass production and long production series characterize the 20th century. Experts foresee the forthcoming century as the century of the client: namely adjusting the product to the demands of the individual customer. The market will have to respond qualitatively and economically to smaller production series and rapid changes. This will bring about the system of "printing on demand" with personalized market segments. There is an accelerated process of change from manual preparation of material for print to advanced uses of digital methods. This process will reach its peak during the early years of the forthcoming millennium.

Digital printing technologies will have respond to these market changes, to the point where the whole flowchart of the working process, from inception to final product, will become digital. Digital printing technologies include close connections between printing heads and types of ink.

The members of the Consortium believe that the scope of local digital printing technology products will reach 5-8 billion dollars in the years 2001-2003, when the market for ink and other printing materials will increase rapidly and will occupy an increasing percentage of the equipment market.

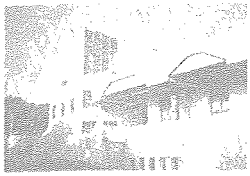
The consortium, an organization of six industrial companies: Scitex, Idanit, Indigo, Tower, Nur, and Shira, and five academic institutions: Bar-Ilan University, Ben-Gurion University, The Hebrew University Jerusalem, Tel-Aviv University, Technion, has defined the following objectives:

- Develop and study new technologies as a basis for developing new products, systems and perishable materials which will put the industrial members in leading positions and control of over 20% of the market.
- Create an academic research infrastructure with industrial vision, to support long-range new ideas and technologies.

Specific R&D efforts focus on the following themes:

- Digital Printing Engines
- Inks for Digital Printing Engines
- Digital Printing Workflow
- CMOS and Color Image Capture
- On-line Color and Printing Quality Control
- Electro-Optical Subsystems and Components

The Neaman Institute was chosen to organize the Consortium's computerized information center. The objectives of the information center are to support discussion groups, to build and maintain the central information repository and to organize seminars on printing technologies.



D

evelopment of Magnesium Technologies Consortium

ACADEMIC RESEARCHERS:

Prof. D. Shechtman

Prof. M. Bamberger

Prof. A. Rosen

Prof. E. Altus

Prof. M. Weiss

Dr. L. Gal-Or

Koren M.Sc

ACADEMIC COORDINATOR:

Dr. A. Rotem

The Israeli Consortium for Development of Magnesium Technologies was founded in 1997 to establish a generic R&D joint venture supported by the "Magnet Program".

The Dead Sea Magnesium Co. (DSM) plans to produce, by the year 2000, up to 55,000 tons per year with 25,000 tons in the first stage, (production started in December 1996).

The added value of magnesium can be increased significantly by the development of new handling technologies that will make new products possible or their production simpler, faster and cheaper. With the aid of the R&D of Consortium members, the Consortium forecasts that Israel will supply about 12% of all the future magnesium-based products, making DSM one of the biggest suppliers in the world.

The objective of the Consortium is the utilization of the metallic magnesium products, through the development of magnesium alloy technologies

Four fields of activities of the Consortium R&D program are:

- Development of new Magnesium alloys, properties study and "Green Technologies".
- Magnesium Casting Technologies.
- Finishing and Corrosion protection Technologies.
- Forming, Joining and Machining Technologies.

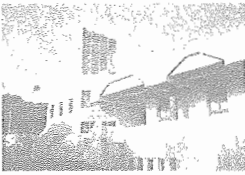
The consortium consists of the following Israeli companies:

DSM; Rotem Ind; Ortal; Matar; Algat; Palbam; Habonim; Electrotherm.

Two Academic Institutes are also members of the consortium:

Technion, Israel Institute of Technology and the Israel Institute of Metals, represented by the S. Neaman Institute.

B.G. University, represented by B.G. Negev Technologies.



Spatial diffusion of industrial innovation and regional development

RESEARCHERS:

Prof. D. Shefer,

Dr. A. Frenkel

This four year research project, sponsored by G.I.F. - German - Israeli Foundation for Scientific Research and Development, was completed this year.

