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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION
INTERNATIONAL CENTRE FOR SCIENCE AND HIGH TECHNOLOGY
TRAINING COURSE ON BASIC USES OF LASERS IN SMALL SCALE INDUSTRIES
19 - 28 MAY 1997, SÃO PAULO, BRAZIL



ICS Training Course
"BASIC USES OF LASERS IN SMALL SCALE INDUSTRIES"
São Paulo, Brazil
19 to 30 of May, 1997

Final Report

by

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Synopsis

A training course on Basic Uses of Lasers in Small Scale Industries, under the sponsorship and co-ordination of ICS/UNIDO, was organised in São Paulo. Several participants from all Latin America and the Caribbean region as well as from Brazil attended. Initially designed to accommodate 40 participants, the course handled more than the double of that, particularly during sessions of sensitisation. A partnership among local organisations like the University of São Paulo, the host institution, the Instituto de Pesquisas Energéticas e Nucleares - IPEN, SEBRAE (the local organisation that congregates micro and small scale industries) and other smaller contributors, provided facilities and funds that allowed more than 80 participants to attend the course and to learn about lasers as an alternative high technology tool to industries. More than 80 hours of classes, laboratory demonstrations, video tape sessions, technical visits and presentations of lasers industries from all over the world were given. Several lecturers and invited speakers from various countries gave their contribution to this activity that could be regarded as highly successful according to the ratings obtained by an evaluation made at the end of the course.

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ICS Training Course
BASIC USES OF LASERS IN SMALL SCALE INDUSTRIES
São Paulo, Brazil
19 to 30 of May, 1997

Final Report

1. Introduction

The Latin American region although developed in some high-tech niches, lack the appropriate University-Industry interaction. The industrial development of such countries processed apart to the investment in higher education. Brazil and Argentina, for instance, have a good critical mass of scientists and engineers but most of the big companies' projects come from abroad. There are basically no development or application laboratories in the local Universities or Research Institutions and multinational companies import equipment and processes directly from their mother organisations. Regarding the automotive industry, for example, high-tech applications in their assembly lines, with robots and lasers, are imported in a turn-key policy directly from the developed countries through their local representatives. Consequently the question of technology transfer and University-Industry interaction are, today, of the most discussed items in the agendas of the Ministries of Science and Technology and in the Economy Courses.

Of particular interest is the industrial use of lasers in small scale industries since this tool may provide the small entrepreneur with a new way of making old things or also manufacturing new things that were impossible to do before the development of lasers. Thus, this new age entrepreneur, with the help of lasers, will now aggregate technology to his product or service. Therefore, the opportunity created by a training course aimed to this particular sector of the economy, is vital to start up a culture of technology transfer and thus help the economical development of the region.

2. Objectives

The philosophy behind this training course was to provide the small industrialist-technologist from Latin America and Caribbean countries with some training on advanced areas of laser applications in their business, and to put them in contact with one another and with their colleagues from different countries, in order to promote exchange of experiences and technical information. Moreover, this course was an opportunity to strengthen the links among ICS/UNIDO, scientific institutions, small industries and business organisations in the region with the final objective of creating a network of high level scientific institutions, small scale industries organisations and technicians from industries in Latin America.

3. Location of Training Course and Choice of the Institution

São Paulo, Brasil was obviously very convenient from the point of view of serving Latin American and Caribbean countries. Specially now with the advent of the Mercosur, São Paulo

became a particularly important city regarding industry and finance in this zone. By hosting such an activity in Brazil, Latin American and Caribbean countries received intensive assistance by the local organisers. The course was held under the scientific responsibility of IPEN, *Instituto de Pesquisas Energéticas e Nucleares* and under the administrative responsibility of FUSP, *Fundação de Apoio à Universidade de São Paulo*. The host Institute, IPEN, provided all facilities for the Training Course (laser job shop facility, laser development laboratory, crystal growth laboratory, auditorium, demonstration equipment, audio, video and multimedia facilities). The Foundation, FUSP, administrated the Training Course budget.

4- Partnerships and Joint Ventures that Provided Additional Support to the Training Course

Considering that the Training Course on Basic Uses of Lasers in Small Scale Industries was specifically oriented towards technology transfer and industrial applications, other interested bodies were also involved. The most important contribution came from SEBRAE/SP, *Serviço de Apoio às Micro e Pequenas Empresas*, the Brazilian Organisation for the Support of Micro and Small Industries that contributed with additional funds (US\$27,500,00) representing 34% of the total budget of the course. This financial support was of a major help since it provided funds to promote the course through advertisements in the local newspapers, radio, telemarketing and to the manufacture and distribution of folders and posters (annex I - course material). Considering that the number of applications that came mostly from Brazil, more than doubled the expected number, the support of SEBRAE was determinant to the success of the course providing that a great number of people had access to this training course. Another support that came from CLAF, *Centro Latino Americano de Física*, helped with the quick purchase of supplies and with small expenses.

5. Programmatic Structure of the Course

Due to the fact that the course was directed mostly to the small entrepreneur and that this kind of public does not have two full weeks to participate in an intensive training like the proposed one, the course was divided into two main parts: one sensitisation module of 16 hours (two full days) mostly to answer such basic questions like WHAT ARE LASERS? WHY AND WHEN TO APPLY LASERS? Another module of 7 days followed where deeper laser concepts were introduced including a Technology Management module of 8 hours. For the sensitisation module more than 80 participants were present (list of participants in annex II). The second module followed with 50 highly interested and motivated participants until its end with the exception of the Technology Management module that allowed the participation of 34 previously selected participants, condition established by the lecturer due to the application of group dynamics method in this module.

The programme developed (annex III) followed a logical sequence where basic principles of lasers and of fundamental optics were given. The 17 lecturers (14 from Brazil, two from Argentina, one from Italy and one from USA) that participated in the course were originated from various institutions (annex IV). More than 10 hours of illustrative video tapes were given by the lecturers and by invited companies representatives (annex IV). Case studies were always opportunely presented and economical issues like cost benefit analysis were approached.

Redundancy of some programme items was on purpose to help the assimilation of concepts since the public did not have physics or laser background. More than 40.000 photocopies of course material (copies of transparencies, texts and referred biography) were distributed to the participants.

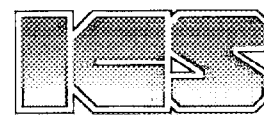
Scientific visits to 6 laboratories and facilities were provided, where demonstrations of laser development and laser utilisation were made. These activities were highly appreciated by the participants that had the opportunity to see *in situ* the application of lasers as a tool to do things that are usually done with conventional tools but now in a more efficient and economic way and with more quality. Since 35% of the industrial laser application market refers to cutting of materials, special emphasis was given to this application. However, a good part of the course was devoted to the description and discussion of the latest technologies implicated in the uses of lasers in industry like cutting, drilling and welding. Lectures on safety and laser classification were also conducted. Three special seminars were given to demonstrate and illustrate other laser applications in medicine, dentistics and to the environment.

