

IAEA's 28th General Conference: Session Highlights

Reflecting the strength and diversity of international support for the peaceful development of nuclear technologies, more than 600 representatives of 97 Member States attended the 28th Regular Session of the IAEA General Conference in Vienna, Austria, from 24 to 29 September 1984.

The session was the first one to be attended by the People's Republic of China as an Agency Member. China had become IAEA's 112th Member in January 1984, and in June 1984 it was designated as a Member of the Board of Governors, the Agency's principal policy-making organ that now has 35 Members.

The Conference featured special activities to mark the 20th anniversary of the joint programme for food and agricultural development conducted by IAEA and the Food and Agriculture Organization (FAO) of the United Nations. (See a following article).

Addressing the Conference, Dr Edouard Saouma, Director General of FAO, commended the Joint FAO/IAEA programme's "pragmatic approach" to problem-solving over the years. "It brings nuclear and related techniques within the experience of developing countries and encourages the establishment ... of 'centres of excellence' where basic research can be linked to practical studies and applications," he said.

Held at Vienna's Hofburg Kongresszentrum, the General Conference attracted representatives of 97 Member States (below). Above at the table, are IAEA Director General Dr Hans Blix (left), Mr Juan Barreda Delgado of Peru (center), who was President of the Conference, and Mr Muttusamy Sanmuganathan, Secretary, Policy-making Organs of the IAEA.



In their remarks to the Conference, heads of delegations strongly endorsed the Agency activities aimed at strengthening international co-operation in the peaceful development of nuclear technologies. The IAEA's programme was reviewed by Director General Mr Hans Blix in his annual statement, highlights of which appear in a following article. Considerable attention was focused on issues related to nuclear proliferation and international safeguards, as well as to steps needed to overcome problems that commercial

nuclear energy still faces in domestic and international markets.

The Conference approved the IAEA regular budget for 1985, which – with expenditures totalling US \$95 million – provides for zero real growth. The budget allots US \$32.5 million for safeguards activities and US \$4.5 million for technical assistance and co-operation. Pledges of voluntary contributions were made toward a 1985 target of US \$26 million for the Agency's Technical Assistance and Co-operation Fund.

Resolutions adopted

The Conference adopted – by a vote of 53 to 17, with abstentions – a resolution in which it demanded that Israel undertake forthwith not to carry out further attacks on nuclear facilities in Iraq or on similar facilities in other countries, "not for peaceful purposes, in disregard of the Agency's safeguards system." It requested the Director General to seek personally from the Government of Israel such undertakings and prepare a report on the matter for submission to the next regular session of the General Conference. The resolution also led upon Israel "urgently to place all its nuclear facilities under Agency safeguards."

Also, the Conference adopted – by a vote of 57 to 10, with abstentions – a resolution in which it demanded once again that "South Africa submit immediately all its nuclear installations and facilities to inspection by the Agency" and requested the Director General "to continue taking the necessary measures in that connection." The resolution also called upon those Agency Member States which have not yet done so "to end all nuclear co-operation with the South African regime and, in particular, terminate all transfers to South Africa of fissionable material and technology which could be used for developing the capability of producing nuclear arms and to reconsider their purchases of uranium from South Africa."

The resolution further requested the Board of Governors and the Director General "to follow closely the activities of South Africa and its evolution in the nuclear field" and to prepare reports on that matter, and also on the implementation of the resolution, for consideration by the General Conference at its next regular session.

Regarding the representation of Member States on the Board of Governors, the Conference requested the Board to

consider proposed amendments to the Agency Statute and to submit its observations and recommendations by the next Conference session. The Conference also amended Article VI.A.1 of the Statute to increase the number of Members designated annually to serve on the Board as being the most advanced in the technology of atomic energy, including the production of source materials.

The Conference also took note of the Board's report on the review of the Agency's activities over the past 25 years. While noting the special importance for developing countries of the Agency's activities, the Conference requested *inter alia* the Board and the Director General to reflect the findings of the review in the future programmes of the Agency, and to provide on request assistance in securing financing from outside sources for nuclear power projects in developing countries.

The Conference again passed a resolution on financing of technical assistance and requested the Board to report on actions taken with regard to earlier resolutions on the subject.