The objective of the study was to identify the spatial diffusion of industrial innovation and to examine this effect on regional development in Israel and in Germany. Industrial innovation has long been recognized as a major service for fostering regional economic growth.

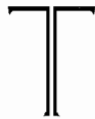
The desire to develop peripheral regions exists in many countries, throughout the world. In Israel this desire has been translated into public policies aimed at developing the Northern Galilee and Southern Negev regions. In Germany, government programs in the form of investment allowances and development of industry-related infrastructure were designed in order to promote the economic growth of lagging regions.

We hypothesized that innovation is more prevalent in the group of fastest-growing industries than in the group of slower-growing industries. Thus, the first task was to identify the group of fastest-growing industries in the two countries - Germany and Israel. The second task was to collect data from a nationally selected sample of industrial plants. Altogether, in both countries, more than 400 industrial plants belonging to the fastest-growing industrial branches (electronics, metals and plastics) and located in three distinct areas (center, intermediate and periphery), were included in the study.

The use of simple statistical models, augmented by multi-variable Logit Models, supports the hypothesis that expenditure on R&D is a good indicator for the probability of the firm to innovate, regardless of the industrial branch to which the plant belongs.

In general, there exists a strong similarity in the character of industrial innovation in both countries; i.e., the rate of innovation in the hi-tech firms is statistically and significantly higher than that found in the "traditional" firms. On the other hand, the pattern and spatial variations in the rate of innovation in Israel is much more pronounced and visible than in Germany.

A final workshop was held on the 17th of December 1998, in the Interdisciplinary Institute for Applied Cultural Science at the University of Karlsruhe, Karlsruhe, Germany. At the workshop the researchers presented the findings and conclusion of the study followed by a very interesting and penetrating discussion. The study methodology, results and conclusions were well received. The workshop concluded with a call for a continuation of research in line with the current study.



Technometric Benchmarking

RESEARCHERS:

Dr. A. Frenkel,

Dr. H. Grupp,

Dr. K. Koschatzky,

Prof. S. Maital

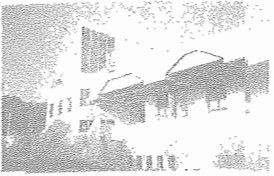
In an earlier project funded by the G.I.F - German Israel Foundation for Scientific Research and Development, Dr. H. Grupp and Prof. S. Maital applied a new method of technology benchmarking, developed by Grupp and known as technometrics, to measure and compare Israeli technology in the fields of industrial sensors and biodiagnostic kits with that in Germany, Japan and the United States. A series of papers in leading technology management journals resulted.¹

The current follow-up project seeks to apply the concepts of technometrics to the innovation process, by developing a set of decision tools for use by managers, to be applied systematically to the entire product development process, from idea through innovation, production, distribution and marketing. Over the past three years, detailed interviews were conducted with Technion's Dimotech companies, and several case studies, applying our models, were carried out on knowledge-based products, like gamma cameras, mammograms, telephone-based email, and others. Articles on this have been published in, or accepted by, *Research Evaluation*, *R&D Management*, *Handbook of Industrial Marketing*, and other journals.²

The researchers are now engaged in writing a book, tentatively titled: *Managing New Product Development: a Microeconomic Approach*, that will assist managers of science-based companies to effectively manage the innovation process by using our feature-based quantitative model. Some software developed by a group of students, under the direction of the researchers, will accompany the book.

¹Frenkel, A., Reiss, Maital, S., Grupp, H., Koschatzky, K., (1994). "Technometric Evaluation and Technology Policy: The Case of Biodiagnostic Kits", *Research Policy*, 23, pp. 283-292.

