



International Centre for Theoretical Physics

News from ICTP

No. 42/43
January/February 1991**Sixty-fifth Birthday Ceremony**

On 29th January, 1926, the world was gifted with a sensible man, a wise man, a scientist, a passionate advocate for the scientific research in the Third World, a Nobel Laureate and a practicing muslim who believes in the unity of nature and the unity of science — he is Professor Abdus Salam, the founder Director of the International Centre for Theoretical Physics (ICTP). To pay respect to this great man and to observe the auspicious occasion of his 65th birthday, ICTP chalked out a programme with enthusiasm and admiration. Many distinguished scientists, ambassadors and Parliament Members of the Trieste City made the occasion gorgeous and decorative.

Prof. H.R. Dalafi, Liaison Officer of the ICTP and organizer of this ceremony, delivered the welcome address. He informed that the Prime

Minister Andreotti and Professor Antonino Zichichi would have attended this Ceremony in honour of Professor Abdus Salam, but Prof. Zichichi informed him that the Prime Minister might be caught up with engagements consequent to the Gulf crisis. He said he was happy to see all the guests, specially Signor Prefetto, the representative of the Lord Mayor, the President of the Region, and all the representatives of the scientific, political, cultural and economic sectors. Prof. Dalafi further said that he was happy to have a physicist as our chairman and an economist as co-chairman. Prof. Dalafi also said, *"I wish to add also that until a few days ago, Prof. Salam did not know anything about this ceremony. It has been a surprise for him because I knew that, if I had told him, he would have cancelled it. We invited those who have worked in close collaboration with Prof. Salam over the last twenty-five years to say a*



Ms. Zingarelli, Head Librarian and eldest Staff Member of ICTP, presents the plaque on behalf of the ICTP Staff.

Contents

Sixty-Fifth Birthday Ceremony	1
Silver Dirac Medal	6
Degree Honoris Causa to Abdus Salam	6
The Brain	6
G.D. Birla Award for Sir Hermann Bondi	8
Organizing one's Own Conference Can Fill a Scientific Void	8
School of Mathematics and Allied Sciences	11
International Colloquium on Physics	12
Activities at ICTP in January/February 1991	12
Calendar of Activities	
Calendar of Activities at ICTP in 1991	16

few words". He wished to have the opportunity to celebrate more and more that kind of occasion for Prof. Salam.

Prof. Paolo Budinich, former Deputy Director of ICTP, in his talk recalled his memories of friendship with Prof. Salam and he reminded the story the coming of the ICTP in Trieste. He said, *"The coming of the ICTP in Trieste and the consequent beginning of my friendship with Abdus Salam was the result of the combination of a series of improbable circumstances like the fact that in 1961 he was in Geneva and then in the range of distance from Trieste*

(like Bologna, Vienna, Zagreb) from where we could afford to invite people to our summer symposia. In the same year he convinced the Pakistani delegation at the IAEA General Conference to propose the creation of an International Centre for Physics under the flag of the United Nations."

Prof. Budinich evaluated friendship, he said that good friendship, specially between people coming from different parts of the world and from different environments were always fruitful, they may only improve people. On his part he understood Muslims and their deep cultural values, maybe he adopted some Muslim habits, and he was convinced that Prof. Salam had appreciated their values. He continued, "The deep link between us originated mainly from the enterprise we started here in Trieste, which during its rapid expansion, more and more convinced us of its usefulness and of its necessity for the benefit of the World in the South but also with our neighbouring friends in the East with which we have kept and developed during 26 years valuable links of scientific, cultural and personal collaborations. Here in Trieste we have experienced how the values of science and culture can only unite people, help them to understand each other, to cooperate and to live and progress in peace."

Prof. Budinich concluded his speech by saying that the aims and ideals which had oriented the ICTP enterprise might become of great value as a remedy to the disaster, damages and bad feelings which the Gulf war would present and certainly leave behind, and in the future the continuation of the ICTP and its expansion to ICS and ICGEB to cope with the ever increasing needs and demands from the South and from the North with the ever increasing needs and demands from the South and from the East will be an absolute necessity.

After the speech of Prof. Budinich, Prof. Salvini requested Prof. L. Bertocchi, Deputy Director of the ICTP to deliver his speech. He said how interaction with Salam took place when he had just arrived at the ICTP from CERN in 1967-68. He was asked to deliver a course at the Postgraduate School of the Trieste University, whose lectures were held here at the Centre. To his astonishment, when he started his lectures, he found, sitting among the students, Prof. Salam. He further stated that Prof. Salam was the best and the worst of those students, always asking questions, never allowing him to talk for more than 10 minutes without

interrupting the discussion, wanting to master all details. Prof. Salam forced him to change the timetable of the course, in order to be able to attend all the lectures. This is an aspect of the personality of Salam, always curious, always eager to learn and re-interpret theories and facts in his own way — this is Prof. L. Bertocchi's first interaction with Prof. Salam.

Finally Prof. Bertocchi wanted to say his experience with Prof. Salam as a science administrator, "I have been fortunate to start my cooperation with the Centre 24 years ago, when I moved to Trieste, and I have been "captured" more and more by Salam, starting first with the organization of seminars, then of courses, to end with the responsibility of the Centre as Deputy Director.

"I will end my talk underlining among his qualities, the one which has always impressed me mostly: the capacity of switching immediately and fully from one subject to another; he could discuss a deep problem in physics with the scientists of his group, then, if interrupted, switch to an administrative problem and discuss this new matter with full attention, to return fully to physics in the time of a few seconds. I know very few people who have this quality at such a level. Lastly with one sentence, Abdus working with you is hard and difficult, but always exciting."

Dr. A.M. Hamende, former Scientific Information Officer and now Consultant at the Third World Academy of Sciences, recalled his memory from 1962 with Prof. Salam. Dr. Hamende is the first person who met Prof. Salam from IAEA in his physics seminar. After the successful operation of the Seminar, Prof. Salam told him, "Hamende will you come to Trieste". Seminar, Prof. Salam told him, "Hamende will you come to Trieste". This was the beginning of his life as an Administrator and Scientific Information Officer in Trieste. More than 26 years have passed since Dr. Hamende started working with Prof. Salam. He said that in front of him is the result of Prof. Salam's faith, competence and indomitable tenacity, this is the work of a generation under his guidance and inspiration, an heritage which must be preserved and further expanded. "Prof. Salam, we join the tens of thousands of scientists who have been here and wish you a very happy birthday this 29 January and good health for the years to come at the head of a magnificent institution that you have so masterly created."

Prof. A. Tavkhelidze, President of the Academy of Sciences of Georgian SSR, said on behalf of the physicists of the Soviet Union and Georgia, "Let me congratulate you on your birthday. You are a Nobel Prize winner in the universal theory of electromagnetic and weak interactions. I think that not only I but many of your friends are convinced that you must have a second Nobel Prize as a humanist who has created a high spirit institute of theoretical physics."

Prof. L. Fonda, Prof. M.H.A. Hassan, Prof. Yu Lu, Prof. Papis, spoke during this ceremony. Finally, Prof. Abdus Salam gave his thoughtful speech for the audience and he said:

"I shall start with the story of the patriarch Abraham who is equally revered by Jews, Christians and Muslims. According to the Holy Book of Islam — the Holy Quran — Abraham, together with his son, is supposed to have founded the Kabbah, the mosque in Mecca. While he was lifting big stones to build the structure, he prayed and said:

Oh Lord, I have settled from among my issue in a valley which is (all but) uncultivated but which enjoins Thine house which I am erecting for you so that they can stand and pray in front of Thee.

Oh Lord, make the hearts of men incline towards them and grant them the fruits of this earth so that they are grateful to you.

"Thus, this prayer to incline men's hearts towards the people who resided in Mecca was made by Abraham himself.

"I do not claim to live in Mecca, but I am part of the same tradition and certainly the prayer of Abraham has been heard so that so many different people from different walks of life have come together with their hearts inclined from different walks of life have come together with their hearts inclined towards me. I feel very grateful to them all who have said such kind things about my role towards the founding of this Centre and the Third World Academy of Sciences.

"I shall mention a few names to illustrate some of the points which have been made.

"Professor Budinich said something of the Christian tradition must have rubbed off on me which is very true. I have been saying to my Muslim friends and I will say it again that we must share the generosity of the Christian tradition if we are to be living on the same planet as they are. I shall repeat this message again. Fundamental faith is good because it leads you to the



Professor Abdus Salam speaks to the audience.

original faith which is set out in the Book. Together with fundamental faith, we must strive to be neither irrational nor intolerant.

