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Continuing  
Education  
and the  
Extended  
Technion



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**CONTINUING EDUCATION**  
**and**  
**THE EXTENDED TECHNION**

A Report

Prepared by

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## INTRODUCTION, RECOMMENDATIONS AND CONCLUSIONS

This report was prepared for the Samuel Neaman Institute for Advanced Studies in Science and Technology in accordance with the following terms of reference:

"To produce a comprehensive report on Continuing Education and a concrete and detailed proposal for an administrative framework for Continuing Education at the Technion. This document would serve the Neaman Institute in the establishment of a mechanism for organizing continuing education and as a guideline for what courses to give, in what framework, with what frequency, lecture and administrative needs, etc."

The author of this report has interpreted these terms of reference in a rather liberal manner. In addition to reporting on Continuing Education, he has put this within the framework of the role of the university, its mission and its purposes. Thus, a broad construction of the term "continuing education" is used. It is interpreted as including all areas of education, other than for the undergraduate and graduate degrees, which are, properly, part of the public service mission of the Technion. The report is written in a rather discursive manner but an attempt is made to tie the various topics together at least by virtue of the order in which they are presented.

Because of the fact that "This document would serve the Neaman Institute . . ." the report considers the manner in which the Neaman Institute can function in this area as part of its goals while, at the same time, assisting the Technion in furthering its goals. Some specific and concrete proposals and recommendations are made.

Before proceeding with recommendations and with the body of the report there is one statement, introductory as well as summary which will appear and reappear in this report in various guises and forms. This statement, which represents the firm and considered opinion of the author of this report follows - :

The Technion will be abdicating its responsibilities to its graduates, to the professions to which it supplies practitioners, and to the country if it does not move forward in the most positive, realistic and serious manner in all matters related to Continuing Education. The Technion is a university, it must act like a university and it must be perceived to be a university. Its presence must be felt in the entire community

- it must become "visible" not only within its immediate community but also in the entire country.

## RECOMMENDATIONS AND CONCLUSIONS

I - The S. Neaman Institute for Advanced Studies in Science and Technology, should, through the various avenues open to it, seek the adoption of an appropriate statement by the Board of Governors concerning the importance of continuing education. A statement such as the following, which is a paraphrase of the policy statement of one of the important professional societies in United States, would capture the essence of its philosophy and importance:-

"Practitioners of the various professions, professional people all, have a personal responsibility to maintain and enhance their skills which identify them with their professional practice. To satisfy this requirement they must engage in a program of educational activity which will continue throughout their professional careers. While the primary responsibility for continuing education rests with the individual, the employer of professional people has a responsibility too - to ensure that the professional will have both the opportunity and the encouragement to maintain his professional competence through continued study."

II- The S. Neaman Institute for Advanced Studies in Science and Technology, should, through the various avenues open to it, seek the adoption of an appropriate statement by the Board of Governors concerning the role and the responsibilities of the Technion with respect to continuing education. The statement should point out that the Technion, which prepares practitioners for a number of professions and, as a consequence, also represents these profession, must assume leadership in providing for the continuing and lifelong education of these professionals. The Technion would be abdicating its responsibilities to its graduates, to the professions to which it supplies practitioners, and to the country if it did not assume these responsibilities and did not move forward in the most positive, realistic and serious manner in the matter of Continuing Education.

III - Strong policy arguments can be made for subsidizing continuing education. It is a major contributor to the shaping of the postindustrial society. Career skills and knowledge, not only of the professionals but also of the entire working population, must be constantly updated. The ultimate resource of the country is the human resource and this resource should be developed to the utmost. Technion and the S. Neaman Institute should take the lead in action to convince the government and the citizenry of the importance of this resource and to demonstrate to the

government and to the citizenry the importance of the human resource and the ultimate good that this resource can bring to all.

IV - The success of the "French Experience" in bringing continuing education to all for the ultimate benefit of all should be learned. One of the conclusions that may be reached is that the time has come to revise the present interpretation of the existing Education Funds, part of many labour agreements, so that the funds will, indeed, be used for education.

V - The Technion is a university, it must act like a university and it must be perceived to be a university. Its presence must be felt in the entire community - it must become "visible" not only within its immediate community but also in the entire country. The Technion should become an "Extended Technion".

VI - Public service activities of an "extended" Technion should include programs to expand the awareness and understanding of public issues which can affect the country and its population; programs aimed at enhancing the cultural and intellectual life of the community; programs aimed at disseminating knowledge and fostering an awareness of developments and activities which can have effects and consequences on the community and on the country. It should seek and develop avenues to foster collaborative programs and activities between the community and the campus.

VII - The goals of the "extended" Technion, the Technion Extension, should be to 'add value' to the economic and institutional infrastructure of Israel through general education, knowledge dissemination, dialogues on public policy, and creative human resources development strategies. The Technion thereby would be enlarging the productive capacity of the society of which we are a part and would play a vital role in building the socio-political infrastructure and the human capital of Israel.

VIII - The goals of a Technion Extension, as laid out here, are almost exactly in line with the aims and goals of the Samuel Neaman Institute for Advanced Studies in Science and Technology at the Technion. It is proposed that the S. Neaman Institute could take over the responsibility for these activities and, with little doubt, could provide the atmosphere and ambience necessary for extension activities and goals. Its name indicates that it deals with advanced studies. It would free the Technion of immediate responsibility for these matters.

IX - An appropriate system of academic supervision for Technion Extension under the aegis of the S. Neaman Institute could be supplied by a Dean of Technion Extension who would report directly to the President of the Technion. The selection and election procedure proposed in this report would result in the Dean drawing his academic authority from the Senate while his status as a Dean would be almost equivalent to that of the vice presidents. The Dean would have to work very closely with and in cooperation with the Director of the S. Neaman Institute from whom he would draw his administrative authority.

X - The anachronism of continuing education at the Technion being under the administration of a non-academic unit, the Mussad, should be ended. The appropriate solution would appear to be the transfer of the Division of External Studies from the Mussad to Technion Extension.

XI - The Technion should apply for institutional membership of the Council on the Continuing Education Unit.

XII - The appropriateness of Division of External Studies programs for youth should be carefully examined. It is the present opinion of the author of this report that the Division of External Studies is not the appropriate venue for such programs and that other, more appropriate, venues exist at the Technion or could be developed.

XIII - The present professional staff of the Division of External Studies, the Course Coordinators, possess few of the requirements for the positions they hold. It is recommended that this staff take advantage of the continuing education possibilities in the Division to enhance and improve their capabilities and to eliminate their deficiencies. Other and additional possibilities to remedy their deficiencies also exist within the Technion or at other institutions of higher education.

XIV - The Senate of the Technion should give serious consideration to the problem of faculty development especially in view of the fact that a relatively high proportion of its faculty completed their formal studies some years ago. Intensive, compressed courses designed for faculty could help the faculty become familiar with material in areas contiguous to their own technical area of expertise.

## THE ROLE OF THE UNIVERSITY

What is the role of the university in society? It was put quite succinctly at the first meeting of the National University Continuing Education Association (NUCEA) in 1915 by Charles Van Hise, then president of the University of Wisconsin, who stated that it is a "duty of the university to carry to the people the knowledge which they can accumulate for their betterment." (Brademas, 1985, p. 12)

The (U.S.) National Commission on Excellence in Education included a goal (as quoted by Brademas, 1985): "In a world of ever-accelerating competition and change in the conditions of the workplace, of ever-greater danger, and of ever-larger opportunities for those prepared to meet them, educational reform should focus on the goal of creating a Learning Society... that affords all members the opportunity to stretch their minds to full capacity". Not only the decision-maker in the government office but also the citizen must realize that, to render judgments on issues of public policy, he will more and more find that these decisions require a mind-stretching command of complex economic, political and scientific knowledge.

Much earlier, during the first decade of this century, the president of Harvard University stated: "It would seem to be the duty of every institution of learning in the country to use its resources for the benefit of the surrounding community, so far as that can be done without impairing its more immediate work." (Freedman, 1987, p. 40)

The needs of the "community" are quite clear. Old-fashioned industry is yielding to the newer technologies and society is realigning its priorities. It is clear that the modern society will become a technological, automated, information-based society. Production has ceased to be an end in itself. In an economy where computers and robots do the actual labour of producing goods, gross production becomes a by-product of the effectiveness of its control system.

In an information economy, the concepts of capital and investment take on new meanings. Capital can no longer be defined only as the money and property used in running a business. The decision-makers must realize that people are a major - in many cases, the major - capital in the economy of society's most critical institutions. At one time it was reasonable to consider hiring, training and replacing people. But, the more sophisticated the technology becomes, the more rigorous are its demands on both its operators and its managers. People, as possessors of the training and ex-



perience necessary for a highly technological economy, become a major investment; they cease to be a feature of the production process and become a strategic resource.

In the information and high technology age no one can stop learning at the age of twenty five, nor can the technological society tolerate such a possibility. One of the important corollaries is that the structure and goals of the university must undergo change. No longer can the university pattern itself mainly on the basis of students in the age bracket of 18-25 years of age who have come to the university to prepare themselves to enter a career in one of the professions. The institutions of higher education must realize that it will have to meet the needs of the adult learners who, if patterns that are developing in the United States also develop in Israel, will represent a majority of the students. This trend is most obvious in the engineering and health professions, in business and in management -- areas in which the Technion is active as a teaching institution -- and in law.

Most university administrators as well as faculty persist in assuming that the average university student is twenty five years of age or younger and is engaged in full-time studies. However, the number of students who are engaged in part-time studies at the Technion, for example, through the Division of External Studies is similar to the number of full-time enrollees. In addition to this there are other providers of continuing adult education - industry, the military, etc. - and the numbers in toto of their students are large, indeed.

The real key, therefore, to the immediate future of higher education lies in the hands of the leadership of the universities. In an atmosphere of accelerating social and economic change, it is obvious that higher education must change and is changing. Higher education and its institutions must continue in their work of unlocking the secrets of nature and of human behaviour. But they also must reconfigure their structure and direction under the prime necessity to understand the attitudes, needs, desires and motivations of the adult learner. Most of the talents and facilities required are already available and intelligent direction of the necessary changes can lead to the changes in the university being accomplished easily and without disruption to major research and instructional programs, "...without impairing its more immediate work."