²Hariolf Grupp and Shlomo Maital. "Identifying Sources of Value a Capital Goods Market: The Case of Industrial Sensors" *R&D Management*, vol. 28, no.2, 1998, pp. 65-77



Follow-up of the immigrant population from the Chernobyl area

RESEARCHERS:

S. Shapiro, M.D.,

N. B. Yosef,

D. Reinfeld, MPH,

H. Rennert, M.P.H

G. Rennert, M.D., Ph.D.

The aim of this activity is to evaluate the magnitude of health effects possibly attributable to radiation exposure following the accident at the Chernobyl nuclear reactor.

Our studies involve immigrants to Israel from areas in the former USSR, where increased Cesium 137 levels were measured following the 1986 accident in the Chernobyl nuclear reactor.

Three different activities are taking place:

1. A study of a group of immigrants from the exposed area who volunteered to provide data to the study center (ICHES). The number of participants accrued is about 12,000. All participants provided self-reported information on their exposure and on their health status before and after the accident. In 1998 a follow-up activity was taken, and 1,800 of the original participants have complied and provided new data. The physicians of these participants also provided confirming information.

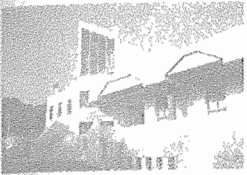
Two control groups were sampled: one includes immigrants from areas not affected by the Chernobyl radiation, such as Moscow and St. Petersburg, to serve as baseline data. The second consists of immigrants from the radiation-inflicted areas, who did not register with the study center. This latter group is used as a control for possible selection bias into the study group due to a volunteer effect.

A very high rate of self-reported medical complaints is evidenced among the study group. These mainly include various thyroid problems but also benign and malignant tumors. These self-reports are currently being validated by the primary-care physicians.

2. A study of children from the Chernobyl area (USAID). Children are known to be more sensitive than adults to the effects of radiation. Eligible are people who were in-utero or up to the age of 5 years at the time of the accident, and who resided in the exposed areas. These children and a

control group of parallel size of unexposed children are offered a complete physical examination with emphasis on evaluation of physical and sexual development, blood tests, and psychological questionnaires to be completed by both child and mother. Thus far 328 exposed children and 175 children from the control group have been tested.

3. A study of the clean-up teams (liquidators). This group is characterized by the highest exposure to radiation. More than 600 of them have immigrated to Israel. All of the liquidators are being evaluated for prevalence of chronic diseases. More than 500 of them have already been examined. Based on our experience, the Ministry of Health has assigned our unit to be the follow-up clinic after this population in accordance with the decision of the Ministerial Committee for Immigrant Absorption.



T echnion-graduates' role in the Israeli economy

RESEARCHERS:

D. Kohn M. Phil.

I. Shalev B.Sc

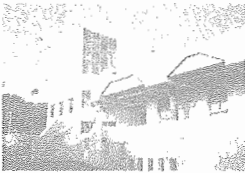
The aim of the study was to analyze the Technion-graduates' role in the Israeli economy. The study measured the national spread of leaders who are Technion graduates and their distribution over the various branches of industry, building companies and engineering services. The leaders are defined as the influential decision-makers in given organizations such as CEOs, presidents, general managers, deputy managers and others of similar standing.

The designated group of leaders, which was taken from a special list prepared by the Liaison Office of the Technion Alumni Association, included approx. 600 graduates. Two percent of the graduates are CEOs, presidents, general managers, deputy managers etc.

The graduates are leaders in 465 companies. Fifty of them are presidents and 310 are general managers. Of all the above companies, graduates fill leading positions in 90 of the top companies in Israel (as listed by the Dun's 100, that includes all the leading companies in Israel). Sixty-one of these companies are industrial firms, such as, Israel Aircraft Industries, the Elron Group, Teva Pharmaceuticals, Motorola Israel, Scitex, ICI, Makhteshim, Neshet, Israel Military Industries, Telrad and others. Seventeen are service companies such as Bezeq, Zim, Supersol, Dor Energy, IBM Israel, and others. Twelve are construction/real estate firms, such as Ashtrom, Malibu, Denia Sivas, A. Dori, Dankner Investments and others.

