INTERNATIONAL CENTRE FOR
FOR
THEORETICAL PHYSICS

Scientific Activities in 1985

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A REVIEW OF THE SCIENTIFIC ACTIVITIES
of the International Centre for Theoretical Physics,
Trieste, Italy,
during 1985

General

The main fields of research and training-for-research at the Centre in 1985 were:

(a) Fundamental physics (elementary particles and fundamental theory);

(b) Physics and energy (nuclear physics, nonconventional energy, plasma physics);

(c) Physics of condensed matter (including atomic and molecular physics)

(d) Applied Physics (laser physics, fiber optics and microprocessor technology);

(e) Physics of the living state;

(f) Physics of the environment and of natural resources (physics of the atmo- sphere, soil physics);

(g) Mathematics (applicable mathematics);

(h) Physics teaching;

(i) Experimental physics training at Italian laboratories and

(j) Physics and development.

Two thousand seven hundred and twenty scientists from 109 Member States visited the Centre during 1985, staying for a total of 2,669 man/months. Sixty percent of them were from developing countries, but they accounted for 81.6% of the total man/months.

Under its Associate Membership scheme, the Centre welcomed 127 associates from 42 developing countries. Approximately 300 researchers from federated institutes in 40 developing countries visited the Centre.

The Centre organized two extra-mural activities – the Regional College on Microprocessors in Bogota (Colombia) and a workshop on sand transport and desertification in arid lands in Khartoum (Sudan).

The Centre received a special contribution for 1985 from the Department for Cooperation to Development of the Italian Ministry of Foreign Affairs. This contribution permitted the Centre to expand its research activity, the Associate Membership and Federation schemes, the extended course programmes and the training at Italian academic and industrial laboratories as well as establishing an Office for External Activities and, through the United Nations University, a laboratory for microprocessor technology and applications.

Fundamental Physics

Research in fundamental physics was carried out throughout the year. The annual summer workshop in high energy physics and cosmology welcomed 161 researchers, 111 of whom from developing countries.

A conference on tests of electroweak theories, polarized processes and other phenomena was organized by the Centre in collaboration with the Department of Theoretical Physics of the University of Trieste, the Italian Institute for Nuclear Physics (INFN) and the International School for Advanced Studies (SISSA, Trieste). Fourty-eight scientists were invited to attend, two of them being from developing countries.

Two hundred and sixteen scientists contributed throughout the year to the research in elementary particles.

In view of the late Professor Paul A.M. Dirac's special association with the Centre, two medals in his name were awarded on his birthday (8 August). Professor Yakov Zeldovich of the Space Research Institute, Moscow, was honoured for far-ranging contributions to relativistic astrophysics, particularly in theories of compact objects and of cosmic evolution. Professor Edward Witten of Princeton University was honoured for stimulating contributions to quantum field theory, particularly with regard to the implications.of new kinds of anomalies.

Physics and Energy

The Italian National Institute of Nuclear Physics (INFN, Rome) sponsored the second workshop on perspectives in nuclear physics at intermediate energies as well as the subsequent related hosted course — the workshop on nuclear and particle physics at intermediate energies with hadrons. The former saw the participation of 98 scientists, 20 of whom were from developing countries, while the latter was attended by 50 scientists, all from industrialized countries.

There followed a spring college on plasma physics under the title "Charged Particle Transport in Plasmas", with the participation of 138 scientists, 90 of whom were from developing countries. During the college, a prize in honour of Professor M. Sandoval Vallarta was awarded to Dr. Ricardo Galvao from Brazil for his outstanding contribution to plasma physics.

In September, the workshop on the physics of nonconventional energy sources and material science for energy attracted 191 scientists, 151 of whom were from developing countries.

The activity in the field of physics and energy was concluded in October with a topical meeting on phase space approach to nuclear dynamics.

Physics of Condensed Matter

The annual research workshop in condensed matter was held through the whole summer and was followed by the Trieste international symposium on fractals in physics. The participation in both activities was rather large — 250 scientists (188 from developing countries) attended the workshop, while 125 (17 from developing countries) took part in the symposium.

The activity in the month of August was further intensified by another two programmes — the working party on mechanical properties and behaviour of solids and the seventh Trieste international symposium on hopping transport. They brought together, respectively, 36 and 62 researchers. One fifth of the participants were nationals from developing countries.

Eighty-two scientists were associated throughout the year to the permanent research group in condensed matter physics.

Applied Physics

The 1985 programme was opened with the college on lasers, atomic and molecular physics which was divided into three parts — an introductory week, a topical meeting on free-electron lasers and a topical meeting on multiphoton processes. One hundred and fifty-nine scientists, 80 of whom from developing countries, attended the whole college.

In the wake of its previous successful sessions, a college on micro-processors was held also this year, with particular regard to the technology and applications in physics. Another college on the same subject was organized as a regional activity in Bogota (Colombia). A training session for the tutors of the college had been organized in January.

A small microprocessor laboratory operated in conjunction with the Italian Institute for Nuclear Physics (INFN) and financed by the Italian Department for Cooperation to Development through the United Nations University was created in October.

Physics of the Living State

The workshop on quality control of X-ray equipment saw the participation of 35 scientists, 7 of them belonging to developing countries.

Physics and the Environment

The college on soil physics aimed at providing participants with a funda-mental understanding of soil physical properties and processes. Within its

frame, a colloquium on energy flux at the soil atmosphere interface was held. There were over 100 participants, 80% of whom from developing countries.

The Centre also organized a workshop on sand transport and desertification in arid lands in Khartoum (Sudan).

The academic year was concluded with the Autumn workshop in cloud physics and climate and with a workshop on drought, desertification and food deficit organized by the Third World Academy of Sciences.

Mathematics

Mathematics research throughout the year witnessed a sharp increase in the number of researchers with respect to the previous year — 46 instead of 15. Four of them were from industrialized countries.

A workshop on mathematics in industry dealt with the application of mathematics to real problems (mathematical modelling) and involved lectures as well as practical exercises (simulation). Out of 83 participants, 2/3 were from developing countries.

As a follow-up to the 1984 autumn course, a workshop on semigroups and applications was organized this year for a restricted number of invited scientists.

Two courses, related to each other, concluded the programme of mathematics research in 1985 — the college on representation theory of Lie groups and the workshop on graded differential geometry.

Physics Teaching

A summer school on physics teaching at university level was specially organized for French-speaking African researchers (32); the whole teaching faculty (10 lecturers) came from France and Belgium.

Training at Italian Laboratories

As in previous years since 1982, the ICTP awarded grants to scientists from developing countries for training at Italian academies and industrial laboratories. The number of grants awarded this year amounted to 96.

Physics and Development

The conference on south-south and south-north cooperation in sciences, organized by the Third World Academy of Sciences and hosted by the ICTP, was one important event in the calendar. The Secretary General of the United

Nations himself opened the conference to which nearly 200 scientists, mainly from developing countries, had been invited.

On the day the TWAS conference ended, a two-day symposium on the state of physics and mathematics in the Arab world took place by the initiative of 21 visiting scientists from Arab countries.

As in the past, throughout the year invited experts as well as participants in the various scheduled activities delivered lectures relevant to the "Physics and Development" programme, at the rate of at least one lecture a week.

Other Activities and Sponsored Projects outside the ICTP

Over 150 scientists visited the Centre in order to carry out independent research in fields for which no activity was scheduled.

In addition to the courses on the scheduled programme, the Centre sponsored or co-sponsored 39 courses which were held outside Trieste.

SUMMARY OF PARTICIPATION IN THE RESEARCH AND TRAINING FOR RESEARCH ACTIVITIES AT THE ICTP 1985

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

.. 14XXXXX25 .... Microprocessors training session (TOT=37 DEV=18)

..... 21XXXXXXXXXXXXXXXXXXXXXXXXXX22 .. ..College on lasers, atomic, molecular physics (TOT=159 DEV=80)

.... 25XXX29 .... 2nd Wrkshp on prosp.in nuclear phys.at inter.energies (TOT=98 DEV=20)

.... 15XXXXXXXXXXX10 .... College on Soil physics (TOT=103 DEV=78)

.... 13XXX19 .... Workshop on quality control of X-Ray equipment (TOT=35 DEV=7)

.... 13XXXXX24 .... Workshop on mathematics in industry (TOT=83 DEV=62)

.... 20XX23 .... Test of electr.polar.processes and other phenomena (TOT=48 DEV=2)

.... 27XXXXXXXXXX21 . Coll.plasma phys."Charged Part.trans.in plasmas" (TOT=138 DEV=90)

.... 10XXXXXXXXXXX5 .... Lat/am reg.coll.on micropr.tech.& appl.* (TOT=87 DEV=77)

.... 11XXXXXXXXXXXXXX19 .. ... Wrkshp on high energy phys.& cosm.(TOT=160 DEV=110)

Workshop in condensed matter physics (TOT=250 DEV=188)....... ... 24XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX6 ....

6th Trieste int.symposium on "Fractal in Physics" (TOT=125 DEV=15)....... 8XXXX12 .. ..

1st symposium on status of phys/maths. in Arab World (TOT=21 DEV=21)..... 10XXX12 .. ..

Ecole d'ete' on physics teaching at university level (TOT=42 DEV=32)..... ..... 26XXXXX3 ....

Working party on mechanical properties (TOT=36 DEV=21)............................. .. 12XXXXXXX30 ....

7th Trieste int.symposium on "Hopping transport" (TOT=62 DEV=8)..................... ...... 27XXX30 ....

Wrkshp on phys.of non-conven.energy sources and mat.sciences for energy (TOT=191 DEV=151)........ 2XXXXXXXX20 ....

Topical meeting on phase space approach to nuclear dynamics (TOT=95 DEV=22)....................... .... 30XXXX4 ....

3rd Trieste college on microprocessors: technology & applications in physics (TOT=134 DEV=102)............... 7XXXXXXXXXX1 ....

Workshop on semigroups and applications (TOT=89 DEV=35).. 7XXXXXXXXXX1 ....

College on repres.theory of Lie groups (TOT=107 DEV=84)... 4XXXXXXXXXX6 .....

Int. Workshop on sand transportation and desertification in arid lands*(TOT=134 DEV=117)................................ .. 18XXXXXXXXXXXX29

Workshop on Cloud physics & climate (TOT=88 DEV=77).. .... 23XXXXXXX20 ..

Workshop on graded differential geometry (TOT=108 DEV=67)... 9XX13 ..

* held outside ICTP

Research (Throughout the year):
    Elementary particle research (TOT=216 DEV=130)
    Condensed matter research (TOT=82 DEV=58)
    Mathematics research (TOT=46 DEV=42)
    Physics & development programm (TOT=17 DEV=6)
    Miscellaneous research (TOT=153 DEV=91)

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    Training in Italian Laboratories (TOT=74 DEV=74)

1XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX31

Totals:	DEV.	IND.	TOTAL
1. for the 24 above activities	1,484	946	2,430
2. Research	327	187	514
3. Training in Italian Labs.	74		74
	1,885	1,133	3,018

SUMMARY OF PARTICIPATION: 1985 versus 1984

in the research and training-for-research activities of the ICTP
during 1985

| | Number of Visitors | | Number of Man/months | | T O T A L S | | Percentage for | |
	from developing countries	from industrialized countries	for developing countries	for industrialized countries	Number Visitors	Number Man/months	developing countries Number of Visitors	countries Number of Man/months
1 9 8 4	1,086	996	1,424.79	445.56	2,082	1,870.35	52.2	76.2
1 9 8 5	1,671	1,049	2,178.86	490.14	2,720	2,669.00	61.43	81.64
Increase	53.9%	5.3%	52.9%	10.1%	30.6%	42.7%		

The above 1985 figures include:

Regional Coll. on Microprocessor & Trainig on Micro. (Bogota' - Lisbona)

	95	29	64.45	6.58	124	71.03	76.61	90.73

Wp.on Sand Transp.& Deser. in Arid Lands (Khartoum)

	117	17	35.97	5.22	134	41.19	87.31	87.32

Italian Laboratories

	74	—	352.17	—	74	352.17	100.00	100.00

Participation in the research and training-for-research activities of the ICTP
during 1985
(by Geographical Area)

Geographic area	Number of Visitors		Number of Man/months		Total for area	
	from developing countries	from industrialized countries	for developing countries	for industrialized countries	Number Visitors	Number Man/months
Africa	477	–	516.49	–	477	516.49
Asia	592	37	996.37	13.17	629	1,009.54
Europe	351	803	324.13	331.04	1,154	655.17
Indonesia & Oceania	14	2	12.23	3.42	16	15.65
North & Central America	42	192	56.50	138.07	234	194.57
South America	195	–	273.14	–	195	273.14
International Organizations	–	15	–	4.44	15	4.44
	1,671	1,049	2,178.86	490.14	2,720	2,669.00

GRAND TOTALS   2,720   2,669.00

Percentage representation from developing countries: Number of visitors   = 61.43
                                                     Number of man-months = 81.64

NOTE: This table shows the actual number of visitors; i.e., visitors who participated in more
       than one activity are counted only once, since this
       table deals with all activities combined.

Participation in the research and training-for-research activities of the ICTP
during 1985
(Long and short-term activities)

Geographic Area	Long-term activities		Short-term activities		T O T A L	
	Number Scientists	Number Man/months	Number Scientists	Number Man/months	Number Scientists	Number Man/months
Developing countries						
Africa	460	512.68	17	3.81	477	516.49
Asia	573	994.19	19	2.18	592	996.37
Europe	322	318.96	29	5.17	351	324.13
Indonesia & Oceania	14	12.23	–	–	14	12.23
North & Central America	41	56.34	1	.16	42	56.50
South America	192	272.48	3	.66	195	273.14
International Organizations	–	–	–	–	–	–
Totals	1,602	2,166.88	69	11.98	1,671	2,178.86
Industrialized countries						
Asia	20	10.33	17	2.84	37	13.17
Europe	595	299.54	208	31.50	803	331.04
Indonesia & Oceania	2	3.42	–	–	2	3.42
North & Central America	148	130.99	44	7.08	192	138.07
International Organizations	15	4.37	–	.07	15	4.44
Totals	780	448.65	269	41.49	1,049	490.14
GRAND TOTALS	2,382	2,615.53	338	53.47	2,720	2,669.00

Percentage representation from developing countries: Number of visitors   = 61.43
Number of man-months = 81.84

NOTE: This table shows the actual number of visitors i.e., visitors who participated
in more than one activity are counted only once,
since this table deals with all activities combined.

Breakdown of the number of scientists who worked at the ICTP in 1985
and of "man/months" per activity

Other tables show that the total number of scientists who came to the ICTP is 2,720 while the total number of man/months is 2,669.00.
In the tables which follow the number of scientists will be higher since several of them took part in more than one activity.

Table I shows a summary of the breakdown while Table III shows the details.

Table I Summarized Breakdown

Activity	No.of Visitors				No.man/months			
	Dev.	Ind.	Total	%	Dev.	Ind.	Total	%
1. Physics and energy	283	239	522	17.3	194.47	56.84	251.31	9.4
2. Fundamental physics	242	182	424	14.0	402.29	167.61	569.90	21.4
3. Physics and technology	567	405	972	32.1	648.51	139.67	788.18	29.5
4. Physics of the environment	272	53	325	10.8	175.56	15.29	190.85	7.2
5. Mathematics	290	143	433	14.3	243.14	42.38	285.52	10.7
6. Physics teaching	32	10	42	1.4	20.36	6.24	26.60	1.0
7. Physics and development	27	11	38	1.3	4.00	0.69	4.69	0.2
8. Physics of the living state	7	28	35	1.2	1.31	3.60	4.91	0.2
9. Others research	91	62	153	5.1	137.90	57.00	194.90	7.3
10. Training in It.Labor.	74	–	74	2.5	352.14	–	352.14	13.0
TOTAL	1885	1133	3018	100.00	2179.68	489.32	2669.00	100.00

The above figures include the data for two activities organized outside i.e.:

1. Latin American regional college on microprocessor (Bogotà) including training session on microprocessors in Lisbona (Portugal)	77	10	87		64.45	6.58	71.03	
2. Int.workshop on sand transportation and desert.in arid lands (Khartoum)	117	17	134		35.97	5.22	41.19	
TOTAL	194	27	221		100.42	11.80	112.22	

.In addition, the Centre supported 39 regional courses, workshops and conferences in all region of World. They are listed in the Report on p. 101.

