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Main

From the Editor *Dudley Creagh*

I must apologize for the lateness of the first issue of 1997, and the issue of Numbers 2 and 3 together in this issue. The production and assembly problems have been overcome, I believe, and future issues should be on time.

As you will see later in the Bulletin the Australian Government has made some significant decisions with respect to the production of uranium oxide and the future of the Australian nuclear reactor, and in the distribution of transmission towers for a rapidly growing mobile telephone service.

It would be foolish to pretend that all sections of the Australian population are overjoyed with these developments. The expansion of the production of uranium oxide requires the development of an underground mine within the boundaries of a World Heritage-listed National Park. Substantial opposition for this exists from the Green Movement and the traditional owners, although the latter had earlier given their written assent to the project. Opposition exists also to the building of a new reactor, both from the philosophical and practical viewpoints. It is to be for medical and research purposes : not for power generation. Australia will remain dependent on fossil fuels for its electrical power generation, and therefore subject to international pressure on its greenhouse gas emission targets.

The problems with the burgeoning mobile telephone industry are concerned with the effect of emissions from the telephones on the users, and the siting of the transmission towers in regions of high population density.

Governments are under considerable pressure from lobby groups from both sides of the argument, and have to make informed judgments on complex national, technological, environmental and population safety issues.

Where do you, individually, and we, collectively, as members of this society, stand on these general issues?

Main Next

PRESIDENT'S COLUMN

Bikash Sinha

For the President of the International Radiation Physics Society (IRPS) to talk about "50 years of Independent India" may sound somewhat inappropriate, yet in a larger sense it is symbolic of a tide of emotion, mixed with a tinge of ecstasy, a feeling of frustration and the longing for a better tomorrow, a desire shared in a broader context by a large part of our planet as it is. And yet, after all, even at a somewhat more mundane level, the very first International Symposium on Radiation Physics (ISRP) was conceived and born in India and thus, undeniably there is an Indian connection and direct relevance. While after celebrating a hundred years of our familiarity with X-rays and radioactivity and the centenary of the discovery of the electron, the fifty years of independence of my country provides me with an impetus to take stock of our achievements and failures, for after all unravelling the mysteries of the universe around us must go hand in hand with the development of human society varied and colourful as it is. In the thirty years since when your President embarked on his intense love affair with Physics, experimental at first and then a long journey in theoretical physics, it is his experience that the associated infrastructure in his country is now far more mature and professional than it was when he first began, despite the nostalgia harking back to the great men of science long since dead with names such as Jagadish Chandra Bose, Chandrasekhar Venkata Raman, Satyendra Nath Bose, Megh Nad Saha and Homi Jehangir Bhabha. But our sense of intellectualism, of our search for enlightment goes back much farther, indeed more than three thousand years, to the Vedas and the Upanishads, to the anguished cry "lead us from darkness unto light!" And thus it is hard to accept the situation where Western Europe and the United States of America, having achieved a degree of sustainable criticality in their economies, appear to be reluctant to make large investments for fundamental research. At the same time it is consoling to note that countries such as Japan, Korea and other emerging nations in Asia and South America (and Brazil in particular) are putting due emphasis on the basics. The community of scientists must hold fast to the ideology of knowledge and wisdom and must not succumb totally to the forces of market economy.

We are having the first meeting of the Council of IRPS after we last met at Jaipur in February this year. I am sure that those of you who were there must remember the excitement, though of course some of the evenings, must for reasons untold, be considered to be lost in blissful oblivion. As you will recall we are to have two meetings of the Council every year in the Spring and the Fall. After Rio, I understand the meeting is to be at Ancona in Italy. It would appear that we are alternating between the Northern and the Southern Hemispheres of our Globe. After that there are several claimants: South Africa, Argentina, China and the United States of America.

There is also a contention that attempts be made to hold meetings of the IRPS Council concommitantly with meetings of Radiation Societies such as those scheduled at Alexandria in Egypt and in Malayasia. These are questions on which you shall deliberate upon and I am sure come up with wise decisions.

One of the important issues which, I believe, should be one of our chief concerns is the possible hazards of radiation, particularly from radioactive waste, and the development of technologies for the abatement of this possible source of pollution, and at the same time to lay proper emphasis on beneficial aspects such as those that reside in their use in medical diagnosis and treatment. This, it seems to me, should be one of the focal points of our Society.

The IRPS Bulletin, as decided in the Jaipur meeting, is being offset printed by us and distributed from Calcutta using the electronic communication system with Professor Dudley Creagh from Australia, bridging as it were the two hemispheres of our globe. We shall continue with this service and shall welcome any suggestions for improvement. I also aspire to see that the Bulletin shall, with renewed vigour, transform itself into a journal wherein researchers in the field of radiation physics shall consider it an honour to have their professional results published. In this effort, if it meets with the approval of the Council, I shall have to count on your unstinted support and help.