6 - Course Evaluation

At the end of the course two questionnaires were distributed. One was dedicated to evaluate the course as a whole and to obtain the participants opinion regarding the course organisation, programme, facilities and lectures (annex V). The other questionnaire was dedicated to evaluate the lecturers, the technical visits to laboratories and facilities, the Technology Management module and the presentations of participating laser companies (annex VI). The first questionnaire provided an evaluation that rated the course as highly successful regarding all aspects approached by the questionnaire placing the answers that classified the course as **good, very good and excellent** (annex VII). In a scale from zero to 10 the second questionnaire rated the lecturers with **8.72** (87,2% of approval), the technical visits with **8.85** (88,5% of approval), the Technology Management module with **8.25** (82,5% of approval) and the companies presentations with **7.65** (76.5% of approval) (annex VIII).

7 - Conclusions and recommendations

Analysing the data obtained by the evaluation questionnaires (annexes VII and VIII), we could say that the course was highly successful. This evaluation seen in the annexes speaks by itself. Since this kind of ICS/UNIDO activity in this high technology area was pioneer in South America, to have such high registered ratings and considering the opinions of lecturers and professors that actively participated in the course, this kind of activity should be more frequent in our region. We could feel the anxiety of the participants to learn about lasers and their utility in industry. The laser facility of IPEN (laser job shop), which is operational, could act as a reference centre for training in this area. This training course could be repeated in the near future and IPEN could stand as a pole (focal point) and training facility to irradiate this kind of knowledge since it was identified a high demand for it and since São Paulo offers good conditions for the realisation of such an activity due to its geographical position in South America and due to the availability of a high density of people interested.



INDUSTRIAL APPLICATIONS OF LASERS

Training Course on Basic Use of Lasers in Small-Scale Industry
Sponsored by the International Centre for Science and High Technology / UNIDO

*Que são lasers?
Por que e para que utilizá-los na sua empresa?
Onde aplicá-los?*

CURSO DE TREINAMENTO EM USOS BÁSICOS DE LASERS PARA MICRO E PEQUENAS EMPRESAS

O Centro Internacional de Ciência e Alta Tecnologia/ICS, órgão da UNIDO localizado em Trieste, Itália, fará realizar no IPEN em São Paulo, de 19 a 30 de maio de 1997, com o apoio do SEBRAE e da CECAE/USP, um Curso de Treinamento em Usos Básicos de Lasers para Micro e Pequenas Empresas. Este curso é dirigido para empresários de indústrias de pequeno e médio porte da América Latina. Seu principal objetivo é oferecer a estes empresários a oportunidade de um contato próximo com lasers e também demonstrar as possibilidades e aplicações potenciais desta tecnologia de ponta para seus empreendimentos.

19 a 28 de maio de 1997
Instituto de Pesquisas Energéticas e Nucleares
Cidade Universitária, São Paulo

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Maiores detalhes e informações: <http://www.ipen.br/m/me/meo/tchomepage.html>



CLAF





United Nations Industrial
Development Organization
International Centre for Science
and high Technology

CURSO DE TREINAMENTO EM USOS BÁSICOS DE LASERS PARA MICRO E PEQUENAS EMPRESAS

TRAINING COURSE ON BASIC USE OF LASERS IN
SMALL-SCALE INDUSTRY

Sponsored by the

- International Centre for Science and High Technology / UNIDO

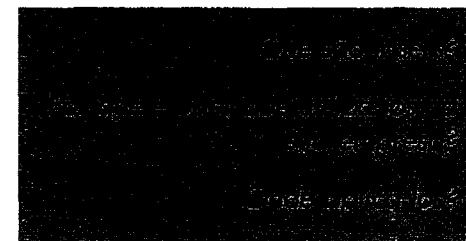
In association with

- Universidade de São Paulo - USP
- Instituto de Pesquisas Energéticas e Nucleares - IPEN
- Serviço de Apoio às Micro e Pequenas Empresas de São Paulo - SEBRAE/SP
- Centro Latino Americano de Física - CLAF

Produção Gráfica: Wtla.



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19 a 28 de maio de 1997
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○ Centro Internacional de Ciência e Alta Tecnologia/UNIDO, localizado em Trieste, Itália, com o apoio do SEBRAE/SP e da CECAE/USP, realizará em São Paulo, Brasil, de 19 a 28 de maio de 1997, um Curso de Treinamento em Usos Básicos de Lasers na Micro e Pequenas Empresas. Este curso é dirigido para empresários de indústrias de pequeno porte da América Latina e do Caribe. Seu principal objetivo é oferecer a estes empresários a oportunidade de estabelecer um contato mais próximo com lasers e também demonstrar as possibilidades e aplicações potenciais desta tecnologia de ponta em seus empreendimentos.

○ curso abordará, em linguagem simples, os princípios do laser e suas possibilidades voltadas para aplicações industriais. Grande parte do curso será dedicada a demonstrações, experimentos, viagens para trabalho de campo bem como discussões. Dessa forma, espera-se que, após o curso, o empresário da indústria de pequeno porte esteja capacitado para tomar decisões no que diz respeito ao aprimoramento de sua linha de produção, considerando agora a possibilidade de agregação da tecnologia laser ao seu produto. Além de aulas formais, haverá seminários e palestras informais sobre assuntos relacionados à aplicações dos lasers em outras áreas, como medicina, odontologia e meio ambiente.

- Sensibilização: por que usar lasers?
- Introdução aos Lasers
- Normas e critérios de segurança
- Tipos de Lasers
- Aplicações específicas
- Corte, furação, solda e marcação
- Instrumentação laser
- Classificação dos lasers
- Visitas para demonstrações

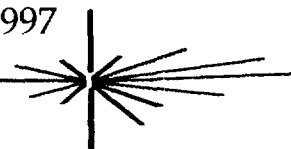
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- ◆ Prima Industrie, Itália
- ◆ OptoEletrônica, São Carlos
- ◆ Lasag, Suíça
- ◆ Coherent, U.S.A.
- ◆ Tumpf, Alemanha

○ curso será dividido em duas partes. Na primeira, será feita uma **sensibilização** por dois dias, nos quais um público de 100 empresários tomará contato com questões básicas como: **o que são lasers, por que e para que utilizá-los e onde aplicá-los**. Na segunda parte, o curso prosseguirá, em nível mais aprofundado, por mais 50 horas para 40 empresários latino-americanos previamente selecionados, dos quais 20 do Brasil.

Serão selecionados, entre os participantes do Curso, candidatos que serão financiados pelo ICS/UNIDO para realizarem visitas de curta duração ou que receberão bolsas de treinamento em estágios mais prolongados em países avançados. Estas visitas e estágios serão realizados em empresas que já utilizam esta tecnologia em suas linhas de produção. Com isso o ICS/UNIDO pretende disseminar a tecnologia laser em países em desenvolvimento, uma vez que se espera que tais candidatos, ao voltarem às suas empresas de origem, atuem como agentes multiplicadores

Curso de Treinamento em Usos Básicos de Lasers para Micro e Pequenas Empresas
Instituto de Pesquisas Energéticas e Nucleares, 19 - 28 de maio, 1997





Desenho: Gráficos Jurek

CERTIFICADO

Certifico que

participou do Curso de Treinamento em Usos Básicos de Lasers para Micro e Pequenas Empresas, realizado de 19 a 28 de maio de 1997, no Instituto de Pesquisas Energéticas e Nucleares, na Cidade Universitária, em São Paulo.

São Paulo, 28 de maio de 1997.