Hosted Activities

1. Conference on South-South and South-North coop. in Sciences (5-10.7)	114	58	172	23.74	9.09	32.83
2. Workshop on drought desertification & food deficit & foundation of the African Academy of Sciences (9-10.12)	15	9	24	1.98	0.69	2.67
3. Workshop on nuclear and particle phys. at intermediate energies	-	50	50	-	-	-
4. Mini workshop on total energy & force method (12-13.12)	-	10	10	-	1.09	1.09
	129	127	256	25.72	10.87	36.59

5. Structure and evolution of active galactic   no data available
   nuclei (10-13.4) (University of Trieste et al)
6. School on industrial applications of Synchrotron
   radiation (Trieste Research Area)
7. International conference on Variation Calculus (9-14.9 SISSA)

and other Committee meetings (Society for International Development, Italian National Institute of Nuclear Physics, United Nations University, International Centre for Astrophysics).

Table II shows a statistical summary of the activities at the ICTP itself and outside its premises.

Table II
Statistical summary on activities held inside and outside the ICTP

	No.of Visitors			No.man/months		
	Dev.	Ind.	Total	Dev.	Ind.	Total
1. At I.C.T.P.:						
a) Research*: High energy	130	86	216	317.34	134.33	451.67
Condensed matter	58	24	82	150.41	34.45	184.86
Mathematics	42	4	46	93.35	1.42	94.77
Others	91	62	153	137.90	57.00	194.90
TOTALS	321	176	497 (15.2%)	699.00	227.20	926.20 (34.2%)
b) Training for research (Courses, workshop and conferences)	1296	930	2226 (75.9%)	1028.12	250.32	1278.44 (48.6%)
2. Outside I.C.T.P.:**						
a) Training in Italian Labs.	74	–	74	352.14	–	352.14
b) Latin American regional college on microprocessor (Bogotà) including training session on microprocessors in Lisbona (Portugal)	77	10	87	64.45	6.58	71.03
c) Int.workshop on sand transportation and desert.in arid lands (Khartoum)	117	17	134	35.97	5.22	41.19
TOTALS	268	27	295 (8.9%)	452.56	11.80	464.36 (17.2%)
TOTALS	1885	1133	3018	2179.68	489.32	2669.00

* Figures on research include long and short-term scientists as well as Associates, scientists from federated institutes and seminar lecturers.
** The 39 outside activities sponsored but not organized by ICTP are not included

TABLE III

SUMMARY OF PARTICIPATION IN THE RESEARCH AND TRAINING FOR RESEARCH ACTIVITIES AT THE ICTP 1985

ACTIVITY	No. of Visitors			No. man/months		
	Devel.	Indus.	Total	Devel.	Indus.	Total
PHYSICS AND ENERGY						
1. 2nd Workshop on prospectives in nuclear physics at intermediate energies (25-29.3)	20	78	98	6.21	13.23	19.44
2. Spring college on plasma physics "Charged Particle transport in plasmas" (27.5-21.6)	90	48	138	82.64	16.72	99.36
3. Workshop on physics of non-conventional energy sources and material sciences for energy (2-20.9)	151	40	191	100.85	14.03	114.88
4. Topical meeting on phase space approach to nuclear dynamics (30.9-4.10)	22	73	95	4.77	12.86	17.63
	283	239	522 (17.3%)	194.47	56.84	251.31 (9.4%)
FUNDAMENTAL PHYSICS						
1. Elementary particle research (all year)	130	86	216	317.34	134.33	451.67
2. Test of electroweak polarized processes and other phenomena (20-23.5)	2	46	48	0.26	4.18	4.44
3. Summer workshop on high energy physics & cosmology (11.6-19.7)	110	50	160	84.69	29.10	113.79
	242	182	424 (14.0%)	402.29	167.61	569.90 (21.4%)
PHYSICS AND TECHNOLOGY						
1. Condensed matter research (all year)	58	24	82	150.41	34.45	184.86
2. College on lasers, atomic, molecular physics (21.1-22.3)	80	79	159	124.84	18.26	143.10
3. Workshop in condensed matter physics (24.6-6.9)	188	62	250	199.90	32.98	232.88
4. 3rd Trieste college on microprocessors: technology & applications in physics (7.10-1.11)	102	32	134	86.08	15.32	101.40
5. Working party on mechanical properties (12-30.8)	21	15	36	17.99	7.63	25.62
6. Microprocessors training session (14-25.1)	18	19	37	included in Latin Am.Reg.College		
*7. Latin american regional college on microprocessors technology & applications (10.6-5.7) including Training session in Lisbona (Portugal) (11-14.5)	77	10	87	64.45	6.58	71.03
8. 6th Trieste int.symposium on "Fractal in Physics" (8-12.7)	15	110	125	2.25	16.61	18.86
9. 7th Trieste int.symposium on "Hopping transport" (27-30.8)	8	54	62	2.59	7.84	10.43
	567	405	972 (32.1%)	648.51	139.37	788.18 (29.4%)
PHYSICS OF THE ENVIRONMENT						
1. College on Soil physics (15.4-10.5)	78	25	103	70.74	6.67	77.41
2. Workshop on Cloud physics & climate (23.11-20.12)	77	11	88	68.85	3.40	72.25
*3. Int. Workshop on sand transportation and desertification in arid lands Khartoum (Sudan) (18-29.11)	117	17	134	35.97	5.22	41.19
	272	53	325 (10.8%)	175.56	15.29	190.85 (7.2%)

Contd.

ACTIVITY	No. of Visitors			No. man/months		
	Devel.	Indus.	Total	Devel.	Indus.	Total
MATHEMATICS						
1. Mathematics research (all year)	42	4	46	93.35	1.42	94.77
2. Workshop on mathematics in industry (13-24.5)	62	21	83	31.37	6.70	38.07
3. Workshop on semigroups and applications (7.10-1.11)	35	54	89	25.99	13.58	39.57
4. College on repres.theory of Lie groups (4.11-6.12)	84	23	107	88.77	14.67	103.44
5. Workshop on graded differential geometry (9-13.12)	67	41	108	3.66	6.01	9.67
	290	143	433 (14.3%)	243.14	42.38	285.52 (10.7%)
PHYSICS TEACHING						
1. Ecole d'ete' on physics teaching at university level (26.7-13.8)	32	10	42	20.36	6.24	26.60
	32	10	42 (1.4%)	20.36	6.24	26.60 (1.0%)
PHYSICS AND DEVELOPMENT						
1. Physics & development programm (all year)	6	11	17	1.89	0.69	2.58
2. 1st symposium on status of physical/maths. in Arab World (10-12.7)	21	–	21	2.11	–	2.11
	27	11	38 (1.3%)	4.00	0.69	4.69 (0.2%)
PHYSICS OF LIVING STATE						
1. Workshop on quality control of X-Ray equipment (13-19.5)	7	28	35	1.31	3.60	4.91
	7	28	35 (1.2%)	1.31	3.60	4.91 (0.2%)
Other research (all year)	91	62	153	137.90	57.00	194.90
	91	62	153 (5.1%)	137.90	57.00	194.90 (7.3%)
*Training in Italian Laboratories (all year)	74	–	74	352.14	–	352.14
	74	–	74 (2.5%)	352.14	–	352.14 (13.2%)
TOTALS			3,018			2,669.00

* Activities held outside ICTP

Contd.

ACTIVITY	No. of Visitors			No. man/months		
	Devel.	Indus.	Total	Devel.	Indus.	Total
Hosted Activities						
1. Conference on South-South and South-North coop. in Sciences (5-10.7)	114	58	172	23.74	9.09	32.83
2. Workshop on drought desertification & food deficit & foundation of the African Academy of Sciences (9-10.12)	15	9	24	1.98	0.69	2.67
3. Workshop on nuclear and particle phys. at intermediate energies	-	50	50	-	-	-
4. Mini workshop on total energy & force method (12-13.12)	-	10	10	-	1.09	1.09
	129	127	256	25.72	10.87	36.59

5. Structure and evolution of active galactic
   nuclei (10-13.4) (University of Trieste et al)   no data available
6. School on industrial applications of Synchrotron
   radiation (Trieste Research Area)
7. International conference on Variation Calculus (9-14.9 SISSA)

and other Committee meetings (Society for International Development, Italian National Institute of Nuclear Physics, United Nations University, International Centre for Astrophysics).

FUNDAMENTAL PHYSICS

Title: ELEMENTARY PARTICLE PHYSICS AND FUNDAMENTAL THEORY
                        RESEARCH

Dates: Throughout the year

Organizers: This research programme was organized by the Director of
                        the Centre, Professor Abdus Salam (Pakistan), the resi-
                        dent physicist, J. Strathdee (New Zealand), the Deputy
                        Director, Prof. L. Bertocchi (University of Trieste,
                        Italy) and the Consultants Professors G. Furlan and R.
                        Iengo from the University of Trieste.

Purpose: To contribute to the advancement of physics at an inter-
                        national standard through individual and team research,
                        stimulate interaction between physicists from developing
                        and industrialized nations, and create genuine research
                        conditions that will encourage Associate Members and
                        visitors from Federated Institutes in their work after
                        their return home.

Programme: Seminars were held on:

                        gauge invariance and Fock states; full effective Lagran-
                        gian from axial anomaly; spectrum of hot hadronic matter
                        and finite temperature QCD sum rules; current algebra
                        approach to critical 2-dimensional QFT; a new approach to
                        auxiliary fields in supergravity; the anomalous baryon
                        number non-conservation in the electroweak theory at high
                        temperatures; the supersymmetric sigma model; lattices
                        and Nambu strings; spontaneously broken quintet baryon
                        model for strong interactions; dynamical implications of
                        sigma-model anomalies; stability and cosmological model
                        in $N = 1$, $D = 11$ supergravity; the force between static
                        quarks and hadron spectroscopy; applications of rheonomy
                        to problems of supergravity theories; $N = 2$ supergravity
                        coupled to matter and super Higgs effect; indecomposable
                        representations and Virasoro-Kac-Moody correspondence;

the dynamics of fast rotating bodies; do the collider events herald new physics?; low-energy hadron physics in the Virton model; supersymmetry in twelve dimensions?; remarks on loop diagrams in string theories; uniqueness of superstring theories; stochastic quantization – non-perturbative aspects; calculation of gauge and gravitational anomalies from short-distance approach; quantum D = 1 + 1 integrable models and simple Lie algebras and superalgebras; sources of massless bosons (old papers by Weinberg and Fronsdal);quark nuggets or baryon nuggets?; spontaneous compactification and torsion; the geometry of dimensional reduction; status of superstrings; breaking global supersymmetry at low energies on $O(10)$; $1 = J = 1-\pi\pi$ scattering amplitude from data on $e^+e^- \to \pi^+\pi^-$; Kaluza–Klein theories as gauge theories of infinite dimensional algebras; CP violation in SUSY models; towards a resolution of the fermion mass – hierarchy problem – steps on the way; quantum supergravichromodynamics; novel baryon resonances in the Skyrme model; parallel computer technics in simulation of dynamical systems in physics; production of gauge bosons, Higgs bosons and jets at hadron colliders; non–Abelian bosonization of an extended Nambu–Jona Lasinio model, chiral anomalies and Skyrme terms; gauge field theories with boundary conditions; new theory of gravitation; the gauge $X^\wedge A_\mu = 0$: ugly, but ghost–free; honest QCD for superheavy quarkonia; compactification of the spinning string; present situation in double beta–decay; consistent super-strings as solutions to the D = 26 bosonic string theory; new developments in QCD chiral symmetry making; stochastic identities and perturbation theory: an explicit example; consistent dimensions of string theories; infinite dimensional algebras in physics; Monte Carlo methods in lattice calculations; cleaning leptonic processes from strong interaction effects: an important step to test electroweak theories at SLC, LEP; properties of hermaphrodite mesons from QCD sum rules; novel baryon resonances in the Skyrme model; positive energy theorems in general relativity; phase transitions in lattice gauge Higgs models; supersymmetric extension of the standard model.

Participation:	Total visitors:		216
	From developing countries:		130
Representation:	Africa	developing:	16
	Asia	developing:	62
		industrialized:	6
	Europe	developing:	40
		industrialized:	56
	Indonesia & Oceania	developing:	1
		industrialized:	1
	North & Central America	developing:	–
		industrialized:	21
	South America	developing:	11
	International organizations:		2

Title:	TESTS OF ELECTROWEAK THEORIES, POLARIZED PROCESSES AND OTHER PHENOMENA
Dates:	10 – 12 June 1985
Organizers:	Professors N. Paver (National Institute for Nuclear Physics, INFN, and University of Trieste, Italy), C. Verzegnassi (INFN and University of Trieste, Italy) and B.W. Lynn (Stanford Linear Accelerator Center, USA, and University of Oxford, UK).
Purpose:	To discuss possible tests from both the theoretical and experimental points of view.

Programme: Topics:
- polarization physics at SLC, LEP and SSC
- one-loop electroweak corrections
- theoretical developments (supersymmetric theories, composite models, etc.)
- e^+e^- annihilation, ν scattering, ep scattering, $p\bar{p}$ and pp scattering, etc.
- LEP/SLC/HERA/SSC/tevatron/TRISTAN/Sp$\bar{p}$S and other machines
- electroweak effects at low energies, CP violations
- experimental signatures of new physics.

Lectures were given on:

recent results from UA1; recent results from UA2; recent results from DESY; the theory of parity nonconservation in heavy atoms; status of the electroweak theory; status of CP violation; breakdown of perturbative QED at LEP; status of the theory of the muon g-2; LEP: status and perspectives; status of the SLC programme; status and perspectives of HERA; experimental tests of new physics; what may we learn from SLC, LEP and HERA; experimental signatures of supersymmetry; physics at SSC; plans for polarised beams at SLC; LEP with polarised beams; structures, sub-structures and polarised e^+e^- collisions; one loop radiative corrections in the Weinberg–Salam theory; two and three jets events in polarized e^+e^- annihilation; limits on τ-composite structure from polarized Z^0 decay; probing beyond the standard model.

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Participation:	Total visitors:		48
	From developing countries:		2
Representation:	Asia	developing:	1
		industrialized:	–
	Europe	developing:	1
		industrialized:	39
	North & Central America	developing:	–
		industrialized:	7

Title:	SUMMER WORKSHOP IN HIGH ENERGY PHYSICS AND COSMOLOGY
Dates:	10 June — 19 July 1985
Organizers:	Professors G. Furlan (University of Trieste/ICTP, Italy), R. Iengo (University of Trieste/ICTP, Italy), J.C. Pati (University of Maryland, College Park, USA), D. Sciama (SISSA and University of Oxford, UK) and Q. Shafi (University of Delaware, USA).
Purpose:	This workshop was intended to provide for an informal environment for discussing topics of current interest in particle physics and related aspects of gravity and cosmology at the highest possible level.
Programme:	Topics: — superstrings, supergravity and super Kaluza-Klein — unification schemes and composite models — cosmology and physics of the early universe — particle physics and galaxy formation — nonperturbative aspects of field theories.

Lectures were given on:

compactification of superstrings; observation and phenomenology of glueballs; introduction to superstrings; cosmology and higher dimensions; two-dimensional superstring actions; anomaly cancellations; conformally invariant quantum field theories in two dimensions; heterotic superstrings; superstrings in the light-cone gauge; QCD on the lattice-current status; strings in curved space/time; dark matter and galaxy formation; superstring light-cone gauge field theory.

