



Absorption of Soviet
Immigrants at the Technion



Technion — Israel Institute of Technology
THE SAMUEL NEAMAN INSTITUTE FOR
ADVANCED STUDIES IN SCIENCE AND TECHNOLOGY



הטכניון - מכון טכנולוגי לישראל
TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

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THE S. NEAMAN INSTITUTE
FOR ADVANCED STUDIES IN SCIENCE & TECHNOLOGY

מוסד שמואל נאמן
למחקר מתקדם במדע ובטכנולוגיה

**ABSORPTION OF SOVIET IMMIGRANTS
AT THE TECHNION-
ISRAEL INSTITUTE OF TECHNOLOGY**

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The S. Neaman Institute

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Introduction

This report describes the 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.

The Technion views the Soviet immigration as an historic opportunity for the development of Israel, and considers the absorption of these immigrants as a top national priority. The great challenge of the 90s is to secure the successful absorption of Soviet immigrants alongside immigrants from other countries, Israeli army veterans, and Israelis returning home into Israeli society, into Israel's industry, science and economy.

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.

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Background: Aliya 1990

From the establishment of the State until the end of 1990, immigration to Israel totalled 2,033,500 - 41% born in Asia and Africa, and 59% born in Europe and America. Among the 2 million immigrants there were almost 367,000 born in the U.S.S.R., 271,000 born in Romania, 266,000 born in Morocco, 170,000 born in Poland, 130,000 born in Iraq, 75,000 born in Iran, 63,000 born in U.S.A., 61,000 born in Turkey, 52,000 born in Tunisia, 51,000 born in Yemen and Aden, 41,000 born in Argentina and 41,000 born in Bulgaria.

The year 1990 was marked by the large immigration from the U.S.S.R., from which 185,200 persons came - 93% of total immigration. The number of immigrants from the Soviet Union in 1990 was the largest number from any single state to reach Israel in any year.

Continuing the trend which began in 1989, the immigration from the U.S.S.R. increased almost monthly during 1990. About 3/4 of the immigrants arrived during the second half of the year, the record month being December in which about 35,600 persons came.

Age

The proportion of the young, up to the age of 19 among the immigrants of 1990 was 30% (compared with 38% in the Jewish population of Israel in 1989), 40% of the immigrants in 1990 were aged 20 to 44, 18% aged 45 to 64, and 12% were aged 65 or over (10.4% in the Jewish population).

The median age of the immigrants in 1990 was 33.3 years, compared with 27.9 years in the Jewish population.

Sex and family status

The proportion of males among the total immigrants in 1990 was 47%, similar to 1989. The proportion of unmarried among the males aged 15 and over was 20% (compared with 30% in 1989), and among females - 14% (24% in 1989).

Among immigrants aged 15 or over, the proportion of unmarried among males was 19% and among females - 13%.

Occupation

69% of the immigrants in general and among immigrants from the U.S.S.R. aged 15 or over, who came in 1990, were registered as having an occupation abroad. Among immigrants aged 15 or over who worked before their immigration, 38% had scientific, academic or similar occupations (about 25% were engineers and 6% doctors), 34% were other professional, technical and related workers, about 4% were managers or clerks, about 16% were skilled workers or unskilled workers in industry, building or transport, 4% service workers, and another 4% were salespeople and agricultural workers (see Table 1).

Number of years of schooling

The median years of schooling in 1990 among immigrants in general and among immigrants from the U.S.S.R. was 13.5 years, 57% of the immigrants in general and of the U.S.S.R. immigrants had a post-secondary education (13+ years of schooling).

District and locality of first residence in Israel

For 26% of the immigrants, Tel Aviv was recorded as their first district of residence, for 23% - the Central District, 22% the Haifa District, 10% in the Northern district, 11% in the Southern district, 7% in Jerusalem and 1% in Judea, Samaria and Gaza area. For 34% of the immigrants one of the three large cities (Jerusalem, Tel-Aviv - Yafo or Haifa) was recorded as their first district or residence.

Preliminary data for 1991

From January to the end of September 1991 143,820 new immigrants arrived in Israel, 118,800 of whom were from the U.S.S.R. 69% of the immigrants of the age of 15 and above provided details of their occupation abroad. 36% had a scientific or academic occupation, 23% engineers, 4% doctors, 33% other professions, 19%

skilled or non-skilled workers in industry, transportation or building. 51% of the new immigrants had an education of more than 13 years.