From 1990 to 1996, Israel's GDP grew by approx. 6% a year and reached 96 billion dollars. The turnover of the 465 companies, in which Technion graduates are leaders, is 30 billion dollars, comprising about 31% of the 1996 GDP. These companies export a total of 10 billion dollars, worth about 33% of the total Israeli exports, and have a work force of 230,000 employees.

In a national economy that increasingly emphasizes innovation and leadership, the findings will extend the understanding of how the Technion has been instrumental in generating new enterprises and extending existing ones.



The Contribution of Science to Israel's Industry and Defense

RESEARCHER:

Dr. R. Eshel

The purpose of this survey is to demonstrate the huge impact of Israel's Research Universities and Institutions on the development of Israel's Defense and Industrial capabilities.

Israel ranks today as no 1 in the world in the ratio of advanced academic degrees in science and engineering per capita. (over 6 per 10000 versus 4 in the U.S.).

Their impact on the development of defense and industrial capabilities is continuously increasing, as follows:

Before 1948: The establishment of the energy industries on the one hand, and the emerging of the Military Industry (TA'AS) on the other hand. The latter produced and supplied the much needed explosives, ammunition and arms to the HAGANA forces.

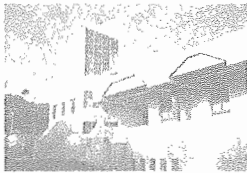
1948 to 1967: This period marked the establishment and enlargement of the Israeli food and chemical industries, as well as the establishment of the science based defense institutions: HEMED (later RAFAEL) and BEDEK (later Israel Aircraft Industries). Shortly after their foundation, they conceived the first missiles and aircraft.

1967 to 1985: As a result of the French arms embargo on one hand, and of the generous U.S. financial and military aid on the other hand, this era was marked by the speedy growth of all the defense industries. The period excelled in a close cooperation between the defense industries and academia, resulting in new concepts and achievements in electronics, electro-optics and advanced materials.

1985 to 1998: The increasing of government-sponsored R&D grants to civilian industries at the expense of the decline of the defense budgets during this period, gave rise to the transfer of well-trained scientists and technicians from the defense to the civilian market, and to the creation and growth of many Hi-Tech Industries and many new start-ups. These are strongly supported by research universities, especially in the fields of communication, bio-technology, medical-engineering and computers.

As a result more than 50% of Israel's industrial work force today is involved in Hi-Tech, yielding more than 65% of Israel's industrial export. Most of the top-echelon of these industries are Technion graduates.

The survey was initiated in October 1997 by Professor Zehev Tadmor, the former President of the Technion, as part of the celebrations marking Israeli achievements in 50 years of independence. The survey was used by Professor Tadmor during his lectures at The Israel Academy of Sciences and abroad, during 1998, and published by the Neaman Institute in August 1998 in two booklets, holding 90 pages each. The numerous illustrations in these publications will be the basis for an exhibition in preparation by the Israel Science Museum at the old Technion campus in October 1999, as part of the celebrations marking 75 years to the opening of the Technion in 1924 in Haifa.



Determination of National Environmental Priorities

PRINCIPAL INVESTIGATOR:

Prof. Y. Avnimelech,

RESEARCHERS:

O. Ayalon, M.Sc.

M. Ben-Meir

Dr. B. Flickstein

Dr. A. Markado

Prof. D. Mehalel

D. Morgenstern

Dr. M. Raviv

Dr. R. Scherf

Prof. G. Shelef

The preservation of the national environment encompasses a very large number of areas, but the national resources (manpower and budget) that can be devoted to this objective are, per force, limited. Israel must, therefore, determine the environmental issues that are more urgent or important than others, and prioritize the dedication of resources accordingly.

The Israel Economic Forum for the Environment, a voluntary consortium of industries, businesses and the "green" organizations, has joined SNI in a collaborative effort to investigate the relative importance and urgency of the environmental issues and to formulate a set of national priorities in dealing with these issues.