"I am grateful to the Presidents of the Royal Society and the National Academy of Sciences and the Chinese Academy and the Soviet Academy as well as the Accademia dei Lincei, for their kind and heartwarming words which they have sent to me. They speak of the resolve on their parts to help the Third World and those from the Third World who are listening to me should remember what goodness means — goodness of the people of Trieste, for example, in giving up their private privileges and in helping us from the Third World.

"Someone spoke of the difficulties of setting up the Centre. The difficulty of setting up the Centre. The difficulty was not of the actual physical process of setting up the Centre. The difficulty lay in getting the ideas accepted in the first place. There was opposition from almost all the large industrialised countries, except Italy, Japan and the Nordic countries. After the first step was taken, the actual building of the Centre did not present difficulties. The City of Trieste took the matter in their own hands. This sustains the messages which were read out today by Professor Budinich, Professor Bertocchi and Professor Fonda as well as by Dr. Hamende, the administrator of the Centre till recently. These men took the creation of the facilities to heart and they provided us with the basis of the most

beautiful location in the world for a scientific centre.

"I see the Prince of Torre and Tasso and I must pay a tribute to his great father who was the first person to write to me regarding Trieste and its possibilities. I remember receiving a long letter which ended with his signature. The signature extended over the whole page. I was very struck by that. I believe I still have that letter preserved in the archives of the Centre. I am also very grateful to the doctors in Trieste who have made it a profession to look after my health. I see Dr. Zambelli and Dr. Rocco who have looked after my broken arm, as well as Dr. Curri who has done so much to keep me in good form.

"Coming to Italy has helped us materially. President G. Andreotti. Coming to Italy has helped us materially. President G. Andreotti, whom I consider as one of my personal friends, came here one day and during that one day, he listened to us and he made up his mind that he was going to help the Third World Academy of Sciences to come into its own. He made an announcement in this very hall. Right away, so that's real generosity, that's real helpfulness. And I must say the Government of Italy and the Italian people are to be commended for this because after all it's funds from their side which are coming to us for those from the Third World and we should be very very happy with this arrangement.

"There are several messages from Heads of State, from the the President of Algeria, the Prime Minister of Italy, the

President of the Ivory Coast, Crown Prince Hassan of Jordan, the President of Nigeria, the President of Sri Lanka, the President of Sudan, President Nyerere, ex-President of Tanzania and finally, my personal friend, President Perez, the President of Venezuela. Some of them have been here and seen the way we have been working. They liked it and we liked them.

"Before I conclude, I must pay a tribute to the Directors General of the IAEA, Dr. Sigvard Eklund and now Dr. Hans Blix, Mr. A. M'Bow and now Dr. F. Mayor of UNESCO as well as Dr. Kouzminov and my personal friends, Dr. A. Kaddoura and Dr. A. Badran.

"I must thank Professor Dalafi because Dalafi was the man who first tried to organize a celebration for my 60th birthday. That effort was quenched tried to organize a celebration for my 60th birthday. That effort was quenched by myself at the last minute by telling Professor Marshak, Professor Witten and Professor 't Hooft who had come specially all the way from their home countries to speak and to honour me. I begged them to desist from that and they were persuaded. I could not persuade Professor Dalafi to stop his efforts this time because he told me that was expecting President Andreotti - the Numero Uno of Italy. Unfortunately, President Andreotti could not come because of the Gulf War. However, President Andreotti, in spite of all the difficulties, has assured us that his spirit is with us and that we shall be able to get ICS successfully off the ground. He has promised to come and inaugurate

ICS. ICS, the International Centre for Science, is the international technological arm of the Centre here. Its three parts are the International Centre for High Technology and New Materials, the International Centre for Chemistry, Pure and Applied, as well as the International Centre for Environment. This last will be in two parts — one here and one in Venice. The Venice part will deal with Marine Sciences. Professor Forti is in charge of the ICS.

"I do not think I have left off anybody else. Ms. Zingarelli represented the staff. I must pay a tribute to the staff of the Centre, the staff of the ICS as well as to the staff of the Third World Academy of Sciences as well as to the scientific staff of the Centres. They are the people whom we should remember always and who have really done the work for which you have given me credit.

"Professor Papic, has to be thanked for his kind contribution and his analysis of what makes Salam tick. I do not agree with all the things which he said, particularly when he spoke of the genius and the hard work. The hard work is certainly there but the genius may not be.

"Anyway, I would like to say the following — to those of us who are from the Third World. I have learnt through my life that sharing all the blessings which we have been vouchsafed — sharing and giving — these are the two things which have always sustained me. The Prophet of

Islam said, "The hand which is above is better than the hand which is below". This means that giving is better than taking. So, always be generous and share your blessings. That is one important lesson from all that one has been able to achieve.

"It is a shock when one hears that one is 65, I wish there were some way in which one could turn the clock back 10 years at least and call oneself 55.

"Mr. Chairman, how old are you?"

Prof. Salvini: I am older, yes. By six years.

Prof. Salam: Six years, good heavens! I would not have thought you to be more than 61.

"I shall finish with the story of Dirac's when we asked him if he would like his 70th birthday to be celebrated in the Centre. He came to me and he was very angry with me, because I dared to suggest this. He said to me, "Do you really believe that I have finished off with physics?" — that's what he thought, that his 70th birthday celebrations meant that he was finished doing physics. I assured him that No sir, your physics was as fresh as ever — which was true. He was then reconciled to it, and he allowed us to go on with his 70th birthday.

"So I have allowed Professor Dalafi to go on with my 65th birthday, in the hope that you don't think that I am finished with physics. I feel particularly proud of my last paper on the Role of Chirality in the Origin of Life.

"Thank you very much, sir."

In the middle of the function the

musicians Cameristi Triestini played lyric music and expressed the gratitude on behalf of the Trieste citizens. From the ICTP, Ms. M. Zingarelli, Head of the Library and eldest Staff Member, presented a gift on behalf of the Staff and wished a happy birthday. Ms. E. Viti, Member of the ICTP Staff, read out the messages from various heads of states.

Lastly, the Chairman of the function Prof. Salvini, President of Accademia dei Lincei, Rome, Italy, gave his presidential address. He said,

"The man we are honouring today is the key person of a part of history of physics of this century. Together with two others, he opened the way to the understanding of the electromagnetic and electroweak interactions. This was a fantastic thing. It took many years. The idea of trying to have evidence of these particles through experiments of the particles divined by Abdus Salam and the others was very, very touching and looked very impossible indeed.

"At the end, the research developed and it was decided that it was possible to find these heavy particles. They were found in 1981-82-83. The man author of this gigantic experience was Carlo Rubbia and I can tell you that, as soon as they were discovered, there was a flux of people coming here to Trieste to Abdus Salam. We remember Carlo Rubbia coming, Zichichi coming... I was very busy in that moment just on these particles. It was a recognition that these key points of the history of the world in all the world had started from



The President of the function, Prof. G. Salvini, gives his presidential address.

Abdus Salam. It was a long chain of scientists. No man can do this alone. There were hundreds of experimentalists and theoreticians, but certainly Abdus Salam deserves a highly significant part of these discoveries.

"This is the part for which I am particularly related to you independently of other aspects of this beautiful celebration."

In the second part of the Ceremony there was a lunch hosted on the occasion of Prof. Salam's 65th birthday. A happy birthday at ICTP in honour of Prof. Salam.

M. Farooque

Prof. Salam received messages from, among others:

S.E. M. Mouloud Hamrouche, Head of Government of Algeria:

"On the occasion of the celebration of your 65th birthday, it gives me a great pleasure to extend to you my sincere congratulations and my best wishes for a very long and productive life.

Your contribution to the advancement of science and your pioneer work in particle physics, culminating in the Nobel Price Award, has made of you a symbol for all scientists of the Third World. Your efforts during the past three decades to establish permanent institutions to help scientists from developing countries to master most advanced sciences and technologies have been so successful in many respects.

Your views on development and the international nature of science deserve great respect. Your insistence that there can be no permanent dominance in science by a single nation and that scientific thought and its creation is the common and shared heritage of mankind, has indeed made you a source of common and shared heritage of mankind, has indeed made you a source of inspiration for all scientists from the North as well as from the South.

Algeria, its Government and its people will all be happy to welcome you at any time of your convenience, in order to be inspired by your thoughts and advices. May Allah keep you well and in good spirit for a very long time for the benefit of humanity."

On. Giulio Andreotti, Prime Minister of Italy:

"I am sorry not to be able to attend the meeting organized by the Centre, also to celebrate your birthday. As you can well imagine, current events and previous engagements really make it impossible for me to come to Trieste, though I would have been really happy

to do so.