Also adopted was a resolution on the International Convention on the Physical Protection of Nuclear Material that expressed "the hope that the Convention will enter into force at the earliest possible date and that it will obtain the widest possible adherence." It noted the Convention now had 39 signatories and 10 ratifications.

In a resolution on the Vienna Convention on Civil Liability for Nuclear Damage, the Director General was requested to continue the Agency's interest in this field. Regarding Agency staffing, the Director General was requested to continue to take further steps to increase the number of staff members drawn from developing areas.



Mr M. Allaf,
Director General of the
UN office in Vienna,
delivered the message
of the United Nations
Secretary General.



Dr Saouma,
FAO Director General

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Attending the Conference for the first time, delegates from the People's Republic of China were warmly received, above at an evening reception ①. Mr Jiang Xinsong ②, Chairman of the Chinese delegation, delivered his country's statement to the plenary, expressing strong support for IAEA's proposed programmes and underscoring China's intention to participate fully in activities. "Co-operation and exchange with other countries in the field of nuclear energy is . . . part and parcel of China's policy of opening to the outside world," he said. He also stated that his country will "in exporting its nuclear materials and equipment, request the recipient countries to accept safeguards in line with the principles established in the Agency's Statute." Similarly, he added, "China will also make sure" that imported nuclear materials and equipment are used "for peaceful purposes."

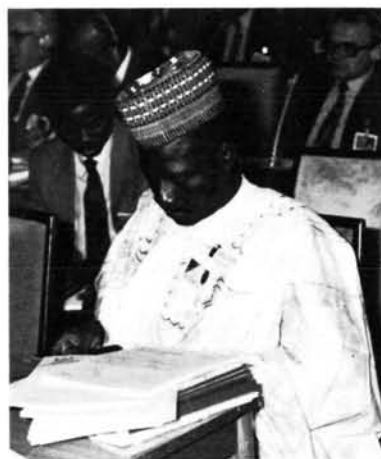
A delegate from Nigeria reviews Conference papers ③.

Electronically linked to Agency interpreters, delegates follow statements as they are simultaneously transmitted in several languages ④.

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③



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Director General notes gains in 1984, positive signs for future

In his annual statement to the General Conference, Dr Hans Blix, IAEA Director General, emphasized positive contributions and trends of progress from nuclear energy's continuing international support and development during 1984.

Largely for economic and environmental reasons, nuclear power will increase its electricity share in years ahead, he said, with plant orders likely to pick up because of economic growth and electrical power demands. Dr Blix emphasized that including more nuclear plants in the energy mix also is one means to reduce emissions of sulphur oxides and other pollutants from fossil-fuel plants, an issue of growing awareness worldwide.

Although gains will be registered, financial and other constraints, however, will inevitably lead to a "flattening" of the curve for world nuclear capacity growth, he said.

Industry taking initiatives

The industry's current period of slower expansion, he noted, has not been without benefit. "Several countries have already begun to use this 'breather' in order to devote more attention to simplifying regulatory procedures and standardizing nuclear plants," he said. "They are taking a serious look at the possibility of broadening the nuclear energy market through the inclusion of district-heating and process-heat production schemes. Also they are examining ways of further improving the efficiency and performance of power reactors."

He pointed out that Agency data show a trend toward steadily improved plant reliability, and he underlined that 313 operating nuclear plants accounted for about 12% of the world's generated electricity during 1983. Although trends in developing countries remain uncertain, Dr Blix said existing constraints to nuclear power development are being addressed and he particularly noted IAEA's study on small- and medium-power reactors, recently launched in response to size constraints.

Broad-based technical assistance

In technical co-operation fields, Dr Blix noted that Agency activities have expanded considerably over the past three years and now encompass more than 800 projects around the world. One important component – the Regional Co-operative Agreement in Asia and the Pacific (RCA) – now spans 15 projects, he said, adding that he hoped future regional participation in RCA would be further enhanced through the association of the People's Republic of China.

In emphasizing the Agency's technical assistance efforts, Dr Blix acknowledged it may sometimes appear

the Agency is far removed from the "grim realities" of poverty and under-nourishment in many Member States. "It is true that we are dealing with some of the most advanced techniques in the world," he said, "but it is our duty to make it clear that many of these techniques can be both useful and cost-effective in the fight against starvation, illness, and under-development."