Absorption in Higher Education Institutions

According to the Planning and Budgeting Committee's data, the seven institutes of higher education absorbed in 1990/91 the following number of immigrants according to their status:

Staff:	1990 -	45
	1991 -	45
Students:	1990 -	700
	1991 -	3,000
Researchers and post-doctorates	1990 -	430
Students studying towards the 3rd degree	1990 -	190
	1991 -	350

Sources:

1. Central Bureau of Statistics - Immigration to Israel, 1990
2. Planning and Budgeting Committee - Information Unit

Immigrants, aged 15 and over, by sex and occupation abroad (1990)

Occupation abroad	Women	Men	Total
Grand total	82,932	70,463	153,395
Worked abroad - total	51,139	49,581	100,720
Scientific and academic occupation	18,369	20,391	38,760
Academics in life sciences and natural sciences	840	589	1,429
Engineers and architects	9,481	15,345	24,826
Physicians and dentists	3,474	2,758	6,232
Pharmacists and veterinarians	492	121	613
Jurists, social sciences and humanities graduates	3,441	1,424	4,865
Teachers in higher education institutions, in secondary and post secondary institutions	102	52	154
Other academic occupations	539	102	641
Other professional, technical occupations	21,052	13,391	34,443
Teachers and principals in kindergartens, primary and intermediate schools	8,562	1,826	10,388
Auditors, cost accountants and workers in religion	271	89	360
Authors, artists, composers and journalists	2,643	2,503	5,146
Social workers, probation officers and related workers	51	17	68
Nurses and paramedical workers	3,904	445	4,349
Physical sciences technicians, engineering, technicians and practical engineers, systems analysts and computer programmers	3,464	4,795	8,259
Other professional and technical occupations	2,156	3,715	5,873
Managers and clerical workers	3,970	585	4,555
Sales workers	1,584	914	2,498
Service workers	2,845	1,063	3,908
Agricultural workers	28	236	264
Skilled workers	2,224	10,507	12,731
Unskilled workers	800	2,009	2,809
Not known	267	485	752
Did not work abroad - total	27,993	17,601	45,594
Housewives	1,464	6	1,470
Students	6,690	7,539	14,229
Pensioners, dependents	19,836	10,037	29,873
Others	-	19	22
Not known	3,793	3,263	7,056

Absorption of Immigrant Students Into the Technion

Undergraduate Studies

The Office of Admission edited a special booklet in Russian that includes Admission Regulations and sample entrance examinations to the Technion.

Each candidate for entry to a course of study at the Technion is interviewed by a counsellor, aided by an interpreter in the Office of Admissions. After evaluating the candidate's qualifications, he or she is directed either to the Technion's Center of Pre- University studies or to begin official procedures for direct admission to the Technion as a freshman or upper classman. The later are admitted only after three months of a preparatory course, unless they are fluent in Hebrew. Candidates may apply directly for entry or are referred by the Ministry of Absorption.

If a candidate is considered to be qualified to enter immediately on a program of study at the Technion, his/her official scholastic documents are passed to a committee composed of senior faculty members who examine the validity of the candidate's qualifications. The candidate is then interviewed by the senior faculty member which each department has assigned to assist the new immigrants. Following this procedure, the Office of Admissions decides whether to accept or reject the prospective student.

A survey conducted by the Center for Assessment in Higher Education in 1991 among 1800 candidates to university studies, shows that 22.6% of the immigrant youths are interested in medicine, 18.7% in engineering, and 14.7% in computer studies. These findings contradict former cliches that the majority of the Russian immigrants are interested mainly in engineering studies. The same pattern is seen at the Technion. The main priorities of immigrants are Computer Sciences, (17.4%), Medicine (14.4%), Electrical Engineering (11.9%) and Mathematics (7.2%), versus the priorities of Israelis that are expressed in major demand for Architecture (18.6%), Medicine (18.7%), Electrical Engineering (11.1%) and

Industrial Engineering and Management (8.3%).

The Technion applies the same criteria for admission to all applicants, Israelis or new immigrants although the criteria for admission for non Israeli high school graduates are now under reconsideration.