Participation:	Total visitors:		160
	From developing countries:		110
Representation:	Africa	developing:	12
	Asia	developing:	48
		industrialized:	5
	Europe	developing:	39
		industrialized:	23
	Indonesia & Oceania	developing:	1
		industrialized:	—
	North & Central America	developing:	4
		industrialized:	22
	South America	developing:	6

Title: SECOND WORKSHOP ON PERSPECTIVES IN NUCLEAR PHYSICS AT
                     INTERMEDIATE ENERGIES

Dates: 25 - 29 March 1985

Organizers: Professors S. Boffi (University of Pavia, Italy), C.
                     Ciofi degli Atti (INFN, Rome) and M.M. Giannini (Univer-
                     sity of Genoa, Italy).

Purpose: The Workshop was intended to review recent work and to
                     discuss the trends in nuclear physics at intermediate
                     energies. It was also expected to provide the necessary
                     orientation to participants working in the field or who
                     have an interest in related subjects.

Programme: Topics: - subnuclear degrees of freedom
                                - baryons and mesons in nuclei
                                - electromagnetic and hadronic probes

                     Lectures were held on:

                     experimental tests of quark degrees of freedom in nuclei;
                     bags, skyrmions and the nucleon; quark shell model of the
                     nucleus; isovector electromagnetic exchange currents in
                     the chiral approach; nuclear forces in the light of the
                     modern gauge theory; gluon contribution to the nucleon-
                     nucleon interaction in lattice QCD; relativistic mean
                     field approaches to nucleon scattering; relativistic
                     scattering theory for charged spinless particles; rela-
                     tivistic effects in three-body systems; three-body calcu-
                     lations; nucleon-deuteron spin observables with meson-
                     theoretical nucleon-nucleon interactions; nuclear struc-
                     ture with isobaric and mesonic degree of freedom; form
                     factors of ^{3}H; triton charge form factor in the quark
                     model; pionic effects in nuclei; electron and pion scat-
                     tering and pion photo-production on light nuclei; nuclear
                     Compton scattering; photon and pion induced reactions on
                     few-body systems; delta excitation in nuclei by hadronic
                     and electromagnetic probes; nuclear saturation in a
                     relativistic BHF approach; calculations in few-body

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systems and nuclear matter; nucleon momentum distributions in few-body systems and complex nuclei; evidence of nuclear dynamics from electron scattering at high momentum transfer; model for nucleon emission induced by electron scattering; M.E.C. and 2p-2h effects in inelastic magnetic electron scattering; the π NN vertex functions; single particle structure studies with high resolution proton knockout experiments; inclusive and coincidence experiments in deep inelastic electron scattering; coincidence experiments with polarized electron beams and polarized targets; (γ, p) and (p, γ) experiments above the GDR; nucleon decay channels in photon and electron reactions of light nuclei at low momentum transfers; dynamical theory of spin excitation; simple nuclear excitation damping; approximations for nuclear knockout form factors; spectroscopy of light Λ and Σ hypernuclei from (K, π), (π, K) reactions and K-capture; supersymmetry: a new current algebra; inelastic diffraction nuclear processes; neutrons, protons and deuterons after stopped π^- in light nuclei; (p, 2p) reaction and momentum distribution of the deuteron; hedgehog shape of the pion mean field in the chiral bag; nonperturbative many-body techniques applied to a Yang-Mills field theory; delta-N interaction π^d observables and dibaryons.

Participation:	Total visitors:		98
	From developing countries:		20
Representation:	Africa	developing:	1
	Asia	developing:	2
		industrialized:	–
	Europe	developing:	15
		industrialized:	69
	North & Central America	developing:	–
		industrialized:	9
	South America	developing:	2

Title:	SPRING COLLEGE ON PLASMA PHYSICS: CHARGED PARTICLE TRANSPORT IN PLASMAS
Dates:	27 May – 21 June 1985
Organizers:	Organized and directed by the ICTP Plasma College Committee: Professors W. Grossmann (USA, Chairman), M.A. Abdallah (USA), M.N. Bussac (France), B. Buti (India), E.M. Campbell (USA), M.H.A. Hassan (Sudan), C. Kennel (USA), R.L. Morse (USA), K. Nishikawa (Japan), S. Ortolani (Italy), and P.H. Sakanaka (Brazil), as well as the ICTP Advisory Group on Plasma Physics: Professors B. McNamara (USA, Chairman), B.B. Kadomtsev (USSR), M.N. Rosenbluth (USA), A. Schulter (F.R. Germany), and J.B. Taylor (UK).
Programme:	Session I: Space Plasma Physics (Mini–symposium)
	Session II: Laser–Beam/Plasma Interactions (Mini–symposium)
	Session III: Magnetically Confined Plasmas (Mini–symposia)

Lectures were given on:

Session I: generation of ultra–relativistic electrons by shocks; plasma transport by spontaneous reconfiguration – statistical mechanics approach; cometary bow shock, the tail, auroral–type processes; convection and magnetic field in accretion disk onto black holes; generation of broadband electrostatic waves in the magnetotail; energy and momentum transport by waves in the solar atmosphere; nonlinear surface phenomena in plasmas; bifurcating plasmas; physics of collisionless high mach number shocks.

Comet Session: the 1985–86 spacecraft missions to comets Halley and Giacobini–Zinner; cometary plasma physics – large–scale interactions; physics of critical ionization velocity; cometary plasma physics – microstructure of boundaries; solar–wind/Venus interaction and its comparison with comets; experiments planned by the Indian observatories to study the plasma tail of Halley's comet; the dynamics of magnetospheric reconnection; origin of the backstreaming ions upstream of the bow shock; solar

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wing — outstanding problems; plasma transport in vicinity
of Saturn; instabilities of magnetoshperes of pulsars;
Langmuir turbulence in space plasmas; heating of He^+ in
the dayside equator; resonant Alfven-wave heating of
solar coronal loops; ionospheric modification by a man-
made signal.

Session II: thermal transport in laser-irradiated tar-
gets; strong interaction of waves with plasmas; numerical
simulation of open beam plasma systems with particle
injection; X-ray spectr ..opy in high energy density
plasmas; X-ray lasers; simulation of high-power microwave
devices; hydrodynamics; strong interaction of waves with
plasma; multidimensional particle simulations; plasma
microwave generator on relativistic electron beam;
laser/plasma interactions; coronal physics; laser
particle accelerators; strong interaction of waves with
plasmas.

Session III: Lagrangian field theories for plasma
physics; transport in plasmas; periodic orbits, invariant
tori and cantori; transport theory in tokamaks; numerical
plasma simulation; breakup of invariant tori, transport
in irregular components; electron cyclotron absorption
and emission in non-Maxwellian plasmas; nonclassical
transport in a tokamak with divertor; nonlinear dynamics
of dissipative systems; RF induced transport in toroidal
devices; noncanonical plasma field theory; toroidal
viscosity and ambipolarity in the neoclassical theory of
axisymmetric tori; drift wave turbulence; quantum noise;
stochastic motion of charged particles in plasma; Schrö-
dinger-like probability amplitude description of certain
nonlinear dynamical systems; particles in thermal energy
transport in plasma near the Lawson limit; confinement
during RF heating in tokamaks; alpha-particles in toka-
maks; algorithms for 1.5-D transport in tokamaks; JET
results; DC and AC impedance of source and collector
sheaths — simulation results; charged particle transport
in tokamaks — experimental results.

Workshop on Nonmajor Plasma Physics Experiments: trends
in plasma focus research; double plasma machine, gyrotron
and other experiments at INPE; plasma focus; ion tempera-

ture measurement; RF heating of plasma in linear mirror machine; filed reversed theta-pinch and other experiments; ion acoustic double layers; FRC studies at the Argentine Atomic Energy Commission; experimental results and future plans for TBR; small plasma experiments in Malaysia; plasma physics in Indonesia; ion acoustic waves in magnetized plasma; single particle behaviour in multiple mirrors; laser/plasma interaction; plasma physics in China; spatial diffusion driven by electrostatic waves; betatron modified ion acoustic instability of the Bennett equilibrium; anomalous phenomena in plasma focus; skin current-driven microinstabilities in magnetized plasma; effect of magnetic field on the Rayleigh-Taylor instability at the interface between two media; nonlinear Rayleigh-Taylor stability for two media with surface tension; heat transport mechanism and growth of ion-acoustic wave in an extended plasma; wave/wave interactions derivable from complex Hamiltonian; excitation of surface waves in an underand overdense plasma by a high-frequency electric field; nonlinear inverse Bremsstrahlung; filamental instability of beat waves in a hot magnetized plasma; Raman back-scattering in a magnetized bounded plasma; target design for ion beam driven fusion; effect of β field on TPD instability in a laser-produced plasma; analytical approach to solve magnetic-field evolution equation in laser-produced plasmas; 3-D simulation of relativistic electron beam injection into tokamak plasma; stability of an imploding plasma shell; analysis of the $m = 2$ rotational instability in reversed field configurations; RF-heating of the plasma in the linear Lisa machine; ion distribution functions during ICRH at the fundamental frequency; Eigen mode analysis of ideal sheet plasma with and without magnetic field; particle orbits at the magnetic null of a field reversed configuration; model for tokamak discharge; impurity ion effects in tokamak transport; numerical studies of lower hybrid current drive in the T-7 tokamak; Alfven-wave heating of high beta plasmas; current generation by electron Bernstein waves in tokamak plasmas; molecular effects of hydrogen recycling in one-dimensional divertor model.

Participation:	Total visitors:		138
	From developing countries:		90
Representation:	Africa	developing:	18
	Asia	developing:	42
		industrialized:	3
	Europe	developing:	17
		industrialized:	23
	Indonesia & Oceania	developing:	2
		industrialized:	—
	North & Central America	developing:	2
		industrialized:	22
	South America	developing:	9

Title:	WORKSHOP ON THE PHYSICS OF NONCONVENTIONAL ENERGY SOURCES AND MATERIAL SCIENCE FOR ENERGY

Dates: 2 - 20 September 1985

Organizers: Professors G. Furlan (University of Trieste and ICTP, Italy), N.A. Mancini (Department of Physics, University of Catania, Italy), A.A.M. Sayigh (Kuwait Institute for Scientific Research, Kuwait) and B.O. Seraphin (University of Arizona, USA).

Purpose: To review and discuss specific research projects and realizations in plenary lectures as well as in seminars and communications by participants and visiting experts. Visits to outside installations were organized.

Programme: Topics: — solar energy conversion
                           — material science aspects
                           — storage
                           — energy management and economics.

Lectures were given on:

measurement and analysis of energy use; acquisition and management of field data for photovoltaic systems: application to the characterization of the experimental plant of Passo Mandrioli (Italy); thermal storage for housing and green-houses by phase change materials; energy measurement in manufacturing; radiative cooling; dust effects on solar devices; fundamentals and properties of solar heat mirrors and solar absorbers; cooling and heating in Japan; review of solar thermal power systems; economic aspects of using nonconventional energy sources in developing countries; cooling and heating in Kuwait; ENEL's (National Company for Electric Energy, Italy) activity in the field of renewable energy sources; a review of storage; recent progress in a-Si solar cell technologies; lattice defects and lifetime of silicon photovoltaic devices; optimization of the physical parameters for silicon solar cells; device physics and optimum design of the a-Si solar cells; recent aspects in the technology of amorphous silicon solar cells; heterojunctions among amorphous semiconductors and relevance

for photovoltaic devices; technology of crystalline P.V.
cells - theory and technology of photovoltaic concentra-
tion; development of polycrystalline solar cells for
terrestrial use; ENEA (Italian National Commission for
Atomic Energy and Alternative Energy Sources) activities
on amorphous silicon solar cells; some topics on R&D
efforts for efficiency improvement; CISE experiences on
Ga As solar cells for terrestrial and space uses;
spectrally selective coatings for energy conserving
windows; material aspects of photo-electrochemical
conversion; an example of research on solar
refrigeration; the R&D programme of the European Economic
Community on Solar Energy; energy/agriculture integrated
projects; integrated rural energy systems and
agricultural applications of renewable energies; pro-
spects of energy demand and supply in developing coun-
tries; qualification and durability tests for solar
thermal collectors; integrated energy planning and its
data needs; qualification and durability tests for photo-
voltaic modules.

Participation:	Total visitors:		191
	From developing countries:		151
Representation:	Africa	developing:	49
	Asia	developing:	55
		industrialized:	2
	Europe	developing:	28
		industrialized:	29
	Indonesia & Oceania	developing:	2
		industrialized:	—
	North & Central America	developing:	7
		industrialized:	7
	South America	developing:	10
	International organizations:		2

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Title: TOPICAL MEETING ON PHASE SPACE APPROACH TO NUCLEAR
                        DYNAMICS

Dates: 30 September - 4 October 1985

Organizers: Professors M. Di Toro (University of Catania, Italy), W.
                        Nörenberg (Gesellschaft für Schwerionenforschung, Darm-
                        stadt, Federal Republic of Germany), M. Rosina (Kardelj
                        University, Ljubljana, Yugoslavia) and S. Stringari
                        (University of Trento, Italy).

Purpose: The aim of the meeting was to bring together physicists
                        working on nuclear collective or cooperative motion, with
                        particular emphasis on phase space dynamics for
                        discussion and interaction. Several new development which
                        occurred since the last meeting on Nuclear Fluid Dynamics
                        held in 1982, were discussed.

Programme: Topics: - microscopic vs. macroscopic description of
                                     nuclear motion
                                   - kinetic equations in phase space
                                   - heavy ion collisions at low and intermediate
                                     energy
                                   - giant vibrations of heated nuclei
                                   - large amplitude motion and dissipation
                                   - fluid dynamical approaches
                                   - role of collision terms in nuclear dynamics
                                   - coherent rotational and vibrational states
                                   - chaos.

                        Lectures were given on:

                        reduced causal descriptions; particle exchange as the
                        dissipative mechanism in nucleus-nucleus collisions;
                        self-consistent quantal dissipation and the wall formula;
                        collective motion and dissipation; influence of the
                        nuclear friction content on the pre-fission particle
                        multiplicities; microscopic approach to dissipation in
                        heavy ion collisions; from classical phase space to
                        quantum levels; chaos in systems with few degrees of
                        freedom; aspects of chaotic motion; limits of deep in-
                        elastic collisions; overview of heavy ion physics between

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20—50 Mev/u; extended Thomas—Fermi calculations at finite temperature; Gaussian parametrisation of Wigner transform of one—body density matrices; finite size effects on the momentum distribution of non—interacting fermions; pairing effects in rotating nuclei: a semiclassical approach; dynamic transport coefficients in a Fermi liquid; application and extension of the TDHF theory in heavy ion collisions; dissipative nuclear fluid theory for large collective motions; collisional fluid dynamics of nuclei; statistical break—up following fusion in light systems; stochastic TDHF and expansion phase of high energy nucleus—nucleus collisions; nuclear percolation; nuclear fragmentation; Wigner distribution functions and collective modes; liquid—vapour phase transition in nuclear matter: microscopic approach to nucleation; temperature effects on Skyme forces and critical behaviour of heated nuclei; effective interactions at finite temperature; isovector resonances as surface and elastic excitations; fluid dynamical approaches to giant resonances; giant resonances at finite temperature; time—dependent Thomas—Fermi calculations for monopole oscillations; semiclassical description of two—body collisions in nuclei; damping width of nuclear excitations at finite temperature; study of giant angle dipole; excitation of giant resonances in grazing collisions between heavy ions; problems of the kinetic theory of gases relevant for nuclear dynamics; Enskog kinetic equation and nucleus—nucleus collisions; quantum dynamics of the collision process; phase space dynamics in nucleus—nucleus collisions; phase space effects on subthreshold pion production in heavy ion collisions; nuclear dynamics in the intermediate energy domain; linear response of a nuclear Vlasov system; reduced kinetic equations: influence functional method; Boltzmann equation approach to medium energy heavy ion collisions; phase space constraints on projectile fragmentation at medium energies; fission barriers at high spin; recent advances in coherent state theory and their applications to nuclear collective motion; coherent states in nuclear dynamics; coherent rotational states; classical and quantum bosons for collective motion in nuclei; dynamics of "maximally—decoupled" collective

motion and its dissipation; low-energy ion collisions and
quantized ATDHF; ATDHF theory of fission and heavy ion
reactions.