More than 10 scientists and engineers, each a noted expert in his field, are charged with developing a set of priorities in the areas of water, air, solid waste, hazardous waste, transportation, urban planning, nature and open space, marine environment, and agricultural systems. Each of the above areas was reviewed by about 10 more experts, so as to develop an accepted and well balanced environmental policy.

The final report is to be issued in March 1999. A concise version of this report will be sent to the various political parties, recommending the inclusion of the findings in their programs toward the forthcoming elections.



Identification of the Major Sources of Greenhouse Gases and Recommendations for their Reduction

PROJECT LEADER:

Prof. Y. Avnimelech

RESEARCHERS:

Energy:

Prof. G. Grader

Prof. E. Shavit

Prof. D. Zaslavski

Prof. A. Shavit

Transportation:

Dr. Y. Shiftan

Dr. L. Tratakovsky

Prof. Y. Zvirin

Industry:

Prof. E. Kehat

Prof. C. Aharoni

Prof. G. Grosmann

Buildings climate:

Prof. E. Shaviv

Prof. R. Becker

Agriculture & open space:

Prof. G. Manor

Solid waste and waste water:

O. Ayalon, M.Sc.

Environmental economy:

Prof. M. Shechter

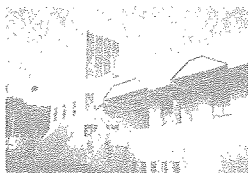
Dr. N. Becker

Environmental chemistry:

Prof. Y. Oref

The Kyoto convention on the Preservation of the Environment is a binding undertaking by all the developed (industrial) countries to reduce their emission of greenhouse gases to prescribed levels. Israel was not included in this category, but volunteered to join the Convention. The Ministry of the Environment intends to submit a National Policy Paper on the reduction of greenhouse gases emission in Israel between now and the year 2050. The Ministry has commissioned SNI to survey all sources of greenhouse gasses emission (industry, transportation and agriculture) to catalogue the sources and propose ways and means to reduce these emissions.

A team of Technion and Haifa University experts was retained to conduct the survey and to propose a national policy.



Organization for the Promotion of Energy Technology

STEERING COMMITTEE:

Prof. M. Sokolov, Chairman

Y. Asia

A. Einav

Prof. U. Mingelgrin

Prof. A. Seginer

M. Shaton

Z. Zamir

OPET ISRAEL (OPETI), was established in January 1998 by a Consortium consisting of the Interdisciplinary Center for Technological analysis and Forecasting (ICTAF) at the Tel-Aviv University, the Israeli EU RTD Center (ISERD), the Samuel Neaman Institute for Advanced Study in Science and Technology (SNI) at the Technion and the Manufacturer's Association of Israel (MAI).

OPETI's mission is to promote efficient use of energy in Israel and to help sustainable economic growth through the use of advanced energy production technologies. OPETI will also help enhance Israeli participation in EU RTD programs on energy and will disseminate information on EU RTD activities and achievements in this field. OPETI takes part in the Israeli DELPHI study to formulate future science and technology policy, and initiates studies and services on technological needs in the energy sector.

The S. Neaman Institute and ICTAF are responsible for the evaluation of technological needs in the energy sector (both in Industry and in academia), the collection and dissemination of documentation and information about energy-related topics and targeted information retrieval and dissemination, aimed at the energy market actors.

In this framework a workshop was organized by the S. Neaman Institute on Incineration and Energy Recovering from Waste on January 21, 1999 in Haifa in which Mr. Regis Vankerkore, of OPET presented an overview on the subject.



Delphi Survey on Technology Forecasting

STEERING COMMITTEE:

Dr. D. Haselkorn, Chairman

N. Arnon

Dr. O. Berry

Dr. K. Flug

Dr. B.Z. Naveh

Prof. D. Izraeli

The Delphi process is a specialized methodology for technology forecasting.