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AIDE-MEMOIRE

INDUSTRIAL APPLICATIONS OF LASERS
BASIC USE OF LASERS IN SMALL SCALE INDUSTRIES

CURSO DE ENTRENAMIENTO EN USOS BASICOS DE LÁSERES PARA MICRO Y PEQUEÑAS EMPRESAS

SÃO PAULO, BRAZIL
19-28 MAY 1997

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BACKGROUND AND JUSTIFICATION

The Latin American region although developed in some high-tech niches, lacks the appropriate University-Industry interaction. The industrial development of such countries processed apart to the investment in higher education. Brazil and Argentina, for instance, have a good critical mass of scientists and engineers but most of the big companies projects come from abroad. There are basically no development or application laboratories in the local established multinational companies. Regarding the automotive industry, for example, high-tech applications in their assembly lines, with robots and lasers, are imported in a turn-key policy directly from the developed countries through their local representatives. Consequently the question of technology transfer is today one of the most discussed item in the agendas of the Ministries of Science and Technology and in the Economy Courses. Of particular interest is the industrial use of lasers in small scale industries since this tool may provide the small entrepreneur with a new way of making old things and thus allowing the aggregation of technology to his product or service. Therefore, the opportunity created by a training course aimed to this particular sector of the economy is vital to start up a culture of technology transfer and thus help the economical development of the region.

AIMS OF THE TRAINING COURSE

The philosophy behind this training course is to provide the small industrialists from Latin America and Caribbean countries with some training on advanced areas of laser applications in their business, and to put them in contact with one another and with their colleagues from different countries, in order to promote exchange of experiences and technical information. Moreover, this course will be an opportunity to strengthen the links among ICS, scientific institutions, small industries and business organizations in the region with the final objective of creating a network of high level scientific institutions, small scale industries organizations and technicians from industries in Latin America.

STRUCTURE OF THE TRAINING COURSE

The course will consist of a sensitisation module of two days, lectures, up-to-date seminars, demonstrations and visits to industrial plants. This course will be devoted to the description and discussion of the latest technologies implicated in the uses of lasers in industry like cutting, drilling and welding. Lectures on safety and laser classification will be also conducted. Special seminars on Environment applications and medical and odontological applications will be given as well. Moreover a visit to the National Laboratory of Synchrotron Light in Campinas will take place.

PARTICIPATION

Participants expected: About 40 participants (20 of whom sponsored by ICS-UNIDO). The number of participants could change subject to the availability of extra funds from various local bodies

Lecturers expected: 5 plus 10 from Brazil.

EXPECTED OUTPUTS

The training course is structured in a way to improve both the individual skills and the capacity building of the organizations from which participants are coming. The main goal is to raise the awareness about the potential uses of lasers as an alternative tool to improve the quality/cost ratio and throughput of industrial products. It is expected that the trainees receive and absorb enough information to be able to transmit it by the time they are back to their countries and organizations. It is expected that each trainee be a multiplier of this technology so he will be able to contribute, in some way, to improve the conditions of produced goods in his original organization thus contributing to the economical development of the region. It is expected that the trainees provide a feedback of their experiences back to their organizations so an effective follow up of the course's efficacy will be attained.

PROGRAMME

The training course will offer the participants the opportunity to be exposed to topics, giving them clear indication on the basic methodology to be applied and on the access to the information and material for learning. The programme will consist of lectures, seminars, videotapes presentations, lab demonstrations and visits to industrial plants and/or laser laboratories.

DOCUMENTATION

The documents available for the training course will be:

- 1) Aide-mémoire of the training course.
- 2) Programme and list of participants.
- 3) Lecture notes, bibliography and copies of transparencies

LANGUAGE

The language of the meeting will be Spanish and Portuguese. Since lectures and seminars will be also conducted in English, knowledge of technical English is highly recommended and will be considered in the selection of candidates.

TIME AND VENUE

The training course will be held from 19 to 28 May 1997 at the Instituto de Pesquisas Energéticas e Nucleares (IPEN) Cidade Universitária, Caixa Postal 11049 Pinheiros, São Paulo, Brazil Phone: +55-11-816-9390 Fax: +55-11-816-9123.

FINANCIAL ADMINISTRATIVE ARRANGEMENTS FOR ICS-UNIDO FINANCED PARTICIPANTS

For those who will be invited by ICS-UNIDO to participate in the training course, round-trip air-economy transportation from the airport of departure will be arranged and prepaid tickets issued where necessary. Room and board at the training course venue plus a daily allowance will be provided upon arrival to São Paulo. Reservation will be made for all participants at the Hotel Eldorado Higienopolis, in São Paulo

The participants will be required to bear the following costs:

All expenses in their home country incidental to travel abroad, including expenditures for passport, visa, and any other miscellaneous items. ICS-UNIDO will not assume responsibility for any of the following costs which may be incurred by the participant while attending the meeting:

- (1) compensation for salary or related allowances during the period of the workshop;
- (2) any costs incurred with respect to insurance, medical bills and hospitalization fees;
- (3) compensation in the event of death, disability or illness;
- (4) loss or damage to personal property of participants while attending the workshop.

CONTACT PERSON

For additional information, please contact Prof. Spero Penha Morato, Coordinator of the Training Course:

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Aplicaciones Industriales de los Láseres

Uso Básico de los Láseres en la Micro y Pequeña Industria

Curso de entrenamiento para los países de Latino América, organizado por el Centro Internacional para la Ciencia y la Alta Tecnología, ICS/UNIDO en asociación con el Instituto de Investigaciones Energeticas y Nucleares - IPEN, Universidad de São Paulo - USP, Servicio de Apoyo a las Micro y Pequeñas Industrias de Sao Paulo - SEBRAE y el Centro Latino Americano de Física - CLAF IPEN - San Pablo, Brasil, del 19 al 28 de Mayo de 1997

PROGRAMA

Lunes, 19 de Mayo

- 8:30 Inscripción-
- 9:00 Sesión de Apertura - Prof. S.P.MORATO
- 9:30 Clase de Sensibilización : ¿Qué son los láseres?
Dr. N. D. VIEIRA. Jr.
- 10:30 *Intervalo - Café*
- 11:00 Clase de Sensibilización: ¿Para qué y en qué usar los láseres en su industria? Dr. F.GRASSI
- 12:30 *Intervalo - Almuerzo*
- 14:00 Clase de Sensibilización: ¿Cuándo y dónde aplicar los láseres?
Análisis de Costo- Beneficio. Dr. F. GRASSI
- 15:30 *Intervalo - Café*
- 16:00 Presentaciones en Video

Martes, 20 de Mayo

- 8:30 Introducción a los láseres con un panorama de sus aplicaciones
Prof. M.. GARAVAGLIA
- 10:30 *Intervalo - Café*
- 11:00 Radiación de cuerpo negro,. Luz incoherente y coherente, Inversión de población, Construcción de resonadores
Prof. M. GARAVAGLIA
- 12:30 *Intervalo - Almuerzo*
- 14:00 Regímenes de operación , Potencia asociada y sus aplicaciones
Características de la propagación de la radiación láser. Coherencia de la emisión y focabilidad . Importancia para las aplicaciones.
Prof. E. LLUESMA
- 15:30 *Intervalo - Café*
- 16:00 Conferencia de LASAG/General Scanning Inc: Aplicaciones Industriales de Láseres de Neodímio
GUIDO BAHLER /WELODIMER NEUSTADTER Jr.