Participation:	Total visitors:		95
	From developing countries:		22
Representation:	Africa	developing:	4
	Asia	developing:	1
		industrialized:	5
	Europe	developing:	15
		industrialized:	60
	North & Central America	developing:	–
		industrialized:	8
	South America	developing:	2

PHYSICS OF CONDENSED MATTER

Title: RESEARCH IN CONDENSED MATTER PHYSICS

Dates: Throughout the year

Organizers: Professors M. Tosi (University of Trieste/ICTP, Italy)
                  and E. Tosatti (University of Trieste/ICTP, Italy).

Purpose: The research programme was organized to carry out re-
                  search at the highest possible level in condensed matter
                  physics and to stimulate scientific interaction between
                  physicists from the developing world and from industria-
                  lized countries.

Programme: Lectures were given on:

                  problems in intermediate valence systems; Green's func-
                  tion solution of the Kondo problem; the Kondo resonance
                  in heavy fermion systems; correlation functions for the
                  one-dimensional exactly solvable models; some aspects of
                  Polaron theory; liquid-glass transition in molten salts;
                  on the use of approximate integral equations in the
                  theory of dense classical fluid; chaotic behaviour in
                  quantum systems; heavy fermion metals; the origin and
                  evolution of life in terms of solid state physics; new
                  surprises in self-avoiding walks; resonant tunnelling in
                  1-d systems; hard spheres: a thermodynamically consistent
                  approach; the origin of incommensurate structures in
                  insulators; dynamics of complex systems; Green functions
                  in the theory of superradiance; dynamical disorder within
                  the CPA: methods and applications; nonlocal optical
                  properties of metal surfaces; electronic and structural
                  properties of semi-conducting alloys; optically forbidden
                  electronic transition studies by electron energy loss;
                  spin glass alloys near percolation threshold; unified
                  approach to molecular dynamics and density functional
                  theory; theory of classical Wigner crystallization in two
                  and three dimensions; optical absorption in molten alkali
                  halides; ionic pairing in binary liquids of charged hard
                  spheres with nonadditive diameters; some properties of

quantum two-dimensional electron liquid; non-primitive electrolytes; X-ray absorption and localized states; pseudopotential of scattering states.

Participation:	Total visitors:		82
	From developing countries:		58
Representation:	Africa	developing:	12
	Asia	developing:	30
		industrialized:	—
	Europe	developing:	9
		industrialized:	18
	North & Central America	developing:	3
		industrialized:	6
	South America	developing:	4

Title:	COLLEGE ON LASERS, ATOMIC AND MOLECULAR PHYSICS
	and
	TOPICAL MEETING ON THE PHYSICS OF FREE-ELECTRON LASERS
	and
	TOPICAL MEETING ON MULTIPHOTON PROCESSES

Dates: 21 January — 22 March 1985

Organizers: College: Professors G. Amat (University of Paris, France), R. Bonifacio (University of Milan, Italy), A. Dymanus (Catholic University, Nijmegen, The Netherlands), F.P. Schäfer (Max-Planck-Institute, Göttingen, Federal Republic of Germany) and O. Svelto (Polytechnic, Milan, Italy).

Topical Meeting I: Professors R. Bonifacio (University of Milan, Italy) and C. Pellegrini (Brookhaven National Laboratory, Upton, USA).

Topical Meeting II: Professors A. Giardini Guidoni (Italian National Commission for Atomic Energy and Alternative Energy Sources, ENEA, Frascati, Italy) and J. Reuss (Katolieke Universiteit, The Netherlands).

Purpose: An effort was made during the College to survey the recent and current developments in the field.
Recent theoretical and experimental advances in the physics of free-electron lasers, including the possibility of high-gain amplified spontaneous emission regime and superradiance, the coherence properties of this radiation and the possible experiments to further explore this area were discussed in a topical meeting, while the most recent developments in the problem of multiphoton processes were reviewed in a second one.

Programme: Lectures were given on:

elements of statistical quantum mechanics; elements of quantum theory of EM field; coherent states of the EM field; elements of photon statistics; elements of group theory and symmetries in molecular vibrations.

Topical Meeting I: Maxwell-Bloch equation and principles of lasers; photon statistics; coherent transients; self-

induced transparency; theory of optical bistability and laser instabilities; theory of laser instability; chaos and bifurcations in optical bistability; generation of ultrashort pulses with distributed feedback lasers; optical bistability (experimental); tests of fundamental of QM with lasers; lasers and the EPR paradox; chaos and bifurcations (experimental); introduction to the laser laboratory; pumping systems; overview of the types of lasers; optical resonators; UV and VUV lasers; new solid-state and IR lasers; squeezed states of radiation field; photostatistics of free electron laser; optical phase conjugation; optical electronics and semiconductor lasers; matrix methods in treating phase-conjugate pheno-mena; picosecond and femtosecond lasers; general FEL physics; FEL Raman regime; pendulum model for an FEL; storage ring physics; single-pass, tapered FELs; produc-tion of very short wavelength radiation in the inter-action between lasers and electron beams; statistical properties of the radiation produced in some interactions between lasers and electron beams; FEL oscillators on storage rings; high-gain and collective instabilities in FELs; amplified spontaneous emission and the superradiant regime of FELs; coherence and statistical properties of FEL radiation; twoand three-dimensional effects in FEL dynamics; description of the LELA experiment; character-ization of high reflectivity mirrors; nonlinear optical problems in FELs; laser techniques in high-resolution spectroscopy; introductory rotation-vibration molecular spectroscopy; molecular electronic spectroscopy: an introduction; molecular beam in high resolution spectro-scopy; rotation-vibration molecular spectroscopy; IR-laser spectroscopy of open-shell molecules; laser Raman spectra; laser spectroscopy and theory of spherical top molecules; complements on group theory; spin-polarized hydrogen; fundamental atomic constants: the ubiquity of alpha; Rydberg atoms; atmospheric molecules; Doppler-free two-photon spectroscopy; interstellar molecules.

Topical Meeting II: multiphoton processes in atoms; multiphoton processes in molecules; quantum dynamics and statistical mechanics of molecular multiphoton excita-tion; cluster-based isotopic enrichment process; photo-

correlation effects in field assisted collisions; infra-
red multiphoton dissociation calculation of a model
linear triatomic molecule; quantitative measurements of
infrared photochemical rates at high fluences: infrared
multiphoton excitation and reactions of $CFCl_3$; new
methods for solving the multilevel Schrödinger equation;
picosecond laser chemistry: a new view of selectivity;
multiphoton spectroscopy of molecules: an experimental
investigation; local normal and chaotic molecular modes;
multiphoton excitation of polyatomic molecules; analysis
of the density matrix approach; highly excited C_2H_4
observed by Raman spectroscopy; adiabatic excitation in
multilevel systems; multiphoton ionization mechanism
spectroscopy and ion chemistry; laser materials produc-
tion; analysis of dissociation processes through inter-
ferometric studies of VT relaxation times; experimental
and theoretical analysis of resonant MPI of Beuzene;
laser assisted deposition; laser isotope separation using
adiabatic excitation; intramolecular dynamics in dimer
and simple molecules; master equations versus thermodyna-
mics; infrared multiphoton dissociation of $^{13}CF_3Cl$;
molecular beam optothermal studies of the multiphoton IR
excitation of CF_3I; Penning ionization of CH_3Cl;
intramolecular kinetics of vibrational spectroscopy of
highly excited molecules; chemical applications of IR
multiphoton excitation; technical aspects of multiphoton
dissociation; criticisms and suggestions for the future.

Participation:	Total visitors:		159
	From developing countries:		80
Representation:	Africa	developing:	12
	Asia	developing:	39
		industrialized:	2
	Europe	developing:	16
		industrialized:	68
	Indonesia & Oceania	developing:	1
		industrialized:	—
	North & Central America	developing:	2
		industrialized:	9
	South America	developing:	10

Title:	RESEARCH WORKSHOP IN CONDENSED MATTER
Dates:	24 June — 6 September
Organizers:	Directed by Professors P.N. Butcher (University of Warwick, UK), F. Garcia Moliner (CSIC, Madrid, Spain), S. Lundqvist (Chalmers University of Technology, Göteborg, Sweden), N.H. March (University of Oxford, UK), E. Tosatti (SISSA and ICTP, Trieste, Italy) and M.P. Tosi (University of Trieste and ICTP, Italy).
Purpose:	To enhance the research activity in developing countries by inviting physicists from developing and industrialized countries to discuss the state of the art of some selected topics in condensed matter.

Programme:	Topics: — phase transitions
	            — disordered systems
	            — surfaces and interfaces.

Lectures were given on:

dynamics of complex systems, studies in diffusion of classical particles; fractional quantum Hall effect; chaos, orders and mobility edges in one-dimensional systems with incommensurate potentials; fractals in physics and physics on fractals; dynamics of rational complex maps of the plane; time-dependent density functional theory; correlation effects in ion neutralization scattering from surfaces; from classical to quantum chaos in the anisotropic Kepler problem; new approach to the fractional quantum Hall effect; possibility of re-entrance in granular superconductors; new attempt to generalize the Laughlin wave function; effective dielectric functions of layered materials useful for electron energy loss spectroscopy and optical spectroscopy; relationship between models for d-dimensional classical stochastic dynamics, quantum mechanics and classical (d+1)-dimensional statics; information changes of self-organizing systems close to instability points; physics of solids at high pressure; hierarchies of Laughlin wave-functions on the Haldane sphere; small size calcu-

lations on the disc; spin-polarization instabilities of a two-dimensional electron gas in a large magnetic field; two-dimensional Ising model on an annealed random field; hysteresis window at first-order transitions; diluted semi-infinite Ising model; structural stability of Hume-Rothery alloys; switching in amorphous semiconductors; mean theory of spin glasses; collective and single-particle electronic excitations in small metallic particles; vibrational spectroscopy of adsorbates and related problems; effect of electronic relaxation on covalent adsorption reaction rates; structure of liquid metal surfaces; surface phases and surface phase transitions (introduction); conductivity mechanisms in the scanning tunneling microscopy; quantum well in an applied electric field; theory for transition metal/electrolyte interface − corrosion resistance; quantum statistics of systems with Coulomb interactions; effective interactions in Coulomb systems; Gutzwiller's method in heavy fermion systems; diffusion on polymers; resistivity of heavy fermions and some recent high pressure experiments; carrier-phonon dynamics in highly excited semiconductors; radon axis model-1/n expansion; Kondo resonance in heavy fermions; UHV-SEM study of Stranski-Krastinov growth systems; shallow donor states in quantum wells; electron spectral density in heavy fermion systems; first-order phase transitions in simple Coulomb liquids; electrical resistivity of liquid noble-metal alloys; fatigue cracking in Al single crystals; transport properties of a-semiconductors with special reference to a-chalcogenides; static and dynamic properties of an intermediate valence system; crystal field effects in rare earth intermetallics; Plasmon damping in the electron gas; atomic diffusion and fractal effects in hydrogen embrittlement leading to cracking in metals; dimers and N-mers in some helium fluids; spin polarized electron energy-loss spectroscopy in itinerant electron ferromagnets; electron-phonon interaction in semiconductors with point impurities; antiferromagnetic excitations on percolation clusters; magnetic interfaces; domain wall dynamics in random Ising system; effect of non-bonding interaction between H-atoms on vibrating spectra of a-Si:H; real-space renormalization group method for directed systems; isotope

effect of self-diffusion in NaCl; recent developments in field theory of localization; magnetic-bubble films; theory of tricritical behaviour in ^{3}He-^{4}He mixtures; self-consistent embedding method for surface electronic structure; correlation theory of low frequency fluctuation dissipation and relaxation and its applications; electronic properties of amorphous semiconductors; theory of bi-excitons in quasi-one-dimensional semiconductors; Devil's staircase and strange attractors in the Ising model; resonance interaction between surface and adsorption-like states; infinite range Ashkin-Teller model; melting of two-dimensional solids; recent progress in mean-field theory of spin glasses and its applications; impurity states in semiconductors by an embedding method; molecular dynamics study of reconstructed W(100) surface; study of anomalous internal friction in metals; universal character of domain growth exponents; exact relations for the dielectric function of a uniform electron gas; factors controlling solid solubility in metallic alloys; shallow impurity states in semiconductors in strong magnetic fields; correlation effects on the order-disorder phase transiton in $(GaAs)_{1-x}Ge_{2x}$; self-avoiding walk model for protein; multicritical properties of uniaxial Heisenberg antiferromagnets; density functional theory and some applications; analysis of heat field of metal sheet during elastic-plastic deformation; phase diagram of a model adsorbed monolayer system; introduction to hopping transport; hopping transport in polyacetylene; Ac conductivity of a disordered chain; spin systems on a Cayley tree: comprehensive treatment; macroscopic dielectric constant of silicon: failure of the local density approximation; band struc- ture calculation and total energy of Nb-Ge compounds; electrical conductivity and thermopower in narrow channel systems; dynamics of random and non-random fractals; memory functions for the electron-phonon system; photo-electrical properties of surface-barrier structures; lattice dynamics of dislocations in random alloys; metallic adhesion; introduction to probabilistic cellular automata; applications of LCAO method to electronic structure of solids; random field Ising model; dynamical density functional theory; charge density wave approach

quantum Hall effect; random structures — from soap froth
to amorphous Si; stochastic Liouville equation approach
to the excitation dynamics in disordered systems; conduc-
ting polymers: oriented crystalline polyacetylene; con-
ductivity of free-carrier plasma in the presence of
impurities; electric dipolar order in pure and dilute
alkali cyanides; non-ohmic d.c. conductivity via
instanton methods; computational simulation of defects in
metals; localization length and fractal dimensionalities
of wave-functions in disordered and incommensurate
models; use of microstructural models for solving prob-
lems related to nuclear technology; dielectric anomaly in
rocks and ceramics; certain conspicuous properties of
metallic superlattices; traversal time in tunnelling;
quantization of the Landau-two fluid model of super-
fluidity; new results on the state of heavy electrons in
metals and related phase transitions; response of the
electron gas surface in hydrodynamic approximation;
optical properties of semiconducting SnI_2; use of
Yukawa functions in the theory of simple fluids; molecu-
lar dynamics for reacting hard spheres; anisotropy of the
Coulomb repulsion and the superconducting gap; correlat-
ed-basis-functions theory of metal surfaces; electronic
properties of semiconducting superlattices; effect of
long-range Coulomb forces on solitons; light scattering
by plasma excitations in GaAs—GaAlAs superlattices —
theory and experiments.

Participation:	Total visitors:		250
	From developing countries:		188
Representation:	Africa	developing:	34
	Asia	developing:	59
		industrialized	–
	Europe	developing:	64
		industrialized:	47
	North & Central America	developing:	8
		industrialized:	15
	South America	developing:	23

Title: SIXTH TRIESTE INTERNATIONAL SYMPOSIUM "FRACTALS IN PHYSICS"

Dates: 9 - 12 July 1985

Organizers: Professors L. Pietronero (University of Groningen, The Netherlands), C. Evertsz (Solid State Physics Laboratory, Groningen, The Netherlands), S. Lundqvist (Chalmers University, Göteborg, Sweden), B.B. Mandelbrot (Harvard University, Cambridge, MA, USA), E. Stanley (Boston University, USA), E. Tosatti (International School for Advanced Studies, SISSA, Trieste, Italy).

Purpose: To provide an overview of the physical phenomena that manifest scale invariance and fractal properties with the aim of underlying the common mathematical features. The emphasis was on theoretical and experimental work related to well defined physical phenomena.