Furthermore, one of the important issues before you is to plan for the next symposium ISRP-8 scheduled to be held in the great city of Prague. Permit me to assure the organisers that the pillar and the anchor of ISRP-7 (Jaipur) shall be available to help in any way necessary to make the next symposium an even greater success.

Ever since you have placed your trust in me, I have felt such a deep sense of gratitude for the encouragement and support from each and every member of the Council and particularly from the office bearers of the Society, as also from the Editorial Board of the Bulletin. Furthermore, I must in particular thank the Secretary of the Council, Dick Pratt for his ungrudging help and also the continued inspiration from John Hubbell, Ananda Mohan Ghosh and P.K. Iyengar who were the pioneers in this our joint venture.

I am certain that the International Radiation Physics Society dedicated, as it is, to questions most fundamental and most relevant, spanning all nations of the world and every continent, probing into all aspects of the universe in space and time, shall with your help and co-operation reach greater heights and in this endeavour it is my great privilege to be your partner.

Reports from Vice Presidents and Councillors

From Vice President Rex Keddy (South Africa) :

LETTER FROM AFRICA

With South Africa no longer considered as the blunt end of the horse by the world (excluding, of course, all those unreasonable persons from the cricket, rugby and soccer playing nations who say rude things about our noble sportsmen out of unashamed jealousy) the contacts, scientific and otherwise between South Africa and the rest of the countries in Africa have mushroomed. It is quite clear that the new democratic South Africa has become a major and influential player on the continent. Co-operation with many South African concerns has been sought and promoted by many African Countries. Delegations of all kinds come either to South Africa or travel from South Africa to other African States. It makes a great deal of sense. Many of the issues that are dealt with often have a uniquely African flavour. Whilst they may not necessarily be confined to the African continent they frequently need African continental solutions not confined to a single African State. Health and hygiene for example, because of travel and population movements and migrations, is a good example. Aids and patients presenting HIV positive with TB involvement is at almost epidemic proportions. The cancer of Africa is cervical cancer, outnumbering all other cancers totalled together by some two orders of magnitude. Lung cancer with bronchial involvement and sophogeal cancers are also prevalent.

What has this to do with radiation physics? In this, the first of my "Letters from Africa", I would like to describe the involvement of radiation physics in some of the health programs of some of the African States. Subsequent "Letters" will describe other radiation physics programmes - academic and applied. Perhaps I will describe also things that are not necessarily "radiation physics" per se but, might impact on physics, radiation or otherwise. The state of academia, the situation at some of our universities, job opportunities for young graduates etc. Perhaps even to digress and mention things that are more general but might be of interest to the radiation physics community. It was certainly my impression in Jaipur (and Rabat and, dare I say, because I am not at all sure that I was supposed to be there, Dubrovnick) that radiation physicists have wide interests and that they appreciate that there is a world outside the discipline. For some reason this reminds me of the story of the flasher who opens his raincoat in front of the young lady and leers "what do you think lady". After a long look she replies "well it looks like a penis only smaller". I believe that our organ(isation)is larger than just radiation physics in its interests -- and I know that this is so. I will therefore indulge my impulse to communicate on diverse matters from time to time.

Radiation physics brought us together, however, and will and must occupy the centre stage so let me kick off then with radiation related health matters on my continent.

It is generally accepted that about 60% of all cancers are treatable with radiation, often in combination with one or both of surgery and chemotherapy. Radiation therapy is expensive and a fully equipped facility may cost upwards of about US$20M. In South Africa we have totally inadequate facilities for radiation oncology and the situation becomes even more bleak as one moves north. Egypt, Morocco and Tunisia also, I would believe, would argue that, by western standards, they are also inadequately catered for, although they do have some modern centres. Then there is staffing. Modern radiation oncology requires highly trained staff ; Oncologists, physicists, radiographers (dosimetrists as they are called in the USA), and the input of other medical disciplines ; radiologists, gynaecologists, surgeons ---- the list is long. South Africa has 1 radiation medical physicist per 1 million of the population whereas, for example, Canada has almost 4 per million. Again, as one goes north from South Africa the situation worsens. It is aggravated by the fact that the pool of science graduates, with a physics major, from whom candidates for training can be drawn is extremely limited. Inevitably government policies also dictate that only their own nationals may be appointed to state positions so that expatriates are often appointed only on a contract basis with no guarantee of permanence of tenure. South Africa, to its credit, is a little more relaxed about this if it can be shown that there is a genuine local shortage and that there is a critical need for the expertise of the foreign applicant. I, for example have on the staff in my department of medical physics, 1 US citizen, 1 Malawian, 1 Czechoslovakian and have recently appointed a national from the Democratic Republic of the Congo (formally Zaire). Including myself there are three South African physicists on my staff. I still have vacancies for five more physicists but am unable to find qualified local applicants. I would appoint also suitable graduates but again young physicists are not, in general, attracted to medical physics which is an applied field. Most of ours wish to conquer the world with quarks and colour. Fair enough but we do have a problem of attracting and retaining staff and our young graduates are, in their turn, going to face the problem of finding a tenured track appointment. In the present South African climate a young though, a young black lady with a science degree and experience is a gem for employers in industry and/or commerce and are made outstanding offers with which state salaries cannot compete. I have recently lost two such physicists to the private sector -- but good luck to them, they deserve it.