Research and technology policy decisions and entrepreneurial innovation management require a planned, systematic, organized approach:

- that analyses the state of a technology (technology monitoring),
- explores its development possibilities (technology forecast),
- estimates the direct and indirect impacts of its application on the economy, the environment, the health system, society and other areas (*technology impact assessment*),
- assesses these impacts based on defined aims and values, compares other desirable developments and formulates activity and organization possibilities from these (*innovation strategies or technology policy studies*).

The Delphi survey is a way of finding ideas, forming opinions and making forecasts, which systematically screens the insights and assessments of selected specialists. The survey results are presented once, or several times, to the experts involved to allow them to examine their views in the light of the other experts' opinions.

The survey was initiated by the Ministry of Science jointly with the Chief Scientist of the Ministry of Industry and Trade. The survey is executed jointly by the S. Neaman Institute and ICTAF of Tel-Aviv University and it covers 12 technology fields: Materials and Processing, Electronics, Information, Life Sciences, Energy, Environment, Agriculture, Urbanization, Communications, Transportation and Medical Care.



Remote sensing of Air Pollutants in Industrial Areas

ORGANIZING COMMITTEE:

Dr. Y. Goldshmid

D. Izikson

D. Kohn

A workshop on remote sensing of air pollutants originating from industrial areas took place on 26.10.98 in Haifa. Over 100 experts and specialists attended the workshop. The speakers were from Israel and abroad and the topics centered around the main theme of remote sensing of air pollutants. The monitoring network around industrial complexes is aimed at achieving three main goals:

1. Enforcement of emission standards on point and diffuse sources.
2. Enforcement of ambient-air standards outside the plant fences.
3. Detection of a release of hazardous materials and sounding an alarm.

Monitoring air pollutants in and around industrial sites is complicated because of the large number of possible present chemical compounds, the high cost and complexity of the monitoring instruments and the need for highly trained chemists and technicians.

The first lecture by Mr. D. Izikson described the nation-wide monitoring network which operates now in Israel and measures only criteria pollutants. He analyzed the measuring of the data collected to date and described the network as a whole.

Dr. Z. Galin described the present monitoring network at Ramat-Hovav, presented some data and described how the special conditions of Ramat-Hovav hampered the instruments performance.

Mr. Z. Furer described the experience of the Haifa Environmental Unit with the use of the DOAS remote sensor. After six months of operation they are still questioning the reliability of the data.

Dr. Y. Goldshmid, who studied the conceptual design of the monitoring network at the Ramat-Hovav industrial complex, talked about the basic principals of designing monitoring networks in general and for the Ramat-Hovav industrial site in particular.

Dr. G. Russwurm of Man Tech. Env. Technology described the work carried out by the U.S. EPA concerning FTIR for remote sensing of air pollutants.

Mr. A. Arnett of Petris Technology described and evaluated a remote sensing system built and operated by their company around the Tosco oil refinery in San-Francisco California. The system relies on three instruments

at each station: a FTIR, and a UV and a Diode Laser monitors. All the instruments send the data to a central computer that alerts the refinery operators in case of high pollutant concentrations.

Mr. L. Henrikson of Opsis described the instruments that his company manufactures and the experience gained by the use of these instruments in Israel.

Dr. M. Luria of the Hebrew University described various remote-sensing instruments used by the air pollution laboratory of the Hebrew University. Dr. Goldshmid, Mr. Izikson and Mr. Kohn, the workshop organizers, summed up the workshop hoping that it will help to promote the idea of remote sensing of air pollutants in Israel and will serve as a sound basis for the air pollutants monitoring network around the Ramat-Hovav industrial complex.



Israel Center for Negotiation and Conflict Management (ICN)



DIRECTOR:

Y. Shamir

TEAM MEMBERS:

D. Ebenstien, Lawyer

J. Kowarsky, Lawyer

Y. Paler, Lawyer

M. Tsur, Lawyer

D. Cohen

A. Har-Lev

D. Levin

B. Sarig

E. Shurp

N. Tal

Dr.R. Weiman

Dr. A. Vraneski

BACKGROUND

The Israel Center for Negotiation and Conflict Management (ICN) was established in June 1996, at the S. Neaman Institute.