Many of the persons enrolled in continuing education are enrolled because their major emphasis is on the practical rather than on the academic, on skills rather than on knowledge and information, and on the applied rather than on

the theoretical (Johnstone and Rivera, 1965, p. 3). Although the study cited is already more than twenty years old and may not, in its details, reflect the sophistication of today's adult student, the practical bent of the student in continuing education programs is clear. It is also clear, however, that today's full-time student is more materialistic and career-focused than his predecessors of a generation ago (Freedman, 1987, p. 51).

It is almost unarguable that it is not the job of the university to train for specific job-related skills but rather it is expected to prepare its students by equipping them with aptitudes suited to a broad range of careers. Thus, the emphasis, also in the professional schools of the university, is on theory and breadth.

After the university has provided the necessary body of theory and analytical skills, continuing education can take over the role of applying this theory and these skills to various career specializations. The fact that the practical applications are not as broadly-based nor as theoretically-oriented as is full-time university instruction does not mean, however, that their study is any less rigorous or demanding. The student in continuing education does not, necessarily, operate at an inferior level of quality as compared to the full-time university student.

The statements of the mission of every university, not excepting the Technion, include, in one guise or another, the notion of public service along with research and teaching. Continuing education is one of the tools by which the university can discharge its mission of public service. The continuing educator must, however, do more than merely extend the university's curriculum to the general public. He must extend into the community the idea of the university whose core is the task of equipping people to deal effectively with difficult and complex ideas through the method of reasoned analysis, based on a command of broad-based knowledge.

## WHY IS CONTINUING EDUCATION NECESSARY

There is a rapidly-growing demand for continuing education and/or adult education. As will be pointed out in more detail later, this report will deal primarily with the advanced levels of continuing education, with what has been termed continuing higher education (CHE). The numbers of adults in Israel participating in CHE already exceeds the number of full-time students enrolled at the Technion. The necessity for continuing education for the professional practitioner is so apparent that it should need no justification or elaboration. The reasons stem, of course, from the rapidly developing and changing technology of the modern world. And not only are these developments rapid but also the rates of change are increasing.

The remarks that follow will examine some of the consequences and conclusions which must be drawn based on the situation as it exists and as it is developing in the engineering profession. These remarks and conclusions apply almost equally well, however, to the other professions taught at the Technion.

The general patterns of higher education have not changed appreciably in the last 50-100 years. The well-established and traditional pattern of engineering study in Western society is a four-year program of studies leading to a B.Sc. degree or to some equivalent designation. In some countries, especially in continental Europe, the degree program formally is five years in length and the degree is an "engineer" degree or equivalent which allows the graduate to practice legally as an engineer. In the United States and in the United Kingdom the holder of an academic degree is not legally able to practice independently as an engineer but must undergo a licensing procedure.

In the simpler past of 50 to 100 years ago the pace of technological change was much slower than it is today. It also was more easily digestible for the engineering practitioner. At that time it was reasonable to assume that a four or five year curriculum based primarily on subjects which represented the professional practice of the day was sufficient to prepare the engineer for a lifetime of professional practice. Although technological change was expected and did take place, it occurred at a pace which did not require extraordinary efforts on the part of the practicing engineer to keep abreast of his field.

The society of today is a technological society of great and increasing complexity and one in which the rate of

technological change has increased dramatically. The engineer is expected, not only to be working at the frontiers of knowledge, but also to be a creative person who is able to innovate and who is able to use knowledge developed by others and to apply it and to develop new techniques and technologies based on this knowledge. This, in turn, means that the engineer must become familiar with discoveries and technologies in other fields which may be pertinent and applicable to the field in which he is working.

One of the practical constraints of an engineering education is the four-year constraint. This constraint requires that the university concentrate its efforts on depth, not on breadth, and on generalization, not on specialization. The tasks and requirements of different jobs vary and the degree program should provide as good a basic competence as is possible to handle all the tasks and jobs expected of the engineer.

It is often forgotten that the intent of the undergraduate engineering program is to prepare the graduate for this multiplicity of career paths that are available to him. The purpose has been stated quite clearly in the report of the panel on (U.S.) undergraduate education of the Committee on Education and Utilization of the Engineer (Council on the Education and Utilization of Engineer, 1986):

"The goals of undergraduate education in engineering are to prepare graduates to contribute to engineering practice, to prepare them for graduate study in engineering, and to provide a base for lifelong learning and professional development in support of evolving career objectives, which include being informed, effective and responsible participants both within the engineering profession and in society."

These goals recognize a number of factors:

That the purpose is not to prepare the engineer for a particular job in a particular industry; that the engineer will need additional education; that the undergraduate engineering curriculum should provide a base for lifelong learning and, finally, that the engineer has a societal responsibility in addition to a professional responsibility.

The results, as are well known by every engineering educator, are comments by industry that the university is not preparing the young engineer for the world of practice and that the young engineer is not able to fulfill the needs

of industry. In a recent Finnish study (Markulla, 1986) the profile of the young, just-graduated engineer was compared with the level of know-how required in different tasks. The survey looked at 12 groups of knowledge, skills and abilities:

1. General knowledge of technology
2. Specific knowledge of one's own field of technology
3. Ability to apply theory to use
4. Knowledge of business economics and corporate planning
5. Knowledge of languages
6. Ability in oral expression
7. Ability to express oneself in writing
8. Management and leadership abilities
9. Prolificacy in ideas and innovations
10. Ability to solve problems independently and by critical analysis
11. Ability to apply the acquired knowledge of computer science.
12. Ability to cooperate and work in teams

The profiles of the just-graduated engineer were close to or slightly exceeded the required profile for items 1, 2, 5, 6, 7, 9, 10, and 11. The job requirements, however, were substantially greater than the know-how level in four groups: with respect to the ability to apply theory to use, with respect to knowledge of business economics and corporate planning, in management and leadership abilities and in the ability to cooperate and work in teams.

Although the details were presented in a different manner, similar results were reported in a survey of practicing chemical engineers made by the journal Chemical Engineering (Lipowicz and Hughson, 1983). The survey showed that the practitioners felt they had not been prepared sufficiently by the university in the managerial and business areas and that the development of communication skills had been neglected.

The university cannot allow itself to be brow-beaten by such reports, conclusions and industrial demands in-so-far as its undergraduate program of studies is concerned. The academic administrator and program-planner should always bear in mind the goals and purpose of undergraduate studies. The university should accept, however, that it has a responsibility to its graduates and to the society which they and the university serve and this responsibility does not end with the granting of the B. Sc. degree.

It may be arguable if the university should be expected to prepare the young graduate in all four of the groups of

knowledge, skills and abilities reported in the Markulla study cited above. There is little doubt, however, that gaps in the areas of business economics, in corporate planning and management and in the development of leadership abilities and communication skills are gaps which are candidates for continuing higher education. Conclusions that can be reached from these studies are that not only is CHE necessary to help the engineer keep up with the rapidly-changing technology but also that CHE is necessary to help the engineer fill the gaps in knowledge which, perhaps, should have been filled as part of university studies had the four-year constraint not existed.

It is quite conceivable that the professions are at a stage where more than four years of university study are required to prepare the engineering practitioner to practice at the professional level. A survey was carried out among 6000 engineering graduates as to what they perceived as shortcomings of their undergraduate engineering studies. It has already been stated (Cranch, 1986), somewhat in jest but as a result of that study, that to teach everything that the practicing engineers thought they should have studied at the university would have meant that the engineer would be able to "graduate in June and then draw his first pension check in July." So, it is reasonable to conclude that neither a four-year nor a five-year nor a ' ' ' -- year program of undergraduate studies would suffice.

There is a consensus that what would be required would demand much more time than is available in the usual undergraduate program, whether it be the 4-year, the 5-year, or any of the other standard formats. There also is general consensus that the rapid rate of scientific and technological progress is such that only a lifelong program of study and education will allow the useful life of the engineer to be extended. One study (Bruce et al, 1982) refers to this as "Preventive Maintenance of Engineers". The demand for highly creative, innovative and up-to-date engineers cannot be met by replacing "obsolescent" engineers with new graduates.

A lifelong program must recognize that the practitioner needs not only broad, basic knowledge but also needs the applied knowledge and skills of a particular speciality. The former - the fundamentals - change, progress and develop relatively slowly but, in the course of time, do become part of the regular undergraduate program of studies. The latter - the applied knowledge and skills - are, of course, the new and the rapidly changing and developing areas.

## PARTICIPATION IN CONTINUING EDUCATION

Why do engineers participate in Continuing Education and what are the expectations of the employer from continuing education courses attended by their engineers? Several surveys have been reported (Committee on the Education and Utilization of the Engineer, 1985) and the survey findings were similar. The two main reasons cited by the engineers as their reasons for participation were 1) to learn new technology and 2) to obtain intellectual stimulation. The employers' expectations, however, were different. The two major reasons they cited for sponsoring or allowing their employees to participate in CHE were 1) to prepare the engineer for increased responsibility and 2) to permit him to perform his present job assignments more efficiently.

Survey results for older engineers confirmed that intellectual stimulation was important and remained the second major reason for their participation in CHE. The major reason cited for the older engineers participation was their goal of better performance in their jobs. Thus, the older engineer focused, primarily, on job-related need. This may reflect that the older engineer, who is further from his academic studies than the younger engineer, either feels that his academic studies or experience did not supply him with the tools and education necessary for him to fulfill his present "engineering" job requirements or else that his present job responsibilities, possibly more managerial in nature, require additional training and education.

In a survey reported by Kaufman (Kaufman, 1986) it was noted that almost half of the engineers surveyed had participated in some type of CE course during the three year period prior to the survey. The courses most frequently chosen were those which pertained to a specific skill rather than providing general knowledge. In addition, the concentration was on studies which were related to the present job held by the engineer and not on courses which might be required for a perceived future job or position. Most of the courses were provided in-house and were non-credit in nature and only about 15% of the courses studied during the period under survey were accredited courses offered by a university.

One of the problems in assessing the effect of CHE on obsolescence and innovation is the difficulty of evaluating these factors (Kaufman, 1986). To the extent to which these factors can be evaluated it can be concluded with respect to professional obsolescence that technical courses contributed more to lower obsolescence than did either reading or participation in professional meetings and seminars. Further-

more, the number of technical courses completed in a three-year period by older engineers was found to be related to lower obsolescence.

With respect to innovation the evaluation reported, based on expert judgments (Ransom, 1983) led to an interesting and possibly significant conclusion. The evaluation showed that those who spent more time in professional development activities also maintained significantly higher levels of innovation than did their colleagues.