Miércoles 21 de Mayo

- 8:30 Láseres del estado sólido compactos bombeados por láseres de diodo
Dr. N. U. WETTER
Láseres de gas, con énfasis en las características de la emisión (CO₂) -
Dr. NICOLAU A. S. RODRIGUES
- 10:30 *Intervalo - Café*
- 11:00 Láseres de estado sólido bombeados ópticamente: Nd:YAG, Vidrio, etc.
Dr. W. DE ROSSI.
- 12:30 *Intervalo - Almuerzo*
- 14:00 Sistemas de focalización. Modos del láser. Óptica volante. Óptica fija.-
Dr. F. GRASSI
- 15:30 *Intervalo - Café*
- 16:00 Parámetros de control de procesos para cada proceso
Descripción de sistemas típicos de 5 - 6 ejes. Focalización de ejes 3D.
Robots, Gantries y Fibras Ópticas -
Dr. F. GRASSI

Jueves 22 de Mayo

- 8:30 Interacción de la radiación con la materia. Absorción, transmisión y
reflexión. Absorción resonante y no resonante -
Prof. M.GARAVAGLIA
- 10:30 *Intervalo - Café*
- 11:00 Processamiento con láseres de potencia en materiales metálicos.
Dr. M. S. LIMA
- 12:30 *Intervalo - Almuerzo*
- 14:00 Difusión del calor. Problemas clásicos y problemas prácticos
Dificultades en el corte de esquinas agudas. Efectos del ciclo de trabajo-
Prof. E. G. LLUESMA
- 15:30 *Intervalo - Café*
- 16:00 Demostraciones en los laboratorios de la División de Óptica Aplicada -
Central de Processamiento Laser - J.R.BERRETTA y E.GALEGO
Laboratorio de Desarrollo de Láseres - Dr. WAGNER DE ROSSI
Laboratorio de Crecimiento de Cristales - Dra. SONIA BALDOCHI

Viernes 23 de Mayo

- 8:30 Aplicaciones industriales de los láseres: perforado, corte, marcado y
grabado - Descripción para diferentes materiales
Prof. E.G.LLUESMA
- 10:00 *Intervalo - Café*
- 10:30 Principales parámetros para la modelación, perforado y corte,
soldadura y la optimización del perfil del haz
Prof. E. G. LLUESMA
- 11:30 Interacción de la radiación laser con la materia viva. Clasificación de
láseres e daños biológicos. - Profa. DENISE M. ZEZELL

- 12:30 *Intervalo - Almuerzo*
 14:00 Modulación de Potencia y el ciclo de trabajo - Prof. E. G. LLUESMA
 15:30 *Intervalo - Café*
 16:00 Demostraciones en el laboratorio LADECOM del Centro Tecnológico da Marinha em São Paulo - Eng R. SIGHAY

Sábado 24 de Mayo

(sala de conferencias del Hotel Eldorado Higienópolis - mañana y tarde)

- 8:30 Tópicos especiales de Gerencia y Transferencia de Tecnología
 Prof. J.ADEODATO DE SOUSA NETO y Prof. S. P. MORATO

Lunes 26 de Mayo

- 8:30 Comparaciones entre los diversos tipos de láseres
 Dr. DAVID A. BELFORTE
 10:30 *Intervalo - Café*
 11:00 Láseres industriales: tendencias en las aplicaciones
 Dr. DAVID A. BELFORTE
 12:30 *Intervalo - Almuerzo*
 14:00 Instrumentación con láseres: Prof. J. C. CASTRO N.
 15:30 *Intervalo - Café*
 16:00 Técnicas ópticas para análisis de superficies - Prof.M. MURAMATSU

Martes 27 de Mayo

Viaje a Campinas: Visita al Laboratorio Nacional de Luz Síncroton (LNLS).
 Prof. ALDO CRAIEVICH y Prof. S.P.MORATO

Miércoles 28 de Mayo

- 8:30 Seminario de interés: Aplicaciones médicas - Dra. E. NICOLA
 9:30 Seminario de interés: Aplicaciones Odontológicas -
 Dr. C.P. EDUARDO
 10:30 *Intervalo - Café*
 11:00 Seminario de interés: Aplicaciones ambientales
 Dr. B. CLEMESHA.
 12:30 *Intervalo - Almuerzo*
 14:00 Evaluación del Curso. Prof. S.P.MORATO
 15:30 *Intervalo - Café*
 16:00 Anuncios de becas y de viajes de estudio -
 Distribución de certificados y ceremonia de cierre

- Dr. FABRIZIO GRASSI

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Tel. +39-11-410.31
Fax +3911-411.28.27

- Dr. MARIO GARAVAGLIA

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M.B. Gonnet - La Plata - Argentina
Tel. +54-21-842957
54-21-840280
Fax +54-21-714341
e-mail: postmaster@cio.edu.ar

■ - Dr. ELISEO GALLEGO LLUESMA

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Fax +54-21-530189
e-mail: laserlab@pinos.com

- GUIDO BALHER

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601 Campus Dr., Suíte B-5, Arlington Heights, IL. 6004
United States of America
Tel. (847)593-3021
Fax (847)593-5062

- WELODIMER NEUSTADTER JR.
GENERAL SCANNING INC.
CONEC - Comércio e Importação Ltda.
Rua Itapeva, 486 - térreo
01332-902 - SÃO PAULO/SP
Fone: 011-285-4755
Faz 011-251-3832

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United States of America
Fax +1-508-347-7737

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Instituto de Estudos Avançados - IEAv
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SÃO JOSÉ DOS CAMPOS/SP
CEP 12231-970
Tel (012) 344-1033
Fax (012)341-4277

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IFCar - Grupo de Ótica
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Fax (016)2713616

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Fax (011) 818-7871

- Dr. BARCLAY CLEMESIA
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Fax (012)325-6952

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- Dr. NIKLAUS URSUS WETTER

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- Dr. WAGNER DE ROSSI

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- Dr. MILTON S. LIMA

ESCOLA POLITÉCNICA-USP

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- Dra. DENISE M. ZEZELL

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Dra. SONIA LICIA BALDOCCHI

Tel. 816-9306

Dr. GESSE EDUARDO CALVO NOGUEIRA

Tel. 816-9307

EGUIBERTO GALLEGO

Tel. 816-9300

JOSÉ ROBERTO BERRETA

Tel. 816-9307

JOSÉ TORT VIDAL

Tel. 816-9300

ICS Training Course: EVALUATION QUESTIONNAIRE

Course/Workshop: Training Course on Basic Uses of Lasers in Small Scale Industries
Instituto de Pesquisas Energéticas e Nucleares, São Paulo, Brazil 19 to 28 of May 1997

A. Organization:

1. How did you obtain information about this workshop/course?

- | | Excellent | Very Good | Good | Fair |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 2. The information process was | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. The announcement and pre-course material was | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Describe the content of the workshop/course: | | | | |
-

- | | Excellent | Very Good | Good | Fair |
|---|--------------------------------------|--|--------------------------|--------------------------|
| 4. I found the scientific programme | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4.1. Applied Lecture/Workshop | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4.2. Use of small working groups | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4.3. Case Studies | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4.4. The time spent by lecturers in class and after
class on specific questions/examples | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 4.5. Students scientific knowledge was | Balanced
<input type="checkbox"/> | Unbalanced
<input type="checkbox"/> | | |

B. Duration of programme:

- | | Just right | Too long | Too short |
|---------------------------|--------------------------|--------------------------|--------------------------|
| 1. Number of days | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Length of working days | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

C. Training facilities & Hotel:

- | | Excellent | Very Good | Good | Fair |
|---------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. Lecture/Training Rooms | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Breaks/refreshments | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

3. Hotel accommodation
4. Meals at the hotel

If "Fair" please explain why: _____

- D. Organizer's response to participants needs
- E. Overall programme organization

F. Would you recommend to others from your institution/
country to attend a similar activity in the future?

Yes Maybe No

1. Which part of the Activity did you find most useful?

2. Which part of the activity do you think should be expanded?

3. Which part of the activity do you think should be dropped?

4. Any other suggestions for future improvements to the programme?

5. Do you think that the topics/tools you studied during the course could be used by industries in you country? If so, how? If not, why not?