In order not to absorb the Russian new immigrants at the expense of Israeli candidates the Technion increased its intake as from 89-90 to 90-91 by 400 undergraduate students as follows:

<u>Year</u>	<u>Candidates</u>		<u>Enrollements</u>	
	<u>Total</u>	<u>Immigrants</u>	<u>Total</u>	<u>Immigrants</u>
1989/90	3,800	N.A.	1,690	60
1990/91	4,800	615	2,057	362
1991/92	3,800	907	1,315	370

(Winter semester only)

Graduate Studies

During 1990/91 the Graduate Studies School absorbed 182 students (50% for the first and 50% for the second semesters). This year 90 were absorbed for the winter semester. The most popular departments were: Medicine, Civil Engineering, Electrical Engineering, Computer Science and Mathematics.

The new immigrants comprise 25% of the total of new students.

Technion Centre for Pre-University Studies

Pre-University Courses for New Immigrants

The Technion immigrant pre-academic course is an integral part of the Technion Centre for Pre-University Studies. The students are mostly young, high school graduates in their countries of origin who intend to continue their academic studies at Technion. The pre-university courses prepare them for the Technion entrance exams and for success in their future studies. As of this year, the Ministry of Absorption (Students Administration) finances studies for new immigrants who have finished Hebrew Ulpan and have been residing in Israel for over 5 months.

The course takes 10 months, and is conducted in Hebrew. The courses open twice yearly - in August and in February. The subjects studied:

Hebrew	(levels B and C)
Mathematics	(5 learning units)
Physics	(4 learning units)
English	some of the new immigrants don't know any English. The course is intended to improve knowledge of the English language

Hebrew - the program is divided into two periods:

- I - Intensive Hebrew Ulpan - 30 weekly hours for 6 weeks
- II - 12 weekly hours for four months.

Mathematics - Algebra, Integral and Differential Calculus, Analytical Geometry, Plane Geometry, Solid Geometry, Trigonometry, Probability, (14-16 weekly hours)

Physics - 12 weekly hours of mechanics, electricity and optics. At this stage the new immigrants do not take part in the laboratory courses.

English - Improvement of the knowledge of English. Studies are conducted at the personal level of each student. (approximately 8 weekly hours). The level of knowledge is determined by a classification test.

Apart from studies certain social and cultural activities are conducted, including excursions to get to know the country, with the participation of the Student Administration.

Refresher Courses - for students who know all the material in mathematics. A three month intensive short course is conducted in preparation of the national mathematics exam.

Acceptance Requirements

1. The new immigrant present his/her documents to the Technion Office of Admissions. The documents are examined by a special committee, which approves their candidacy.
2. Entrance examinations - Mathematics and Hebrew.

The Hebrew test is destined to determine the level of the students' knowledge. The classes are divided according to the results of this test.

Mathematics - A comprehension test in mathematics at the level of 3 learning units. This is an acceptance requirement to the course.

Later on a classification test in English is conducted, according to which the English classes are divided.

The Student Population

Until last year most of the students from abroad came to Israel on a temporary basis, mostly alone, and their families remained in their countries of origin.

Last year the massive immigration from the Soviet Union started and 90% of the student population were Russians. Mostly are high school or professional school graduates, ages 17-18.

The financing for their studies comes from the Student Administration (Ministry of Absorption and the Jewish Agency). Those who do not reside in Haifa or its vicinity get lodgings in the Jewish Agency Hostels.

There are two Students Hostels in Haifa - one on Hanita Street in Neve Sha'anana and the other in Hameginim Street. Until now each student received a small scholarship of 140 NIS per month. This year these scholarships have been suspended due to budgetary restrictions.

Until this year the new immigrants received funding for a year of pre-university courses and four years of university studies. As of now the financing is for two years only including pre-university studies.

The rest of the course students come from France and South America, and very few from other countries (Morocco, Belgium, Italy and Turkey). These are temporary residents.

At the end of the first semester, there is a follow-up test and suitable students are directed towards studies at Technion, or alternative courses. Many of them are accepted at the National School for Handassaim.

Some of the students previously accepted by Technion achieved high results in the national mathematics exam (150 points out of 150) and were included in the list of exceptional students this year. (A third of the recipients of the excellence scholarships were graduates of this pre-university course).

Special Problems

The main difficulty for these students is not the subject matter, but the Hebrew language. Students are helped by Technion students, and by immigrants from Russia paid by the Pre-University Centre.

There are extreme economic problems within the families of the students - some have finished Ulpan but have not yet found employment and their economic situation is difficult. The burden of travel and other expenses is very heavy on the family budget. Students must accept any work available, and are taken advantage of salary-wise.