## THE PROVISION OF CONTINUING EDUCATION

Continuing and adult education is provided by many groups. They include not only, as could be expected, the institutions of higher education but also educational institutions at almost all levels. Continuing education also is provided by other organizations including governmental and quasi-governmental bodies, industry, the military, professional organizations, labour unions, museums, fraternal organizations, religious groups, and many more. In addition, much directed and undirected continuing education takes place on a personal and individual basis through a number of avenues such as, to name only a few, reading, computer programs, audio- and video tapes.

Because there are so many types and providers of continuing and adult education it is necessary, for the purposes of this report, to divide the field in accordance with some reasonable criteria and to examine primarily that segment. In view of the fact that the Technion is, generally, preparing its students to enter a profession, it is reasonable to divide in accordance with level of study. Thus, this report will deal primarily with the advanced levels of continuing education or continuing higher education (CHE).

Although one would expect that the major providers of CHE should be the institutions of higher education this is not necessarily the case. There are many other purveyors and providers of continuing advanced education.

Every business or manufacturing enterprise of any reasonable size provides advanced education to some of its employees through various training programs, seminars and management courses. These courses would be provided either by its own staff or by staff hired on a temporary or contract basis, or else are provided on an in-house basis from an outside source which supplies such services. In some instances these outside sources might be an institution of higher education.

### PROFESSIONAL SOCIETIES

Professional organizations and societies have recognized the need for CHE and many of them provide advanced continuing education. The American Institute of Chemical Engineers, for example, provides hundreds of short courses per year in conjunction with its various regional and national meetings. This is in accordance with the policy of the AIChE that -- "As professional people, chemical engineers have a personal responsibility to maintain and

enhance their skills which identify them with their professional practice. To satisfy this requirement chemical engineers must engage in a program of educational activity which will continue throughout their professional careers. While the primary responsibility for continuing education rests with the individual, the chemical engineer's employer has a responsibility too - to ensure that he will have both the opportunity and encouragement to maintain his professional competence through continued study." And, further - "AIChE, which represents the profession of chemical engineering, must assume leadership in providing for continuing education."

The short courses provided by the AIChE are usually of two days duration so that they can mesh comfortably with the scientific program of the meetings. The Institute of Chemical Engineers of England, however, schedules the short courses which it provides to the profession on an ad hoc basis and their courses range in duration from one to as many as five or even six days.

#### TWO PRIVATE ORGANIZATIONS

A number of private organizations are engaged in providing CHE on either a for-profit or else on a non-profit basis. Two organizations of this type will be described - The Center for Professional Advancement and the Continuing Education Institute - the former being a for-profit and the latter a nonprofit organization.

The Center for Professional Advancement - The Center for Professional Advancement was established twenty years ago with the motto of "Continuing Education Through Total Involvement". Its aim is to satisfy the need for on-going education and to sustain the effectiveness of engineers by providing intensive, practical short courses. The courses are presented by teaching teams of experienced practitioners at locations away from the individual engineer's normal environment although the Center is willing to provide in-house courses. The teachers not only are experts in their fields but also are acknowledged as such by their peers for their high level of knowledge and professional competence. The members of the teaching teams have contributed to their branch of engineering via their research and engineering and continue to practice in their fields.

The Center fosters an intensive learning environment by 1) removing the engineer from his normal habitat, 2) by identifying and attempting to address his interests and problems, and 3) by involving him in a blend of lectures, workshops, case studies and practical problem-solving sessions. An interactive atmosphere develops and the course

participants themselves are encouraged to contribute from their own experience. The approach fostered results in a unique opportunity for the participants to interact not only with the teaching staff who, generally, are also expert in teaching professional engineers, but also with engineers from other companies, other countries and with other professional backgrounds.

The fact that engineers with different backgrounds and problems would gather, meet and learn together means that courses must be properly structured and selected. The courses and content selected must, therefore, meet the criteria of having general applicability, of not being industry-specific and of being multi-disciplinary in application and interest. The types of courses and subjects which meet these criteria would include courses dealing with a thorough and practical review of some process operation; courses dealing with advances in knowledge in a discipline which could give rise to advances in a related discipline; courses dealing with the application of a new instrument or tool to new areas, and courses in which the engineer would be exposed to a technology which is new or different as compared to the one in which he received his professional training or work experience.

The success or failure of an operation such as that carried out by the Center for Professional Advancement depends to a great extent on the successful choice of topics for short courses. The Center structure includes Program Directors who are technical professionals. These directors keep abreast of the fields involved by reading, by participation in scientific and technical meetings and by frequent contacts with companies in many industrial sectors. They have worked in industry and have developed a network of international contacts who can assist them in defining contenders for short courses and also in locating experts who can teach the course in accordance with the philosophy of the Center. In addition and of great importance is the expertise of Advisory Boards, each of which has the responsibility for a major industrial sector. And finally, a course is not offered for presentation until it has been market-researched usually among groups of previous course participants. At the end of each course an audit for quality is done and the course participants are requested to perform a detailed evaluation of the course. This evaluation can then be used to strengthen future presentations.

As a for-profit organization the Center for Professional Advancement undertakes all of the financial risks involved in promoting and presenting courses. It selects the courses and enters into contractual arrangements with the teaching teams concerning honoraria and expense

reimbursement. The teaching teams have no financial responsibility for the commercial success or failure of the courses they present.

The success of the Center for Professional Advancement in satisfying a need can be judged to a certain extent by the fact that some eight thousand professionals each year attend short courses organized by the Center in the United States and more than three thousand a year attend courses which are presented in Europe.

Continuing Education Institute - The Continuing Education Institute (CEI) is a non-profit organization established in 1980. It, too, presents short CHE courses but its structure and philosophy differ from those of the Center for Professional Advancement. It has no owners or shareholders but is governed by a Board of Directors and is guided by an Academic Advisory Council. The Continuing Education Institute has two, very loosely linked and essentially autonomous, centers, one in the U.S. and one in Sweden.

The stated principle goal of the Institute is to accelerate the introduction of new achievements in engineering into the technological community. In its choice of courses the Institute aims at areas which are moving from research into development and production and focuses on areas of technology which are undergoing rapid change. The audience the Institute seeks includes the engineers, scientists, technical specialists and managers of technological activities and it presents the material through intensive lectures by outstanding experts. The lecturers it provides not only are actively working or doing research in the subjects they teach but also are aware of the latest technological developments because they are creating those developments.

While the Center for Professional Advancement undertakes all of the financial risks involved in promoting and presenting courses and enters into contractual arrangements with its course lecturers concerning honoraria and expense reimbursement, the Continuing Education Institute operates on a different basis concerning financial risk. Each CEI course is developed by a course director who is responsible for the selection of topics, for the selection of lecturers and for a number of decisions which affect costs. The course director also would be expected to present at least one-third of the course lectures. The Institute believes that the highest standards for courses will be maintained and that it is in the best interest of the Institute if the course directors and instructors have a financial interest in the success of the courses.

In accordance with this philosophy the Institute does not assume complete financial responsibility for the individual courses and requires that each course it offers have financial underwriters who, generally, are the course director and the instructors. In exchange for underwriting the course, the underwriters share in the financial success of the program. The financial loss the underwriters can suffer would be limited to the amount of their deposit which is based on a "worst-case" scenario of a small enrollment. Financial loss above that amount, which could still be significant, would be covered by the Institute.

The Institute share in the financial success of a program is used to cover its general overheads and administration costs as well as to cover losses from unsuccessful programs. Another loss the Institute might suffer is bad debts which are not rolled over to the underwriters but are absorbed by CEI.

Promotion costs represent the largest single cost item in a typical course budget. Typical promotion costs per course are \$8000-\$10000 which represents approximately 30% of the total direct cost. The course administration is about 20% of the total cost while the remaining 50% would cover the costs of the instruction, hotel and facilities, travel and per diem costs plus the cost of course materials. The direct expenses of a typical CEI 4 day course would be \$25000 to \$30000.

The fact that the CEI which, in accordance with its enunciated policy, aims at areas that are moving from research into development and production and focuses on areas of technology undergoing rapid change, also makes it vulnerable to changes. It is difficult to predict what will happen in six to seven months, the typical course lead time, in a rapidly-changing and developing field.

This lead time for a course, preferably a minimum of six months, is necessary so as to allow sufficient time to announce the course offering in brochures and in professional journals. During that time changes can occur which can lessen the importance of a course or even make a course obsolete. The fact the the Institute specializes in areas that are at the interface between research and development/production also makes it vulnerable to changes in government policy. Government funding policy can define or redefine areas of research interest and this in turn can result in demand for certain courses or result in a lack of interest in certain courses. In addition government policy can redefine which areas of technology are to be the "favored" areas.

The projections of CEI envisioned the presentation of some 500 courses per year in the United States. It appears that this goal will not be reached and the Institute is now in the 100-200 course per year range. Part of this gap between projections and reality is the result of the factors stated above. There also may be a snowball effect as a result of the underwriting requirement. The failure of a course would mitigate against the underwriters "trying again". In addition, potential course directors may not propose potentially profitable courses because of the fear that they may lose their underwriting deposit.

At the time this information was being gathered the policy of the CEI was undergoing a reexamination. What is presented here may no longer represent the present situation and may no longer represent plans and projections insofar as future activities and policy of the CEI are concerned. Any possible changes in CEI structure or policy, however, would have no bearing on the thrust of this report.

## THE UNIVERSITY IN CONTINUING HIGHER EDUCATION

This report has considered and discussed the role of the university in society and in the community. It should be quite apparent that one of the roles of the university, and a role which it must assume to an increasing extent as time goes on, is that of being a provider of continuing higher education or lifelong learning. The university is almost ideally suited to this task.

First, continuing education programs are a crucial means for the dissemination of new information. As centers of expertise and learning in various fields, colleges, and universities stay at the forefront of knowledge. Through conferences, short courses, media courses, and a variety of other mechanisms, continuing education programs spread knowledge and information into the community. As society becomes increasingly reliant upon information in its decision-making, the need for current information will increase, and the importance of continuing education will continue to grow.

Second, continuing education programs are among the few reliable means for maintaining professional competence in a world of rapid change. In the world of the twenty-first century, professional practice in all fields - medicine, engineering, management, business, marketing, and so on - will be changing rapidly as new information, new technologies, and new practices evolve. In such a world, professional competence must be maintained through continual reeducation; it is the only means to avoid a loss of effectiveness. Colleges and universities maintain large staffs of professional faculties whose job it is to know and to teach the most current practices in their fields. Those faculties are the obvious and natural reservoir of expertise for continuing professional education in the future.