MISSION

ICN is committed to change the social climate and culture, through the improvement of conflict resolution skills of negotiation, mediation, facilitation and cooperative decision making in the public and private sectors in Israel and the region. The approach is comprehensive, including training, academic and professional research in the fields of business, labor, law, education, community, family and the environment. ICN is committed to academic and professional research, training, and high quality education.

INTERNATIONAL ADVISORY BOARD

The ICN Advisory Board is composed of prominent international and Israeli experts and leaders in dispute resolution from academia, business and government including:

From Israel

- | | |
|-----------------------|---|
| Prof. Moshe Arens | - Minister of Defense |
| Prof. Itzhak Gal-Noor | - Former Commissioner of Public Service |
| Prof. David Libai | - Former Minister of Justice |

From abroad

- | | |
|-----------------------|---|
| Prof. Max Bazerman | - Northwestern University |
| Marjorie Corman Aaron | - Harvard University |
| Prof. Kevin Clements | - George Mason University |
| Prof. Brian Mandell | - Harvard University |
| Prof. Robert Mnookin | - Harvard University |
| Prof. Howard Raiffa | - Harvard University |
| Prof. Leonard Riskin | - University of Missouri-Columbia |
| Prof. Larry Susskind | - Massachusetts Institute of Technology (MIT) |

MAJOR ACTIVITIES

In the past year, ICN expanded its activities and services throughout the country. The current activities include:

1. Courses, seminars, lectures, conferences and workshops
2. Research and publications
3. Consultation, facilitation and outreach programs to special interest groups
4. Mediation services, Internship program for mediators

ACTIVITIES during 1998

Workshops and Seminars

- Four mediation workshops for judges in Labor Courts, Magistrate Courts and Family Courts in the country.
- Two mediation workshops for lawyers at the Attorney General Office.
- Lectures, seminars, five workshops for officers at the Police Academy, and one course for top level personnel at the Academy.

Courses

- Thirty courses for mediators during 1998, each consisting of 40 hours of lectures and simulation exercises.
- Courses were in the areas of Labor Law, Family Law and other laws concerning special issues, each of 20 hours.
- Two Negotiations courses, 28 hours each of lectures, case studies and simulations for the MBA classes, Faculty of Industrial Engineering at the Technion.

Mediation Center

ICN helped to establish and supports mediation centers in Haifa and in Tel-Aviv, getting court-referred cases for its mediators and interns from the magistrate court, Labor and family courts. ICN also provided support for the development of mediation centers in Jerusalem and Beer-Sheva.

Internship program

Graduates of the courses for mediators are participating in the internship program at the mediation centers, first by observing the mediation process, and then by co-mediating with experienced mediators in court-referred cases.

CONFERENCES

- Conference "Mediation in Business and Labor Disputes", to introduce mediation to the business community and lawyers, was held on December 10, 1998 Dan Acadia Hotel.

Guests of honor: Minister of Justice Mr. Tzachi Hanegbi

Speakers: **Chief Justice Aharon Barak**, President of the Supreme Court, Israel, **Prof. Robert Mnookin**, (Harvard U.), **Prof. Stephen Goldberg**, (Northwestern U.), **Al Bilik** (AFL-CIO), **Prof. Len Riskin**, (Missouri-Columbia U.), **David Hoffman** (Hill & Barlow), **Roger Dietz**, lawyer.