In assuring you that I shall be there with my thought and all my friendship, I send to you my very best and most heartfelt wishes for a happy birthday."

M. Alassane Dramane Outtara, Prime Minister of Ivory Coast:

"At the time when the international scientific community expresses to you its sympathy and recognition on the occasion of your birthday, kindly accept the gratitude and the affectionate thoughts of the Government of the People of the Ivory Coast.

commend such contributions, but I can say that such contributions have not only been countless, but that as a generous scientist, you have never waived to share your knowledge with other, for the welfare of all.

Wishing you all the best for your 65th birthday and many happy prosperous years to come."

H.E. General Ibrahim B. Babangida, President and Commander-in-Chief of the Armed Forces of Nigeria:

"This is to congratulate you for the



Dr. N. Tomizza gives his present on behalf of the Trieste City.

I take this occasion to underline the excellence of the links of scientific cooperation which you have created and reinforced over the years between the International Centre for Theoretical Physics and the young School of Mathematics and Physics of our country. Mathematics and Physics of our country.

In my own personal name and in the name of the scientists of the Ivory Coast, these signs of recognition accompany our heartfelt congratulations.

Wishing you a happy birthday and health and happiness for the year 1991 for yourself and your family, we ask you to accept our expressions of friendship."

H.R.H. El Hassan Bin Talal, Crown Prince of Jordan:

"At times of international turmoil, lack of understanding and reaching out amongst the nations of the world, it is a great pleasure to send heartiest congratulations to you, a dear friend, whose contributions have not been confined to your own country, but to the world at large. It is not for me to

enormous achievements you have made in your professional career and as Nobel Laureate as well as Founder Director of the International Centre for Theoretical Physics on the celebration of your 65th birthday. You are, no doubt, a credit not only to your country alone, but to the Third World for all your achievements. Only to your country alone, but to the Third World for all your achievements.

Among your achievements are the Presidency of the Third World Academy of Sciences, Third World Network of Scientific Organisations and numerous other awards, including a D.Sc. (Hons.) from the University of Maiduguri, Nigeria, in 1981.

We wish long life and many more returns on this occasion of your 65th birthday. Personally, and on behalf of the people of Nigeria, I would like to send you messages of goodwill and best wishes. May the Almighty Allah bless and guide us all in our various endeavours."

H.E. the President of Sri Lanka:

"I wish you good health and long life so that you may continue with your

exemplary services in the field of Science and Technology".

H.E. Omer Hassan Ahmed El-Beshir, Chairman of the Revolution Command Council of Sudan:

"On your 65th birthday Muslim scientists feel proud. Third World Academicians claim distinction. International Scientific Community hail a prominent member.

May Allah bless you and give you more knowledge."

Dr. Hans Blix, Director General of the International Atomic Energy Agency:

"Important commitments prevent me from being with you in Trieste, today, on the occasion of your 65th birthday but I wish to add my congratulations to those of so many distinguished guests honouring your accomplishments and paying well deserved tribute to your untiring efforts to promote the development of science in the Third World.

Thanks to you and your staff, the acronym ICTP and the city of Trieste have become familiar to all physicists; and more than 40 000 of them in the past 27 years have been associated, in one way or another, with ICTP's activities.

Under your guidance, the Centre has known a tremendous development and success and while the generous, ever increasing, support of Italy to the activities in Trieste must be gratefully acknowledged, there is no doubt that at the base of this support are the ideas and ideals underpinning your work.

The Agency takes pride in its long association with ICTP activities and intends to continue its financial and other support to the programme irrespective of any future changes that our support to the programme irrespective of any future changes that the expansion and diversification of ICTP activities might make desirable."

Silver Dirac Medal

The Silver Dirac Medal for the Advancement of Theoretical Physics is awarded by the University of New South Wales on the occasion of the Public Dirac Lecture. The lecture and the Medal commemorate the visit to the University in 1975 of Professor P.A.M. Dirac, one of the greatest theoretical physicists of the century. Professor Dirac gave five lectures at the University, which were subsequently published as a book, *Directions of*

Physics. Professor Dirac kindly donated the royalties from this book to the University for the establishment of the Dirac Lecture Series. The Silver Dirac Medal has been awarded from 1979.

Since then the Medal was awarded to the speakers of the "Public Dirac Lectures". These are the following prominent persons who delivered the Lectures:

- 1979 — Professor Hannes Alfvén, Nobel Laureate;
- 1981 — Professor John C. Ward, FRS;
- 1983 — Professor Nicholas Bloembergen, Nobel Laureate;
- 1985 — Professor David Pines, M.Am.Ac.Sc.;
- 1987 — Professor Robert Hofstadter, Nobel Laureate;
- 1988 — Professor Klaus von Klitzing, Nobel Laureate;
- 1989 — Professor Carlo Rubbia, Nobel Laureate;
- 1989 — Professor Kenneth Wilson, Nobel Laureate;
- 1990 — Professor Norman F. Ramsay, Nobel Laureate;
- 1991 — Professor Herbert A. Hauptman, Nobel Laureate.

The Silver Dirac Medal was presented in the name of the University by the Vice Chancellor. All lectures were supported by the Australian Institute of Physics. The Dean is the Chairman of the Committee and the Head of the Department of Theoretical Physics is the ex-officio convenor. Members of the Committee are the Heads of the School of Physics, Chemistry and Mathematics or their representatives.

If you have any queries please write to: Professor Heinrich Hora, Convenor of the Dirac Committee, UNSW, Kensington, Australia.

M. Farooque

NSW, AUSTRALIA.

M. Farooque

Degree Honoris Causa to Abdus Salam

The Dean of the Faculty of Science of Dakar University announced that Abdus Salam, Nobel Laureate for Physics and Director of the International Centre for Theoretical Physics in Trieste, will be awarded a degree *honoris causa* by the University Cheikh Anta Diop of Dakar, Senegal, for "*deep knowledge of the scientific world, international fame of his works and research, especially in the field of physics, and their impact on Africa*".

The honorary title will also be

awarded to the Italian Prime Minister Andreotti.

This initiative of the Faculty of Law was unanimously approved by the university board of the African institute.

The Brain

Courtesy of The Economist, February 16th, 1991.

To understand the human mind will take a lot more ideas, techniques and hard slog than are yet available.

Ask a scientist what the most glaring piece of human ignorance is and he will reply in all sorts of ways. If he is solid-state physicist, he might say the mechanism of superconductivity; if a particle physicist, the origin of mass or a so-called "theory of everything"; if a biologist, the origin of life of the still utterly mysterious phenomenon of ageing; if an astronomer, dark matter or the big bang or the enigma of extraterrestrial intelligence; if a paleontologist, the cause of mass extinctions.

But by far the most likely reply from almost any kind of scientist is two words: "the brain". To develop a theory of the mind would complete a triumphant scientific hat-trick for the century: first the atom, then the gene, and now the mind.

Those two are encouraging precedents. Neuroscience stands today roughly where atomic physics was in 1919, when Ernest Rutherford discovered the nucleus, or where molecular biology stood in 1944 when Oswald Avery proved that the genetic material was made of DNA. In both cases the problem seemed suddenly vulnerable to attack, and in both cases there remained huge surprises. It was unthinkable in 1919 that physics would have to enter the looking-glass world of the quantum or in 1944 that molecular biology would soon be a matter of reading a cipher written in three-letter words in a four-letter alphabet.

Likewise, neuroscientists do not really know what questions they should be asking. So far they have mostly been doing phenomenology: a person with a tumour here loses speech, one with a tumour there loses memory; too much dopamine seems to be linked to schizophrenia, too little to Parkinson's disease; birds grow new neurons when they learn new songs, mammals do not;

ion channels in synapses alter when something is learnt — and so on. All true, all intriguing, but so far merely descriptive. One of the troubles with phenomenology is that it often leads to a trivial symptom and not a cause. The alpha waves of sleep, for example, may turn out to be as relevant to the working of a brain as noise is to the function of a gun.

In both the atom and the gene, the greatest surprise was the simplicity of the final result: the Schrödinger model of the atom and the triplet code of DNA. In 1919 and 1944 there was no guarantee that either problem would be so easily understood.

Terrence Sejnowski of the University of California at San Diego, a neuroscientist, takes heart from this. He believes a principle as simple as the genetic code or the periodic table in chemistry may yet emerge for the brain, though he admits he has no candidates yet. The individual neurons that make up the brain are well understood; the way they link together in simple networks to carry out functions such as detecting edges in the visual field is becoming clear; the way whole networks combine to form whole systems of vision, memory, mood and so on are as yet obscure.