Third, continuing education programs, by their very structure and most fundamental tenets, have a primary focus on learning as a lifelong process. They will, therefore, serve as natural contact points between the university and the growing number of students who choose to continue working toward a degree after launching themselves into a career. For such students, non-traditional learning methods--such as media instruction using computer assistance, video-discs, or telephone linkages--will be increasingly important and increasingly practical. Continuing education programs will, therefore, become more and more important as mediators between adult students with a desire to learn and faculties with a mission to teach.

## CONTINUING EDUCATION IN FRANCE

France is one of the countries which recognizes that the ultimate resource of a country is the human resource. France has a long tradition of education and training during the course of a man's working life (Ter-Davtian, 1986). This has been the situation since the French Revolution. In 1791 the Marquis of Condorcet stressed the need for a lifelong education in a speech delivered at the Legislative Assembly. In 1794 the Conservatoire National des Arts et Metiers was created. This educational institution offers evening and Sunday courses, especially in the fields of science and technology, to all who want to improve their qualifications whatever their level of education.

The present system of continuing education in France is the outcome of a perceived need to organize and structure what was a proliferation of continuing education courses given in-house by companies and by engineering schools. The aim was to make these courses available to a wider audience and also to broaden the base and not to confine them to engineering.

The engineers, who were the first to sense the need for continuing education, played a major role in the creation of the system which functions for the benefit of all. The basic instrument of the French system of continuing education is a law of 16, July 1971. It is based on an agreement reached between the Employers' organization and the Trades Unions and signed in 1970. The law proclaims that continuing education is a "national obligation" and provides substantial means to finance such education. It also sets the the framework within which continuing education can develop. The legal provisions represent a reasonable balance of compulsion and freedom for the ultimate "benefit of all".

The major legal provisions provide that:

All firms - private or nationalized - which employ more than nine persons must spend at least 1.1% of their total wages and salary bill on continuing education to improve the skills of their manpower at all levels. A firm that does not meet this requirement must pay the difference to the Treasury. (The average participation of firms is, however, 2,5%, much more than the legal minimum of 1.1%.)

All workers, also those in companies employing less than nine persons, have the right to take a paid leave for study. This is subject to certain



conditions so that the employer would not be left without any workforce. The employer pays the worker's salary during this leave but is reimbursed through a special fund.

The firms are free to decide on the type of continuing education they think is suitable for their personnel. The worker is free to decide on the kind of education he or she needs and to go to a course of his or her choice for a duration of up to one year.

Any group, body or institution can offer continuing education courses subject to certain conditions of quality and administration. This can include courses presented internally by companies to their manpower.

The financing for this program of continuing education comes from two sources - one, the 1.1% of total salaries which represented \$2.7 billion (58% of the total cost of the program in 1984) and the State which participated to the extent of \$1.8 billion (42% of the total cost).

Some of the statistics presented by Ter-Davtian are mind-boggling. Approximately 21 million workers are covered by the continuing education scheme. The situation required several years to stabilize after the adoption of the law in 1971. After that stabilization period, the statistics were that an average of 15 % of the covered workers participated in a continuing education course each year. In 1984, a typical year, the total number of hours of training was 428 million when 3.3 million people participated in a continuing education course, i.e., 140 hours per person each year.

About one in five of the engineers undertake a continuing education program each year as compared to one in seven out of the total covered population.<sup>1</sup> The breakdown of subjects studied by the engineers is illuminating. Thirty four percent studied science and technology courses; thirty percent studied management and finance; ten percent economics; twelve percent psychology and human relations and fourteen percent studied a course in languages.

The engineering schools played an important part in this program and presented courses not only to engineers but also to graduates in other disciplines.

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<sup>1</sup> This should be compared to the Kaufman findings (Kaufman, 1986) which found that almost half of the engineers had participated in a CE course over a three-year period, i.e., about one in seven of the engineers per year in the U.S.

The system in Israel also supports continuing education and Educational Funds are included in many wage agreements as one of the "inalienable" rights of the worker. It is an open secret however that, under the best of circumstances, only a very small part of these funds are actually expended for "Education" or for what is referred to in this report as Continuing Education. The question that can be asked is -- does this represent a program "for the benefit of all"?

The lessons of the French Experience should be studied carefully and the appropriate conclusions must be drawn. Israel cannot afford to waste its limited ultimate resource, the human brain, it cannot allow that this resource be dissipated and it cannot tolerate a situation in which this resource is not developed to the maximum.

## UNIVERSITY AND CONTINUING EDUCATION OPERATIONS

There are a number of important differences between Continuing Education and usual University operations. These differences stem from a number of factors and these differences and factors should be noted. They can be put into several categories.

Income and Expenses - Most of the income and funding for usual university operations come from sources that are not directly related to their activities. The university income, for example, can be from government funding, from alumni organizations, from contributions of one kind or another including contributions from pseudo-alumni organizations such as Technion Societies, etc. and very little comes as a direct result of the fact that a particular course or subject is taught by some department or other.

This is not the case for the purveyor of continuing education at the Technion as well as in most universities. CE must be self-supporting and, not only must it be self-supporting, but it also may be looked upon by the university administration as a source of funding for other university operations which cannot be funded, for one reason or another, from the usual university sources.

Marketing - Continuing Education is market-driven and, in addition, provides a service to a clientele which can "vote with its feet". The university is not market-driven, except in the most general sense, and its clientele represent, to a great degree, a "captive" clientele. The university academic administration, through its various committees and governing bodies, determines what knowledge must be imparted in order for the student to be granted his degree and what courses, when satisfactorily completed, constitute the measure of this knowledge. The student has little, if any, say in these matters. Once he has been accepted as a student he has, to a large degree, given up his liberty and freedom of choice as to what or how he studies.

More than that, the student has no choice as to who will teach him. No secret would be revealed if mention is made of the fact that not all university teachers are good teachers. In fact, some are pretty bad teachers, no matter what their other qualifications for academic appointments and promotions may be. But the university student is stuck with that bad teacher if the teacher has been assigned to teach 001987, Intro. to Gibbering Elements, and if 001987 is a requirement for the degree. The student

also would not be in a position to do much other than to gripe about the fact that the overhead projector never works or that the lecture room is not heated or that the handouts are not available on time.

Not so with the CE student. If he has reason to believe that the instructor is not satisfactory the CE student will cancel his enrollment in the course. If the facilities are not satisfactory he will register his disapproval in the most direct way - he will withhold his patronage. As has been pointed out earlier there are a number of providers of continuing education and there is competition in the provision of continuing education services that does not exist in the usual university environment. The CE student must be "sold" on the course, on the facilities and on the calibre of the teaching staff. The CE student is, generally, a working adult and his needs have to be met. The adult CE student will not be willing to accept study conditions that the university student may be forced to accept. The purveyor of CE must be aware of these matters and the wise university administration will also bear them in mind when looking at the Continuing Education function of the university.

Planning and Operations - The cycle of planning and operations for the CE function not only differs, to a certain degree, from that of the university but also is subject to many more uncertainties. The university, to a very great degree, determines how many students it will have and, to a somewhat lesser extent, what their distribution is to be among the various departments. But even the latter aspect, although less under control of the university administrator than the administrator may desire, is known well in advance of the beginning of the academic year. Thus, appropriate planning can be undertaken to ensure that the teaching requirements will be met. This is not, however, the situation with respect to the CE function.

The operating cycle for the continuing education year begins well in advance of the teaching program. The cycle requires, first, that predictions and projections be made as to what the demands for courses might be and what the market requirements for new and different courses might be. Advertising brochures must be prepared on the basis of approved course and subject syllabi, instructors must be lined up and teaching facilities organized well in advance of the beginning of instruction. But no reliable predictions can be made for CE enrollments. They are subject to a number of factors including, among others, fluctuating economic conditions. And, on top of all that, the cycle is a semester cycle. What was true for the fall semester enrollment may

not be at all true for the spring semester. The university is not subject to this type of instability and uncertainty.

The university also has completely different expense-income patterns to deal with as compared with the continuing education function. The university operates on a true budget system and it is the function of the administrator to deal with approved, budgeted outlay which is balanced against budgeted income. The budgeted income includes only a small proportion of monies due to tuition fees which could, perhaps, be considered to be uncertain but even here the expected number of students is known with high accuracy. The remainder of the expected income can be considered to be truly expected unless changes in government policy or severe changes in the general economy occur.

Such is not the case with CE where essentially all of its income comes from tuition payments and the actual course enrollment is one of the great uncertainties. Thus, income can be estimated but only with uncertainty. On the other hand, an important part of the CE expenses are up-front and are incurred well before a course is given and, in fact, even well before the decision to run or to cancel a course is taken on the basis of actual enrollment. These "sunk" costs can represent a not-inconsiderable part of a course expenditure.

## QUALITY IN CONTINUING EDUCATION

The function of the university and its place within the community has been discussed. It is now appropriate to discuss some of the characteristics of the university and how they impinge upon continuing education within the university environment. Each university possesses its own distinguishing characteristics, but there is one characteristic that is shared by all universities. The characteristic shared by all is the ideology of elitism. Their elitism begins with their faculty. The faculty are professionals, they have undergone extensive preparation, they are appointed on a highly selective basis with promotion and academic tenure coming only after severe standards of performance have been met. The elitism continues with respect to the students. Students are admitted on the basis of a selection process and they must meet and maintain certain standards of performance to retain their status as students.

The value system of the university is based, as it should be, on quality. This quality is enforced, first and foremost, by the faculty and also by the students. And the value system is elitist in nature. With respect to continuing education within this elitist society, the majority of the faculty can be categorized as being essentially uninterested, or as being uninvolved or else as being believers in the policy of benign neglect. On every university campus, however, and even on the campus of the Technion, there is a small and even hostile minority who see Extension Studies or External Studies as a provider of "basket weaving" courses which they consider to be inappropriate to the elitist function of the university. This in spite of the facts that the professional societies, and the industries to whom they supply professional practitioners, do not doubt the importance of continuing education and also invest large amounts of money to provide such education to their professionals.

As has been pointed out, continuing education programs are unique in at least one respect:- such courses and programs, with very few exceptions, have to be self-supporting - and the support is by virtue of student fees. Within the university environment continuing education must, at the very least, pay its own way and sometimes even is expected to be a source of income. This means that its programs must be sensitive to consumer needs and to market-place considerations. These are considerations to which the university is not exposed.