Until this year we helped needy students by scholarships gathered by The Israel Technion Society. No such scholarships were available this year.

Number of students and percentage of acceptance to Technion

<u>Year</u>	<u>Total</u>	<u>Graduated</u>	<u>Total accepted</u>	
			<u>No.</u>	<u>%</u>
1990	150	63	29	46
1991	183	72	59	81.9
Jan.Refresher	34	23	18	78.26
Jan.regular	139	not yet finished		

Faculty and Scientists Absorption

Data of Ministry of Science and Technology indicate that during the past two years 5500 scientists have immigrated to Israel, 2,000 of whom were absorbed in the scientific system, 500 have applied to industry on their own and about 3,000 are still waiting to be absorbed in the Israeli economy.

Senior Faculty

Technion has absorbed during 1990/91 10 new immigrants on the tenure track, and 6 during 1991/92. Some of these were absorbed with the help of the Beracha Fund (2 in mathematics and 1 in chemistry) and with the help of the Rashi Fund (1 from the USA, 1 from France and 1 from the USSR).

Immigrant Scientists and Engineers

This track includes 150 new immigrants, 70 post-doctorants and 80 senior scientists. Their absorption is financed by the Center for Absorption in Science at the Ministry of Immigration Absorption. Most of them are employed at the Department of Civil Engineering, Mechanical Engineering, Chemistry and Aeronautics.

New immigrants, with a Ph.D. are accepted for a period of one year with a possibility of extension for one more year. Each department has appointed a senior faculty member who deals with their absorption starting from examination of their papers, assistance in their employment within existing working groups. Some have already moved on to work in industry.

The S. Neaman Institute Activities

The S. Neaman Institute was active in the following aspects of immigrant absorption at the Technion:

1. Report on Technion's Role In the Absorption Process

A report entitled "A proposal for Technion's Role in the Absorption Process" by Professors E. Nissim and Z. Tadmor (in his previous capacity as Director of the Neaman Institute), in May 1990, was submitted at the request of Technion President to Technion management. The report analyses programs for absorbing immigrant students, scientists and research engineers as well as plans for retraining courses and entrepreneurial projects. As a result of the report, a "Technion Absorption Committee" was appointed by the President to implement the proposals.

2. Survey on absorption of Soviet engineers

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

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

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

While 87% of the sample expressed a preference to find employment in their field of specialization, 88% said they were willing to switch fields if necessary. Computer studies was an especially popular field among the Soviet immigrants, and 38% of

those who expressed interest in further training specifically mentioned this field. Some 63% of those surveyed had no familiarity with computers, with the remainder good familiarity. Knowledge of both English and Hebrew, a must in today's Israeli industrial environment was poor. 78% of the immigrant engineers questioned had no knowledge of Hebrew and 75% rated their knowledge of English as poor to non-existent.

3. Retraining Courses

A methodology for planning retraining courses, to adjust engineers to the requirements of a Western market economy was developed by Professors M. Heymann and A. Lempel. The first application of this program is a course for Electronic engineers. The course is carried out with the participation of Elbit Industries, which has undertaken to employ the top graduates of the course.

The S. Neaman Institute participated in preparing an additional course for retraining in insurance for mathematicians, Prof. A. Zaks serves as Academic Advisor to the course. The S. Neaman Institute supplied equipment and literature to the participants.

4. Textbooks on Hebrew for Technology and Science for New Immigrant students, engineers and scientists

The S. Neaman Institute is publishing two text-books for the study of Hebrew in Science and Technology for new immigrants (intermediate and advanced levels). As mentioned in the survey conducted by Prof. M. Moore, the majority of new immigrants have no knowledge of Hebrew and the books on Hebrew for Technology and Science serve as textbooks for engineers, scientists and students.

In addition, ongoing projects include planning entrepreneurial courses for immigrant engineers, and an International Symposium on the effect of Immigrant Absorption on the Quality of Life in Urban Areas. This conference is projected for January 1993.

The S. Neaman Institute has implemented absorption by employing Dr. David Reti, who recently arrived from Hungary.