Most neuroscientists think that consciousness, whatever that means, will prove to be their central problem, but they will need guidance from the philosophers to identify it first. Attention is another candidate. One of the most intriguing finds of recent years is a candidate for attention at least in vision: a semi-synchronised oscillation in the activity of neurons at about 40 hertz may be responsible for the ability to concentrate on one thing in the visual field. Representation is a third candidate. Vision scientists are groping towards an understanding of what the brain does when it sees — or conjures up — an image.

Which approach to the brain will yield the best results? In the past few decades there have been fashions for anatomy (left brain-right brain, or the localisation of language in Broca's and Wernicke's areas), for neurochemistry (the discovery in the 1970s of neuropeptides that seemed to affect sleep, pain and mood), and more recently for computer simulations of how parts of the brain work. Dr Sejnowski has high hopes of optical recording techniques by which it will be possible to film the firings of groups of neurons

almost as they happen. Mr. Maddox, the editor of *Nature*, who has seen these fashions come and go, expects a different fashion to sweep the science: a fashion for studying genetic mutations, introduced into mice, which seem to knock out specific brain functions.

More genes are switched on in the brain than in any other organ, says David Baltimore of Rockefeller University, one of the pioneers of this approach. Daniel Koshland of the University of California at Berkeley, the editor of *Science* magazine, now has pure cell lines that can both "habituate" and "potentiate" — in other words, learning had been transferred to the test tube. John Tooze of the European Molecular Biology Organisation in Heidelberg says the wiring problem of the brain (how each neuron knows where to connect to each other one) must involve "molecular recognition" events. In other words, here come to molecular biologists.

The physicists are coming, too. Roger Penrose of Oxford has written a book claiming to argue from first principles that new kinds of physics will be necessary to understand consciousness. Sam Edwards, at the Cavendish Laboratory in Cambridge, points out how a startling new branch of mathematics (for those who understand these things, one illustrated by the Rayleigh-Taylor instability equations) seems ideally suited to explain the growth patterns of neurons.

One of the messy aspects of neuroscience is that facts abound and theories abound but the two do not neatly intersect. So the subject has been dogged by metaphor. In the 19th century, mechanical or thermodynamic analogies dominated speculation about the brain. In the 1960s the sequential analogies dominated speculation about the brain. In the 1960s the sequential computer, with a memory and a central processing unit, became the dominant model. At the same time there was a brief enthusiasm for the notion that memory was a hologram. Today, parallel computing is the dominant metaphor for much of the brain.

The neural-network boom

The mistake has been to take these analogies too seriously. The brain is more like a computer or a telephone network than it is like a water mill or a car, but that does not mean it need have anything specific in common with mankind's lumps of silicon. The history of computing serves only to emphasise that man has invented

something very different from a brain: something that is good at precise, fast, encyclopedic memory, sorting and calculation (and perhaps chess), but not at painting, politics or philosophy.

One of the analogies borrowed from computing that might prove misleading is the distinction between software and hardware. Scientists have usually kept distinct the fast, reversible changes that occur as signals pass along nerves (software) from the slower, more permanent changes in the synapses between nerves, which enable signals to pass more or less easily next time (hardware). Yet many insist that this is an artificial distinction. Indeed, changes in synapses can last any length of time from milliseconds to hours, from software to hardware.

None the less, the technology of artificial intelligence is now a standard part of neuroscience. As a result it is possible that a main function of the brain (probably vision) may be simulated on a computer before it is "understood". This is because the recent fashion in artificial intelligence is for neural networks that "learn" how to solve problems by adjusting the strengths of the interconnections between layers of units until the desired solution emerges. This is a quite different kind of computing from that practised by normal computers, which must be given specific instructions for every step.

Not that neural networks deserve the extravagant hopes placed on them in recent years by venture capitalists (and by the Defence Department: even some artillery shells now carry neural networks). They are, in a sense, little more than an expression of human ignorance about how to program parallel computers. They are run on ordinary computers. They are run on ordinary computers, but they aspire to have parallel properties. Many of the companies formed to exploit them in business are doing little that is "intelligent" and much that is artificial. Yet they are clearly a closer analogy to how the intelligent parts of the brain work than was the preceding fad in artificial intelligence, expert systems.

The fashion for parallelism may have a broader significance. It is part of a wider pattern. In a number of different sciences at the same time, parallel, evolutionary ideas are replacing sequential, cause-and-effect ones. This might be coincidence. Or it might be that most thrilling of scientific beasts, a paradigm shift.

G.D. Birla Award for Sir Hermann Bondi

The prestigious G.D. Birla International Award for Outstanding Contribution to Humanism was presented in New Delhi on 10 November 1990 to Sir Hermann Bondi by Vice-President Dr. Shankar Dayal Sharma at a simple function at the FICCI auditorium.

Sir Hermann, the internationally acclaimed scientist and humanist, is the second recipient of the award — the first being Baba Amte.

The award carries convertible cash worth Rs 5 lakh besides a crest and a citation. The award is conferred biennially.

The citation read out at the ceremony by Dr. Raja Ramanna, a member of five-member jury, mentions the powerful and passionate voice raised by Sir Hermann over the years against religious and political bigotry. "He has championed the humanist cause with a superb, Shakespearean recognition that *Man is the quintessence of dust*", the citation adds.

Soon after presenting Sir Hermann with the coveted award, Vice-President Dr. Shankar Dayal Sharma in his address called upon all the scientists of the world to rise against the misuse of the science that threatened the very existence of the universe.

Calling for conscious efforts to evolve educational systems, both in the developed and the developing countries, in such a manner that the focus was not only on developing intellectual faculties but also ethical sensibilities, Dr. Sharma stated that India had such a tradition since hundreds of years in the past. "We have such a tradition since hundreds of years in the past."

Awareness: The Vice-President stated that the emphasis on promoting awareness of the essential unity and common ethical values of all the great religions as a part of the educational process could safeguard and forewarn the young minds vis-à-vis the dangers and defects of narrow thinking.

Referring to the specific Indian traditions, the Vice-President said that this tradition regarded both science and religion to be really meaningful only to the extent of its service to humanity. "We also seek to avoid, in either science or religion any presumption of finality, absoluteness or exclusivity of conclusions," he added.

Stressing the importance of science

in the evolution of human civilisation, Dr. Sharma stated that there was an inner linkage between the apparently diverse objectives and disciplines of science and religion. However, the Vice-President asserted that in India, science and religion were concerned with the search for truth.

In his acceptance speech, Sir Hermann Bondi while paying homage to the visionary and missionary seal of the late G.D. Birla during his lifetime both as an industrialist and a freedom-fighter, stated that he felt honoured to be associated with such a coveted award.

Sir Hermann stressed the importance of making people of different religions, countries and continents work together for a better world. "Sir Hermann asserted that the cooperation was possible only through the evolution of a scientific temper among the humans".

Calling upon the people to leave a better planet — the earth — for the future generations for optimum pleasure and wellbeing, Sir Hermann forcefully put forth the import of the programme at a global level so that the increasing numbers were kept under check.

Paying tribute to the resilience of Indian democracy, Sir Hermann stated that it is a matter of pride that despite many a problem confronting the people here, the Constitution asserted the prime importance of secularism and socialism and also that of a scientific temper among its citizens.

Among others who spoke at the function were the Chairperson of Birla Academy of Art and Culture, Mrs. Sarla Birla, and Mr. Aditya Birla, the noted industrialist.

The function was attended by a large number of eminent personalities, Members of Parliament besides a number of diplomats. Members of Parliament besides a number of diplomats.

Organizing one's Own Conference Can Fill a Scientific Void

by Jeff Seiken

From "The Scientist", June 11, 1990;
Copyright 1990, "The Scientist".

All rights reserved.

Reprinted by permission.

Sadao Mori's proposal sounded promising to Du Pont chemist Howard Barth. Mori, a researcher at Mie University in Japan, had contacted Barth, an active member of the American

Chemical Society, in early 1987, seeking his assistance in setting up a conference on polymer analysis under the auspices of ACS and its Japanese counterpart. While talking over the idea with Mori, however, Barth was struck by a new notion: Why not enlarge the scope of the meeting and bring scientists studying polymer characterization into the fold as well?

Such a gathering would be a novel one, for despite the natural overlap that existed between the fields of polymer analysis and polymer characterization, scientists working in each area rarely intersected on a professional basis. In Barth's view, arranging a joint conference seemed like the perfect way to break down the wall separating the two camps of polymer scientists.