The charges made by the vociferous minority, once they get beyond the charge of basket weaving, usually are:- it is mostly practical and applied training and is not education (how-to, not why); CE is driven by market considerations; it is superficial; it does not belong in the university curricula; the students are not equipped for serious study.

The continuing educator will reply: as compared to the regular full-time degree programs the CE curricula is more flexible and more responsive to the needs of the students and of the economy; the teaching staff are much more concerned with the quality of their teaching; the adult students are more highly motivated than their full-time counterparts; the service provided to students is student-oriented and less bureaucratic; the quality and intellectual challenge of CE courses and programs is as great as the courses provided to the degree-students.

All is true! But the continuing educator still must work within the framework of the elitist university society and the CHE provided must also be perceived, even by the most vociferous critics, to be appropriate to the university mission.

The temptation can exist to seek potentially lucrative programs that may be inappropriate for the university environment while limiting the number of high quality, academically desirable programs which, however, would have limited profitability. The question has already been put by the Dean of Extension Studies of the University of California, Berkeley in the clearest and most straightforward manner possible : "Can you walk in the marketplace and keep your academic virtue?" (Stern, 1982). It is the contention of responsible continuing educators, including Stern, and also of the writer of this report, that academic virtue can be retained, even in the marketplace. How to retain virtue will be the subject of the remainder of this section.

### APPROPRIATENESS

Some universities have restricted their continuing education activities to a replication of campus degree courses with the possible addition of courses directly within the interests of the faculty. This view is not held, however, by the majority of the universities which have adopted a broader construction of what is appropriate for the university. By adopting this view they also accept that there is a fundamental academic rationale for continuing education and especially for continuing higher education. Thus, the points to be considered have to deal with the characteristics of sound program design; the guidelines

necessary for programs outside of the regular campus programs; and the focal point, of course, of appropriateness.

First, we can accept as axiomatic that continuing higher education is concerned, principally, with advanced levels of study. A university must be perceived to be dealing with university-level studies. The continuing education programs it offers also must be perceived to be dealing with university-level studies. An obvious conclusion is that CE courses for the continuing education of professionals in the areas in which the university is preparing professionals are appropriate. Not only are they appropriate, they represent an important element of the mission of the university. The author of this report is of the opinion that the Technion would be remiss in its responsibilities and duties to its graduates and to the professions to which it supplies graduates if it did not provide continuing higher education in these areas.

This conclusion of appropriateness can be extended to include courses which, although not necessarily in a degree program, are of university level in difficulty and complexity. Some of them are regular campus courses for which the Division of External Studies functions as the administrative agent in enrolling non-degree students in existing Technion courses. Other programs could include, for example, certificate studies in management. Although these are not regular degree courses not only are they equivalent to those presented at the undergraduate or advanced undergraduate level on campus but, in addition, the participants either already hold an academic degree or else are at an equivalent level based on their experience.

The situation is more difficult of resolution when one is dealing with the preparation of paraprofessionals. One example would be a course of studies leading to a certificate qualifying the holder as an architectural draftsman who would provide supporting services to a professional architect. If the program of studies would be of such a nature and quality that the preparation is, to a great extent, on the basis of university level courses there would appear to be a justification of appropriateness. An additional justification could be the desire or necessity to provide a ground-breaking program which could serve as a model for programs to be provided by others and to set the quality of the desired instruction.

It would not appear to be appropriate for a university continuing education operation to provide courses in areas that can be dealt with by high schools, and by technician and vocational educational institutions. This is not to



belittle the importance of these courses but rather it is a recognition of the fact that the university, by and large, is neither equipped nor constitutionally able to deal with this type of education and training.

A somewhat related area is that of preparatory and remedial programs for high school students. Traditionally, universities have been involved with the education of high school students for reasons involving the two extremes - the talented students and the ill-prepared students; the former so as to spur their development and growth and the latter so as to overcome deficiencies in high school preparation. The main concern of continuing education should be continuing education and this is for adults. It is doubtful if the Division of External Studies at the Technion has developed any special expertise in dealing with high school and preparatory level programs. If so, these should be placed at the disposal of the Preparatory School on campus who should possess the teaching staff and expertise to deal with these youth. With respect to gifted students, they are not adults and although the Technion should have legitimate concern, should take appropriate and forceful action and should develop appropriate programs for these talented youth, it is doubtful if the Division of External Studies is the appropriate venue.

Two other areas remain to be dealt with in the category of appropriateness. One area is that of "basket weaving", in other words - courses dealing with arts and crafts. This point should be laid to rest once and for all. It should be pointed out that crafts represent one of the tools used by the anthropologist in his studies of people and cultures, that major sections of museums are devoted to crafts, that a study of crafts provides, even today, inspiration to designers. It might be illuminating for the "basket weaving" critic to present his arguments in front of any audience of architecture faculty. As far as the study of art is concerned it is insulting to the arts even to hint at a question of their "legitimacy". So-called "basket weaving" courses are appropriate to the university provided that they are at the appropriate academic level and are monitored for quality.

The other area is that of the appropriateness of liberal arts courses within the Technion programs for continuing education. The Technion has a Department of General Studies which the Technion has, off-and-on and in a sporadic manner, tried to strengthen and develop. This Department presents courses to degree-candidate students and its programs, by definition, thus meet the requirements of appropriateness. The courses it offers must be at the appropriate level for adult CE and they should, possibly, be

aimed at the adult who possesses professional preparation of the type provided by the Technion, but their legitimacy cannot be questioned.

One additional and important factor must be considered in this regard. The Department of General Studies should be the Department most able to carry its courses to the general public, to extend to the general public the idea of the university and to be one of the means for the Technion to fulfill its public mission.

### QUALITY

Two points are to be considered in connection with quality of education in continuing higher education - the criteria of quality and the control or monitoring of quality.

The matter of quality is not a factor in question for the continuing educator when dealing with regular campus degree courses. The usual academic criteria would be applied by the academic unit involved and the courses would undergo the usual academic review procedures. This is not the case, however, with non-credit courses or with certificate programs as offered through a continuing education operation. In most universities, and also at the Technion, new CE courses are submitted for review to the appropriate academic unit before a course is advertised. Such prior review can prevent some criticism of the level and types of courses offered in continuing education. Unfortunately, at the Technion such review procedures, generally, have been done rather perfunctorily. In addition, many existing courses may have been reviewed and approved years ago and the Division has relied on its consultants to see that quality was maintained.

One way to maintain quality and to ensure faculty involvement is have programs reviewed and monitored by senior and respected faculty of the appropriate academic units. This technique can work but requires that 1) the selected faculty receive appropriate remuneration for the time and effort involved; 2) that they have professional course coordinators with whom they can work and 3) the job environment be such that their interest in and enthusiasm for the efforts they would be expending on CHE would not deteriorate to a routine involvement in which the remuneration became the only incentive.

One additional and important element in the quality monitoring picture should not be overlooked. This has already been alluded to and this additional element is the continuing education student himself. His importance in the

quality-control and monitoring operation cannot be minimized. For one thing he will not let it be minimized. The typical adult continuing education student is attending a course or program on a voluntary basis, he has many other conflicting pressures and calls on this otherwise free time, he will be devoting great efforts to his study, and either he will be paying the tuition fee himself or else will have to account to his company if the company is paying. In addition, he is a more mature student than the full-time student, has more life-experience, and is a better judge of the value of the studies and of the instructor. The assessment made by the students is another important factor in the picture of quality control. And he lets his assessment be known by one way or another.

### CONTINUING EDUCATION UNITS

Although Continuing Education Units, of themselves, provide no guarantee of the quality of continuing education they do provide a record and also, at least, provide some guidelines.

Many continuing education students have a need for some kind of official record of their studies. Although in some cases an official letter or transcript which confirms the student's participation is sufficient, the student may need an official record of the amount of work involved in his studies. In the United States such certification is provided by the Council on the Continuing Education Unit. The official Continuing Education Unit (CEU) is defined as:

Ten contact hours of participation in an organized continuing education experience under responsible sponsorship, capable direction and qualified instruction.

The Council on the CEU does not require that an institution be authorized to award CEU. The CEU may be awarded by any college, university, company or organization that is willing to abide by the criteria established for the use of the CEU (Council on the Continuing Education Unit, 1986).

The primary purpose of the CEU is to provide a permanent record of the educational accomplishments of an individual who has completed one or more significant non-credit educational experiences. Only those programs that are rigorous enough and long enough to represent a significant educational experience and for which a permanent record will be meaningful should be included in the CEU program.

Thus, programs that impart general or technical information which is applicable to the professional or technical

field and will be of value wherever the individual is employed would be appropriate for the awarding of CEU. Programs, however, that relate, for example, only to organizational procedures and internal policies would not be eligible for CEU.

Although the CEU is widely used it is awarded usually on the basis of hours of attendance at noncredit courses and without any assessment of the student's performance. The CEU's guidelines do include, however, suggestions on assessment which include such items as written or oral examinations, written reports, etc. and suggests that these results should be entered on the students record along with the number of CEU's earned.

The CEU could be used by the individual as a documented record of personal educational achievements. It would provide an official summary of educational activities as might be necessary for licensing and as evidence of appropriate preparation for additional responsibilities or higher level positions. Within the organization the CEU could provide a standardized measure of continuing education efforts and achievements of the individual and of the various departments and divisions.

Even though the CEU is a generally accepted measure of the number of hours of attendance, the fact that CEU's are granted for a continuing education program is not, of itself, a guarantee of the quality of the educational experience. Only a few educational institutions provide a measure of evaluated performance in the form of "extension credit-units" which is granted in the cases of graded performance in courses which are comparable to degree-credit courses in length and difficulty. This method has not been generally adopted in the United States primarily because of the semantic problem that a "credit is a credit" and universities would have difficulty in evaluating the "extension credit-unit" as compared to a "university credit-unit" with regard to completion of degree requirements, acceptance of credits and transfer of credits from university to university. In the meantime the CEU is regarded as the appropriate device for documentation of continuing education participation with assessment, as appropriate, being entered on the student's record.

## CONTINUING EDUCATION AT THE TECHNION

Approximately thirty years ago the Division of External Studies was established at the Technion. It was to provide what now is called continuing education by presenting courses to persons not enrolled at the Technion as students. It also administered a decelerated program of first year evening school studies to enable students who needed to work to support themselves to complete their first year of studies over a two-year period.