Programme: Lectures were given on:

                       multiplicative chaos and fractal measures; cluster struc-
                       ture and the termite model of a random two-component
                       composite material; fractal surfaces and their connection
                       to the theta point of a polymer; random walks with long
                       memory; fractals in turbulence; reactions in disordered
                       media modelled by fractals; spreading of epidemic proces-
                       ses leading to fractal structures; Laplacian random
                       walks; fractal dimension and the synthesis of branched
                       polymers; scattering by fractals; clustering in the
                       universe; anomalous diffusion, temporal scaling and 1/f
                       noise in chaotic systems; properties of Laplacian frac-
                       tals for dielectric breakdown in two and three dimen-
                       sions; some recent advances in the simulation of diffu-
                       sion limited aggregation and related processes; continuum
                       diffusion limited aggregation: random fractal growth
                       generated by a deterministic model; fractal growth of
                       viscous fingers; growing interface in diffusion limited
                       aggregation and Eden processes; sticking probability
                       scaling in diffusion limited aggregation; new uniaxial
                       scaling on diffusion limited aggregation with uniaxial
                       anisotropy; structure of random materials from scattering

techniques; fractal surfaces and pose size distribution of disordered materials; kinetics of clustering and Smoluchowski equation; dynamical properties of random and non-random fractals; percolation in a concentration gradient; static and dynamic properties of loopless aggregates; geometric studies of clusters grown by the clustering of clusters process; movie on aggregation; fractal time in semiconductors, glasses and polymers; mode locking: experiments and theory; metric from field propagation on fractal structures; fractal properties of clusters in the Ising model; collapse of loaded fractal trees; measure of fractal dimensionalities through physical properties; elastic properties of fractal structures; self-similarity of mutual and self-intersections of random fractals; ying-yang saddle sinks: topological dynamic stabilizing the 2/3 — 5/3 scale invariance of brain proteins manifesting phase transitions.

Participation:	Total visitors:		125
	From developing countries:		15
Representation:	Asia	developing:	2
		industrialized:	4
	Europe	developing:	11
		industrialized:	86
	North & Central America	developing:	1
		industrialized:	19
	South America	developing:	1
	International organizations:		1

Title:	WORKING PARTY ON MECHANICAL PROPERTIES AND BEHAVIOUR OF SOLIDS — PLASTIC INSTABILITIES
Dates:	12 — 30 August 1985
Organizers:	Directed by Professors G. Caglioti (Politechnic of Milan, Italy) and V. Balakrishnan (Indian Institute of Technology, Madras, India).
Purpose:	The objective of the Working Party was to bring together a group of scientists who master different theoretical and experimental techniques, but who are interested specifically in the basic problem of correlating the defective structure of solid materials with their mechanical properties and behaviour under nonequilibrium conditions. Also during the the 1982 Working Party organized by ICTP, emphasis was given to the general problem of interpreting the macroscopic mechanical behaviour of solids under stress with the atomic structure. Nevertheless, in this Working Party attention was focussed on key problems characterizing the mechanical behaviour of materials, and the adequacy of the methods of irreversible thermodynamics of nonlinear systems far from equilibrium to describe phenomena such as plastic instabilities, plastic flow and fracture was explored.
Programme:	Topics: — yield as thermoelastic—plastic dynamical instability — plastic flow — thermodynamics of plastic deformation and fracture — modern techniques of observation of the defective microstructure of materials and its evolution.

Lectures were given on:

thermodynamics of the elastic deformation; mechanisms of fracture; thermodynamics of the elastic deformation and the thermoelastic—plastic limit; thermodynamics of plastic deformation; continuum mechanics approach to plastic flow — constitutive equations; synchrotron radia-

tion and X—ray topography; physical aspects of the yield transition: acoustic and thermal emission; quantitative high precision strain measurements by synchrotron radiation; dislocation micromechanics and plastic flow; reaction diffusion equations; technological applications: criteria for mechanical characterization of structural materials; approach to dislocation patterning in terms of reaction—diffusion equations; dislocation patterning and crack propagation; thermodynamics of fracture; physical manifestation of instabilities in plastic flow; role of entropy in plastic deformation; fractals and fracture; generalized Fourier law for heat conduction; dislocation structure in the plastic region at a crack tip; stress corrosion and related problems; constitutive equations and equations of state in plasticity; mechanical spectroscopy of polymers; study of defects using channeling; application of infra—red techniques to mechanical properties; yield and flow stress in a dual phase steel; exoemission from metals under stress.

Participation:	Total visitors:		36
	From developing countries:		21
Representation:	Africa	developing:	7
	Asia	developing:	7
		industrialized:	—
	Europe	developing:	4
		industrialized:	11
	North & Central America	developing:	—
		industrialized:	4
	South America	developing:	3

Title:	SEVENTH TRIESTE INTERNATIONAL SYMPOSIUM: HOPPING TRANSPORT
Dates:	27 – 30 August 1985
Organizers:	Professors P.N. Butcher (University of Warwick, Coventry, UK), J. Chroboczek (Max–Planck–Institut, Grenoble, France), E. Tosatti (International School for Advanced Studies, SISSA, Trieste) and M. Tosi (University of Trieste/ICTP, Italy).
Purpose:	To discuss experimental aspects of hopping transport in amorphous semiconductors, impurity bands and organic materials.
Programme:	Lectures were given on:

review of hopping transport; rate equation theory; universal behaviour; tetrahedrally bonded amorphous semiconductors; scaling theory; small polarons; introduction to localisation; 2D impurity bands; group IV semiconductors; III–V semiconductors; effects of intrasite Coulomb interactions; Coulomb gap; mean field theory of the Coulomb glass; applications of the mean field theory to hopping counduction; dispersive transport; hopping theory of band tail relaxation in disordered semiconductors; experimental studies of hopping mechanisms; chalcogenides; polymers; correlated hopping; transport near a mobility edge; boron carbide.

Discussion panels: localisation, Coulomb interaction; problems for the future.

Participation:	Total visitors:		62
	From developing countries:		8
Representation:	Africa	developing:	1
	Asia	developing:	3
		industrialized:	8
	Europe	developing:	4
		industrialized:	33
	North & Central America	developing:	–
		industrialized:	13

APPLIED PHYSICS

Title: THIRD TRIESTE COLLEGE ON MICROPROCESSORS: TECHNOLOGY AND
                  APPLICATIONS IN PHYSICS

Dates: 7 October – 1 November 1985

Organizers: Directed by Dr. C. Verkerk (CERN, Geneva, Switzerland).

Purpose: The rapid development in the use of microprocessors makes
                  it very important and timely to spread the knowledge of
                  their technology and their applications in physics among
                  scientists in developing countries. The purpose of the
                  College was to bring participants, in a period of 4
                  weeks, to a level which will enable them to develop
                  microprocessor-based systems and to use them efficiently.

Programme: Topics: – general introduction to microprocessors
                             – microcomputer hardware: architecture and
                               interfacing
                             – assembly language programming
                             – techniques for microprocessor project devel-
                               opment
                             – applications of microprocessors in various
                               fields.

                  Lectures were given on:

                  impact of microprocessors in theoretical physics; digital
                  logic; introduction to (micro)computers; the 6809 micro-
                  processor; assembly language programming; introduction to
                  FLEX system; input/output and interfacing; presentation
                  of Colombo 84 board; hardware debugging; software de-
                  bugging; digital to analog and analog to digital con-
                  version; buses and data communications; new computer
                  architectures; floating point processing; kernel for
                  Colombo 84; introduction to projects; software tools and
                  techniques; microprocessor applications for energy devel-
                  opment in the Third World; other microprocessors; hard-
                  ware maintenance; design of a real-time system; design of
                  sequential circuits; application in nuclear physics;
                  multichannel analyzer; laboratory projects.

Participation:	Total visitors:		134
	From developing countries:		102
Representation:	Africa	developing:	33
	Asia	developing:	39
		industrialized:	—
	Europe	developing:	19
		industrialized:	25
	Indonesia & Oceania	developing:	1
		industrialized:	—
	North & Central America	developing:	2
		industrialized:	2
	South America	developing:	8
	International organizations	industrialized:	5

PHYSICS OF THE LIVING STATE

Title: WORKSHOP ON QUALITY CONTROL IN MEDICAL X-RAY DIAGNOSTIC
EQUIPMENT

Dates: 13 - 18 May 1985

Organizer: Dr. A. Benini (General Hospital, Parma, Italy).

Purpose: The aim of the course was to standardize and organize the
quality control of X-ray diagnostic equipment. All tech-
nical characteristics of equipment were taken into ac-
count with the view of having all parameters under con-
trol.

Programme: Lectures were given on:

the WHO programme in the field of quality control;
quality control from the point of view of the radio-
logist; image quality and medical diagnostic decision
making; actual status and future development of quality
control; the organization of quality control in the UK;
the experience of the Strahlenhygiene in Munich; tech-
nical parameters with regard to the determination of
image quality; diagnostic radiation health physics;
routine checking of quality control parameters in an
adequate fashion; KV-measuring equipment and methods for
checking filtration; dosimetric measurements and tech-
nical aspects of TLD dosimetry; quality control results
at Brescia (Italy) General Hospital along with cost
effectiveness evaluation; latest developments in C.A.T.
and related quality control procedures; digital radio-
logy: summary of technical parameters to be taken into
account; image quality control evaluation in some of the
most important investigation; image intensifiers; German
standard for image quality assurance; comparative evalua-
tion of various tools available; image quality evalua-
tion: mammography application; protection of staff and
patients; the results of Next programme; quality control
programme with particular reference to digital radiology
and record keeping; X-ray output and related quality

control measurements; film screen combination; image
quality and quality assurance; care and maintenance
suggested methods and organization.

Participation: Total visitors: 35

                   From developing countries: 7

Representation: Africa   developing: 2

                   Asia   developing: 1
                                         industrialized: —

                   Europe   developing: 4
                                         industrialized: 25

                   North & Central America developing: —
                                         industrialized: 2

                   International organizations: 1

Title: COLLEGE ON SOIL PHYSICS

Dates: 15 April – 3 May 1985

                    and

Title: COLLOQUIUM ON ENERGY FLUX AT THE SOIL ATMOSPHERE INTERFACE

Dates: 6 – 10 May 1985

Organizers: College: directed by Dr. D. Gabriels (State University of
                    Ghent, Belgium) and Dr. E.L. Skidmore (U.S. Department of
                    Agriculture, Manhattan, Kansas, USA).

                    Colloquium: organized in cooperation with the Commission
                    I (Soil Physics) of the International Society of Soil
                    Science (Chairman: Dr. S.S. Prihar, Department of Soils,
                    Punjab Agricultural University, India).

Purpose: To provide participants with a fundamental understanding
                    of soil physical properties and processes so that they
                    may apply knowledge gained to solving problems in
                    practice.

Programme: Topics:

                    College: – general properties of soils
                                – soil water
                                – soil and water conservation

                    Colloquium:– flow of heat and gas in the soil
                                – microclimatology
                                – soil surface sealing
                                – infiltration, evaporation and evapotrans-
                                  piration.

Lectures were given on:

College: development of soil physics; the soil resource: soil origins, soils in the world and soil classification; soil composition; soil structure — aggregation; soil porosity; soil consistency, strength and stress-strain; release of NH_4 from interlayer ammonium in wetland paddy soils; principles of degradation and restoration of soil structure; soil stabilisation and environment protection; agricultural climatic characteristics of Bajgah Valley (Iran); soil physical aspects on research in Argentina; optimum mulch rate for soil erosion control; soil water determination; soil water potential; nuclear techniques in soil physics studies; water flow in saturated soil; some aspects of applied physics research in water planning in Mexico; plant growth, nutrient availability of soil aggregation as influenced by portland cement; soils of Konya Karapinar (Turkey); sand dune stabilization; agricultural physics at the University of Dar-es-Salaam (Tanzania); saturated hydraulic conductivity; water flow in unsaturated soil; soil physical aspects in irrigation of agricultural lands; X-ray computerized tomography: general principles; water balance in root zone; applications of X-ray computerized tomography to soil physics; use of zeolites as soil conditioners; organization of agrometeorology in Tanzania; soil erosion problems and control in Malaysia; movement of solutes: convection and diffusion; movement of solutes: miscibiles displacement; hydraulic parameters of an Argentinian Typical Argiudoll; salt affected soils and agriculture in Pakistan; some works in erosion control on volcanic soils in eastern Zaire; spatial variability of soil physical properties; soil physical aspects in drainage of agricultural lands; runoff-erosion and nutrient losses from an oxisol in South East Nigeria; soil physics research realted to agricultural development in Mauritius; erosivity factor in the erosion process; modelling water erosion processes; mechanics of soil detachment and transport by wind; physics of dust mobilization; soil conservation practices.

Colloquium: process of infiltration; infiltration through crusts; water infiltration into two Aflfisols; research methodology to quantify and understand the modification of the energy flux at the soil atmosphere interface; evaporation process; tillage and evaporation; physics of mulching, with particular emphasis on grass mulches; influence of tillage and mulch on soil water; effect of bitument emulsion on soil physical properties; control of infiltration and evaporation in the soil surface for regulating the soil moisture regime in the semi-arid tropics; water balance in the root zone: a case study; estimation of actual evapotranspiration during a dry period; flow of gas in the soil; determination of soil aeration status; influence of soil physicsl properties on oxygen content and microbial activities; oxygen diffusion and strength as related to compaction; emergence as related to oxygen conditions of soils; thermal regime of bare soils; experimental measurements of effective thermal conductivity of porous media by a thermal probe; energy exchange at the soil atmosphere interface; problems of validation of heat and mass transfer models; study of thermal conductivity and moisture content in loose materials (soil); relationship between soil temperature and vapour pressure above the soil surface; water thermotransport in the upper soil layer affected by daily temperature wave; water transport as affected by temperature; methods of assessing soil surface sealing; use of a penetrometer to determine the mechanical resistance of surface seals; development of a new laboratory method for the determination of the soil crust strength; raindrop impact, soil particles detachment and transport; effect of physical properties of crust on Kampangsan (Thailand) soil on the impedance of emergence of corn seedling; effect of soil moisture and soil compaction on soil temperature.

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Participation:	Total visitors:		103
	From developing countries:		78
Representation:	Africa	developing:	33
	Asia	developing:	22
		industrialized:	--
	Europe	developing:	10
		industrialized:	21
	Indonesia & Oceania	developing:	2
		industrialized:	1
	North & Central America	developing:	1
		industrialized:	2
	South America	developing:	10
	International organizations	industrialized:	1

Title:	AUTUMN WORKSHOP IN CLOUD PHYSICS AND CLIMATE
Dates:	23 November - 20 December 1985
Organizers:	Professors J. Latham (Department of Pure and Applied Physics, University of Manchester, UK) and R.P. Pearce (University of Reading, UK).
Purpose:	The Workshop was intended for scientists who are already active in the field of Meterorology as well as for those with a different background but who wish to devote part of their research or teaching activities towards aspects of the drought problem. One of the aims of the Workshop was to encourage research collaboration on projects involving Meteorology Departments and Universities in developing countries affected by the drought problem.
Programme:	Topics: - general meteorology - cloud physics - weather modification - satellite meteorology - general atmospheric circulation and climate of arid zones.

Lectures were given on:

cloud microphysical processes; cloud models; general meteorology; early history of could seeding; remote sensing, satellite and radar meteorology; meteorology; atmospheric cloud physics measurements; cloud physics and weather modification; cloud physics and weather modifica- tion in China, and the studies of Chinese thunder and hail storms; hailstone analysis and grain boundary migra- tion in ice; recent advances in the research of drought and flood in China; analysis of climate in the South Arabic peninsula; some numerical simulation experiments of tropical cyclones with Arakawa-Schubert cumulus para- meterization; applications of a one-dimensional numerical could model; day-to-day variability in stratocumulus cloud deck in central Chile due to subsynoptic disturban- ces; weather modification experiments in Argentina; turbulent transfer of aerosol droplets from the lower

levels of the atmosphere to crop canopies; new results on
the growth law of ice crystals; thunder, lightning and
the break-up of water drops; numerical weather predic-
tion; world climate program; preliminary study of the
effects of El Niño on rainfall at selected Philippine
regions; glider measurement and modelling of thermals;
problems associated with the creation of a 3-D numerical
cloud model; statistical and physical results of hail
suppression activity in the Yugoslav Republic of Serbia;
climatic anomalies in the Peruvian Amazon.