6. Can you suggest any programme and future activities which ICS could pursue in order to help with the technological and scientific advancement of your country?

7. Do you think you have benefited from participation in this course/workshop? If so, how? and your Institution?

8. How do you intend to disseminate the information you have acquired during the activity once back in your own country?

G. Evaluation of Lectures and Speakers

	Excellent	Very Good	Good	Fair
1. Course material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Resident Lecture presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. International Lecture presentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Ability of lecturers to answer specific questions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Any comments:

Thank you for your collaboration.

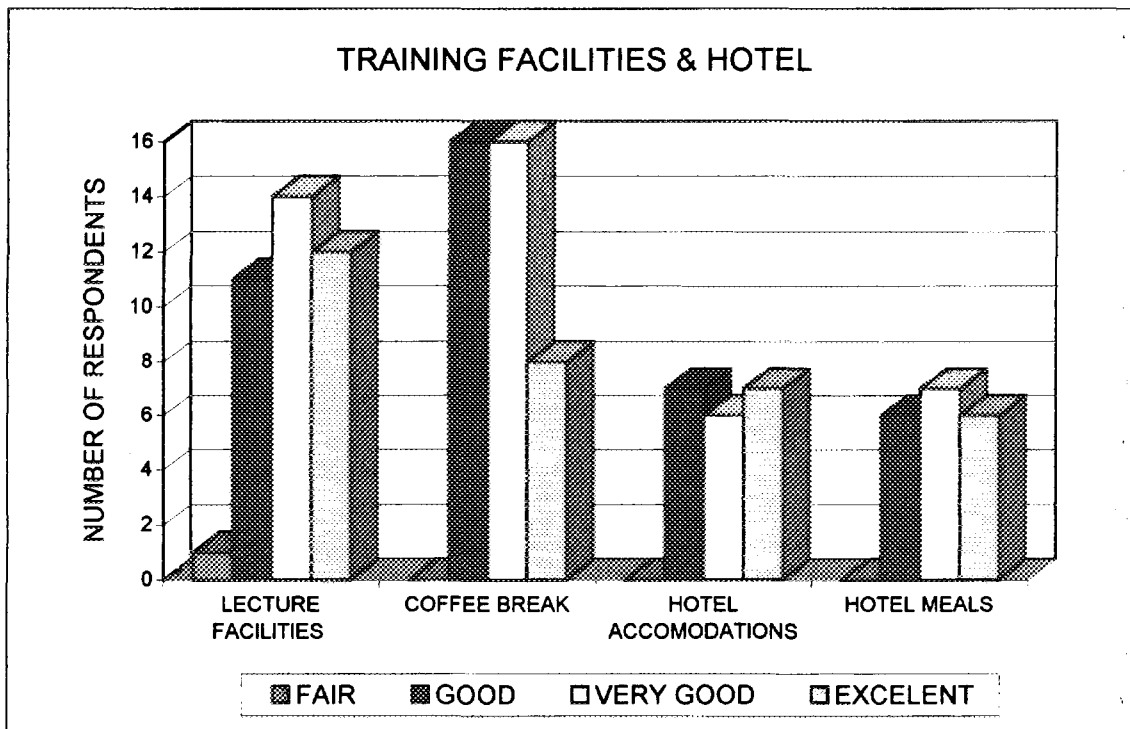
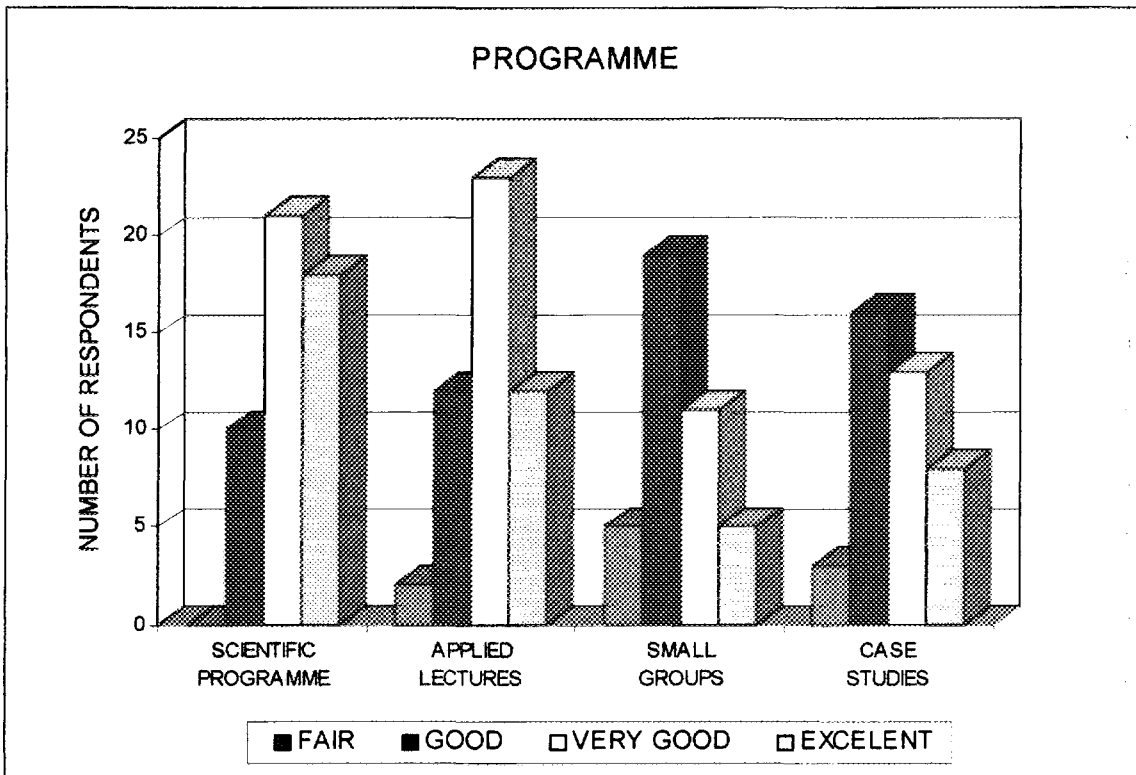
Training Course: “Laser Applications in Small Scale Industries”