The International Atomic Energy Agency has recognised the need for modern radiation oncology facilities to be established in Africa. They have initiated a program sponsoring the training of appropriately qualified citizens from participating African States and will agree also to sponsor a substantial fraction of the radiation equipment required to service a centre. The participating country is required to also make a contribution to the facility, the magnitude of which is decided, I believe, by negotiation with the IAEA. The participating country is, of course, also expected to operate the facility. South Africa has played a major role in this training program and also in the commissioning and ordering of equipment for some of the installations. One of the successes of this program is to be seen in the facility at the Windhoek State Hospital in Namibia. For two years we had a young Namibian physicist training in my department. He returned to Namibia at the beginning of this year when he and I calibrated the units and entered all the beam data into the treatment planning computer. I was appointed as an IAEA "expert" for the mission and, for me, it was truly a privilege to have this involvement. The excitement came when in February of this year we treated the first patient. A palliative half body irradiation for the relief of pain. The Namibian authorities have provided a brand new cancer wing to the State Hospital. This wing houses not only radiation oncology but also medical oncology (chemotherapy) and nuclear medicine. They now have a total oncology centre of which they can be truly proud and which can act as a role model for the rest of Africa. It is light, modern and attractive. The patients just have to get a good feeling about entering the "Dr May Cancer Care Centre". These are patients which used to be sent to South Africa for treatment at considerable cost.

A lot of thought went into deciding what would be the most appropriate radiation therapy equipment for an African State that is not first world but is also not truly third world. All therapy equipment is high-tech and requires a degree of support infra- structure that the western world would take for granted. Telephone services, power and water utilities, public transport are random items that come to mind for example and, for a facility that should be in a position to treat the most prevalent of cancers, equipment ruggedness must be a feature. Technical maintenance is usually not on call in most African States. It was finally agreed that three units should comprise the minimum radiation armament of a typical centre. These would be a cobalt teletherapy unit for external beam therapy, a High Dose Rate Afterloading (HDR) unit for brachytherapy and a HVX X-ray unit (100/250/300 kVp) for surface tumours.

Training for the cobalt and HVX units poses no real problem. It is my view however that the training of all staff for HDR operation should be intensive and complete. It is our experience that the HDR unit can treat a majority of the cervix, sophagus, lung and bronchus cases but bear in mind that the 192Ir source has an activity of 370 Gbq (10 Ci) as a 5mm long, 1mm diameter cylinder welded to the end of a steel cable. 192Ir exposure constant is = 0.47 cGy.hr-1.Ci-1.cm2 which converts to a dose of 47Gy.hr-1 at 1cm. A lethal tissue dose can be given in a very short period of time therefore – that is why it is known as "High Dose Rate" obviously. The advantage is that patients do not have to be hospitalised. They can receive their treatment fraction and go home. There is no ward containing patients with radioactive inserts which is often of considerable concern to the nursing staff who express an anxiety about nursing such patients for days at a time. Up to 30 patients per day can be treated per HDR unit. Often it is the setting up procedure which is time consuming. Catheters are inserted into the body site either by using specially designed gynaecological, or sophogeal, or bronchial catheters or by threading hollow needles through the tumour. The patient frequently has to be anaesthetised to do this. A hollow guide cable is then connected between the catheter and the HDR unit and, under pre-planned computer controlled conditions, the 192Ir source is pushed to the maximum length of the catheter and withdrawn in stages with computer controlled times at each dwell position. The point here is that the whole HDR procedure is such high-tech and a very serious radiation incident is possible if procedures are incorrectly implemented so that in-depth training is absolutely essential.

In Windhoek they have put a cherry on the top by also installing a computerised treatment planning system and a modern simulator. Two sites in Ghana, one at the Korle-Bu Teaching Hospital, Accra and the other at the Komto-Anokye Teaching Hospital, Kumasi are presently nearing completion. I believe that they are envisaging much the same sort of additional equipment as Namibia but as yet I do not have the details. I will be visiting the sites at the end of July and will be able to report on their facilities at a later date. One difference that I know of is that the IAEA are having Chinese cobalt teletherapy sources installed at the Ghana sites whereas a Canadian unit was installed in Windhoek.