And if he was going to topple professional barriers, Barth thought, why not tackle national ones as well? The chemist envisioned making the conference truly global in scale, shifting its location to a new country every year. The only hitch in his scheme was that this sort of globetrotting arrangement ruled out ACS involvement. Confronted with the prospect of having to modify his vision of the conference to conform with ACS policy, Barth elected to run the symposium himself.

To set things in motion, Barth sank \$1,000 of his own funds into the meeting for legal counsel and stationery supplies. He figured that revenues from registration fees would cover the bulk of his costs. In retrospect, though, he says that his plans were fraught with a little peril. "The first meeting, financially, was touch-and-go," he recalls. "I estimated a worse-case scenario of 50 to 70 [registrants]. I figured that there had to be at least 50 people who would be interested enough to come. If I could do to be at least 50 people who would be interested enough to come. If I could do that, great." If not, he would have suffered a financial loss.

As it turned out, 90 scientists showed up for the First International Symposium on Polymer Analysis and Characterization at the University of Toronto in the summer of 1988, more than enough for Barth to meet his expenses. The conference was also sufficiently successful to ensure its continued survival. The third such symposium is scheduled to take place July 23-25 in Brno, Czechoslovakia, with attendance expected to top 200.

Responding To Needs

Barth is one of a number of scientists who have bypassed normal

channels and organized conferences on their own initiative. The primary impetus behind most of these home-grown affairs is need. Although the scientific community certainly suffers from no shortage of symposia, there's still a demand for small-scale forums that address the interests of individual clusters of researchers.

The desire for autonomy can also play a part in the decision to go it alone. As Barth's story demonstrates, managing a conference from start to finish secures the organizers not only the freedom to set their own agenda, but also the flexibility to conduct the meeting as they see fit.

Yet it's sometimes more than mere selfless dedication to the advancement of one's science or an independent turn of mind that prods a researcher into action; the urge to engage in a little self-promotion can serve as a spur as well. When he launched a conference on nitrogen fixation in the early 1970s, for example, chemist William Newton's overt intentions were to establish a clearinghouse for research in the field. But Newton, who at the time was working at the Charles F. Kettering Research Laboratory in Ohio, acknowledges that he also hoped the gathering might ease the lab's funding problems. A conference would be "one way for us to tell people what we're doing and convince them how good we are and that they should give us money," he says.

Scientists should not expect to profit personally from conference organizing, however. Once a conference planner becomes established and well accepted, Barth says, "it may be possible to make a few bucks out of it. But for a new symposium, it doesn't pay."

Symposium, it doesn't pay.

Initiative A Must

Regardless of one's motives, starting a conference from the ground up is not a task to be undertaken lightly, veterans of the process warn. It takes some initiative, says Jim Rollings, a chemical engineer at Worcester Polytechnic Institute who has arranged a series of biotechnology conferences. "You have to figure out everything that has to be done, because you don't have the support of a society."

"Everything that has to be done" includes such responsibilities as deciding when and where to hold the meeting, whether to seek outside assistance and sponsorship, and what sort of program and format to adopt. Although this list

is by no means all-inclusive, it does embrace the salient questions that all prospective organizers must consider in the course of planning a conference.

Crucial Decisions

The very first order of business calls for gauging whether the interest in the meeting actually exists. "Technically, there has to be a need," Barth explains. "One has to have a good idea what's already out there and if a niche can be filled. I contacted a number of people in the area of polymer characterization just to get their input and see if they thought it was a worthwhile venture. Then I put together a governing board of well-respected scientists in the area who [agreed] to help me out."

Once the viability of a meeting is determined, then the organizer can proceed to hammer out the arrangements. When it comes to picking a date, it's essential to coordinate the timing of the event with the schedules of the prospective attendees. In other words, if academic scientists constitute the principal audience for a gathering, it can be counterproductive to run the meeting during the middle of a semester.

A corollary to this rule is to avoid conflicts with any conference likely to siphon off attendance from one's own. However, smart organizers can sometimes use the drawing power of another group's meeting to their advantage. That's exactly what Barth did when he arranged to hold last year's polymer conference in Austin, Texas, the weekend before ACS' spring bash in Dallas. "I figured it would be convenient for people attending the national ACS meeting to stop by," he says.

To some extent, the timing of a

meeting can be dictated by its location, as geologist Henry Halls discovered when he tried to find a suitable date for a 1985 conference on the ancient sheets of rock known as dikes. He had elected to host the symposium on his home turf — the University of Toronto's Erindale Campus — and accommodate attendees in the dormitories, a decision that instantly narrowed his choices down to the few months when school was not in session. The college's prior commitments further restricted the times when its facilities would be available.

Complicating the issue even more were the work routines of the conference's audience. "You can't have [a geology meeting] in the summer,

because geologists are away in the field," Halls says. He eventually managed to reserve a slot in early June that satisfied all of the parties involved.

Location is partly a matter of economics. Reserving a convention center or a block of hotel rooms in most cities requires some form of credit or seed money. Without either, one's options are curtailed considerably. Caught in this sort of financial squeeze when casting about for a conference site his first time around, Barth ended up going the college campus route, holding the meeting at the University of Toronto. While the accommodations were not as posh as he would have liked, Barth says, the university did have the undeniable advantage of not asking for payment in advance.

Brigham Young University chemist Milton Lee, on other hand, enjoyed the luxury of a \$15,000 state grant awarded him for the purposes of organizing a conference on supercritical chromatography in Utah. With such a fat bankroll in hand, Lee could afford to select any site in the state for the January 1986 meeting. He chose Park City, a locale that not only was close to his own offices at Brigham Young, but also had the added appeal of being one of Utah's premier ski resorts.

There are still numerous other logistical details that must be attended to as well. It can all seem a little daunting, but help in various forms is available, often just for the asking.

Sources of Help

According to Geri Goodenough, director of scientific meetings at the Federated Association of American Societies for Experimental Biology (FASEB), neophyte conference organizers are welcome at her door, (FASEB); neophyte conference organizers are welcome at her door, although she does charge a fee for her services, depending on the degree of assistance requested. "I tell them what's negotiable with the hotel or convention center and give them advice on suppliers, and how to solicit for funding if they need it," she says.

ACS' meeting office extends similar assistance to conference-organizing scientists who feel overburdened by their responsibilities. "We can provide conference management services at any level: We can just handle registration or send out mailings and brochures, or we can do the whole works," reports Christine Pruitt, Goodenough's counterpart at ACS. In exchange, Pruitt merely asks that ACS members receive

a discount on registration. Her office also distributes upon request a booklet about conference management, a sort of do-it-yourself guide explaining various trade secrets, including tips on negotiating with hotels and dealing with exhibitors. Conference organizers do not have to be members of ACS or FASEB to take advantage of these services, as long as their meeting is of potential interest to society members.

The source of support closest at hand, though, is often the organizer's own institution. In laying the groundwork for the first nitrogen fixation symposium, for instance, Newton was able to turn over most of the financial and administrative responsibilities to the business managers at the Kettering Lab, leaving him free to concentrate on the scientific end of the conference. Newton credits the aid he received from the Kettering Lab as being crucial to his meeting's overall success, not to mention his own peace of mind. "You need some organization in order to help you do this, to share the workload, and share the blame," he advises.

This is not to say that it's impossible to conduct a meeting relying strictly on your own sensibilities for guidance. Brigham Young's Milton Lee has run both his International Symposia on Supercritical Chromatography as one-man shows, handling all of the arrangements himself and even dispensing with a governing board. "It's easier to control if I make all of the decisions. It's too time-consuming to organize a scientific committee or board," he says.

Financial Aid

The biggest question mark hanging over most first-time conferences tends to be finances. Relying on registration fees alone to pay for the conference puts one in a precarious position, especially if expenses prove to be higher, or attendance lower, than expected. One way around this problem is to solicit money from outside agencies. The National Science Foundation, for example, issues grant money for conferences as part of its normal funding activities.

Industry is another source of potential assistance. In preparation for the third installment of his symposium coming up next January, Lee asked 30 different companies for funds. As bait, he dangled the offer of free registration for one or two employees and mention

in the program booklet as sponsor. So far, he reports, the response has been encouraging, with six or seven firms promising commitments.

It's also possible to approach a scientific society like FASEB or ACS asking for a sponsorship that involves no financial component. The chief value of such a setup is that the imprimatur of a respected organization lends one's meeting credibility. And there may be other benefits as well. When Barth signed on the International Union of Pure and Applied Chemistry (IUPAC) as a sponsor for this year's polymer symposium in Czechoslovakia, the society agreed to publicize the meeting in its journal and assist attendees in attaining visas.