At an early stage of its existence the Division was put under the administrative aegis of the Technion Foundation for Research and Development (the Mussad) for a number of reasons. One of the reasons was based on the fact that the Mussad was in contact with local industry. The Division was supposed to be giving courses which were aimed at the professional practitioner who was working in industry. It was assumed, therefore, that the Mussad would have a direct line to industry and would be the appropriate venue for External Studies. In those, more innocent, times the director of the Mussad also was the Director of the Division of External Studies. No other case has come to the attention of the author of this report in which the administration of a university's Continuing Education function was set up as it is at the Technion.

It is well-known that a University is ill-equipped to deal with the part-time adult student, his motivations, his requirements and his demands. This stems, of course, from the fact that the university is accustomed to and at home with dealing with the full-time student who, still in his formative years is, generally, in his twenties. This is in spite of the fact that the university is accustomed to and at home with the teaching function. The Mussad, on the other hand, does not teach, does not know how to teach and teaching is not one of its functions. It is a Foundation for Research and Development but it does neither research nor development. It administers research and development which, generally, is initiated by the faculty and which the faculty want to do. It would not be at all be surprising, then, if the Mussad would view the Division, primarily, as a source of income. After all, even the university, where the normal situation is that the extension division is administered by the university, in many cases views continuing education as a source of income. So, why shouldn't the Mussad which performs only an administrative function, see the Division as a money-maker with only minimal, if any, consideration for any other reasons for the Division's existence.

## DIVISION OF EXTERNAL STUDIES

Facilities - The Division is organized into two geographical centers, one in Haifa and one in Tel Aviv. The office space available to the center in Haifa, which also houses the Division director and his staff, is on campus in the Churchill Auditorium and the physical facilities available to the administrative staff are satisfactory. The center in Tel Aviv, however, occupies a facility which is completely inadequate. The space available to it is adjacent to the offices of the Technion Society and is small, cramped and insufficient for the volume and quality of work which should go out of the Tel Aviv center.

The Division has no classroom facilities which it can call its own, with one exception. The one exception is the Division's computer teaching facility on the Technion campus. It is equipped with IBM computers, whose purchase was financed by the Division out of its current earnings. These computers are used in many of the computer-related courses offered by the Division. Most of the classrooms used by the Tel Aviv center are high school classroom obtained on the basis of rental arrangements with the schools. On occasion and where appropriate, lectures, conferences and seminars may be organized in hotels.

The Haifa center is more fortunate in that the Haifa campus infrastructure is available to it, at least in principle. In practice, the search for suitable classroom space is one of the more time-consuming jobs of the center's director and the course coordinators. The classrooms at the Technion are usually under the control of the individual Departments which are reluctant to put rooms at the disposal of the Division in the evenings because of problems of security, housekeeping and building services. The "general" pool of classrooms is partially in use even in the evenings and the problems of security, housekeeping and services still remain. An overhead projector which fails and cannot be put back into service during a lecture can "turn off" the most devoted adult student. The problem of finding classroom space is usually a matter for negotiation between the center's director or the Division director and the heads of those departments whose buildings have rooms appropriate for continuing education classes.

Staff - The professional staff of the division is made up of the two center directors and eight course coordinators, four at each center, who are supported by secretarial and other support personnel. The Division director is supported by a senior administrative assistant and a secretary.

All of the professional staff hold academic degrees but only one of them has a degree in an engineering or scientific area. None of the staff are perceived to be expert in the fields in which they serve as course coordinators and none of them have had any special training or education in the field of adult education. In fact, the director of the Haifa center is doing his doctorate degree research in a project related to pupils of pre-college age.

The fact that the course coordinators are not experts in the fields they coordinate, nor are they perceived as such has consequences. They possess few, if any, of the attributes of the Program Directors of the Center for Professional Advancement as detailed earlier. This means that the coordinators are not able to initiate, to plan or to construct programs of study and this task has been turned over to consultants who are retained by the Division. These consultants are, by and large, Technion faculty although industry experts are also retained for this purpose. The coordinators act as administrators of the various courses and programs, prepare course budgets, prepare the promotional material, ensure that rooms and instructional material are available as needed, keep the records, assist in searching for teaching personnel and serve as the contact between the students and the Division which, in the minds of the students, is synonymous with the Technion.

The consultants play an important role in the structure of the Division. The quality of the programs offered by the Division is, to a great degree, in their hands. They also represent the link between the Division and the individual academic departments of the Technion. Although most of the consultants are conscientious in their attention to their duties and responsibilities, some of them look upon their association with the Division as an easy and relatively painless way of supplementing their incomes. The problem of academic consultants is especially difficult with respect to Division courses for which no counterpart courses of study or academic personnel exist at the Technion. The Division then finds itself in the position of relying upon the reputation and good will of consultants who owe no academic allegiance to the Technion and who are under no academic supervision or evaluation by academic peers.

The question which must be asked here is how can the quality of courses be maintained and guaranteed and how can the Division/Technion ensure that the courses offered, their level and their intellectual challenge reflect the image

which the Technion wishes to have as its perceived image and which reflect the idea of the university. Some of the principles were already discussed in a previous section. This problem will be discussed further in the following section.



## THE CONTINUING EDUCATION STAFF

One of the most important elements in the fabric of a system which provides continuing higher education is the professional staff. The job title usually is program coordinator, program specialist, continuing education specialist or some other similar designation. The job title in the Technion's Division of External Studies, as mentioned earlier, is Course Coordinator. The task of the Course Coordinators is to provide the academic administration of the continuing education courses and programs. At the Technion these functions are carried out in coordination with the Director of the Division of External Studies, a position which, in U.S. universities, would go by the name of Dean of Continuing Studies or Dean of Extension Division, or some other similar title.

These professionals must be competent in four broad areas in order to perform their functions (Freedman, 1987):

- 1) Curriculum Building
- 2) Methods, Formats and Learning Resources
- 3) Marketing
- 4) Administration

The professional CHE staff, in their curriculum building function, must be able to determine the course content and to build programs and curricula. In the second category of methods, formats and learning resources, the coordinators are charged with the direction of course evaluation procedures, with the supervision of the learning environment, with the task of providing the appropriate learning and teaching facilities and also, and most importantly, with the task of selecting course instructors and monitoring their performance. The marketing function requires that the coordinator be able to identify CE markets and the target audiences, to identify new and developing market areas, and to be competent in developing and supervising appropriate advertising programs. The final category, administration, involves staff supervision, direction of program logistics, as well as the extremely important functions of budget preparation, monitoring and control.

To expect every program specialist to be equally competent and proficient in all of the areas mentioned above would be unreasonable. Every program specialist or course coordinator should, however, be reasonably competent in all of those areas and it would not be unreasonable to suggest that each coordinator should possess more than well-above-average proficiency in several of them.

Freedman also lists a number of personal qualities needed such as, enthusiasm, flexibility, initiative, conceptual ability, negotiating skills, etc. which represent the attributes one would expect of any effective and competent administrator. In addition, several other qualities are required because of the nature of the Continuing Education "business" including an entrepreneurial, risk-taking personality, sound judgment, energy and self-confidence.

From the description above it is obvious that the competent continuing educator administrator should possess appropriate career preparation. Successful relevant experience in fields such as industry, business, engineering, etc., would obviously represent a desirable asset. Although experience may obviate the necessity for a higher academic degree, it is now accepted that a senior position in CHE administration does require a higher degree. It has also been pointed out that an educational background in the liberal arts does not provide the necessary skills in management, budgeting and marketing. Obviously, training in business administration would provide these skills but such education would not address any of the principles and problems of the adult learning process.

Many universities offer formal programs of studies in the discipline of adult education. There now is, however, a growing body of opinion that formal study in adult education should not be regarded as the sole or even as the principal kind of preparation for CHE. Freedman (Freedman, p.154, 1987) puts it quite succinctly and clearly:

"...as each area of knowledge becomes more complex, the task of determining what kinds of continuing education programs are required to keep up with it becomes ever more sophisticated and technical and requires people whose training is in a subject-matter discipline related to that task. They need not themselves be research scholars in the fields they administer. Typically, in fact, they are required to be generalists, with assignments ranging over broad areas of knowledge. .... But their effectiveness as generalists is likely to be enhanced if they have a strong enough background in at least one of the subject areas in their jurisdiction to be able to speak the language of the research scholars, to be perceived by them as belonging to the same intellectual world, and to be able to keep abreast of the new ideas and new concepts in their fields of responsibility."

He then continues and warns:

"However, those who enter the practice of CHE from disciplines other than adult education cannot afford to disdain training in the special characteristics of their vocation."

but also casts doubt on the value of the typical program of education in adult education with respect to the unique character of Continuing Higher Education, especially when it is carried out within a university framework.

It is the opinion of the writer of this report, based on his experience as one of the former Directors of the Technion's Division of External Studies, that, in general, the Course Coordinators who comprise the professional staff of the Division, possess few, if any, of the requirements for the positions they hold. These are the requirements as outlined above which were laid down by respected and perceived experts in the fields of CHE administration. He also finds it difficult to understand how it was that this staff did not take advantage of the continuing education possibilities in the Division to enhance and improve their capabilities and to eliminate their deficiencies by participating themselves as students in appropriate CE courses.

## ADMINISTRATION OF CONTINUING EDUCATION

Part of the administrative function and requirements of continuing education already has been discussed. Some additional aspects of the administrative support function required and of budgeting will be presented in this section.

### STAFFING

It is an exercise in the obvious to point out that administrative support requires personnel in a number of areas. In addition to the professional staff (the course coordinators) mentioned earlier, these include - secretarial staff, financial staff, maintenance staff, marketing staff, public relations staff, archival staff - the list could go on. In short, the same functional support that the university requires also is required by the continuing education function. The numbers of people may be smaller and a number of functions may be carried out by one and the same person but the administrative staff requirements are an image and reflection of what the university requires.

One of the questions to be answered deals with the number of people required to support the CE functions. This will be looked at from two aspects - the professional staff and the support staff.

Attempts have been made to establish what is a reasonable work load for a program director or course coordinator. One conclusion of such a study (Cooper, 1986) was that there were at least two essential ingredients in making such determinations. One was a definition of the duties and responsibilities of the coordinator and the other was knowledge of the extent of the support function available to the coordinator.

The Continuing Education program at the Oklahoma State University, the university at which Cooper developed his method, presents only short courses and one to five-day conferences. The program differs substantially from that at the Technion and the factors developed by Cooper would appear to be irrelevant to the Technion scene. Cooper concludes his report by stating "The challenge to each continuing professional development administrator seems to be to accurately describe the coordinator's role, train the coordinator against a job criteria as a standard, assign work so that maximum productivity is achieved...". But, finally, he admits "Much work still needs to be done to accurately determine workload standards for professionals involved in engineering professional development."