Participation:	Total visitors:		88
	From developing countries:		77
Representation:	Africa	developing:	24
	Asia	developing:	29
		industrialized:	—
	Europe	developing:	12
		industrialized:	8
	Indonesia & Oceania	developing:	4
		industrialized:	—
	North & Central America	developing:	1
		industrialized:	3
	South America	developing:	7

Title: MATHEMATICS RESEARCH

Dates: Throughout the year

Organizer: Professor L.K. Shayo (ICTP, Tanzania).

Purpose: The intent was to give more continuity to the mathematics
                    programmes (extended courses and workshops) and to set up
                    a mathematics research group in order to allow Asso-
                    ciates and visitors from Federated Institutions to have
                    the possibility of contact with high—level mathematicians
                    throughout the year.

Programme: Lectures were given on:

                    global smooth solutions for quasilinear hyperbolic equa-
                    tion; Liapunov functionals and estimate of solutions in
                    PDEs; on a singular integral equation rising in aero-
                    dynamics; the geometry of the reaction—diffusion opera-
                    tor; some problems of dynamical systems on 3—manifolds;
                    applications of Hahn—Banach theorem to sequence spaces;
                    nonuniform nonresonant oscillations of some third order
                    nonlinear differential equations; Poincare's problem of
                    the irregular integrals: mathematical theory and applica-
                    tion to singular potential problems; the probability of a
                    false negative in schistosomiasis laboratory tests; new
                    set of symmetries for the integrable equations, Lie
                    algebra, non—isospectral eigenvalue problems; exactly
                    solvable models of surface interactions in nonrelativ-
                    istic quantum mechanics; rings with splitting properties;
                    the solution of soliton equation and Darboux transforma-
                    tion; a fourth order finite difference method for solving
                    elliptic partial differential equations; convexity for
                    surfaces defined over triangles; local—belonging sets in
                    Banach algebras; 1/N expansion technique for the solution
                    of Schrödinger equation with Hulthén potential; uncondi-
                    tional convergence in nonlocally convex spaces; an open
                    problem on exceptional sets for entire functions; non-
                    linear boundary value problems at resonance; the geometry

of complex flag bundles; oscillations of differential
equations caused by delays; mapping with closed range and
compactness.

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Participation:	Total visitors:		46
	From developing countries:		42
Representation:	Africa	developing:	25
	Asia	developing:	15
		industrialized:	—
	Europe	developing:	1
		industrialized:	4
	South America	developing:	1

Title:	WORKSHOP ON MATHEMATICS IN INDUSTRY
Dates:	13 - 24 May 1985
Organizers:	Professors H. Neunzert (University of Kaiserslautern, Federal Republic of Germany), C. Storey (University of Technology, Loughborough, UK) and A.B. Tayler (University of Oxford, UK).
Purpose:	The objective of the Workshop was to demonstrate how successful mathematical models are constructed.
Programme:	Topics: - simulation of car behaviours

Topics:
- simulation of car behaviours
- free boundary problems associated with melting and solidification processes
- optimal control applied to the temperature profile of a chemical reactor.

Lectures were given on:

Part I: introduction to Kaiserslautern group; numerical solution of systems of ordinary differential equations; methods for treatment of simple identification problems; representation of linear systems and identification; stochastic processes; exercises: computation of auto-correlation functions and simulation of ARMA-processes; spectral analysis of stationary processes - linear systems and stochastic processes; exercises: computation of spectral densities, linear systems with added noise and independent and uncorrelated processes; estimation of correlation and spectral densities; time series analysis and some examples from practice; application of time-series analysis to earthquakes; identification of linear systems - some methods; data reduction as a special principle in fatigue-analysis.

Part II: modelling, well posed Boundary Value Problems; nondimensional variables, normalisation; diffusion and convection of heat; parabolic BVPs; finite difference methods; analytical methods; use of transforms; Green's functions, asymptotics; smoke dispersion; modelling discussions; model development and analysis; smoke diffusion problem; heated flat plate problem; free and

moving boundaries; Stefan problems and conditions; weak solutions; front tracking method; enthalpy method; similarity solutions; phase degeneration and interface stability; welding two steel plates; continuous casting problem; laser meltpool problem; laser welding problem and extension to MIG welding; finite element methods for diffusion and convection; molecular diffusion in a porous medium; crystal growth; alloy solidification; dendritic growth; mathematics in industry.

Part III: industrial theme problem — the model and a general introduction to optimization; static unconstrained optimization 1— optimization from calculus, gradient methods; linear and quadratic programming; variational approach (unconstrained control) and the minimum principle (constrained control); static unconstrained optimization 2 — conjugate direction methods and direct search techniques; general linear constrained programming; nonlinear programming; specially structured problems; dynamic programming and the linear quadratic problem. Some classical problems in dynamic optimization and the general problem of optimal control; dynamic unconstrained optimization — tha calculus of variations; some computational methods for dynamic optimization — static optimization formulations and gradient methods; complementarity problem in mathematical programming.

Participation:	Total visitors:		83
	From developing countries:		62

Representation:	Africa	developing:	18
	Asia	developing:	33
		industrialized:	—
	Europe	developing:	9
		industrialized:	20
	North & Central America	developing:	—
		industrialized:	1
	South America	developing:	2

Title: WORKSHOP ON SEMIGROUPS AND APPLICATIONS

Dates: 7 October — 1 November 1985

Organizers: Professors. M. Crandall (Mathematics Research Center,
                          Madison, Wisconsin, USA) and R. Kappel (Institut für
                          Mathematik, Graz, Austria).

Purpose: To further discuss and to apply to current situations the
                          topics dealt with in the 1984 Autumn Course on the same
                          subject.

Programme: Topics: — semilinear evolution aequations and mathe-
                                       matical physics (nonlinear wave equation,
                                       nonlinear Schrödinger equation, nonlinear
                                       heat equation)
                                     — abstract semigroup theory and related topics,
                                       delay systems, Volterra type equations
                                     — diffusion equation, reaction-diffusion equa-
                                       tions, porous medium equations
                                     — equation of continuum mechanics and fluid-
                                       motion (Navier–Stokes equations).

                          Lectures were given on:

                          the Cauchy problem for nonlinear Schrödinger and Klein–
                          Gordon equations; scattering theory for nonlinear Schrö-
                          dinger and Klein–Gordon equations; boundedness of solu-
                          tions for some semilinear evolution equations; reaction-
                          diffusion systems; self–similarity and variational prob-
                          lems for a nonlinear diffusion equation; asymptotics of
                          blow–up of semilinear heat equations; blow–up results for
                          nonlinear wave equations in one space dimension; asympto-
                          tic behaviour of evolution equations and Hopf bifurca-
                          tion; wave equation with nonlinear damping and a forcing
                          term; some nonlinear mixed problems with free boundaries
                          arising in physical applications; local solutions for the
                          equation of the nonlinear vibrations of strings and
                          membranes in the degenerate case; applications of semi-
                          group theory to the Navier–Stokes equations; Schrödin-
                          ger's equation in $L^p(R^n)$; formation of singularities
                          in nonlinear hyperbolic equations; the Cauchy problem for

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the Yang—Mills equations; decay and asymptotics of certain systems of nonlinear wave equations; about extending nonlinear semigroups in L^1 to a space of measures; Cauchy problems in $L^p(R^n)$; integro—differential equations and applications; generation results for dual semigroups and applications; scattering for the transport equation; boundary value problems and semigroups; product formula for consevation laws and Boltzmann—like scheme; generation results for semigroups; invariance sets for semigroups and the variation of constants formula for semilinear equations; T—accretivity and maximum principle; Volterra integro—differential equations with completely positive kernels; asymptotic behaviour for the semigroup associated with the linear transport equation; partial integro—differential equations of singular type; existence results for some elliptic and parabolic quasilinear equations; local vanishing properties for quasilinear equations; free boundaries for highly degenerate diffusion equations; fast diffusion equations; method of moving planes for Hamilton—Jacobi equations and degenerate diffusion equations; introduction to continuum physics; materials with memory waves; introduction to nonlinear elasticity; hyperbolic conservation laws; Glimm's functionals; homogenization; introduction to continuum physics; Kelvin—Helmholtz instability: global singular solutions to Euler's equations in the plane; the interface bounding the support of solutions of the porous medium equation; introduction to the theory of viscosity solutions of Hamilton—Jacobi equations; degenerate parabolic equations; bifurcation; control theory and differential games and large deviation problems; degenerate diffusion equations.

Participation:	Total visitors:		89
	From developing countries:		35
Representation:	Africa	developing:	6
	Asia	developing:	12
		industrialized:	1

71

Representation: Europe   developing: 7

industrialized: 42

North & Central America   developing: 1

industrialized: 11

South America   developing: 9

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Title:	COLLEGE ON REPRESENTATION THEORY OF LIE GROUPS
Dates:	4 November — 6 December 1985
Organizers:	Profs. J.H. Rawnsley (University of Warwich, UK) and E. Vesentini (Scuola Normale Superiore, Pisa, Italy).
Purpose:	To introduce the participants to the theory of representation of Lie groups, to survey part of the current related knowledge and to draw attention to research problems and applications.
Programme:	Topics: — prerequisites in functional analysis
	— topological groups
	— structure of Lie groups and Lie algebras
	— linear representations.

Lectures were given on:

topological groups; semi—simple and solvable Lie algebras; Cartan's criterion; structure of Lie groups and Lie algebras; Killing form; complete reducibility of finite-dimensional representations of semi—simple Lie algebras; classification of irreducible finite-dimensional representations of the algebra sl_2; roots of a semi—simple Lie algebra and the Cartan decomposition; the root system: Weyl chambers and the Weyl group; Peter—Weyl theorem and representations of compact groups; structure of noncompact semi—simple groups and algebras; characters induced representation and Bogan's algorithm; the Borel—Weyl theorem; canonical realizations of Lie algebras; introduction to differential geometry; amorphic forms and representation theory; mathematical aspects of quantization; noncommutive calculations in one variable; convolution on the Heisenberg group and quantum mechanics; basic concepts of topology; how to read and understand an ancient scientific work; basic concepts of functional analysis; the beginning of arithemetics: cross—cultural history; basic concepts of group theory; character generators and their use in physics; the theory of unbounded ✕—derivations in C✕ algebras and its applications to statistical mechanics and dynamical systems; induced

representations and Kirillov's theory; the Plancherel
formula for semisimple Lie groups; harmonic analysis on
homogeneous trees; applications of Lie groups to a class
of differential equations; basic concepts of covering
spaces and simply connected spaces; representations of
Lie groups and special functions; a survey of some appli-
cations of representations of compact groups in geometry;
harmonic analysis in nilpotent Lie groups; symplectic
actions of Lie groups and geometric quantization; working
with infinite dimensional representations of semisimple
groups; Lie algebras and special functions of mathemat-
ical physics; the cohomology of generalized Lie algebras;
compact manifold of coherent states invariant by semi-
simple Lie groups; induced representations and Kirillov's
theory; non-Abelian charge quantization; multiplet clas-
sification of generalized principal series representation
for real semisimple Lie groups and invariant differential
operators.

Participation:	Total visitors:		107
	From developing countries:		84
Representation:	Africa	developing:	15
	Asia	developing:	42
		industrialized:	1
	Europe	developing:	19
		industrialized:	20
	North & Central America	developing:	1
		industrialized:	2
	South America	developing:	7

Title: WORKSHOP ON GRADED DIFFERENTIAL GEOMETRY

Dates: 9 — 13 December 1985

Organizer: Prof. J. Eells (University of Warwick, UK).

Purpose: To describe the foundations of graded differential geometry from the physics as well as representation theory points of view.

Programme: Topics: — graded Lie groups
                         — graded manifolds
                         — models for supersymmetry.

Lectures were given on:

graded manifolds and supermanifolds; what is the geometry of supersymmetry ?; algebraic structure of chiral anomalies; graded variational theory; calculus in supermanifolds and supergravity; motivation of supersymmetry for mathematicians; isoperimetric inequalities on Riemannian manifold; supersymmetric Yang–Mills equations; graded vector space and supersymmetry; graded bundles and their moduli spaces.

Participation:	Total visitors:		108
	From developing countries:		67
Representation:	Africa	developing:	12
	Asia	developing:	33
		industrialized:	—
	Europe	developing:	14
		industrialized:	41
	North & Central America	developing:	1
		industrialized:	—
	South America	developing:	7

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PHYSICS TEACHING

Title: SUMMER SCHOOL ON PHYSICS TEACHING AT UNIVERSITY LEVEL (in French)*

Dates: 24 July – 13 August 1985

Organizer: Dr. C. Taïeb (Palais de la Découverte, Paris, France).

Purpose: To enable university-level teachers from African French-speaking developing countries to compare their own experience and to discuss new methods for teaching physics.

Programme: Topics: – learning an advanced language
                                   – methodology for the elaboration of teaching software
                                   – original contribution of informatics in the learning process of physics.

Participation: Total visitors: 42

                        From developing countries: 32

Representation: Africa   developing: 32

                        Europe   developing: –
                                                   industrialized: 10

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* Supported by the French Ministry for Foreign Affairs.

TRAINING AND RESEARCH IN ITALIAN LABORATORIES

Dates: Throughout the year

Organizers: The programme is co-ordinated by Profs. G. Furlan (Uni-
                    versity of Trieste/ICTP, Italy), G. Denardo (University
                    of Trieste/ICTP, Italy) and E. Tosatti (SISSA/ICTP,
                    Trieste, Italy), in collaboration with Advisory Commit-
                    tees in each of the fields concerned.

Purpose: This project is meant to give participants in ICTP activ-
                    ities the opportunity of widening their experience by
                    becoming directly involved in the research of
                    laboratories at Italian universities, research centres
                    and institutions, in relation to practical applications
                    and industrial projects.

Programme: This year, scientists representing 26 developing Member
                    States worked — with grants from the Centre — in 55
                    Italian laboratories for a total of 352 man/months.
                    In 1985, the research subjects included:
                    Laser Physics,
                    Condensed Matter Physics,
                    Plasma Physics,
                    Soil Physic,
                    Geophysics,
                    Noncoventional Energies,
                    Climatology,
                    Microprocessors,
                    Biophysics,
                    Medical Physics and
                    Communication Physics.

Participation:	Total visitors:		74
	From developing countries:		74
Representation:	Africa	developing:	14
	Asia	developing:	44
		industrialized:	—
	Europe	developing:	8
		industrialized:	—
	North & Central America	developing:	1
		industrialized:	—
	South America	developing:	7

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PHYSICS AND DEVELOPMENT

Title: PHYSICS AND DEVELOPMENT PROGRAMME

Dates: Throughout the year

Organizer: The programme is co-ordinated and directed by Prof. H.R.
                  Dalafi (ICTP).

Purpose: The main purposes of this programme are to increase the
                  awareness of scientists of the role of physics in social
                  and enonomic development, and to inform Third World
                  scientists of potential sources of assistance for physics
                  research and its applications to the development needs of
                  their countries.