If sponsorship is forthcoming, however, the advantages it brings may also involve certain obligations. For instance, while landing NSF's backing for the first symposium on nitrogen fixation solved all of William Newton's financial worries, he did have to bow to the foundation's wishes and hold the gathering at Washington State University. "The NSF had an interest in pushing some work that was ongoing at that campus, so we compromised on sites," he says. As part of the terms of his arrangement with IUPAC, Barth is granting members a 10 percent discount on admission to his meeting in Czechoslovakia and is allowing the society to pick the journal in which the proceedings of the meeting will be published.

Agenda Setting

In devising a program for a new meeting, Halls suggests, the important point to remember is "keep it well focused. Make sure there's a distinct kind of problem for people to think about," he says.

Some thought also needs to be given to the expectations of the attending scientists, especially if the meeting is targeted at a mixed audience of academic and industrial researchers. Rollings advises meeting planners to talk with both segments and have a give-and-take about what each group wants. "You may have to have some flexibility about the agenda to attract the audience you want to reach," he says.

A conference's format can be just as important as its content in promoting the organizer's goals for a meeting. For instance, one of Newton's objectives for his meeting was to foster interdisciplinary communication among

researchers in nitrogen fixation. Therefore, rather than conduct parallel sessions, which can easily result in a meeting segregated along disciplinary lines, he decided to go with single sessions. That way, "people working at the chemical end would get a feel for what's going on at the genetic or the agricultural end, and vice versa," he explains.

Is Once Enough?

The last issue to be resolved is the symposium's frequency — is the conference to be a recurring event, and, if so, how often should it meet? The answer to the latter half of this question largely depends on the pace of research within the particular area. In Newton's field, a two-year timetable seemed best suited to the rate of new development. "A two-year cycle is one where we could be pretty certain that somewhere within the overall research effort that nitrogen fixation encompasses there would be reasonable progress and make it worthwhile for us to get together again," he says. The nitrogen fixation conference just celebrated its eighth meeting last month in Knoxville, Ten.

Once was enough for Henry Halls. Three weeks before his meeting was to occur, he remembers, the number of confirmed attendees totaled only 70, which meant the conference would be operating at a loss. A last-minute surge in registration actually enabled Halls to turn a profit, but the stress was enough to induce him to bow out of the conference business. "When you're in charge, you carry the [responsibility]. You can imagine all sorts of horrible scenarios," he says. "The worry and the potential for ulcers — that's why I wouldn't do it again."

But the conference Halls initiated on

But the conference Halls initiated on dike forms is not dead. Inspired by Hall's lead, the delegation from Australia stood up at the meeting in 1985 and pledged to host another gathering five years later. Halls has retained a spot on the governing board, but the only responsibility he faces this time around is figuring out how to get himself to Adelaide (...).

Tips for Conference Organizers

- Assess the need for a conference first. Canvass your colleagues for their opinions.
- Take into account the schedules and commitments of your intended audience. Avoid conflicts with other meetings these scientists might attend.

- Be aware of sources of assistance, such as the meetings division of a professional society or the conference planning office at your university.
- Seek financial support or other forms of sponsorship if you feel such backing is needed. However, make sure you understand how the terms of the arrangement affect your independence.
- Keep the meeting focused. Don't try to address too broad a range of issues.
- Settle on a format for the meeting that best suits your goals.

Jeff Seiken is a freelance writer based in Pittsburgh.

School of Mathematics and Allied Sciences, Gwalior, India

The Department which took shape from 1984 was planned to develop a centre of higher learning in biomathematics including computer applications in biology. The first activity in this direction was the research in the area of mathematical and numerical study of physiological heat flow problems, including mathematical modelling of cancerous tumors in human subjects and *polycythemia vera*. Extensive use and modifications in finite element methods have been envisaged for this purpose. Later on, the group activity was extended to new areas like mathematical ecology. This includes research on population dynamics, epidemiology, environmental pollution and pheromone communication in animals. The size of the group also went on enlarging which still continues. At the same time the emphasis is always laid on an integrated approach to various subdisciplines. It is needless to say that necessary computer facilities were also acquired during due course of time. The members of the group were encouraged to have interaction with other international centres. As a result of this, one faculty is visiting Imperial College, London, and another left for ICTP to attend the Workshop on Mathematical Ecology. The members also participated in short-term international academic programmes related with the field.

At present the School of Mathematics and Allied Sciences is a well known centre of research in biomathematics. The activities at the centre include mathematical modelling of diffusion and flow, processes in



The Department Building of the School of Mathematics, Gwalior.



Prof. V.P. Saxena (Chairman) in discussion session with his colleagues.



The Computer Centre.

biological media and their analysis using computer oriented numerical and mathematical techniques. The SOMAAS has an active group working on biomathematics headed by Prof. V.P. Saxena and comprising of four more faculty members, and about ten other research workers. Apart from this activity the department has the following regular academic programmes:

1. M.Sc. (Master of Science) — Group A: biomathematics, numerical analysis, operations research; Group B: system analysis, data processing, optimization methods, simulation, database management systems, computer programming.
2. M.Phil (Master of Philosophy) — physiological flow problems, mathematical ecology, population, dynamics, futurology.
3. P.G.D.C.A. (Post-graduate Diploma in Computer Applications) — system simulation, management information systems, computer oriented numerical and statistical techniques.
4. Ph.D. (Doctor of Philosophy) — This degree is awarded by thesis and viva-voce examination.

International Colloquium on Physics

The XIX International Colloquium on "Group Theoretical Methods in Physics" shall be held in Salamanca, Spain, from June 29 to July 5, 1992.

For information, please contact the Chairman of the Organizing Committee: Prof. Luis J. Boya
 Departamento de Física Teórica
 University of Zaragoza
 50.009 Zaragoza
 Spain.
 Phone: 34-76-554214
 Spain.
 Phone: 34-76-554214
 Fax: 34-76-567920
 E-mail: ICGTMP@cc.unizar.es

Activities at ICTP January-February 1991

Title: SECOND COLLEGE ON THEORETICAL AND EXPERIMENTAL RADIOPROPAGATION PHYSICS, 7 January - 1 February.

Organizers: Professors J. Van Bladel (Secretary General, Union Radio-Scientifique Internationale, URSI, and University of Gent, Belgium) and S.M. Radicella (Programa Nacional de Radiopropagación, PRONARP, Buenos Aires, Argentina and ICTP), with the

co-sponsorship of URSI and the International Council of Scientific Unions (ICSU, Paris, France) and with the participation of the International Centre for Science and High Technology (ICS, Trieste, Italy).

Lectures: Response of linear circuits and systems. Fourier series and integrals. DFT and FFT. Noise and probability. Analog modulation. Maxwell's equations. Potentials. Boundary conditions. Digital modulation. Transmission lines. Power budget. Poynting's vector. Information theory. Sinusoidal phenomena. Polarization. Modes and eigenfunctions. Closed electromagnetic waveguides. Plane waves. Reflection and transmission at plane interfaces. Far field — time harmonic sources. Aperture antennas. General equivalent circuit. Antenna arrays. Scattering cross-sections. Doppler effect. The radar equation. Radiopropagation problems in tropical regions. High frequency communication problems. Ionospheric time delay effects on earth-space links. Scintillation effects on transionospheric communications. Tropospheric propagation: present aspects and approaches. Electromagnetic compatibility. Radio frequency spectrum management.

Computer exercises. Open discussion on telecommunications problem in developing countries.

Participants' seminars: Group activity report at Banares Hindu University. A brief introduction to CRIRP. Efforts at instrumentation, instrument network and communication links development for meteorological and environmental monitoring purposes. Microwave line of sight propagation system design. Problem on Ghana's communication network; university-system design. Problem on Ghana's communication network; university-industry collaboration — an alternative approach in solving them. HF propagation over the very long distance. Comparison of IRL with ionosphere observed in China. Longitudinal control of the occurrence of equatorial ionospheric plasma bubbles and observations on their eastward drift. Radiowave reflection from parabolic layer of absorptive plasma (ionosphere): isotropic case, anisotropic case (circular and line polarization), stochastic case. Transequatorial propagation of TV signals. Faraday polarization fluctuations associated with amplitude scintillations at Lunping. Ionospheric scintillations. Time domain transient electromagnetic field studies. Upon

lighting direction finding system. Ionospheric modification experiments over Fairbanks, Alaska. Pertaining research on natural generation of propagation of electromagnetic waves. Tropospheric propagation. 450 MHz mobile radio propagation. Mobile communication.