Retraining Courses for Olim: from the Classroom to the Workplace

According to the data presented in table 1, approximately 40,000 engineers, architects and academics in life and natural sciences immigrated to Israel in 1990. They have been educated and trained according to methods and needs of the Soviet Union, that differ from the western scientific and engineering practices prevailing in Israel, and from the needs of the Israeli economy. The Technion, being the major institution for engineering education in Israel, offers the new immigrant academics and engineers courses and study programs aimed to qualify them to the needs of the Israeli economy. The courses are organized in two frameworks:

- a) Technion's Unit of Continuing Education and External Studies.
- b) Department of Teacher Training in Science and Technology.

The courses are partly financed by the Ministry of Labor and Welfare.

These activities place a heavy organizational and financial burden on Technion. The best teachers serve as teachers and coordinators for these courses. There is a shortage in of classrooms and installations which are already in shortage in view of the expansion in student numbers in undergraduate and graduate studies. The motivation of these students is very high and they make great effort to succeed in their studies in spite of the heavy load of material and the new language. Most of these new immigrants are also not fluent in English, which puts an extra burden on them during the course of their studies.

Details of Courses within the framework of the Technion's Unit of Continuing Education and External Studies.

1. Retraining Insurance Course for Mathematicians

Academic Advisor: Prof. A. Zaks (Mathematics)

Duration: 6 months. **Starting Date - August 1991.**

28 mathematicians participating, out of 600 applicants.

Target of the Course: Retrain the mathematicians to work in insurance companies as actuar assistants.

Subjects of study: Israeli financial market and stocks and bonds; introduction to computers, computer languages, actuary calculations, probability and statistics, introduction to economics, analysis of financial statements, selected topics in insurance. The S. Neaman Institute supplied equipment and literature to the participants.

2. Retraining Course for Chemical Engineers

Academic Advisor: Prof. A. Or-EI (Chemical Engineering)

Duration: 6 months **Starting Date - October 1991.**

26 participants out of 200 applicants.

Target of the Course: Retrain chemical engineers in new technologies, so they can be absorbed by the Israeli Chemical Industry.

Subjects of study: Process calculations, fluids, heat transfer and engineering applications, thermodynamic applications for chemical industry, economics in the chemical industry, computer applications, dynamics and process control, plant design, chemical engineering laboratory.

3. Retraining Course for Electrical Engineers (Jointly with the S. Neaman Institute)

Academic Advisors: Prof. A. Lempel and Prof. M. Heymann (Computer Science)

Duration: 6 months **Starting Date - October 1991**

29 participants out of 500 applicants.

A methodology for retraining courses to adjust engineers to the requirements of a Western market economy was developed by Professors M. Heymann and A.

Lempel. The first application of the program is in this course. Selection of applicants was done by the S. Neaman Institute. The course is carried out with the participation of Elbit, who has undertaken to employ the course graduates for professional training after the course.

The course includes two stages:

Stage I - about 350 hours - given at Technion according to a program outlined by the academic advisors.

Stage II - about 300 hours - will take place at Elbit.

Subjects of study: Computers and numerical systems, introduction to analogous electronics, introduction to computers, Quality control, economics, organization and labor relations, Production engineering and stock control, etc.

4. Retraining Course for Surveyors (in Tel-Aviv)

Academic Advisor: Prof. Ch. Pappo

Duration - 1 year Starting date - October 1991

Graduates will be employed by the Surveying Department of the Ministry of Labor.

In addition to these courses the Center intends to open two new courses:

1. Update for transportation and road engineers
2. Update for electrical and electronics engineers (with the participation of Intel).

**Courses within the framework of the Department of Teacher Training
In Science and Technology.**

The following courses take place within the department:

Name of Course	Dates	Duration in weeks
Retraining engineers for teaching electricity and electronics	4.12.90-31.1.92	22
Retraining engineers for teaching mechanics	4.12.90-31.1.92	18
Training Chemistry teachers	10.2.91-31.1.92	22
Training Physics teachers	10.2.91-31.1.92	27
Retraining engineers for teaching technology for 9-11 grades	4.11.91-31.8.92	27
Retraining Ph.D. graduates to teach electronics	10.11.91-31.8.92	14
Retraining Ph.D. graduates to teach mechanics	10.11.91-31.8.92	12
Training teachers to teach mathematics for 9-11 grades in Haifa	4.11.91-31.8.92	27
Training teachers to teach mathematics for 9-11 grades in The Northern Region (in collaboration with the Yizrael College)	21.11.91-31.8.92	27

Moreover the department was asked to grant guidance for courses carried out in colleges:

- a. Tel-Hai College - Retraining immigrant doctors for teaching of biology.
- b. Yizrael College (Upper Nazareth)- Training immigrant teachers for teaching of Mathematics
- c. Beer-Sheva: Retraining M.Sc. and Ph.D. graduates to teaching

General structure of the courses

- a. Hebrew - 300 hours
- b. Teaching and professional training 600 hours
- c. Compulsory Hebrew studies 350 hours

Total 1250 hours

The graduates will get a teaching certificate, the others will receive a certificate detailing their studies and achievements which will enable them to obtain a temporary teaching permit of the Ministry of Education.