In summary, radiation medicine is moving in Africa. I have not mentioned developments in nuclear medicine on the continent, nor straight diagnostic radiology. There is a legal requirement in South Africa for radiation medical physicists to be associated with nuclear medicine facilities and neighbouring States are wanting to follow suite. In the near future there will also be some legislation about physics involvement in diagnostic radiology. It is quite clear from our local experience that the diagnostic radiologists generally have little or no idea of what radiation dose is delivered to patients for any exposure procedure. Many times I have had calls from local practitioners who have discovered, post the exposure, that the lady was pregnant and they have then the dilemma of what dose the foetus received.

Well I seem to have rambled on but, for me, it was good to get this all onto paper. If this kind of news letter" on African radiation physics matters finds favour I will repeat it otherwise my next communication will be more scientifically oriented. .

From Councillor Dudley Creagh (Australia)

NEWS FROM AUSTRALIA

The Australian Government has recently taken a number of policy decisions which significantly change the direction of Australia as a supplier and user of nuclear radiation.

The first decision has been to move from the two-mine policy espoused by the former Labour Government by the adoption of a proposal for the development of a new uranium mine at Jabaluka, in the Northern Territory. The proposed new mine will make available a very substantial body of high grade ore for processing and subsequent export. The problem is that the mine will lie within the boundary of the Kakadu National Park, which has World Heritage listing. The proposal is for an underground mine with processing taking place outside of the boundaries of the park. The decision has been condemned by the Green Movement and the Australian Conservation Foundation. And the traditional owners, who had previously given their consent, are now opposed to the proposal. Such equivocation is not unusual: the proposed Century Zinc development has recently been endorsed legally by the traditional owners, after several changes of mind.

The second decision is to build a new nuclear reactor to replace the ageing HIFAR reactor at Lucas Heights, on the outskirts of Sydney. The new reactor is to be constructed so as to commence operation in 2005, at a cost of $ 280,000,000 in today’s dollar terms. It is to be used for medical and research purposes. Insufficient details are currently available for an assessment of the research component to be made. It is known that the proposal includes the provision of a cold source. The involvement of the Australian Academy of Science and the Academy of Technological Sciences will be necessary to ensure that correct decisions are made about the scientific experimental program. I believe that the assistance of societies such as the IRPS will be necessary if the best scientific benefit is to be achieved.

The third decision involves the signing of a Memorandum of understanding between the Australian Nuclear Science and Technology Organization and the Oak Ridge national Laboratory for a medium size waste proposal plant usin the Synroc process which has been under development in Australia for two decades. This process embeds the waste in crystallographically similar synthetic minerals to the minerals in which the radioactive materials are found in nature.

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MEMBERS' PAPERS

DETECTION OF LAND MINES : A RADIATION-PHYSICS PROBLEM

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Introduction

In September, 1997, more that 100 countries met in Oslo and successfully developed a treaty to ban future use of land mines. This treaty will be signed in Ottawa in early December. A major humanitarian effort is also underway to raise money for aid to maimed victims of this dreadful weapon. While the treaty deals with the future and the aid helps the victims, the problem will not be completely eradicated until all landmines in the world are removed.

The first step in mine clearing is to locate them. Wars, large and small, are hardly conducted in an orderly fashion and maps are rarely, if at all, available. The detection process may be conducted on a global scale to locate a mine field, or locally to determine the location of a particular land mine. The latter problem is where radiation physicists can contribute.

In this article the detection problem of land mines is discussed, in the hope of simulating interest among members of this society, particularly those in affected countries.

The Problem

Land mines come in all shapes and sizes, and can be encased in metal, plastic, wood or nothing at all. Their fusing mechanism varies from simple pressure triggers to trip wires, tilt rods, acoustic and seismic fuses, or even magnetic influence fuses. They can be embedded in a field cluttered with various materials and objects and buried underground, at various depth, or scattered on the surface.

A land-mines detection system should be able to detect various types of explosives, TND, RDX, etc., distinguish them from background clutter, and detect mines regardless of shape, depth of burial, or type of casing. This is to be done so that it provides good standoff distance, detection probability of almost 100%, a near-zero false-negative alarm rate, an acceptable operational speed, and preferably, viewing (imaging) capability.

With such demanding requirements, it is inconceivable that a single detection technology will be able to meet all the needs. Each technology has however its distinct capabilities, as explained below. /Continued

Thermography

Infrared thermography relies on the difference in the thermal capacitance between soil and mine, which affects their heating and cooling rates and the accompanied infrared emissions. This technology has the advantage of being passive, can be performed remotely, by aerial search, and can cover a large area in a short time. Infrared thermography is best suited for identifying minefields, rather than searching of individual mines. It cannot however work when the soil and mine are in thermal equilibrium [1].

Photo-Optics

Laser detection utilizes the difference in the reflectance and polarization of soil when disturbed by laser energy. This requires however a large laser power and a complex data interpretation process [1].