The matter of estimating the required overall personnel requirements for a continuing education program is a bit simpler than that of determining the workload standard for the course coordinators. A factor method can be used based on the annual money turnover or income generated by the continuing education function.

The table below presents information on University of California Extension. Each of the eight universities in the University of California system operates its own extension division. They present short courses, certificate programs, seminars, transferrable degree-credit courses, travel-study programs, in fact, almost any conceivable program which furthers the University goals of serving the people of the state of California. The UC Extension was established in 1893 and in 1985 the total system had 350,000 enrollees (approximately three times as many as the number of full-time students in the university system) who attended 11788 courses, lecture series, seminars, conferences and travel-study programs.

The ratios and factors which one can work out from these figures are not only interesting but, in the experience of the author of this report, also seem to be quite representative of the ratios and factors for continuing education programs at other institutions.

The number of employees in the University of California Extension programs, the equivalent of the Technion Division of External Studies, is in the range of 11 to 13 employees per million dollars of income generated per year by the operations. The number of enrollees in each program is in the range of 20 to 30 and the cost (and income) per program is in the range of \$3000 to \$7000. The figures in the higher range are from those universities that have a relatively high proportion of short courses and travel-study courses which generally are more expensive than the longer-term, transferrable credit courses.

An interesting conclusion is that there appears to be no advantage to scale of operations with respect to the personnel requirements. Both UC Los Angeles with the largest income followed by UC Berkeley required 13 employees per million dollars while UC Riverside, with one of the smallest budgets needed 13.6 full-time-equivalent employees. On the other hand, UC Santa Cruz with the smallest program required 11.6 employees to generate one million dollars of income and the smallest personnel requirement was at UC San Diego where 11.6 employees sufficed (62 employees generating an income of almost \$6 000 000 per year).

THE UNIVERSITY OF CALIFORNIA EXTENSIONActivity at the Various Universities  
1985-86

<u>University</u>	<u>Enrollees</u>	<u>Programs</u>	<u>Budget</u>	<u>Employees</u>
Berkeley	44835	1566	\$10810	140
Davis	26025	1060	\$4766	61
Irvine	19102	734	\$4250	49
Los Angeles	126445	4344	\$25820	338
Riverside	18848	743	\$2495	34
San Diego	31971	1620	\$5497	62
Santa Barbara	12975	583	\$2335	27
Santa Cruz	15111	687	\$2013	24

**Notes:**

- a) The budget is in thousands of dollars.
- b) The number of employees is full time equivalent employees
- c) The University System also operates a continuing education program for the legal profession. This had 40444 registrants in 933 programs with a budget of \$16511100 for the 1985-86 year.

The number of administrative support personnel in the Technion Division of External Studies per \$1 000 000 of income generation is similar to but slightly larger than the numbers cited from the University of California system. To this, however, one must add the academic consultants much of whose function in the UC system is performed by the program specialists.

### BUDGETING

One of the important elements and operations involved in the CE operation is cost and operations budgeting. Unfortunately, only a relatively small proportion of the professionals involved in Continuing Education have the necessary background in this area to permit them to function independently not only in budgeting but also in budget control and cost monitoring.

Knowledge and experience in budgeting and finance can be of great assistance to the course coordinator and, in many instances can represent the vital elements. They are essential in a number of decision-making categories, for example, in decisions concerning promotional activities, in cost-effectiveness, in go-no go decisions about course presentations and in other areas such as in the search for new market opportunities.

This topic is a large one and one that cannot be addressed in any detail in a report such as the present one. A book devoted to this topic has appeared recently (Matkin, 1985). The author of this report highly recommends it as a comprehensive text and reference book on the budgeting of the continuing education function.

## THE EXTENDED TECHNION

As is the case with every university, the Technion is charged with a number of functions such as - undergraduate instruction, graduate instruction, research - and, in addition, it is charged with a public service function. One of these public service functions is, of course, the provision of continuing education. The present activities of the Division of External Studies at the Technion deal with only one of the many aspects of university public service through continuing education. It does not require a very broad construction of the meaning of continuing education to realize that service to the public, in addition to addressing some of the educational needs of adult professionals and some youth activities, can and does include many additional activities and address many other problems.

Public service activities of a university such as the Technion should include programs to expand the awareness and understanding of public issues which can affect the country and its population. It should have programs aimed at enhancing the cultural and intellectual life of the community. It should have programs aimed at disseminating knowledge and fostering an awareness of the effects and consequences of the knowledge explosion and information age, as well as of other developments and activities which can have effects and consequences on the community and on the country. It should seek and develop avenues to foster collaborative programs and activities between the community and the campus.

What this really means is that the Technion is a university, it must act like a university and it must be perceived to be a university. Its presence must be felt in the entire community - it must become "visible" not only within its immediate community but also in the entire country. The Technion must become an Extended Technion.

Perhaps the founding fathers who gave the name External Studies to the continuing education function of the Technion were wise in the choice of name. The term Extension has not yet been appropriated by another function of the Technion and this would be a fitting and appropriate name for characterizing the operations and purpose of the Extended Technion. One of the functions of the Technion Extension, obviously, would be continuing education.

The Technion grew and developed within an environment that was characterized by rapid economic growth and by rapid population growth. The country was blessed with well-



educated professionals, the Technion added to their numbers and furthered their intellectual growth and development, a number of high technology industries developed, some of them with Technion assistance, and continue to develop. But, in the opinion of the author of this report, the Technion, is not doing enough to develop the ultimate resource - the human brain. And, further, the Technion neither now or ever did do enough to convince the government and the citizenry of the importance of this resource nor to demonstrate to the government and to the citizenry the importance of the human resource and the ultimate good that this resource can bring to all. One of the important and effective ways of doing this is through an extended Technion by means of a properly thought out, developed and executed public service program.

Another university, following a reappraisal of its public service function and its program of continuing education, which are carried out by its Extension Department, recently phrased the following goals (Walshok, 1987):

"The educational challenges and opportunities facing University Extension over the next five years are not simply to serve individual students, respond to identifiable adult constituencies, or react to market trends, but through general education, knowledge dissemination, dialogues on public policy, and creative human resources development strategies to 'add value' to the economic and institutional infrastructure of this region. This means enlarging the productive capacity of the society of which we are a part and playing a vital role in building the socio-political infrastructure and the human capital of this region through a diversified program of courses and educational services."

This statement represents the goals of UC San Diego Extension which serves a metropolitan area of approximately 2 million people. Surely the Technion, serving a population of approximately four million, can do no less.

In reaching these goals UC San Diego intends to concentrate on five areas all of which are equally relevant for the Technion. They are:

- 1) To build a strong professional and managerial infrastructure through programs serving teachers, public administrators, health workers, business and managerial workers, engineers and technicians.

- 2) To assure a robust intellectual infrastructure through programs which enhance technology transfer, social and cultural awareness, political and public policy savvy, aesthetic and artistic values.

3) Encouraging economic development and entrepreneurship through activities which enhance knowledge and skills, foster opportunities for successful enterprise development and manufacturing growth and enhance sophistication of the service sector.

4) Developing skills for working and living in an international context through programs dealing with trade and export, languages, cultural understanding and international interdependencies.

5) Preparing leadership in all sectors to deal with change and challenges.

Walshok continues "This strategic plan is both a statement of the important goals of the organization as well as an explanation of the multi-year strategies for achieving these goals. ... In some instances we have firm strategies ... in other areas we advocate broad preparation and informed opportunism."

In a paraphrase of some other remarks made by Walshok this author can add - in a community as dynamic as Israel, a management and academic posture of constraint and inflexibility would be less than the community needs and less than the Technion is able to offer.

The goals of an Extended Technion, as laid out here, are almost exactly in line with the aims and goals of the Samuel Neaman Institute for Advanced Studies in Science and Technology at the Technion. The S. Neaman Institute would provide the atmosphere and ambience necessary for such activities and for reaching such goals. Its name indicates that it deals with advanced studies. It would free the Technion of immediate responsibility for these matters but would allow a great measure of supervision, hopefully benign, by the Technion academic administration. A proper system of Technion control and monitoring can, without doubt, be established.

Serious consideration should be given to the transfer of the Division of External Studies from the Mussad to the Extension function. This would end the anachronism of continuing education at the Technion being under the administration of a non-academic unit, the Mussad, which has no connection whatsoever with continuing education and which possesses no expertise in this area. Such a transfer would require changes in the structure of the Division and, in addition, possible retraining and continuing education of some of the present Division staff.

Additional and important reasons for delegating the External public service activities to the S. Neaman Institute have to do with financial and administrative matters. This function, if carried out under the aegis of the S. Neaman Institute, would be divorced from Technion administrative, budgetary and financial considerations and limitations, and would not be a tempting source of cash flow. Financial gains could be used to further extension operations, losses could be borne by the S. Neaman Institute and funds, hopefully provided also through Technion sources, could be used for the development of new and important areas in accordance with the principle of "...broad preparation and informed opportunism".

It is inconceivable that a function as important and essential to the Technion as Technion Extension not be under appropriate Technion academic monitoring and control. And such would be the situation for Technion Extension under the aegis of the S. Neaman Institute. In the opinion of the author of this report, an appropriate system of academic supervision could be supplied by a Dean of Technion Extension who would report directly to the President of the Technion.

The appointment procedure for the Dean of Technion Extension cannot be the same as that for the Director of the Division of External Studies. It is suggested that the President propose to the Senate a candidate for the position of Dean of Technion Extension. The Senate would vote on this proposal in a procedure similar to that for the Senate consultation with respect to the candidacies for the various vice presidential positions. By this means the Dean would draw his academic authority from the Senate as well as from the senior Technion academic administration. This voting procedure plus the fact that he reports to the President, would make the Dean's status almost equivalent to that of the vice presidents.

A Senate decision concerning the Director of the Division lays down that the Director reports directly to the President, but this decision has been construed rather broadly in the past. In this loose construction the Director reported to the VP for Academic Affairs on academic matters and to the VP for Research (by virtue of the fact that he represented the Technion administration and Senate with respect to the Mussad) on administrative and financial matters. This loose construction cannot be tolerated with respect to the Dean of Technion Extension.

The Dean would have to work very closely with and in cooperation with the Director of the S. Neaman Institute from whom he would draw his administrative authority. The

practical result of this probably would be that the Director would be the person who would propose to the President the candidate or a short list of candidates for the Deanship. The programs for Technion Extension would be prepared by the Dean and brought to the Director in accordance with para. III of the Senate decision of 5.2.78 with respect to the Samuel Neaman Institute. This program, however, would be submitted by the Director but in coordination with the President, not to the VP for Research as presently laid down in para. III for the research program.