PROGRAMS FOR SPECIAL INTEREST GROUPS

- **Young Negotiators**

This program is designed to train students in negotiation at the junior-high school levels, in the Jewish and Arab schools. The program is aimed at developing skills for resolving conflicts - including those of ethnic, religious and cultural origin - in a non-violent way, to strengthen tolerance among school students. The program will be conducted in cooperation between ICN, the Ministry of Education and the Program for Young negotiators (PYN) in Cambridge MA.. **A pilot project started in Haifa and the North, December 13, 1998.**

- **Training Program for the Border Personnel - Israelis and Palestinians**

This program is designed to train the people, both Israelis and Palestinians working together at the checkpoints. The purpose of the program is to provide the participants with skills, that will enable them to resolve conflicts and solve problems in a cooperative way. It is a joint effort to facilitate the process of problem solving at the border passes. **Training started in Gaza on November 25, 1998.**

RESEARCH

Applied research in dispute resolution is done in areas of urban and regional planning, environmental issues, law and education.

Building Partnerships

ICN continues to strengthen its collaboration with relevant organizations.

- **Government Ministries:** Ministry of Justice, Ministry of Education, Ministry of Foreign Affairs, Ministry of the Environment and Ministry of Internal Security.
- **Universities and professional organizations in Israel and abroad:**
- Technion - Faculty of Industrial Engineering, Faculty of Architecture (Center for urban and regional planning), Israel.
- Haifa University - Faculties of Law and Education, Israel.
- Tel-Hai College, Israel.
- IIASA - PIN - International Institute for Applied Systems Analysis, Austria,
- The Justice Institute-B.C CANADA, Government & Community Mediation Services of British Columbia-CANADA,
- The Consensus Building Institute (CBI), USA
- Conflict Management Group (CMG), USA.
- Program for Young Negotiators (PYN), USA.
- Conflict Management Australia (CMA), Australia.
- Mediation Works Inc. (MWI), USA.

FOUNDATIONS

- The New Israel Fund, Israel
- The Jewish Agency
- Yad Hanadiv, Israel
- Philip and Sandra Gordon Foundation, USA



Workshops and Seminars 1998-1999

Consortium for Digital Communications:

Presentation of Academic Research, December 8, 1998

Presentation of Industrial Research, December 18, 1998

Consortium on Ground Stations for Satellite Communication:

Presentation of Academic and Industrial Research, December 1998

Quarter Micron Technologies Consortium:

Presentation of Academic Research, June 6, 1998

Presentation of Academic and Industrial Research, December 28, 1998

Physics Laboratory Demonstrations, January 17, 1998

Emission & Flow Standards, March 4, 1998

Remote sensing of Air Pollutants in Industrial Areas, October 26, 1998

Emission & Flow Standards, December 10, 1998

Incineration and Energy Recovering From Waste, January 21, 1999



LIST OF PUBLICATIONS* - 1996-1999

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Shefer D., Matal S., INNOVATION: Technology Assessment, Forecasting, Strategy and Regional Policy, May 1997.

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Frenkel A., Shefer D., "Technological Innovation and Diffusion Models: A Review", Chapter in a book: CS. Bertuglia, S. Lombardo, P. Nijkamp (eds.), Innovation Behavior in Space and Time, Springer Series in Advances in Spatial Science, Berlin, Springer Verlag, Chapter 3, pp. 41-63, 1997

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Abstracts, 1996 IEEE Information Theory Workshop, Israel, June 9-13, 1996.

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Conference Proceedings ECLAS - 1997, European Conference of Landscape Architecture Schools

Presentations at The UN Workshop on Space Communications Technology for Capacity Building, Israel, 21-25 September, 1997.

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- חרמץ מ., ויס ד., מטוס ללא טייס (מל"ט) בעל הנעה משולבת לשהייה ארוכה בגובה רב - בדיקת היתכנות, דצמבר 1996.
- שכטר מ., כרמל ג., אבנימלך י., אילון א., תמריצים כלכליים במדיניות פסולת עירונית מוצקה, דו"ח סופי, ינואר 1997.
- ממן י., ניטור ומניעת זיהום אויר בחומרים אורגניים נדיפים, VOCs, פברואר 1997.
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- כהן ד., שלו א., המחסור במהנדסי אלקטרוניקה ובוגרי מדעי המחשב בחברות המאגדות באיגוד תעשיות האלקטרוניקה, יולי 1997.
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