Eddy Current and Microwaves

Since eddy-current can be generated only in metals and microwaves are completely reflected off metallic surfaces, metal encased land mines can be detected by pulse-induction metallic detectors and microwaves (ground penetrating radar). Unfortunately, however, not all mines are metallic.

Nevertheless, microwaves are also scattered, though to a lesser extend, by nonmetallic objects and characteristic refection signatures can be related to material type, and hence can be used to identify explosives. This approach has however significant difficulties, because of the propagation loses in the soil, the low contrast between target and soil, and the large variety of echoes from the rough surface and other shallow contrasts such as rocks, tree roots, etc. The discrimination of mine from clutter under the wide variety of surface and soil conditions remains very difficult [2].

Photons

Penetrating radiation (neutrons and photons) offers another probe for standoff land mine detectors. Unlike conventional radiographic or tomographic methods, one cannot rely on radiation transmission, as it requires access to two opposing sides of the object; a situation not attainable with land mines. Therefore, one has to rely on radiation scattering or activation (production of secondary particles). Photons, in the form of x- or gamma-rays, incoherently collide (Compton scatter) with atomic electrons with a probability that is dependant on the electron density, and consequently the mass density, of the medium. As the scattered photons travel back towards the detector, they are removed by further scattering or absorption; with the photo-absorption probability being strongly dependant on the atomic number. The difference between the atomic number and density of mine and soil allows, therefore, the identification of the former. This is the essence of the x-ray backscattering system of Campbell and Jacobs [3]. Gamma-rays can also provide similar information.

Neutrons

Since explosives are usually characterized by their high nitrogen content, neutron activation of nitrogen, and the subsequent emission of characteristic (10.8 MeV) gamma rays, can be used for mine detection. This requires, however, the employment of thermal neutrons, the generation of which necessitates the use of a bulky moderating material, to slow-down fast neutrons emitted from an isotopic source. The soil itself can be used as a moderating material, but then the amount of activation will depend on the type of soil (in particular its hydrogen content). Since the activation probability (cross section) is not so high, a strong neutron source is required. This causes some difficulties in radiological shielding and handling and affects the portability of the device. Moreover, nitrogen is present in fertile soil and tree roots. Under such conditions it becomes difficult to detect mine based on nitrogen content alone.

Conclusion

All the techniques discussed above use a signature "finger-print" signal characteristic of mine. Given the wide variety of mine material, casing and shape, as well as the various type of soil and the non-uniformity of clutter, such a characteristic signature varies widely depending on the circumstances; making it difficult to apply any one technique unless the nature of the mine, soil and background clutter is well known. What is needed, therefore, is a technique that is more specific in its identification of the hazardous material in a land mine, i.e. the explosive material itself.

The explosive material in land mines is most likely, TNT; but RDX and other plasticized explosives are also used. These explosives are rich in nitrogen, which serves as a bonding agent. However, the amount of nitrogen alone is not sufficient to definitely identify an explosive material from other innocuous materials [4]. Explosives are also rich in oxygen (which is simply the oxidizer). Therefore, knowing the nitrogen content together with the oxygen content provides the most unambiguous identifier of an explosive material.

The challenge for radiation physicists is to, not only develop techniques that can meet the demanding detection problem, but also tailor such techniques to their local conditions. After all, detecting land mines in the sandy desert of Egypt or Kuwait is very different from finding them in the fertile soil of Vietnam or Laos.

Can this society undertake it as a mandate to help rid the world of this scourge that kills or wounds 25,000 people a year (about 3 every hour)? A research co-ordination group, a lobbying team, a session in the regular meeting, an electronic- forum, or any other approach will be certainly a welcome step. Can we collectively do something to prevent further suffering and tragedy?

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NEWS ITEMS

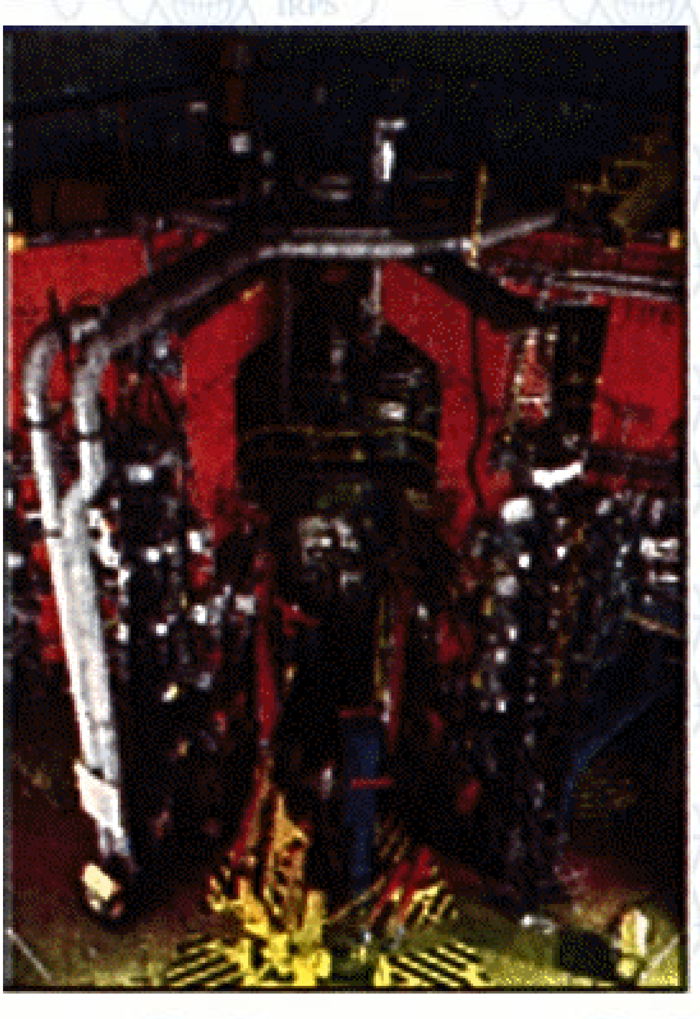
Europe could delay or abandon international fusion project