Programme: Lectures were given on:

                  research area of Trieste, present and future activities;
                  an overview on Laser applications; protein-rich food from
                  green leaves; appropriate food technology; the role of
                  the research in development; science policy for the
                  developing countries; science and development in a small
                  country; present international economic crises and the
                  prospect of South-South cooperation; soil physics and
                  agricultural development; physical processes in soils;
                  politics of development in Africa and South of Sahara;
                  physics, economics and development; an American Physi-
                  cist's view of the nuclear weapons race and disarmament;
                  recent development in polymer physics; economic and
                  social policies: the perspectives of developing countries
                  and those of industrialized countries; Hiroshima and
                  after: the need for nuclear disarmament; physics and the
                  origin of modern technology; the present role of physi-
                  cists in industrial development; some illusions on
                  nuclear proliferation; physics education in Africa –
                  statistical overview; solar energy for developing coun-
                  tries; how to succeed in research and development work in
                  a developing country – an example in Pakistan; the role
                  of the mathematician in developing countries; pioneer
                  physicists in developing countries – the case of India;

the need for creating institutes of mathematical sciences
in developinng countries; how to read and understand an
ancient scientific work; the beginning of arithmetics:
cross cultural history; the role of scientific networks
in the Third World; some meteorological experiments in
the natural atmosphere.

Participation: Total lecturers*:   17

                      From developing countries*:   6

Representation: Africa   .   developing: 1

                      Asia   developing: 1
                                                       industrialized: —

                      Europe   developing: 4
                                                       industrialized: 9

                      North & Central America   developing: —
                                                       industrialized: 1

                      International organizations   industrialized: 1

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* Figures do not include about 15 other lecturers who participated in other
activities as directors or lecturers.

(A)

THE FEDERATION AGREEMENT

AND THE ASSOCIATE MEMBERSHIP SCHEMES

Report on

the Associate Membership Scheme

in 1985

1 — Associates

Associate Members are scientists from and working in developing countries who are appointed, upon recommendation of the Scientific Council, for a period of six years during which they are entitled to pay six research visits to the ICTP. Each of such visits should not exceed 90 days but should last more than six weeks during the appointment period. Then, if the 30x90 = 270 days have not been fully utilized during the 6—year period, the remaining days may be used for additional visits for which the ICTP will not bear the costs of the travel expenses. During their period at the ICTP, Associate Members work either independently or in collaboration with other scientists in residence and attend workshops, conferences or extended courses.

The Centre expects that they will be engaged in enhancing physics and mathematics education at the secondary, polytechnical and college levels as well as teaching and research at the university level. Moreover, they should also pay attention, in their research work, to problems of physics and mathematics connected with their locale.

In 1985, the number of appointed Associate Members was 266. Some 113 of them (42.5%) came to the ICTP for a total of 226 man/months with an average duration of stay of exactly two months this year. These figures should be considered normal since every Associate Member is entitled in practice to a research visit every second year. Some of them may, of course and for various reasons like academic requirements or family situations, break the 2—year cycle by anticipating or differring the timing of their visit with respect to the time they would normally be expected at the ICTP. Tables I and II show to what extent the Associate Membership scheme has been used from the geographical areas and from the research interests viewpoints respectively. Table III shows a summary.

The intellectual benefits which Associates derive from their research period visit at the ICTP are numerous. Many of them succeed in publishing a

Table I

Number of Associates Entitled to a Research Visit in 1985
and Number of Associates who Actually Came,
per Geographical Areas

Geographical areas	Associates entitled to a research visit		Research visits			
	No	%	No	%	man/months	%
1. Africa	70	26.3	32	28.5	62	27.4
2. Asia	139	52.3	64	57	134	59.3
3. Europa	9	3.4	4	3.5	8	3.5
4. Indonesia + Oceania	3	1.1				
5. North + Central America	6	2.3	3	2.4	5	2.2
6. South America	39	14.6	10	7.5	17	7.6
TOTAL	266	100	113	100	226	100

Table II

Number of Associates Entitled to a Research Visit in 1985
per Scientific Field of Interest

Field of Interest	Associates entitled to a research visit in 1985		Research visits	
	No	%	No	%
1. Elementary Particles	60	22.6	29	25.4
2. Condensed Matter — Solid State	57	21.3	31	27.2
3. Atomic, Molecular and Laser Physics	21	7.9	7	6.1
4. Nuclear Physics	23	8.6	6	5.3
5. Plasma Physics	10	3.8	5	4.4
6. Mathematics	40	15	17	14.9
7. Geophysics (Physics of Oceans, Atmosphere and Earth)	26	9.8	6	5.3
8. Solar Energy	18	6.8	9	7.9
9. Biophysics	9	3.4	1	0.9
10. Microprocessors/Informatics	2	0.8	1	0.9
11. Astrophysics	1		1	0.9
TOTAL	266	100	113	100

Table III

1. No of appointed Associates in 1985..................... 266
2. No of Associates who visited the ICTP in 1985.......... 113
3. No of Member States represented........................ 39
4. Average duration of stay........................... 2 months
5. No of preprints prepared by Associates.................. 80

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paper. This year, 80 preprints were prepared by Associate Members, either alone or in collaboration with others.

Associates, while at the ICTP, have an opportunity to re-orient their research, to collaborate at a distance, once they are back home, with their colleagues of other developing countries or from industrialized countries or to up-date their scientific literature and, for many of them, to improve their teaching at their home universities.

2 - Senior Associates

Some of the former Associates of the ICTP who have acquired an international reputation and/or who have distinguished themselves as "entrepreneurs" in their home countries in the research or in academic training, may be appointed Senior Scientists of the ICTP upon recommendation of the Scientific Council. The duration of the appointment is 5 years during which they may draw from a fund of 3,000 US$ for each of them which can be used for subsistence and travel in relation to their visit to the ICTP.

Senior Associates do come to the Centre for various reasons. Some take advantage of their visit for carrying out their research since they can concentrate on their work being relieved from their administrative duties. Others come for boosting the collaboration between their colleagues and the scientists of the ICTP. Others take advantage of their being in Europe to come to the ICTP in order to attend a workshop or conference which can be interesting for themselves or their collaborators, or to give a seminar.

In 1985, the ICTP list of Senior Associates included 47 names from 20 Member States.

Fourteen Senior Associates representing 8 Member states came for a total of 11.57 man/months. Therefore, the average duration of a research visit was 26 days (o.8 man/months). They produced 7 preprints and came from the following geographical areas:

Africa	2
Asia	4
Europa	1
North and Central America	1
South America	6

Junior Associates are selected among those participants in the ICTP extended courses and workshops, who work at institutions in developing countries with poor library facilities. A Junior Associate is appointed for four years and entitled to a 350 US$ grant for buying scientific books and/or subscribing to scientific periodicals which must be made available to his/her colleagues. At the expiration of their appointments, Junior Associates are considered candidates to the Regular Associate Membership Scheme. In 1985, 96 scientists held a Junior Associate Appointment.

Table I shows the distribution of the 96 Junior Associates by fields, while Table II shows their distribution by geographical areas.

Table I

Distribution of Junior Associates

by Fields

FIELDS	No J. ASSOCIATES
1. Condensed Matter Physics	29
2. Physics of the Earth, Oceans and Atmosphere	28
3. Mathematics	9
4. Nuclear Physics	4
5. High Energy Physics	2
6. Plasma Physics	1
7. Biophysics	8
8. Atomic, Molecular and Lasers Physics	3
9. Microprocessors	5
10. Solar Energy and Other Renewable Energy Sources	7
TOTAL	96

Table II

Distribution of Junior Associates

by Geographical Areas

GEOGRAPHICAL AREA	No J. ASSOCIATES
Africa	39
Asia	50
Indonesia and Oceania	2
North and Central America	2
South America	3
Total	96

As in the past, the ICTP concluded Federation Agreements with institutions in developing countries whereby these institutions may send their scientists to the ICTP for a specified number of days depending the location of the institution with respect to Trieste. A limited number of agreements is also concluded with European Institutions, mainly in Eastern Europe.

Federated Institutions are encouraged to send their junior scientists to Trieste when activities of their interest are taking place at the ICTP. Scientists from Federated Institutes, therefore, attend extended courses, workshops, conferences or discuss their research projects with ICTP scientists and use its computer and library facilities.

Table I shows in a summarized way the type of agreements (allocation of number of days and possible assistance for travel expenses) which were concluded in 1985 and the number of institutes with which such agreements were signed. The terms of some of the Agreements are at variance with those of types A, B, C and D in order to take particular local conditions into account.

Table I

Types of Agreements

Type	No of Days	Travel (US$)	No of Institutions	Location of the Institutions
A	40	nil	19	Industrialized European and OPEC Countries
B	80	nil	15	Eastern Europe
C	80	1,050	34	North Africa and the Mediterranean
D	120	2,100	31	India, Pakistan, Far East, South-of-Sahara Africa, Latin America
Special Agreements are concluded with institutions from Argentina, Brazil, Iraq, Kuwait Foundation for the Advancement of Science, Pakistan and Qatar.				

The utilization of the resources offered by the Standard Federation Agreements is summarized in Table II.

Table II
Standard Agreements

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| ------------------------------------------------------------------------------ |
| 1. Number of Agreements proposed.........................................129  |
| 2. Number of Agreements signed...........................................111  |
| 3. Number of Agreements utilized..........................................97  |
| 4. Total number of scientists who benefited                                   |
|       from the Federation Agreements.....................................299  |
| 5. Total number of Member States which benefited                              |
|       from the Federation Agreements......................................38  |
| 6. for a total number of man/months of..................................209  |
| 7. For the 97 Agreements which were utilized, the total                       |
|       resources (8,930 days), expressed in man/months, were,                  |
|       in 1985,......................................293 man/months            |
| 8. Therefore, the utilization rate was.................................71.3%  |
| ------------------------------------------------------------------------------ |
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For the Special Agreements, the utilization of the resources was as shown in Table III.

Table III
Special Agreements

	No. of Visitors	No of Days	Man/Months
1. Kuwait Foundation for the Advancement of Sciences			
1/a. from Kuwait University	9	120	3.9
1/b. from Arab and Islamic countries	39	1,051	34.74
2. CNPq (Brazil)	4	199	6.5
3. Qatar	3	78	2.5
4. Argentina	2	44	1.43
5. Pakistan	2	132	4.32
Totals	59	1,624	53.39

Table IV shows totals for Standard and Special Agreements.

Table IV

Type of agreement	No of visitors	No of man/months
Standard	299	209
Special	59	53.4
Total	358	262.4

Note — 262.4 man/months represent 10.7% of the total man/months for ICTP activities held in Trieste.

Title: MISCELLANEOUS INDEPENDENT RESEARCH

Dates: Throughout the year

Purpose: To allow scientists wishing to avail themselves of the
                          Centre's facilities (library, computing facilities,
                          presence of ICTP Consultants and other experts) to carry
                          out independent research in periods when no activity is
                          scheduled in their field of interest and to have contact
                          with others at the Centre working in their own or related
                          fields.

Participation: Total visitors: 153

                 From developing countries: 91

Representation: Africa   developing: 23

                 Asia   developing: 50
                                             industrialized: —

                 Europe   developing: 9
                                             industrialized: 50

                 Indonesia & Oceania   developing: 2
                                             industrialized: —

                 North & Central America   developing: 2
                                             industrialized: 5

                 South America   developing: 5

                 International organizations industrialized: 6

Figures also include short-term visitors coming for organizational activities
only.

ICTP DONATION SCHEME

1. Book Donation Programme

Several years ago the Centre initiated a project for supplying libraries of universities in developing countries with scientific literature. Several appeals were made to libraries, publishing companies and individuals, asking them to kindly donate any books, journals and proceedings they no longer needed, with the International Centre acting as a broker. Their response to these appeals has been very encouraging.

Within this scheme, the Centre is distributing every year approximately 14,000 journals, 4,000 proceedings and 2,000 scientific books to more than 200 institutes in 80 developing countries.

So far, the Centre has received and distributed fairly complete sets of Physics and Mathematics journals (from 1975 onwards).

The proceedings are usually those of international conferences in Theoretical and Applied Physics which have been held in Europe and USA in recent years.

The value of the books, journals and proceedings offered to the Centre by different donors can roughly be estimated in thee range of 600,000 US dollars every year.

2. Equipment Donation Programme

This scheme was initiated in 1984. An appeal was made by the Director of ICTP, Professor Abdus Salam, to the leading laboratories in Europe for the donation of surplus equipment for distribution among the laboratories and institutes in developing countries. This appeal has had positive responses from various laboratories in Europe. In the past, under this scheme, several institutes in developing countries such as:

Physics Department, University of Dhaka, Bangladesh

Physics Department, University of Rajshahi, Bangladesh

Physics Department, University of Peshawar, Pakistan,

Physics Department, University of Khartoum, Sudan

Physics Department, University of Ghana, Ghana

have received in the range of 50 to 100 different items of equipment which had been donated by the following laboratories:

- Rutherford Appleton Laboratory in UK

- Seibersdorf Laboratory in Austria.

- The Nuclear Research centre in Jülich, Federal Republic of Germany,
  (which donated a microfiche reader printer which was sent directly to
  the Physics Department, University of Ilorin, Nigeria).

- The European Centre for Nuclear Research (CERN) which donated equipment
  to four institutes in Argentina, Brazil, Malaysia and Pakistan.

The equipment which is currently distributed is estimated to be of the
value of 1.5 million dollars approximately.

- Rutherford Appleton Laboratory in UK

- Seibersdorf Laboratory in Austria.

- The Nuclear Research centre in Jülich, Federal Republic of Germany,

REGIONAL ACTIVITIES ORGANIZED BY THE CENTRE

Title: LATIN AMERICAN REGIONAL COLLEGE ON MICROPROCESSORS: TECHNOLOGY AND APPLICATIONS

Dates: 10 June — 5 July 1985

Organizers: Mr. C. Verkerk (CERN, Geneva, Switzerland) and Prof. E. Posada (Asociación pro Centro Internacional de Física, ACIF, Bogota, Colombia); local technical co-ordinator: Mr. J.M. Trujillo Vargas (University of Antioquia, Medellin, Colombia).

Purpose: To replicate the colleges held at the ICTP on this subject in the developing countries themselves, in order to spread the knowledge of technology and applications of microprocessors in the context of local problematics.

Programme: Topics: — general introduction to microprocessors
- microcomputer hardware: architecture and interfacing
- assembly language programming
- techniques for microprocessor project development
- applications of microprocessors in various fields.

Lectures were given on:

introduction to (micro-)computers; characteristics of the 6809; assembly language programming; demonstration of Rosy; introduction to Logic; input, output and interfacing; presentation of Colombo 84; software techniques; DAC and ADC conversion; floating point processing; kernel for Colombo 84; buses and communications; development systems; introduction to projects; hardware maintenance; other microprocessors; software tools; from chips to systems; multichannel analyzer.

Participation*:	Total visitors:		87
	From developing countries:		77
Representation:	Africa	developing:	1
	Europe	developing:	1
		industrialized:	9
	North & Central America	developing:	9
		industrialized:	1
	South America	developing:	66

Prior to the College, a <u>Training Session</u> for the tutors had been organized at the ICTP from 14 to 25 January 1985.

Participation:	Total visitors:		37
	From developing countries:		18
Representation:	Asia	developing:	13
		industrialized:	—
	Europe	developing:	2
		industrialized:	18
	North & Central America	developing:	—
		industrialized:	1
	South America	developing:	3

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* Including the participants in the Training Session on Microprocessors held in Lisbon (Portugal) from 15 April to 10 May 1985.

Title: INTERNATIONAL WORKSHOP ON SAND TRANSPORT AND
                    DESERTIFICATION IN ARID LANDS

Dates: 18 — 29 November 1985

Organizers: Professors F. El—Baz (International Development ITEK
                    Optical Systems, Lexington, Massachusetts, USA) and
                    M.H.A. Hassan (ICTP/University of Khartoum, Sudan).

Purpose: To review several case studies of sand transport and
                    deposition by wind, selected from certain regions in
                    Sudan and in other countries where drifting sand is
                    seriously affecting fertile soil. Based on these case
                    studies, the general purpose of the Workshop was to
                    identify common factors contributing to the flow of sand
                    and to determine, through the applications of field and
                    laboratory studies, remote sensing techniques and mathem—
                    atical models, the rate of sand movement around human
                    settlements, water resources and productive areas. The
                    workshop also investigated critically and constructively
                    the effectiveness of existing approaches to sand fixation
                    and endeavoured to explore new and realistic methods to
                    curb sand encroachment.