It is the opinion of the author that the welfare of an Extension program requires that the Dean of Technion Extension serve in that position for a minimum of four years, preferably even for a longer period. It is suggested that a Dean be elected for an initial appointment of two (or possibly three) years and that this appointment be renewable. A well-organized Extension function which is staffed with competent permanent personnel should be able to survive a poor Deanship for several years. It is doubtful if such a function can survive a parade of short-term Deans. Not only should a successful Dean be allowed to serve additional terms but he should be encouraged to do so. The search for Dean of Technion Extension should be recognized as serious business. Based on the personal experience of the author such a Deanship would be a full-time job almost equivalent in demands on the incumbent as is a Technion vice-presidency.

The general tenor of the proposals made here would require very few amendments to the Senate decision of 5.2.78 concerning the S. Neaman Institute. It is suggested, however, that an appropriate translation to Hebrew be found for the word STUDIES in the name of the institute which is "The Samuel Neaman Institute for Advanced Studies in Science and Technology at the Technion". The present translation is unsatisfactory.

## COURSES, PROGRAMS AND LECTURES

The terms of reference for the work reported herein included a statement concerning guidelines for courses to be given, in what framework, with what frequency and lecture needs. Whatever the programs, courses and lectures which are to be undertaken may be, they must be the results of appropriate market surveys, of studies by qualified program directors, of discussions, meetings, evaluation of needs, etc. Proposed activities also must be confronted with the realities of cost considerations, income projections, budgeting, availability of qualified teaching personnel and physical facilities, in other words, with the multitude of factors which enter into a forecasting and planning campaign. Thus, it would be impossible, in a report of this type, to present a listing of suitable courses, programs, lectures, etc. for continuing education and for Technion Extension which could serve as a working model for activities. And, in addition and no matter what the framework, a continuing education operation is expected to be self-supporting, or almost self-supporting, even when under the aegis of an Institute such as the S. Neaman Institute.

Notwithstanding all of this, what follows is a listing, more or less random, of short courses, credit courses, certificate programs, seminars, etc. which have been gleaned from discussions and from information about continuing education functions and extension activities at a number of universities. This listing may be able to provide some guidance as to the types of activities that can be considered and might also succeed in sparking-off additional ideas and thoughts about additional areas and activities.

### Short Courses

- Fiber Composites
- Metal Matrix Composites
- Corrosion of Engineering Materials
- Metal-Ceramic Bonding and Applications
- Secure Communication Systems
- Information Systems Security
- Coding for Reliable Transmission and Cryptography
- Graphic Kernel Systems
- Microwave Circuit Design
- Multi-User Communication Systems and Networks
- Creative Problem Solving
- Kalman Filtering
- Integrated Logistic Support: Elements and Application
- Logistics Support Analysis

Artificial Intelligence: Technology, Industry and Applications  
High Performance Computer Architectures: Supercomputers and Alternative Systems  
Submicron Electronic Devices  
Numerical Methods and Digital Computer Techniques for Engineers and Scientists  
Photometry and Colorimetry for Information Displays  
Analysis and Design of Flight Systems Using Modern Control Theory  
High-Speed Si and GaAs IC Design  
Local Area Network Applications of Fiber Optics  
Introduction to Artificial Intelligence and Expert Systems  
Writing Better Computer Software Documentation for Users  
Technical Writing with Computers  
Characteristics of Magnetic Storage Devices  
Solid-State Electronics for Non-Electrical Engineers  
Elements of Project Engineering  
Advanced Professional and Technical Writing  
Decision Support Systems: How to Design, Select, Evaluate and Use  
Implementing Statistical Control Methods for Productivity and Quality  
Solving Engineering Design and Analysis Problems Using Probabilistic Methods  
Industrial Biotechnology  
Biotechnology and Bioprocesses  
Strategic Innovation for Corporate Venturing  
Developing Effective Engineering Teams  
VDT Ergonomics: Man-Machine Interface  
Plasma Etching  
Loss Prevention in the Process Industries  
Crystallization Technology  
Patent Law for Engineers and Scientists  
Licensing and Negotiation for the Technical Manager  
Constructing and Purchasing Law  
Emergency Response Planning  
Marketing Research and Strategic Planning  
Barrier Metals for Semiconductor Fabrication  
Advanced VLSI Packaging  
Creative Negotiation  
Cost/Schedule Control Systems Criteria  
Import/Export  
Construction Management

and the list goes on. Mention should be made of the large number of courses in the health and medical areas.

Credit and Certificate Courses and Programs

In Business and Management:

General Management  
 Management of Functional Areas  
 Leadership Development  
 Communication  
 Personal Development  
 Computers and Information Systems  
 Marketing and Advertising  
 Finance  
 Economics  
 Accounting  
 Personnel Training and Management  
 Engineering Management

In Engineering and Science:

Telecommunications and Communications Engineering  
 Artificial Intelligence  
 Engineering Management for Construction  
 Plant Engineering  
 Fire Protection Engineering  
 Manufacturing Engineering  
 Microprocessor Hardware/Software Engineering  
 Computer Science  
 Introductory Science  
 Toxic and Hazardous Materials Control and  
 Management

and, in addition to this sampling, transferrable credit courses in all of the disciplines.

Potpourri of Certificate Programs

Interior Design  
 Interior Architecture  
 Fitness Instruction  
 Interpretation and Translation  
 Technical Communication  
 Graphic Design/Visual Communication

and, in addition to this sampling, a number of programs in the health and medical areas.

Additional Public Service, Extension Programs

Research and technical briefings to industry researchers, scientists and engineers.  
 Technology and entrepreneurship seminars - Making the connection between high-tech companies,

university and financial sources.  
Technology forums  
Public lectures, individual lectures and lecture series  
Extracurricular programs in topics such as -  
    Visual arts  
    Performing arts, film, theater and television  
    Music  
    Decorative arts  
    Graphic arts

and, in addition,

Overseas study programs in  
    Languages  
    Music  
    Archeology  
    History



## CONTINUING EDUCATION FOR TECHNION FACULTY

The Quality of Engineering Project of the American Society for Engineering Education produced a report in which it was pointed out that most engineering teaching faculty were finding difficulty in keeping up-to-date in subjects outside of their own teaching areas (Helping Professors Keep Up To Date, Eng. Educ. News, p.1, January, 1987.). In fact they were even unfamiliar with much of the material that their own students were learning. As examples, they pointed out that aeronautical engineers now use composites and adhesives rather than aluminum and rivets, that chemical engineers are now dealing with biotechnology, etc. And the list continues of subjects that were not taught or of areas which, perhaps, did not even exist when most of the present teaching faculty were doing their university studies. The situation now prevailing is that the teaching faculty who may be up-to-date and current in their own research area may, in essence, be illiterate not only with respect to developments in other professional disciplines but also even with developments in other areas in their own discipline.

This problem of faculty development has been tackled by the Electrical and Computer Science Department of the Massachusetts Institute of Technology. This Department has been offering compressed versions of its new undergraduate courses to the engineering faculty of the university. The Department also organized a Workshop for educators in electrical engineering and computer science to discuss career-long learning programs for the teaching faculty. The summary of this workshop concluded that intensive, compressed courses designed for faculty could help the faculty become familiar with material in areas contiguous to their own technical area of expertise.

The American Society for Engineering Education has taken action along the lines recommended by the Workshop. It has taken the first step in creating a comprehensive career-long education system for engineers by sponsoring the Continuing Education Program for Engineering Faculty. Two-week courses in electrical engineering and computer science will be offered to engineering faculty. The purpose is not to teach new advanced material to experts in the field. Its purpose is to provide a rigorous introduction to a new area for faculty members with different specialties. Seven two-week courses are scheduled for the summer of 1987 and twelve are planned for the summer of 1988.

The Senate of the Technion should give serious consideration to the problem of faculty development especially in view of the fact that a relatively high proportion of its

faculty completed their formal studies some years ago. Some of the faculty may not be au courant with developments and changes which have been taking place not only in areas contiguous to their own, but also in other more remote areas which could have bearing on their teaching, planning, course structure and content.

Professor Louis D. Smullin who was one of the organizers of the career-long learning workshop and who also is one of the academic members of the Board of Governors, would, without doubt, be willing to assist the Senate in its deliberations and to bring his knowledge and experience in this area to bear on the problem.

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APPENDICES

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TERMS OF REFERENCE

The terms of reference for this work were laid down by letter dated 3 September, 1986 to Professor W. Resnick signed by Professor G. Hetzroni, then Director of the Samuel Neaman Institute for Advanced Studies in Science and Technology. They were:

To produce a comprehensive report on Continuing Education and a concrete and detailed proposal for an administrative framework for Continuing Education at the Technion. This document would serve the Neaman Institute in the establishment of a mechanism for organizing continuing education and as a guideline for what courses to give, in what framework , with what frequency, lecture and administrative needs, etc.

PERSONS INTERVIEWED

<u>Name</u>	<u>Organization</u>	<u>Location</u>
Thelma Estrin Associate Dean	University of California University Extension and Continuing Education	Los Angeles California
L. Freedman, Dean	University of California University Extension and Continuing Education	Los Angeles California
S. Gordon, President	Center for Professional Advancement	East Bruns- wick, N. J.
G. Matkin, Director Adm. Services	University of California University Extension	Berkeley California
Tom Mincer, Executive Director	Continuing Education Institute	Woodland Hills, CA
M. Robinson, Vice President	Center for Professional Advancement	East Bruns- wick, N. J.
R. Skwarek, Director	University of California UCSD Extension, Department of Business and Management	San Diego California
M. Stern, Dean	University of California University Extension	Berkeley California
J. Stone, Director Financial Services	University of California University Extension and Continuing Education	Los Angeles California
Mary Walshok, Associate Vice Chancellor	University of California UCSD Extensiion	San Diego California

DICTIONARY

For the purposes of this report:

Engineer-can refer also to architect, chemist, physicist, doctor, etc. In short to all the professionals produced by the Technion.

Faculty-refers to the academic staff of a university. It may also refer to a specific teaching unit, i.e., the Faculty of Electrical Engineering.

He-refers to he or she, i.e., the engineer, he, means the engineer, he or she.

His-refers to his or hers.

Mossad-the Technion Foundation for Research and Development.