The College was attended by 67 lecturers and participants (58 from developing countries).

Title: FIFTH INTERNATIONAL WORKSHOP ON COMPUTATIONAL CONDENSED MATTER PHYSICS, 16 - 18 January.

Organizers: Professors M. Schlüter (AT&T Bells Laboratories, Murray Hill, USA), R. Car and R. Resta (International School for Advanced Studies, SISSA, Trieste, Italy), with the co-sponsorship of SISSA.

Lectures: Correlated ground states for real materials. Calculations of the properties of solids with Green's function MC. QMC studies of materials: magnetic structures of BCC hydrogen. Dynamics of the Anderson model from QMC and maximum entropy. Precise and efficient ab-initio molecular dynamics. Pseudopotentials, pseudohamiltonians and physical ions. GW quasiparticle pseudopotentials. Implementation of ultrasoft pseudopotentials in ab-initio molecular dynamics. Car-Parrinello-like implementation of the APW method. Strongly correlated models for high T_c superconductivity. Lattice dynamics and structural instabilities in high T_c superconductors. Ab-initio study of zone-boundary phonons and their coupling to electrons in $YBa_2Cu_3O_7$ and $Ba_{1-x}K_xBiO_3$. Electronic structure and positron annihilation in high T_c and $Ba_{1-x}K_xBiO_3$. Electronic structure and positron annihilation in high T_c superconductors: the problem of the Fermi surface. Localization in the self-interaction corrected density functional formalism. Static and dynamical properties of quantum many-body systems: finite cluster calculations. High energy spectroscopies compared with exact solutions of multiband model Hamiltonians. Model for low energy electronic states probed by X-ray absorption in high T_c cuprates. Self-consistent electronic structure of a vortex line in a type-II superconductor. Dielectric response and quasiparticle energies in Ni. Quantum-mechanical calculations of the spontaneous polarization: pyroelectric BeO . Alternative total energy functionals in

DFT. First principles energy density and its application to GaAs polar surfaces. First-principle statistical mechanics of semiconductor and metal alloys. Structure and thermodynamics of Si-Ge alloys from ab-initio Monte Carlo simulations. Alloy formation in the effective medium theory. Ordering in Cu-Au alloys: a new approach to alloy phase stability. Ab-initio studies of the Si(111) surface. Theory of electron transmission through interfaces. Comment about density functional calculations of Schottky barrier heights. Exchange and correlation in Schottky barriers and heterojunctions. A self-consistent surface Green-function method: chemical trends, bonding mechanisms and charge transfer of isolated adatoms on Al(100) and Al(111). Ab-initio calculations of self diffusion constants in Si. Ab-initio calculation of free energies in real materials: application to the vacancy formation in Si. First principles molecular dynamics simulations of amorphous phosphorus and liquid and amorphous selenium. Ab-initio molecular dynamics simulation of liquid Na-Sn alloy. Summary and outlook.

The Workshop was attended by 151 lecturers and participants (30 from developing countries).

Title: WINTER COLLEGE ON "MULTILEVEL TECHNIQUES IN COMPUTATIONAL PHYSICS (Physics and computations with multiple scales of lengths), 21 January - 1 February.

Organizers: Professors S. Baroni (International School for Advanced Studies, SISSA, Trieste, Italy), A. Brandt (Weizmann Institute of Sciences, Rehovot, Israel) and C. Rebbi (Boston Brandt (Weizmann Institute of Sciences, Rehovot, Israel) and C. Rebbi (Boston University, USA), with the co-sponsorship of SISSA.

Lectures: Multiscale computations: tasks and types. Tutorial on modern iterative methods. Multigrid tutorial. Multigrid methods for PDE's: general approaches, basic algorithmic components, demonstration software and introduction to hands-on experimentation. Full approximation scheme (FAS): nonlinearity, Eigen-problems, continuation, frozen tau, local refinements. Local mode analysis of multigrid. Multilevel adaptive methods: basic ideas. Modern iterative methods: conjugate-gradient-like methods. Multigrid and programming exercises. FAS, Eigen problems, frozen tau,

constrained optimization. Boundaries, singularities, discontinuous coefficients, operator dependent coarsening. Free exercises and question answering. Multilevel integral transform and many body calculations. Multigrid development in general relativity. Meaning of ellipticity and multigrid for general non-scalar systems. Multigrid methods for Navier Stokes equations. Multigrid at vanishing ellipticity. Algebraic multigrid (AMG). Multigrid methods for transport problems. Multigrid for time-dependent problems. Rare local activation of fine scales. Parallelization in time. Introduction to Monte Carlo methods in statistical mechanics and quantum field theory. Introduction to lattice gauge theories. Introduction to electronic-structure calculations. Coarsening particle simulations and multigrid derivation of macroscopic equations. Introduction to lattice fermions. Multilevel targetted matrix inversion and determinant calculations. Fermionic matrix: fast inversions and determinant updates. Approximate stochastic coarsening and fast calculations of thermodynamic limits. Multigrid for fermions in lattice gauge theory. Multigrid Monte Carlo for lattice field theories. Multilevel solvers for integral equations and inverse problems. Computer simulation of the liquid-vapour phase transition. Multilevel global optimization. Cluster algorithms for lattice gauge theory. Monte Carlo methods for self-avoiding random walks. Concluding remarks and future perspectives. Tutorial on Car-Parrinello methods.

The College was attended by 76 lecturers and participants (42 from developing countries).

developing countries).

Title: SECOND TRAINING COLLEGE ON PHYSICS AND TECHNOLOGY OF LASERS AND OPTICAL FIBRES, 21 January - 15 February.

Organizers: Professors G. Denardo (ICTP), G. Guekos (Eidgenossische Technische Hochschule Honggerberg, ETH, Zurich, Switzerland), M. Matera (Consiglio Nazionale delle Ricerche, Istituto Elettronica Quantistica, Florence, Italy), and F. Tosco (Centro Studi e Laboratori Telecomunicazioni, CSELT, Turin, Italy), in cooperation with the International Centre for Science and High Technology (ICS, Trieste, Italy) and with the co-sponsorship of the Direzione Generale per la Cooperazione

allo Sviluppo (Ministry of Foreign Affairs, Rome, Italy).

Lectures: CO₂ laser. Gas lasers. Optogalvanic spectroscopy. Physics and technology of semiconductor lasers. Nonlinear optics. Solid state lasers. Dye lasers. Environmental applications of lasers. Holography. Lasers in medicine. Fibre theory fabrication characterization. Fibre communication systems. Optical neural networks. Introduction to fibre communications. Detectors and receivers. Lasers for communications. Switching and modulation. Fibre passive components. Optical amplifiers. Fibres passive components. Solitons in optical fibres. Industrial lasers.

Introduction to laboratory experiments: Bit error rate system. Holography system. Bedding on optical fibres.

The College was attended by 84 lecturers and participants (56 from developing countries).

Title: EXPERIMENTAL WORKSHOP ON HIGH TEMPERATURE SUPERCONDUCTORS AND RELATED MATERIALS (basic activities), 11 February - 1 March.

Organizers: Drs. G. Leising (Technische Universität Graz, Austria), F.C. Matarotta (Istituto per la tecnologia dei materiali metallici non tradizionali, Milan, Italy) and C. Segre (Illinois Institute of Technology, Chicago, USA), in cooperation with the International Centre for Science and High Technology (ICS, Trieste, Italy) and with the co-sponsorship of the Direzione Generale per la Cooperazione allo Sviluppo (Ministry of Foreign Affairs, Rome, Italy), Consorzio Interuniversitario Nazionale Fisica della Affari, Rome, Italy), Consorzio Interuniversitario Nazionale Fisica della Materia (INFM, Italy) and the International Union for Vacuum Science, Technique and Applications (IUVSTA).