List of Lecturers and their affiliations

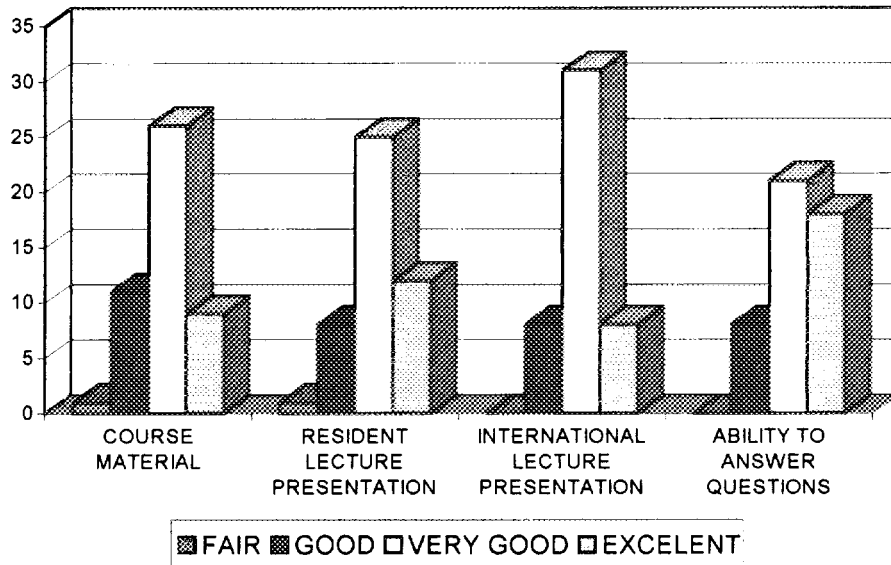
Dr. Nilson Dias Vieira Jr/IPEN/Brasil
 Dr. Fabricio Grassi/PRIMA/Italy
 Prof. Mario Garavaglia/CIOP/Argentina
 Prof. Eliseo Gallego Lluesma/CIOP/Argentina
 Dr. Niklaus Ursus Wetter/IPEN/Brasil
 Dr. Nicloau A.S. Rodrigues /IEAv - CTA/Brasil
 Dr. Wagner de Rossi/IPEN/Brasil
 Dr. Milton Lima/EPUSP/Brasil
 Dr. Denise M. Zezell/IPEN
 Dr. David Belforte/INDUSTRIAL LASER REV./USA.
 Prof. Mikia Muramatsu/IFUSP/Brasil
 Prof. Jarbas Caiado de Castro/IFSC-USP/OPTO/Brasil
 Prof. Carlos de Paula Eduardo/FOUSP/Brasil
 Prof. Esther Nicola/UNICAMP/Brasil
 Dr. Barclay Clemesha/INPE/Brasil
 Dr. José Adeodato de Sousa Nt/SPECTRUM/UNIDO
 Prof. Aldo Craievich/LNLS - Campinas/Brasil

List of Laser Companies Present and their Countries of Origin

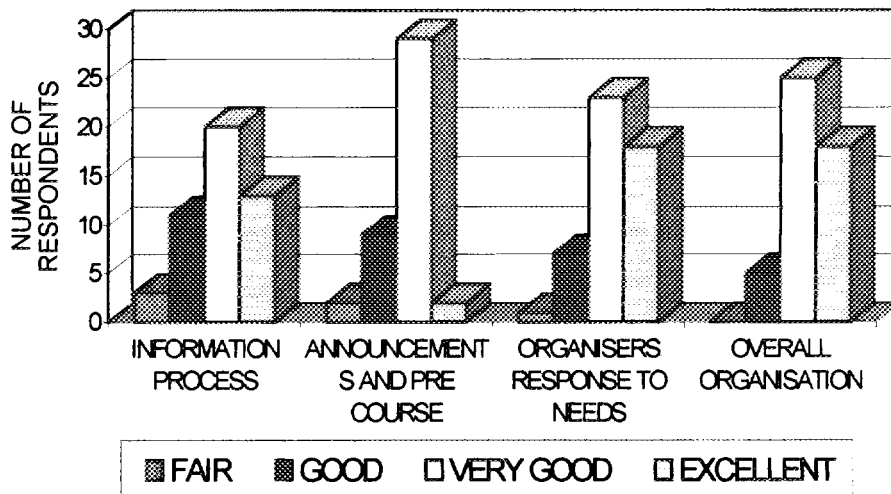
PRIMA INDUSTRIE/ITALY/Dr Fabricio Grassi
 LASAG/SWITZERLAND/Dr. Guido Failer
 GENERALSCANNING/U.S.A/Welchimer Neustadter
 MAZAK/JAPAN/Devanir Torres
 MAZAK/JAPAN/Yoshikazu Kanatani
 TRUMPF/GERMANY - only sent material