Programme: Topics: — geomorphological aspects of sand movement:
                              classification and monitoring of wind driven
                              sand features based on space photography,
                              LANDSAT imagery and remote—sensing tech—
                              niques;

                              — laboratory and field studies: application of
                              modern instrumentation to air transport of
                              sand, and determination of parameters
                              controlling the development of various sand
                              features;

                              — theoretical studies: modes of particle
                              transport and rates of sand drift. Formation
                              and propagation of ripples and dunes.

                              — control of sand transport: identification of
                              focal points for halting sand movement.

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Lectures were given on:

applications of space photography to the study of transport patterns of desert sands; the need for a unified cartographic network for the Arab World; a modern approach to ground water exploration in arid and semi-arid land; a synoptic view of sediment aeolian transport; remote sensing applications in the hyperarid western desert of Egypt — the end product of desertification; drought-related surface changes in the upper inland Niger delta; monitoring wind driven sand in northern Sudan; the green belt of Algeria — remote sensing and cartography; the hazard of sand movement in northern Sudan; sand encroachment on the fringe of the Nile valley in Egypt; shifting sand hazards in North-West arid China; dune movement in the Kharga depression; natural desertification mechanisms along the arid West coast of South America; dunes of Qatar; sand distribution and general geological features in Sudan; origin of sand dunes in Sudan; sand movement and desertification studies in northern Sudan with emphasis on the Dongola area; vegetative sand stabilization in Pakistan and Saudi Arabia deserts; sand dune fixation by RAPG via aggregation and plantation; the effectiveness of a natural vegetation cover at protecting a surface from deflation; the stabilization of sandy soils by means of clay minerals; wind erosion control and sand dune stabilization practices implemented in the great Konya basin, Turkey; environmental changes and aeolian dynamics during the late quaternary in the Arabian peninsula; control of soil erosion from highway embankment in arid regions with special reference to Kuwait; climate change in North-West Sudan; aspects of desertification problems in parts of northern Nigeria; cost of desertification in Sudan; drought creep in Sudan; utilization of ground water in combating desertification in the Dongola area; environmental impact assessment to control desertification in the Sudan; Gum Arabic in Sudan; Kordofan resource inventory; desertification in the central Kordofan region: causes, effects and possible remedies; agricultural practices influencing desertification in the Darfur

region, Sudan; source region of wind erosion in the southern High Plains of the USA; research of sand stabilization of dunes in the Tengger and other deserts in Nortwest China; wind tunnel modelling of sand transport physics and control; field work and wind tunnel experiments; laboratory simulation of field tests on chemical stabilization of aeolian sand; erosion by wind-blown sand; on the structure of aeolian sand dunes created by porous fences; particle size distribution and mineralogy of some sand dunes in Sudan; aerosols in the atmosphere of Egypt; effect on aerosol particles on potential gradient; the erosion of dust particles by an air stream from a deposit of solid particles; sand ripples and dunes; a general model of sediment transport by wind, with implication for aeolian abrasion; soil erosion and its control; a self- consistent model of aeolian saltation; a physically based wind erosion estimation method.

Participation:	Total visitors:		134
	From developing countries:		117
Representation:	Africa	developing:	100
	Asia	developing:	13
		industrialized:	—
	Europe	developing:	2
		industrialized:	6
	North & Central America	developing:	—
		industrialized:	11
	South America	developing:	2

REGIONAL ACTIVITIES CO-SPONSORED BY THE CENTRE

This year the International Centre for Theoretical Physics was co-sponsor of the following activities*, organized in various regions:

1. Winter School in Solid State Physics,
   Islamabad, Pakistan, December 1984 — January 1985.

2. International Bose Symposium on Statistical Physics,
   Calcutta, India, 27 December 1984 — 1 January 1985.

3. Nile Winter College,
   Khartoum, Sudan, 5 — 19 January 1985.

4. Seventh International Conference on Positron Annihilation,
   New Delhi, India, 6 — 11 January 1985.

5. Symposium on Physics and Energy for Development,
   Dhaka, Bangladesh, 26 — 29 January 1985.

6. Twenty-Fourth Winter School,
   Schladming, Austria, February 1985.

7. International Workshop on Optical (Laser) Communication,
   Madras, India, 7 — 12 March 1985.

8. Second International Conference on Heliothermic Transfers,
   Monastir, Tunisia, 9 — 12 April 1985.

9. Marcel Grossmann Meeting on General Relativity,
   Rome, Italy, 17 — 21 June 1985.

10. Tenth Nathiagali Summer College on Physics and Contemporary Needs,
    Islamabad, Pakistan, 26 June — 18 July 1985.

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* This list also includes five activities which took place in Europe (Austria, Federal Republic of Germany, Italy and Spain) and for which the ICTP provided limited financial support in favour of participants from developing countries

11. Workshop on Functional Analysis and Applications,
    Abidjan, Côte d'Ivoire, 8 - 10 July 1985.

12. Twenty-Fifth Latin-American School of Physics (LASP),
    Cali, Colombia, 22 July - 4 August 1985.

13. First Palmyra Summer School for the Advancement of Sciences,
    Damascus, Syria, 22 July - 5 August.

14. Workshop on Valence Fluctuations and Heavy Fermions,
    Bariloche, Argentina, 12- 19 August 1985.

15. Nineth Latin-American Symposium on Solid-State Physics,
    Mar del Plata, Argentina, 19 - 24 August 1985.

16. ANZAAS (Australian and New Zealand Association for the Advancement of
    Science) Festival of Science,
    Clayton, Australia, 26 - 30 August 1985.

17. International Conference on Physics Education: Communicating Physics,
    Duisburg, Federal Republic of Germany, 26 - 30 August 1985.

18. Mathematical Modelling of Ecological Environmental and Biological Systems,
    Kanpur, India, 27 - 30 August.

19. Conference on Elementary Particle Physics,
    Bogota, Colombia, August 1985.

20. Multiciencias '85,
    organized by the Consejo Nacional de Ciencia y Tecnología (CONCYTEC),
    Cuzco, Peru.

21. Workshop on Astrophysics,
    Colombo, Sri Lanka, end of August 1985.

22. Third Petra School of Physics,
    Yarmouk, Jordan, 1 - 8 September 1985.

23. First Workshop on Van de Graaff Accelerators in Research, Training and
    Technological Applications,
    Amman, Jordan, 8 - 14 September 1985.

24. ASPEN (Asian Physics Educational Network) High Energy and Nuclear Physics Seminar,
    Beijing, People's Republic of China, September 1985.

25. First Mediterranean Symposium on Plasma Physics,
    Madrid, Spain, 22 - 30 September 1985.

26. Third International Symposium on Radiation Physics,
    Ferrara, Italy, 30 September - 4 October 1985.

27. Workshop on Electronics and Modern Communication Physics,
    Gauhati, India, Autumn 1985.

28. Microcomputer Applications and Measuring Techniques in Physics Education (ASPEN),
    Bangkok, Thailand, 28 October - 9 November 1985.

29. Symposium on Functional Analysis,
    Ibadan, Nigeria, 3 - 7 November 1985.

30. ACIF (Asociacion pro Centro Internacional de Física) Course on Material Science,
    Cali, Colombia, 18 - 29 November 1985.

31. Solar Energy Seminar,
    Lomé, Togo, 25 - 29 November 1985.

32. International Meeting on Synchrotron Radiation in Developing Countries,
    Brasilia, Brazil, 25 - 29 November 1985.

33. Seminar on Biophysics and the Eye - Advances in Eye Exploration and Management,
    Tunis, Tunisia, 28 - 30 November 1985.

34. Third International Workshop on the Physics of Semiconductor Devices,
    Madras, India, 27 November - 2 December 1985.

35. Second Tropical College on Applied Physics - Laser and Plasma Technology,
    Kuala Lumpur, Malaysia, December 1985.

36. ACIF Workshop on Teaching of Geophysics,
    Bogota, Colombia.

37. S.A.M.S.A. (South African Mathematical Sciences Association) University of Swaziland,
    Kwalusem, Swaziland, 12 — 20 December 1985.

38. Fourth Asian School on Solar Energy Harnessing: Solar Components,
    Bangkok, Thailand, 12 — 20 December 1985.

39. Structure and Evolution of Active Galactic Nuclei (International School for Advanced Studies, SISSA),
    ICTP, 10—13 April 1985.

HOSTED ACTIVITIES

1. Third Meeting of the Society for International Development (SID) Chapter Leaders - Europe's Role in Development Cooperation,
   18 - 20 January 1985,
   - organized by the Friuli Venezia Giulia Association for International Development.

2. Workshop on Nuclear and Particle Physics at Intermediate Energies with Hadrons,
   1 - 3 April 1985,
   - organized by the Italian National Institute of Nuclear Physics (INFN).

3. III Commission of the Italian National Institute of Nuclear Physics (INFN),
   2 April 1985.

4. Structure and Evolution of Active Galactic Nuclei,
   10 - 13 April 1985,
   - organized by Department of Astronomy (University of Trieste), Department of Physics (University of Milan), Italian National Research Council (CNR), Italian National Group of Astronomy, International School for Advanced Studies (SISSA), Astronomical Observatory (Trieste) and Scuola Normale Superiore (Pisa, Italy).

5. Meeting of the United Nations University Computer Consultative Committee,
   11 - 13 April 1985,
   - organized by the United Nations University.

6. School on Industrial Applications of Synchrotron Radiation,
   17 - 19 June 1985,
   - organized by the Consortium of the Institutes of Physics.

7. Conference on South-South and South-North Cooperation in Sciences,
   5 - 10 July 1985,
   - organized by the Third World Academy of Sciences (TWAS).

8. First Symposium on the State of Physical and Mathematical Sciences in the Arab World,
   10 - 12 July 1985,
   - organized by the ICTP Arab Friends Society (SARF).

9. International Conference on Variation Calculus,
   9 - 14 September 1985
   - organized by the International School for Advanced Studies (SISSA).

10. Meeting of the Scientific Council of the International Centre for Biotech-
    nology and Genetic Engineering,
    2 - 6 November 1985,
    - organized by ICGEB.

11. Meeting of the International Centre for Relativistic Astrophysics (ICRA),
    8 - 9 December 1985,
    - organized by ICRA.

12. Workshop on Drought, Desertification and Food Deficit,
    9-10 December 1985,
    - organized by the Third World Academy of Sciences (TWAS).

13. Mini-workshop on Total Energy and Force Methods (SISSA),
    ICTP, 12-13 December 1985.

GUEST OF HONOUR:

SIR FRED HOYLE

Sir Fred Hoyle was Guest of Honour at the International Centre for Theo-retical Physics from 11 to 15 November 1985.

On 13 November, he gave a lecture on the nature of the interstellar grains.

PRIZES AND OTHER CELEBRATIONS

KASTLER DAY

11 March 1985

This commemorative day was dedicated to Nobel Laureate Professor Alfred Kastler, former Chairman of the Centre's Scientific Council and one of the founders of the series of Colleges on Lasers, Atomic and Molecular Physics.

The ICTP 1983 Prize in honour of Professor Kastler had been awarded to Dr. Ganapathy Baskaran, a theoretical physicist of the University of Madras who has made important contributions to the theory of antiferromagnetic insulators, phase transitions in condensed matter, and lattice gauge theories.

The following lectures were given:

> Kastler and the Centre; Professor Kastler's scientific achievements; Kastler, ICTP and French-speaking colleges on physics teaching; Kastler and the origin of optical pumping; Kastler: a scientist, a friend; studies in double resonance and optical pumping; optical double resonance and optical pumping in Heidelberg; the impact of Kastler's work in India; quantum optics and QED tests with Rydberg Atoms; Kastler and polarization-suppressed molecular recombination; optical pumping and atomic parity violation experiments.

Prof. S. Lundqvist (Göteborg University, Sweden), Prof. M.C. Taïeb (Paris), Dr. B. Cagnac (Paris), Prof. A. Gozzini (Pisa, Italy), Prof. G.W. Series (Oxford, UK), Prof. G. zu Putlitz (Heidelberg, Federal Republic of Germany), Prof. S.A. Ahmad (Bombay, India), Prof. S. Haroche (Paris), Prof. D. Kleppner (Cambridge, Mass., USA) and Prof. M.A. Bouchiat (Paris) were invited to attend the ceremony.

VALLARTA PRIZE

7 June 1985

The 1984 ICTP Prize for Physics, which was in honour of the late Professor Manuel Sandoval Vallarta, former chairman of the ICTP Scientific Council, was awarded to Dr. Ricardo Galvao from the Institute of Advanced Studies in Sao Paulo, Brazil, for important theoretical contributions in fields ranging from magnetohydrodynamic equilibrium and stability, resistive modes and interaction of laser radiation with matter. Ms. Vallarta attended the award ceremony.

The following lectures were given:

Professor Abdus Salam: Opening speech;

Mrs. Sandoval Vallarta: Trieste, my Memories;

Dr. J. Herrera (Mexico):   Sandoval Vallarta, a Man of his Time;

Dr. Ricardo Galvao: Plasma Physics in Brazil.

DIRAC MEDALS
8 August 1985

To honour one of the greatest physicists this century and a staunch friend of the Centre, the International Centre for Theoretical Physics awarded two Paul Adrien Maurice Dirac Gold Medals, one to an outstanding senior and the other to an outstanding younger physicist.

The first two medals were announced on 8 August – Professor Dirac's birthday – 1985.

Professor Yakov Zeldovich of the Space Research Institute, Moscow, USSR, was honoured for far-ranging contributions to relativistic astrophysics, particularly in teories of compact objects and of cosmic evolution.

Professor Edward Witten of Princeton University, USA, was honoured for stimulating contributions to the quantum field theory, particularly with regard to the implications of new kinds of anomalies.

The award ceremony took place on 7 February 1986 at 11.00 a.m., on the second day of the two-day symposium on "Perspectives in Particle Physics", in the Lecture Hall of the International Centre for Theoretical Physics in Trieste. Among the distinguished guests were Professor C. Rubbia (CERN), Nobel Laureate 1984, Professor A. Zichichi (CERN) and Professor R. Marshak (Virginia Polytechnic), both members of the Scientific Council, and Professor G. t'Hooft (Rijksuniversiteit, Utrecht, The Netherlands) in addition, of course to Professor E. Witten. Professor Ya. Zeldovich who was also expected, could not attend.

The Dirac Medals Award Committee was composed of: Prof. Stig Lundqvist, chairman of the Scientific Council of ICTP (Göteborg University, Sweden), Prof. Robert Marshak (Virginia Polytechnic, USA), Prof. Abdus Salam (ICTP, Trieste, Italy), Prof. Julian Schwinger (University of California – Los Angeles, USA), Prof. Leon van Hove (CERN, Geneva, Switzerland) and Prof. Steven Weinberg (University of Texas – Austin, USA).

EMMY NOETHER DAY

22 November 1985

During the College on Representation Theory of Lie Groups, the International School for Advanced Studies (SISSA–ISAS) organized an afternoon session which was dedicated to Emmy Noether (1882 – 1935). The last of Emmy Noether's students who is still alive, Professor B.L. van der Waerden, was invited and attended the session.

The following lectures was given:

> Emmy Noether's course of lectures "Hyperkomplexe Gruppen un Darstellungstheories"; some comments on Emmy Noether.

The role of women in science was discussed in a round table.

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WSPC	Winter College on Fundamental Nuclear Physics, 7 February – 30 March 1984	Vol 1 – 712 Vol 2 – 546 Vol 3 – 620
USTL**	IVème séminaire sur l'énérgie solaire	800
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* World Scientific Publishing Co. Pte. Ltd., Singapore.

** Université des Sciences et Techniques du Languedoc.

Number of preprints and internal reports issued in 1985:   313.

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Key:
AP	Atomic Physics
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GEO	Geophysics
MP	Medical Physics
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