Lectures: Cryostat design. Introduction to HTS theory. Substitutional studies on Bi-Sr-Ca-Cu-O system. Point contact tunnelling studies on oxide superconductors. Possible superconductivity in LaCa₂Co₃O_x at 227K. Model of 'weak link' of inhomogenous media. Temperature measurement and control in the 4-150K range. Principles of vacuum technology. The magnetic penetration depths in high T_c superconductors measured by muon spin rotation technique. Softening of the flux-line structure of La-Sr-Cu-O

measured by vibrating reed. The substitution of sulphur for oxygen in $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$. Superconductivity and the $\text{YBa}_2\text{Cu}_3\text{O}_7$ structure. Structural refinement techniques. Low T_c ceramic materials. Magnetic flux behaviour in HTS materials. Interfaces between $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$ and other materials. Single particle tunnelling in mono- and polycrystals based on Bi-Sr-Ca-Cu-O:Pb. Search for superconductivity in some perovskite related compounds. Radiation effects on high T_c superconductors. Structural aspects of Bi and Tl-based HTS. Chlorine incorporation in $\text{La}_{1.8}\text{Sr}_{0.2}\text{CuO}_{4-\delta}$ electrical resistivity. Mechanical properties of BISCCO systems. High T_c superconducting 1 2 3 films by sputtering. Optical characterization of HTS materials. Characterization of HTS materials by neutron scattering techniques. Large single crystal growth and physical anisotropy of superconducting single crystals of Bi-Sr-Ca-Cu-O. Thermodynamical fluctuations in high T_c superconductors. Experimental study of mechanisms of HTSC: X-ray absorption spectroscopy. Magnetic properties of $\text{Pb}_2\text{Sr}_2(\text{Y}_{0.3}\text{Ca}_{0.7})\text{Cu}_3\text{O}_8$ single crystals. Microwave absorption measurements on high T_c superconductors. High T_c superconducting thin films of Bi-Ca-Sr-Cu-O by resistive evaporation method. EPR spectroscopy and microwave absorption of HTS materials. Tunnel effect in HTS.

The Workshop was attended by 85 lecturers and participants (68 from developing countries).

Title: WINTER COLLEGE ON ULTRAFAST PHENOMENA, 18 February - 8 March.

Organizers: Professors C.H. Brito Cruz (Universidade Estadual de Campinas, Unicamp, Brazil), G. Denardo (ICTP), F.-P. Schäfer (Max-Planck-Institut für Biophysikalische Chemie, Göttingen, Germany) and O. Svelto (Politecnico di Milano, Milan, Italy), with the co-sponsorship of the Direzione Generale per la Cooperazione allo Sviluppo (Ministry of Foreign Affairs, Rome, Italy).

Lectures: Introduction to mode-locked lasers. Pulse compression in optical fibers. Femtosecond pulse amplification. CPM, Sinc. pumped and Raman shifting. Applications of DFB. USP measurements. DFB lasers. Industrial application of lasers (video). Generation of ultrashort high intensity excimer laser pulses. Dispersive effects on the duration of fs pulses. Femtosecond pulses amplification and applications. Parametric amplification and oscillations of ultra short light pulses. The femtosecond laser facility in Rome. Solid state physics and quantum wells. The femtosecond laser facility in Florence. The femtosecond laser facility in Milan. Applications of OPO and OPA in ultrashort spectroscopy. Generation of pico- and femtosecond light pulses by methods of nonlinear fiber optics. Pico- and femtosecond relaxation processes in molecules. Picosecond laser pulses in chemistry. Ultrafast processes in photosynthesis.

The College was attended by 83 lecturers and participants (57 from developing countries).

Title: SECOND ICTP-INFN COURSE ON BASIC VLSI DESIGN TECHNIQUES, 18 February - 15 March.

Organizer: Professor A.A. Colavita (ICTP). Dr. Dai Jialin (ICTP) acted as Head of practical exercises.

The Course was organized in collaboration with the Istituto Nazionale di Fisica Nucleare (INFN, Padua Section, Italy) and with the International Centre for High Technology and New Materials (ICTM, Trieste, Italy), with the co-sponsorship of the United Nations University (Tokyo, Japan) and the Direzione Generale per la Cooperazione allo Sviluppo (Ministry of Foreign Affairs, Rome, Italy).

Lectures: Introduction to VLSI technologies. Introduction to SOLO 1400. MOS physics and design. SOLO 1400 — requirement for test. CMOS processing technology and layout. DRAFT — the schematic editor. Logic and circuit design. SOLO 1400 — model. System design and design methods. CMOS subsystem design. SOLO 1400 — analogue library. New approaches for VLSI. Logic design. SOLO 1400 — generators and layout. SOLO 1400 — MADS the simulator. Algorithmic state machine design. SOLO 1400 — layout. SOLO 1400 — design acceptance. SOLO 1400 — UNIX. Analogue IC technology and design techniques: introduction; basic circuit components and limitations; design of the building blocks; operational amplifiers — trade-offs and applications.

The Course was attended by 45 lecturers and participants (40 from developing countries).

developing countries.



Second College on theoretical and experimental radiopropagation physics, 7 January – 1 February.



Second Training College on physics and technology of lasers and optical fibres, 21 January – 15 February.



Second ICTP-INFN Course on basic VLSI design techniques, 18 February – 15 March.

Activities at ICTP in 1991

Workshop on mathematical physics and geometry	4 - 15 March
Conference on geometry and physics, Edinburgh	19 - 28 March
Round Table on scientific brain drain the Third World and in countries of Eastern Europe.....	25 - 26 March
ICTP-WMO international technical conference on long-range weather forecasting research.....	8 - 12 April
Spring school and workshop on string theory and quantum gravity	15 - 26 April
Course on "Oceanography of semienclosed seas"	15 April - 4 May
Fifth workshop on perspectives in nuclear physics at intermediate energies.....	6 - 10 May
Spring college in materials science on "Nucleation, growth and segregation in materials science and engineering".....	6 May - 7 June
Trieste Conference on quantum field theory and condensed matter physics.....	13 - 16 May
Third ICFA school on instrumentation in elementary particle physics	20 - 31 May
Structural and phase stability of alloys (Adriatico Research Conference).....	21 - 24 May
Spring school on plasma physics	27 May - 21 June
Second school on non-accelerator particle astrophysics.....	3 - 14 June
Working party on initiation and growth of cracks in materials.....	3 - 14 June
Working party on simulation of materials degradation	3 - 14 June
Physics of inhomogeneous materials (Adriatico Research Conference).....	11 - 14 June
Miniworkshop on nonlinearity: fractals, pattern formation	11 June - 6 July
Summer school in high energy physics and cosmology	17 June - 9 August
Research workshop in condensed matter, atomic and molecular physics.....	17 June - 27 September
International conference on complex systems: fractals, spin glasses and neural networks	2 - 6 July
Miniworkshop on strongly correlated electron systems	8 July - 2 August
Open problems in strongly interacting electron systems (Adriatico Research Conference).....	9 - 12 July
Course on ocean-atmosphere interactions in the Tropics.....	29 July - 17 August
Course on path integration.....	19 - 30 August
College on singularity theory	19 August - 6 September
Working party on surface phase transitions.....	2 - 13 September
Workshop on materials science and physics of non-conventional energy sources.....	2 - 20 September
Path integration and its applications (Adriatico Research Conference)	3 - 6 September
School on dynamical systems.....	9 - 27 September
Conference on recent developments in the phenomenology of particle physics.....	23 - 27 September
Workshop on soil physics.....	30 September - 18 October
Workshop on stochastic and deterministic models.....	7 - 11 October
Second international workshop on radon monitoring in radioprotection and earth science.....	7 - 18 October
College on microprocessors-based real time control — principles and applications in physics	7 October - 1 November
School on "Use of synchrotron radiation in science and technology".....	14 October - 8 November
Workshop on composite materials.....	28 October - 8 November
Third workshop on telematics.....	4 - 22 November
Conference on major problems of the atmospheric system and the developing countries.....	11 - 16 November
Workshop on "The programme on training and interdisciplinary research in atmospheric physics.....	18 - 21 November
School on materials for electronics: growth, properties, and applications.....	18 November - 6 December
Workshop on non-linear dynamics and earthquake prediction.....	25 November - 13 December
Workshop on non-linear dynamics and earthquake prediction.....	25 November - 13 December

For information and applications to courses, kindly write to the Scientific Programme Office.

International Centre for Theoretical Physics
of IAEA and UNESCO
Strada Costiera, 11
P.O. Box 586
34136 Trieste
Italy

Telephone: (40) 22401
Cable: CENTRATOM
Telex: 460392 ICTP I
Telefax: (40) 224163
E-mail: POSTOFFICE@ICTP.TRIESTE.IT
Bitnet: POSTOFF@ITSICTP
Decnet: VXICP1::POSTOFFICE
or 40124::POSTOFFICE
PPSDN: 022224110125

EDITORIAL NOTE - *News from ICTP* is not an official document of the International Centre for Theoretical Physics. Its purpose is to keep scientists informed on past and future activities at the Centre and initiatives in their home countries. Suggestions and criticisms should be addressed to Dr. M. Faroque, Scientific Information Officer.