Judy Redfearn
Physics World, p.5, Vol. 10, No. 7,
July 1997

A decision on whether and where to build the International Thermonuclear Experi-mental Reactor (ITER) could well be delayed until 2000. The four ITER part-ners - the European Union, Japan, Russia and the United States - have already invested $1 bn in the engineering design for the project and had planned to decide on construction next year. Delaying this decision by two years is one of five options currently being considered by the EU in response to budget difficulties. Another possibility would be for the EU to aban-don ITER but retain the ability to con-sider similar options in the future. Building the next-generation magnetic fusion energy reactor is expected to cost around $lO bn (about ECU 8.8 bn).

Europe's attitude towards ITER needs to be determined now, as it will shape the budget and scope of fusion under the EU's 5th Framework of R&D, which is due to run from 1999 to 2003. The struc-ture and budget of the 5th Framework is due to be approved at a council meeting of research ministers in November. To help focus the discussions at this meeting, the Netherlands - which held the presidency of the EU until the end of last month - has put forward five possible scenarios for Europe's future fusion programme:

- Abandon nuclear fusion and concentrate efforts on other energy options. Winding down costs, including decommissioning the Joint European Torus (JET) at Culham in the UK, would be about ECU 250 m during the four-year lifetime of the 5th Framework. The budget for fusion under the 4th Framework was ECU 850m.
- Abandon ITER but preserve sufficient research and technological capability to revisit the option sometime in the future. The cost during the 5th Framework would be about ECU 700m, as-suming that JET continued to operate.
- Postpone the decision on INTER for two years until 2000 to allow time for the prospects of other energy sources to be fully explored. Specific engineering designs for building ITER on dif-ferent sites could also be prepared. JET would need a three-year extension to 2002 to bridge the gap, but this option could be achieved at current budget levels.
- Construct ITER in either Europe or Japan. Construction in Europe would cost the 5th Framework about ECU 1050m. However, if ITER was built in Japan, European participation would cost about ECU 950m. Neither the US nor Russia can afford to host the project.



Stopgap – the JET project might be extended if ITER is delayed

- Go it alone and build a European next step machine. This option, which was retained under the 4th Framework, would "exceed the present budget several times over,,' says the Dutch presidency's note.

The commission has been charged with elaborating on these options by the end of September. However, the first and last suggestions seem unlikely and, with Japan recently expressing reservations about the cost of hosting ITER, the prospects for option four are also now looking slim. Therefore it is likely that ITER will either be delayed or abandoned.

An evaluation of the fusion programme last year, the Barabaschi report, was intended to focus the debate on key issues (Physics World December 1996 p5) and feed into plans for the 5th Framework. But the report, which came down in favour of Europe hosting ITER, did little more than mention the need to assess the socio-economic impact of fusion or its merits relative to other energy options. Debate is now being stimulated in a wider context.

Swiss approve new synchrotron light source

Emma Sanders
Physics World, p.5, Vol. 10, No. 7,
July 1997

Switzerland is to have a new synchrotron radiation source. Last month the Swiss parliament voted unanimously to build the Swiss Light Source (SLS) at the Paul Scherrer Institute in Villigen. One of a series of third-generation synchrotron sources being planned for Europe, the SLS is scheduled to begin operation in 2001 (Physics World , March p5). Initial research will focus on materials science, surfaces and interfaces, micro and nano structures, and protein crystallography.

The synchrotron radiation will be generated by accelerating a 2.1 GeV electron beam around a 288 m ring. The energy range of the radiation – from ultraviolet to X-ray – has been designed to complement the European Synchrotron Radiation Facility (ESRF) in Grenoble, France.- Although the SLS will cover a lower energy range than the ESRF, its beams will be more focused and will have a higher luminosity density. Picosecond pulses will be available to users, who will have the freedom to tailor their own sequence of pulses.