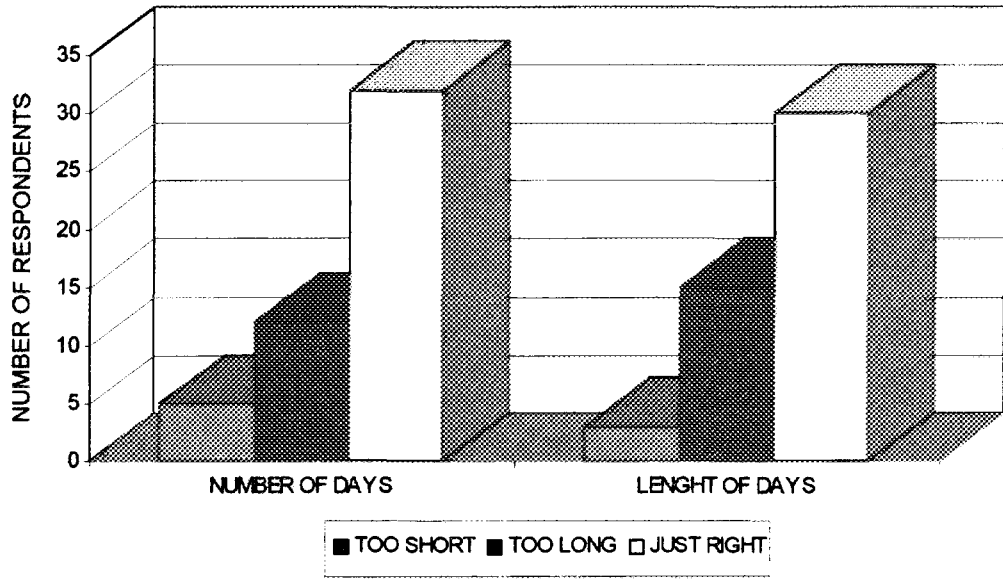
EVALUATION OF LECTURERS AND SPEAKERS



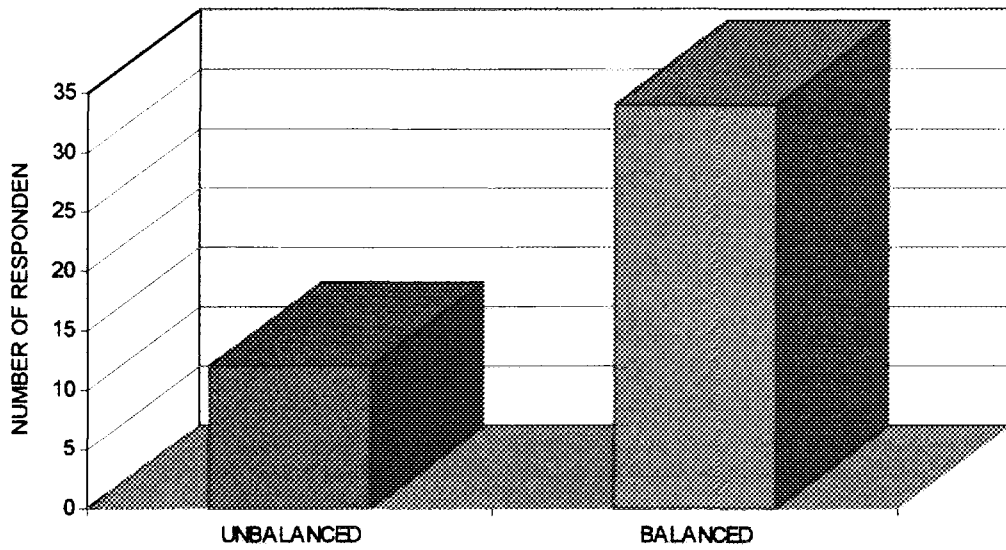
ORGANISATION



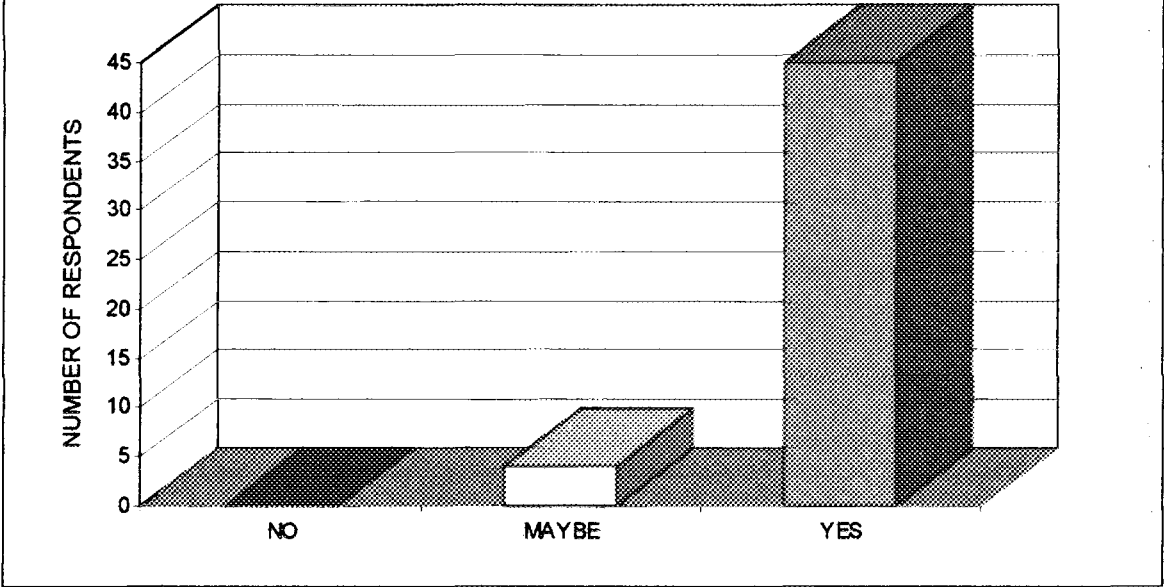
DURATION OF THE COURSE



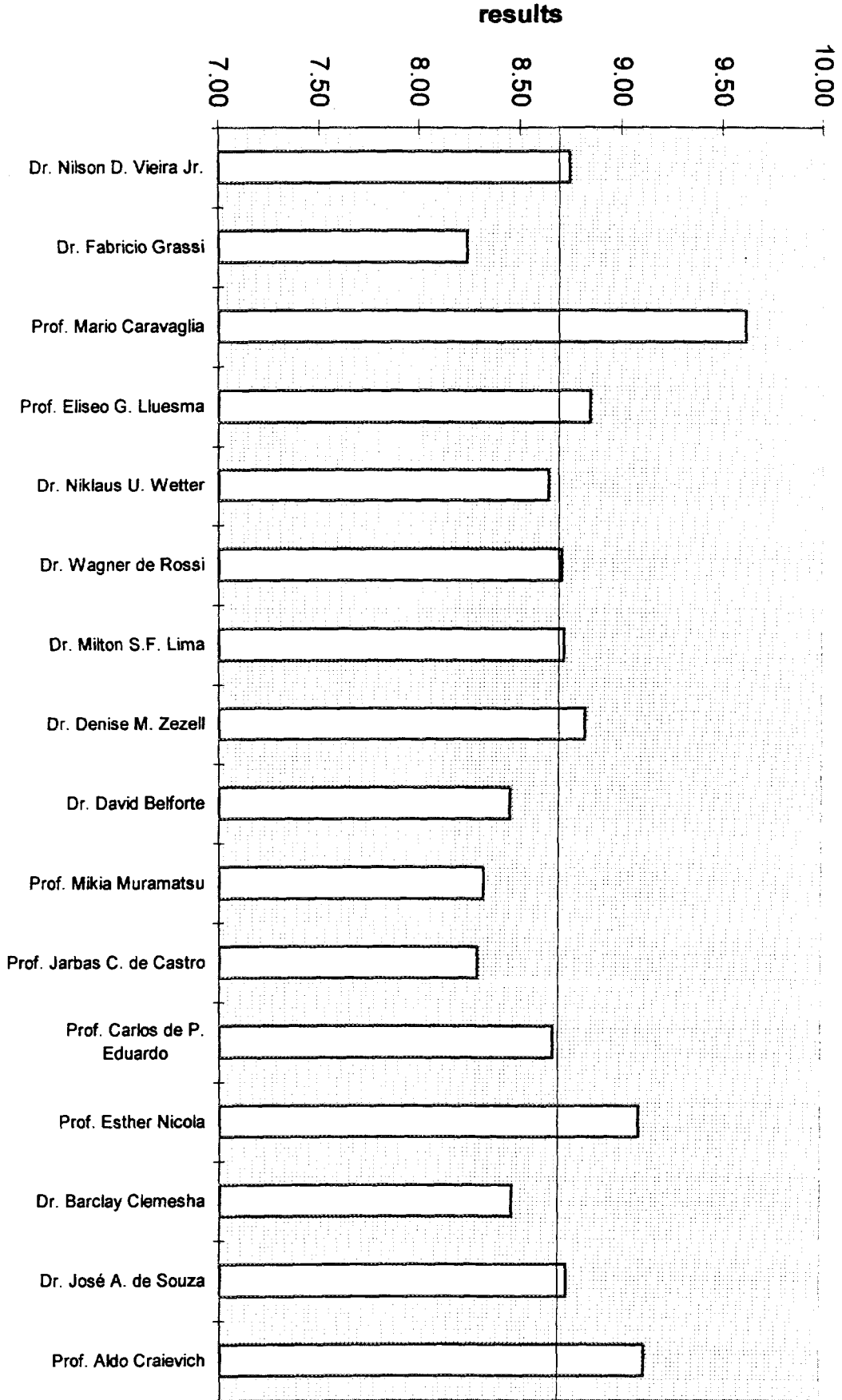