To assist its 112 Member States in getting all necessary information for various nuclear fields, IAEA organized some 290 technical meetings in 1983, Dr Blix noted, and published over 150 separate books or journal issues. Additionally, the Agency's International Nuclear Information System (INIS) now contains some 860 000 entries, with new items added at the rate of about 6000 to 7000 a month.

Nuclear safety consultants, assistance teams

Dr Blix announced that he intends to set up an International Nuclear Safety Advisory Group, initially for a period of three years, to deal with broad safety issues and to advise the Director General on the best ways to advance nuclear safety. The Group will review and analyse safety information, provide a forum for an exchange of information on generic issues and, if possible, formulate commonly shared safety concepts.

"Only experience will show whether the latter task will be feasible, given the wide differences in technological background and in political and socio-economic conditions between countries," he acknowledged.

Dr Blix noted that the Agency serves as an instrument for the exchange of experience and for the joint elaboration of guidelines of various kinds in nuclear safety. Its annual *Nuclear Safety Review*, he said, could be "open and dispassionate" because the industry's safety record has been very good.

He cited several particular areas of progress. Three reviews have now been completed by the Agency's Operational Safety Review Team (OSART), which was set up last year. Additionally, IAEA's Incident Reporting System (IRS) now has the full or partial participation of more than 20 Member States. Moreover, the Agency is now active in the preparation of guidelines aimed at facilitating mutual assistance among Member States in the event of a nuclear accident or radiological emergency – including co-operation between Member States when such incidents occur in border areas.

A most successful activity, he said, has been the Agency's development of regulations for the safe transport of radioactive materials. An important updating and revision of IAEA's recommended regulations was completed during 1984 and will be published soon in the Safety Series. (See *News in Brief* in this issue).



Dr Blix addresses the plenary.

Dr Blix also pointed out that the Agency is assisting Member States to implement the Basic Safety Standards for Radiation Protection, which are jointly sponsored by IAEA, ILO, WHO, and NEA. The Standards – updated in 1982 to implement the new system of dose-limitation recommended by the International Commission on Radiological Protection – have not yet been fully incorporated into national practices of Member States, particularly where there is a shortage of trained radiation protection personnel. Moreover, some Member States do not yet have effective mechanisms for promulgating standards and regulating practices involving the use of ionizing radiation.

IAEA assistance to Member States is aimed at avoiding serious accidents caused by erroneous handling of radiation sources used in medicine and industry, events that might undermine public confidence in nuclear activities. Agency assistance includes sending radiation protection advisory teams to Member States on request to help identify potential or existing problems and to help draw up plans for solutions. Teams will consist of people with expertise relevant to a wide variety of radiation protection measures – ranging from regulatory to technical preventive and emergency measures – and will cover all uses of radioactive materials and other sources of ionizing radiation in a country.

Nuclear waste management: building confidence

Although waste management remains a highly emotional issue in several countries, Dr Blix drew some positive signs from the debate. “Public concern has had a positive effect in prompting utilities and atomic energy authorities to work out policies and plans for the long-term disposal of nuclear wastes,” he said.

“It is lamentable, however,” he added, “that legitimate concern has sometimes been replaced by

politically or emotionally motivated obstructionism directed against any activity relating to the nuclear fuel cycle, including steps to find suitable repositories for nuclear wastes. I remain optimistic that, in the long run, the environmental advantages of nuclear power will be generally recognized.”

To help increase public confidence, international codes and standards might be needed, he said. More than a third of IAEA’s Safety Series documents already deal with various aspects of radioactive waste management, and work has begun on a comprehensive report on policies and proposals relevant to underground disposal of highly radioactive wastes, with the aim of highlighting areas of agreement as well as issues needing resolution.

As useful general guidance on safety matters, the Secretariat is nearing completion of a Code of Practice on the Management of Radioactive Waste from Nuclear Power Plants for issue as a Safety Series document. The Code defines minimum requirements for the design and operation of systems involved in the management of wastes produced at nuclear power plants, and it is expected to be a valuable document for Member States, especially those just embarking on nuclear power programmes.

Safeguards: gains outweigh costs

The Director General emphasized several aspects of international safeguards that should not be overlooked.