The courses take place twice a week during the morning and twice a week during the afternoon. Students are attached to high schools, some for part-time jobs and some for practical training. Each teacher has a tutor and tutors have professional trainers.

The 'Incubator Program' in the Department of Mathematics

The current waves of Soviet immigration include a particularly large number of highly talented mathematicians, far more than could be possibly hoped for absorption in regular positions at Israeli universities. The State of Israel in general and the Technion in particular feel a special obligation to find ways and means for this great and precious reservoir of brainpower to express itself.

As of August 1, 1991, The Technion's Department of Mathematics implemented - with the approval of the Ministry of Science - an "Incubator Program" for new Soviet immigrants mathematicians, the purpose of which is to retain the most potential of these mathematicians within the framework of the Technion. The Technion was the first to start a program of this nature but other Israeli universities soon followed suit, including Tel Aviv University and Ben Gurion University.

The program was made public in several ways:

1. The Technion Department of Mathematics sent out posters to all major Soviet universities, advertising scholarships for post-graduate studies.
2. Notices were sent out to the American Mathematical Society advertising scholarships for post-graduate studies for new Soviet immigrants.
3. Staff of the Technion's Department of Mathematics used their own personal connections with faculty members within mathematics departments of Soviet universities.
4. The Technion received information from other Israeli universities as to the presence of prominent new Soviet mathematicians who were at the time unaware of the "Incubator Program" within the Technion's Department of Mathematics.

To-date, over 200 academic mathematicians have applied to this program, both from the Soviet Union and from Israel. The Department has been able to accept only the most extremely talented individuals. Some of the remainder will especially

enhance Israel's secondary education system together with the many already retrained immigrant teachers. Others will integrate in some way or another into the Israeli industrial market, making use of their academic skills, yet at the same time, many others will unfortunately be forced to turn to other fields of work for lack of suitable employment opportunities in their specialty.

The Technion's Department of Mathematics chose 15 participants from the "Incubator Program" to stay within the Department for a period of two years. These participants excel academically and have at the least a Doctorate degree. They arrive at the Department after a 5-month ulpan program and have an average age of between 35 and 40.

All facilities of the Department are available to the participants - library, computer facilities, secretarial services etc. They may participate freely in the Department's seminars, participate in research activities, both within the Department and within other Technion departments, and several may even help in teaching activities. Upon completion of the 2-year program, only a small percentage of the participants will be able to join the Department; most will be required to seek employment within the Israeli industry.

Organized courses are provided to the participants and they include:

1. Advanced Hebrew instruction
2. Technical English
3. Special computer courses
4. Other topics which will help them adapt to Israeli industry.

The advantages of the "Incubator Program" are as follows:

1. To the Department of Mathematics:

The Soviet mathematician participants are "visitors" of a very high level. They contribute to research activities in the Department, they write articles; and give seminars on unique and varied topics of interest to both staff members and students. The Department has the opportunity to observe these participants very carefully to get to know them on a more personal level during their 2-year stay, and

to finally make the difficult decision as to the acceptance of a choice few to the Department staff.

2. To the Technion:

Several of the participants dealing with research topics applicable to other engineering faculties, will be able to contribute this wealth of knowledge to those specific faculties involved.

3. To Israel:

Without a program of this type, the knowledge and experience of these new Soviet immigrant mathematician participants would literally be "lost" to the country. This 2-year program will provide a suitable "incubation" interval which will help them tremendously to adjust and prepare to be incorporated into the Israeli industry.

4. To the new Soviet immigrant mathematician participant

Being a participant in the "Incubator Program" provides the new immigrant with the ideal opportunity to continue in his/her research and expansion of his/her scientific knowledge. This interim period before entering into the working world will provide him/her with an appropriate and familiar academic environment so that he/she may better foster interaction between himself/herself and his/her potential employers.