STUDENTS SCIENTIFIC KNOWLEDGE



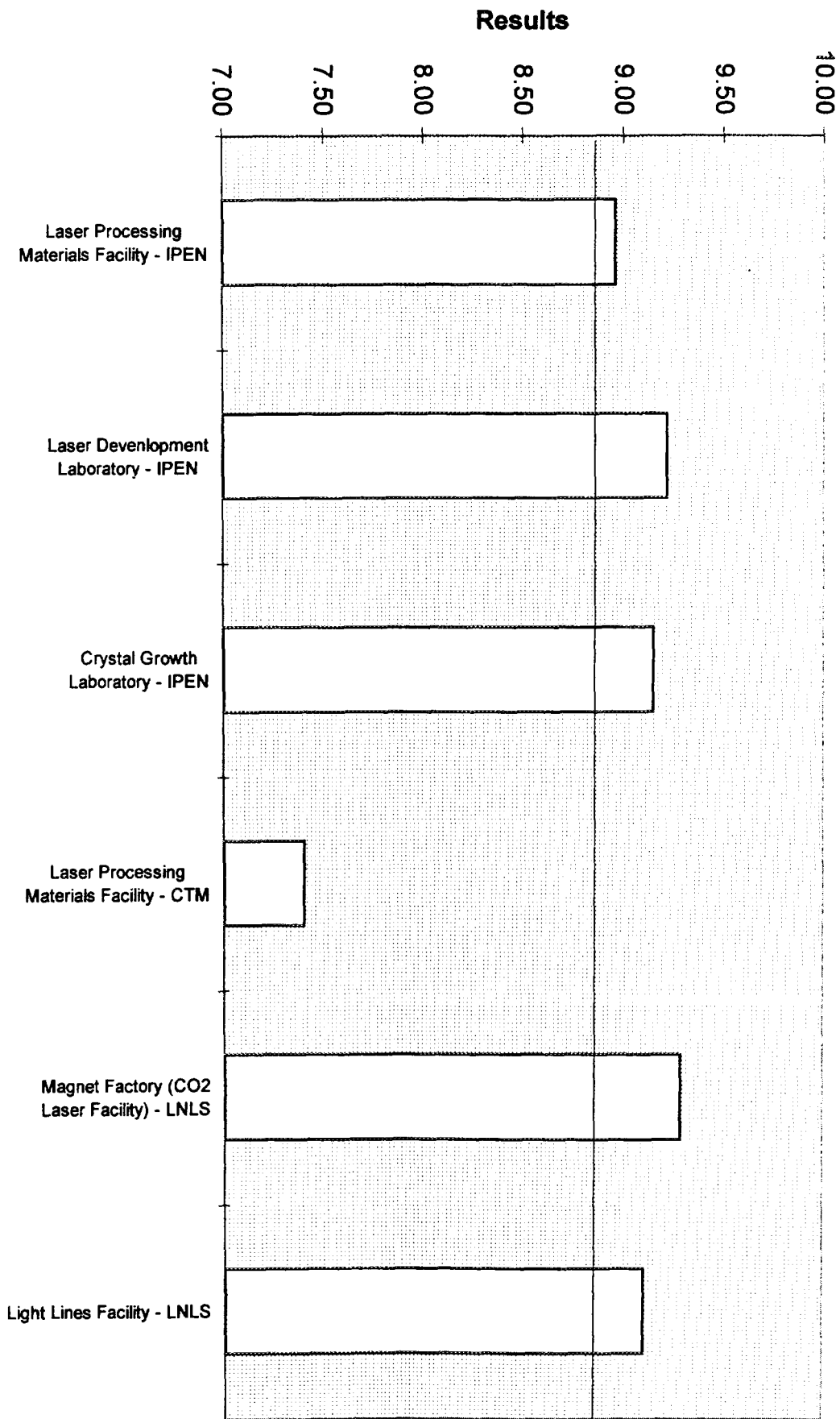
WOULD YOU RECOMMEND THIS ACTIVITY?



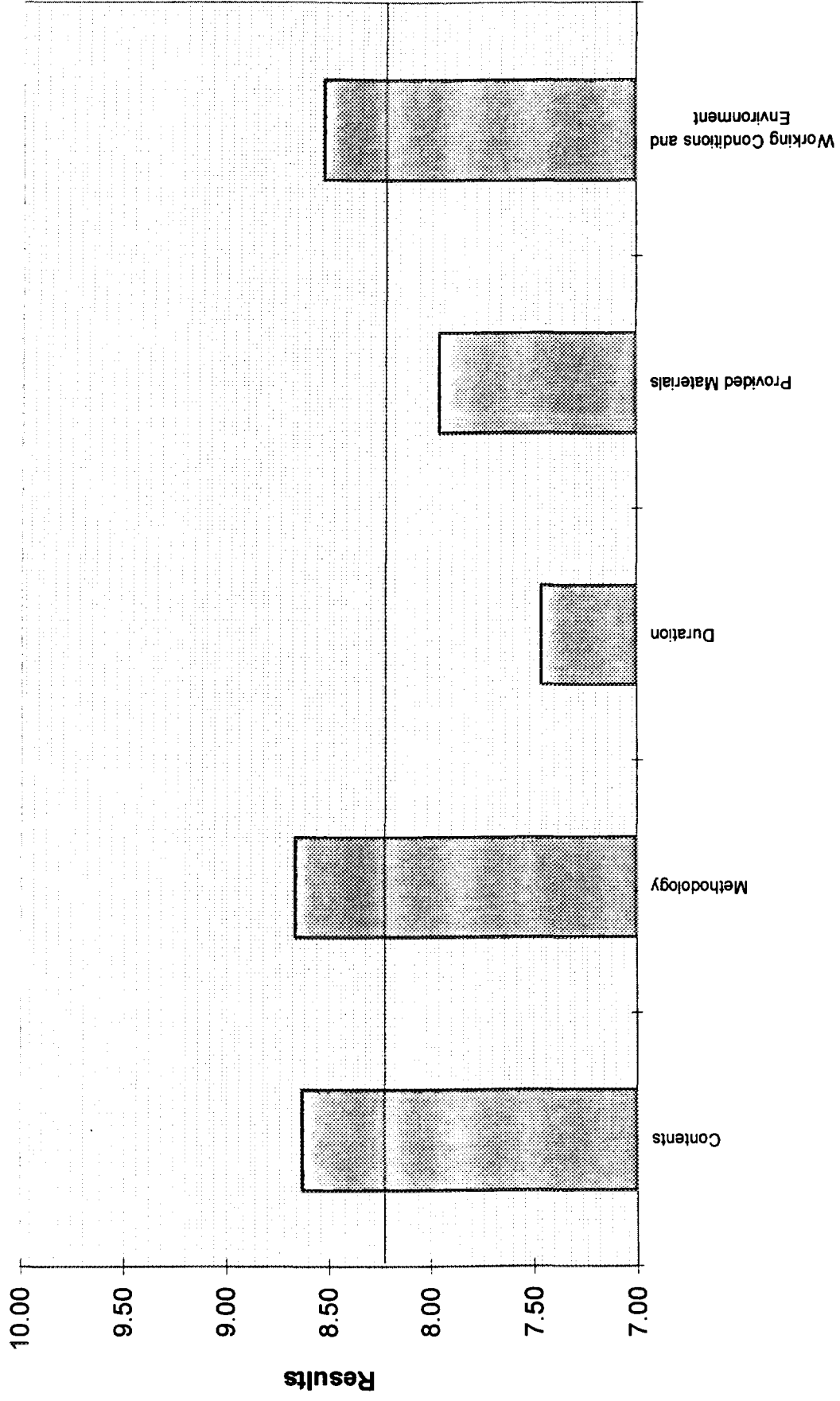
Professors



Technical Visits



Technology Management



Companies' Delegates