The construction bill of SwFr159 m (about £67 m) over four years will be covered by a special grant from the Swiss federal budget. Initially, five beam-lines will be built, although another two may be added if industry provides a further SwFr 9 m. The annual running costs of SwFr 23 m will be met by the Paul Scherrer Institute and the facility will be freely available to international research institutes and universities.

Martin Durrani
Physics World, p.5, Vol. 10, No. 7
July 1997

Three new régions have joined the race to host France's third-generation synchrotron source, SOLEIL. The entry of Aquitaine, Champagne-Ardennes and Alsace brings the total number of contenders to thirteen. The new French government is expected to issue a call for tender early this month.

The FFr lbn (about £100m) lab will be used by physicists, chemists, biologists and industrialists for surface science, ma-terials science, biocrystallography and other condensed matter work. A decision on where to build the lab is expected to be made by the French research minister, Claude Allegre, at the end of the year. The Aquitaine bid is centred on Bordeaux – whose mayor is the former prime minister, Alain Juppé.

Gravity Ball

(Source : Physics World, p.13, Vol. 10, No. 7
July 1997)

A spherical sensor about 200 times more sensitive than existing devices could be detecting gravity waves by 2002. A group of physicists, led by Giorgio Frossati of the Kamerlingh Onnes Institute in Leiden, the Netherlands, has just submitted a research proposal to the Foundation for Fundamental Research on Matter (FOM) and the Dutch Research Council (NWO) for a project to detect gravity waves using a copper sphere 3 m in diameter cooled to 0.01 K.

Five SQUIDs will monitor the vibrations of the sphere and will be able to detect changes in distance of 10–21 m. Even at 0.01 K, this amplitude is much less than that of the thermal motion of the atoms, says

Fons de Waele of the Technical University of Eindhoven. "Because the quality-factor of the sphere is so high, the amplitude remains constant for several hours. When a gravity wave hits the sphere, it will change this amplitude, and that is really our signal," says de Waele.

An initial research phase of two years will cost about Fl 10 m (about £3.1 m). The total project will have a price tag of about Fl 40 m. "We are hoping to make it part of an international collaboration," says de Waele, who is very optimistic that the project will be approved.

Chinese Telescope

(Source : Physics World, p.13, Vol. 10, No. 7
July 1997)

Chinese scientists visited the Royal Greenwich Observatory in Cambridge, UK, last month to discuss their plans for the world's largest survey telescope. The proposed telescope will be able to simultaneously study 4000 stars or galaxies by reflecting light onto a 4 m diameter mirror containing 4000 robotically positioned optical fibres at its focus. Known as LAMOST (Large Sky Area Multi-Object Fibre Spectroscopy Telescope), it will have ten times the observing power of today's best fibre-fed telescopes. The Cambridge astronomers hope to develop the telescope. The project has the full backing of the Chinese government, who see it as a major facility for basic research.

Hercules 1997

(Source : ESRF Newsletter, p.11, No. 28, April, 1997

The seventh session of the HERCULES course (Higher European Research Course for Users of Large Experimental Systems) took place at the Maison des Magisteres, CNRS, Grenoble, from 16 February to 27 March 1997 with 82 participants from 18 countries (mostly European, but including participants from Brazil, China and Japan who are registered at European Universities):

- Session A : neutron and synchrotron radiation for physics and chemistry of condensed matter with 44 full-time participants and 19 part-time participants.
- Session B : neutron and synchrotron radiation for biomolecular structure and dynamics with 19 full-time participants.

As in previous years, the course included lectures, practicals and tutorials. This year, session A was particularly centered on recent developments of neutron and X-ray spectroscopy (circular magnetic dichroism, inelastic scattering...). In Grenoble, most of the practicals were carried out at ESRF beamlines S(including French, Italian and Swiss-Norwegian CRG beamlines) and at the ILL. The collaboration of EMBL, IBS as well as CNRS and CEA-Grenoble was also greatly appreciated. Participants from the two sessions carried out practicals at LURE (Orsay) and the Léon Brillouin Laboratory (Saclay).

The poster session at the Maison des Magisteres (54 posters displayed) was one of the highlights of the course and allowed fruitful exchanges between participants and Grenoble scientists.