TEIC - Technion Entrepreneurial Incubator Company Limited

TEIC Ltd. is a Technion undertaking which assists in the establishment of enterprises based on high technology and provides entrepreneurs - mainly new immigrants - with facilities for the development of their inventions and ideas. TEIC employs highly skilled immigrant scientists and engineers in these enterprises.

The Technion was directly involved in establishing TEIC to harness the know-how of the experienced Soviet scientists who are part of the current massive wave of immigration to Israel. TEIC provides incubator facilities to enable immigrant scientists to develop their own ideas into commercial projects.

TEIC is supported by the Office of the Chief Scientist of the Ministry of Industry and Commerce and several U.S. Zionist Federations. Representatives of major Israeli industries and Technion scientists are involved in guiding the projects. Outside investors are being given the opportunity to get in on the ground floor of a wide range of new industries based on the technologies that are the Technion's expertise.

TEIC provides funding for initial research and development projects and bridge financing over the interim period necessary for commercialization. It actively seeks investment for each specific project.

Strict criteria have been established for accepting a project.

All projects must be high-tech and must have:

- ◆ Commercial potential
- ◆ A development timetable of not more than two-to-three years
- ◆ Export potential
- ◆ Immigrant employees

Involvement of senior Technion faculty members in the day-to-day running of the projects, as well as the participation of Israelis and veteran immigrants helps the new immigrants to adjust to Western standards.

Projects accepted by TEIC receive the following services:

- ◆ Help with business planning and management
- ◆ Assistance with the development and implementation of financing, marketing and manufacturing strategies
- ◆ Provision of professional and manufacturing services.

Hereinafter is a list of Research and Development status activities and capabilities in TEIC Ltd.:

* **Center for Special Glass development. Areas of R&D in this center are:**

1. GLASS AND FIBERS FOR RADIATION DETECTION

2. UV-VIS SHIFTER GLASS

Glass capable of absorbing UV radiation and shifting it to VIS.

3. HIGH TEMP HIGH PRESSURE GLASSES:

Development of materials that are:

- Super durable (for high-pressure apparatus).
- Super hard (for abrasive materials).
- Super thermo insulating (for atomic techniques).
- High temperature superconductive on the basis of glass system.
- Super compatible layers for integral optics.
- Cladding, protective and luminescing on the basis of glass and glass-ceramics.
- Super radiation:

- radiation resistance
- radiation sensitive
- radiation active (accumulative and transforming of radiation energy for filters, detectors, etc.).
- Super fibers:
High aperture fibers for fiber-optics. Special fibers for medicine (e.g. Cateters)
- Multifunctional glass-ceramics (technical and biological).

* **Center for Research and Development in the Field of Tribology**

Areas of reseach in the center are:

- Laps with plastic coating.
- Development of artificial joints.
- Technology of vibration rolling.
- Dynamic simulation of ringless pistons for improved performance.
- Engine's cylinder sleeves with regular micro-relief.

* **Development of Fine Chemicals**

The scientists are involved in the synthesis of biotechnological techniques of optically pure compounds, using microorganisms and enzymes. The optical purity of a chemical is particularly important for the pharmaceutical industry.

- * **Development of Circumference Agricultural Sprayer** for fields of crops (primarily cotton and corn). The development of a new sprayer will enable spraying inside the foliage and covering both sides of the leaves, thus ensuring effective protection against pests.
- * **Development of instruments for implementing horizontal motion at a very high level of precision, of about 50 nanometers.** The instrument is targeted to the microelectronic industry and to modern microscopes technology.
- * **Development of a novel strain gauge,** which transforms the effect of mechanical strain on the propagation of elastic waves in heterogeneous solid

media into an electrical signal proportional to the strain. This device, when developed, can be used to measure very high strains such as: metal rolling mills, large presses, jet engines and cranes.

- * **Development of new technology for production of new materials (ceramics and monocrystals) with emphasis on oxide, fluoride, oxyfluoride compounds of niobium and tantalum.**

- * **Development of hydrolysis of single-cell protein, and on its basis to produce proteinaceous base for microbiological culture media, a starter feed for industrial fish farming and aquarium fish.**

- * **Development of an instrument to treat Psoriasis-skin disease by special UV radiation.**(In collaboration with Professor Friedman of the Rambam Hospital).