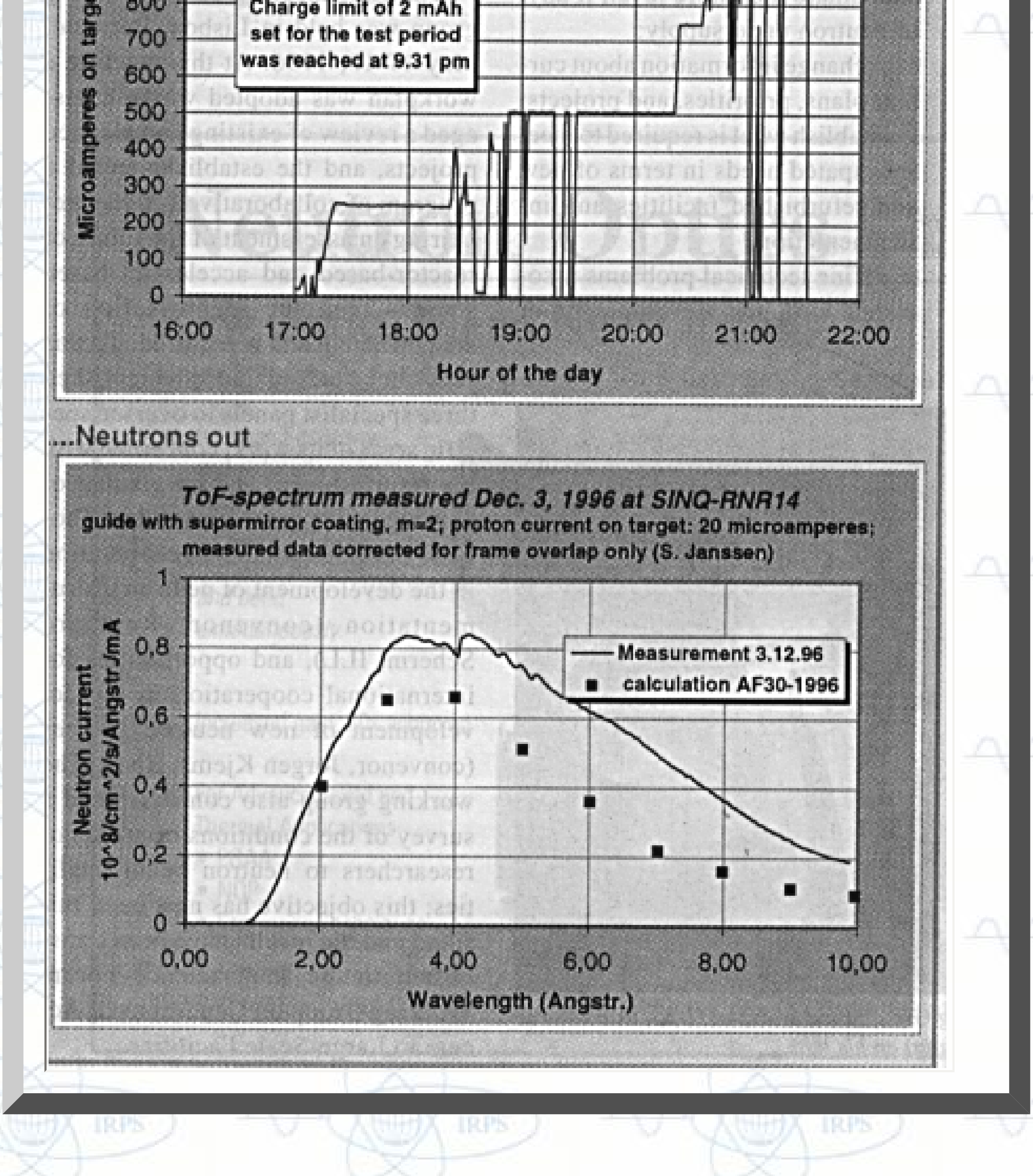
HERCULES 98 will take place next year with the same two parallel sessions, from 22 February to 3 April (provisional dates).

Information and application forms will be available at the beginning of July 1997.

First neutrons from the Swiss Spallation Source at PSI

Walter Fischer
PSI CH-5232 Villigen, Switzerland
in "Neutron News", Vol 8, Issue 2, 1997

On December 3, 1996, the Swiss Spallation Neutron Source (SINQ) was, for the first time, fed by the proton beam. The beam current for this first test of the neutronics performace was 20 mA. Flux measurements at the supermirror guide system have been carried out. Furthermore, the spectral distribution from the cold source was measured. The performance of the source with the installed "day-one" target was somewhat above our latest expectations. With the lead target, planned to be installed as soon as possible, the neutron flux values will be twice as high. In the evening of December 4, 1996, we raised the current up to approximately 900 mA, corresponding to a beam power of about 520 kW. During this high power run, we were able to test the shielding concerning the neutron and gamma background, as well as the adequate function of cooling- and gas-containment of target, moderator, and in particular, the cold neutron source. After these satisfactory tests, we plan to give to the source a "last" finish in order to start regular operation in spring 1997 with four or five spectrometers attached to it. The figures below tell the story of these tests.



New Members, Address Changes etc.

MEMBERSHIP INFORMATION IS AVAILABLE ON THE WEB

http://beth.canberra.edu.au/IRPS/welcome.html

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