While the organization and administration of the Agency’s safeguards system continue to provoke discussion among Member States, Dr Blix noted that “safeguards are not an end in themselves.” They exist, he said, “to enable States to create confidence in their respective regions, and the world at large, that all nuclear

activities which they have placed under safeguards are being conducted without any diversion of fissionable material."

Discussions of safeguards, he stressed, "should not be allowed to undermine the broad support which exists for the only international verification system which has so far seen the light of day in the nuclear field."

Safeguards costs, he said, are "relatively small" in view of "the vital interest" that the world has in having a verification system that functions well and provides confidence. "I would also submit," he added, "that if we are to err in our ambitions, it would be wiser to set them a bit too high than a bit too low."

Dr Blix also underlined that IAEA safeguards are based directly on the Agency's Statute, even though most safeguards agreements with IAEA are concluded pursuant to obligations entered into by States parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the Tlatelolco Treaty. It should not be overlooked, he said, that a State so wishing can, through a bilateral agreement with the Agency, commit

itself to safeguards verification that all its present and future nuclear activities are for peaceful purposes.

Regarding the Soviet Union's voluntary offer to submit some nuclear installations to safeguards, Dr Blix reported that negotiations are proceeding well and that an agreement is in sight. "Such an agreement," he stressed, "is most welcome, not only because it will broaden our safeguards experience, but also because it will strengthen the precedent of verification measures being carried out in nuclear-weapon States."

With respect to nuclear trade, the Director General urged "tangible progress among the nuclear-weapon States toward nuclear disarmament." This would, he said, "increase support and understanding among non-nuclear-weapon States for conditions and restrictions which aim at ensuring horizontal non-proliferation." Secondly, he added, "there needs to be an increased awareness that, frustrating and frightening as the current failure in the field of nuclear disarmament is, it is in no way a reason for relaxing efforts, which are really in the interests of all, to prevent a further spread of nuclear weapons."



**NEW IAEA BOARD OF GOVERNORS
for
1984-85**

Argentina	German Democratic Republic	Morocco
Australia	Germany, Federal Republic of	Nigeria
Austria	Greece	Norway
Belgium	Hungary	Peru
Brazil	India	Philippines
Canada	Indonesia	Syrian Arab Republic
Chile	Iraq	Tunisia
China	Italy	Union of Soviet Socialist Republics
Cuba	Ivory Coast	United Kingdom of Great Britain and Northern Ireland
Ecuador	Japan	United States of America
Egypt	Jordan	Yugoslavia
France	Malaysia	

The 28th Regular Session of the General Conference unanimously approved the addition of one seat to the Board, bringing the total number of members to 35.

The General Conference, held 24-29 September 1984, also elected 11 Member States for a period of two years. They are: Argentina, Ecuador, German Democratic Republic, Greece, Indonesia, Ivory Coast, Jordan, Malaysia, Morocco, Norway, and Peru.

Elected as Chairman for 1984-85 by the newly constituted Board was Ambassador Mohammed El-Taher Shash, the Governor from Egypt. The new Vice-Chairmen are Ambassador John Kelso of Australia and Ambassador Georg Sitzlack of the German Democratic Republic.

“Fruitful international co-operation”

Sessions mark 20-year bond of atoms for food and agriculture

To mark what one speaker described as “two decades of fruitful international co-operation,” several hundred scientists, delegates, and journalists attended special exhibits and lectures during IAEA’s 28th General Conference that reviewed – and in some cases demonstrated – how countries are effectively applying nuclear technologies in food processing, agriculture, and pest control.

Specially featured was a scientific afternoon to commemorate the 20th anniversary of co-operative efforts in these fields by IAEA and the Food and Agriculture Organization (FAO), a partnership exemplified by the joint programme they established in 1964 to assist countries in using nuclear techniques for food and agricultural development.

In addition to exhibits and displays staffed by Agency experts, three distinguished scientists presented lectures focusing on specific nuclear applications – to control pests threatening crops and public health, to improve plant and animal productivity, and to preserve food.* Highlights of the papers follow:

“The Use of Induced Genetic Sterility for Insect Control,” by Dr Thomas Odhiambo, Director of the International Centre of Insect Physiology and Ecology (INCIPE) in Nairobi, Kenya.

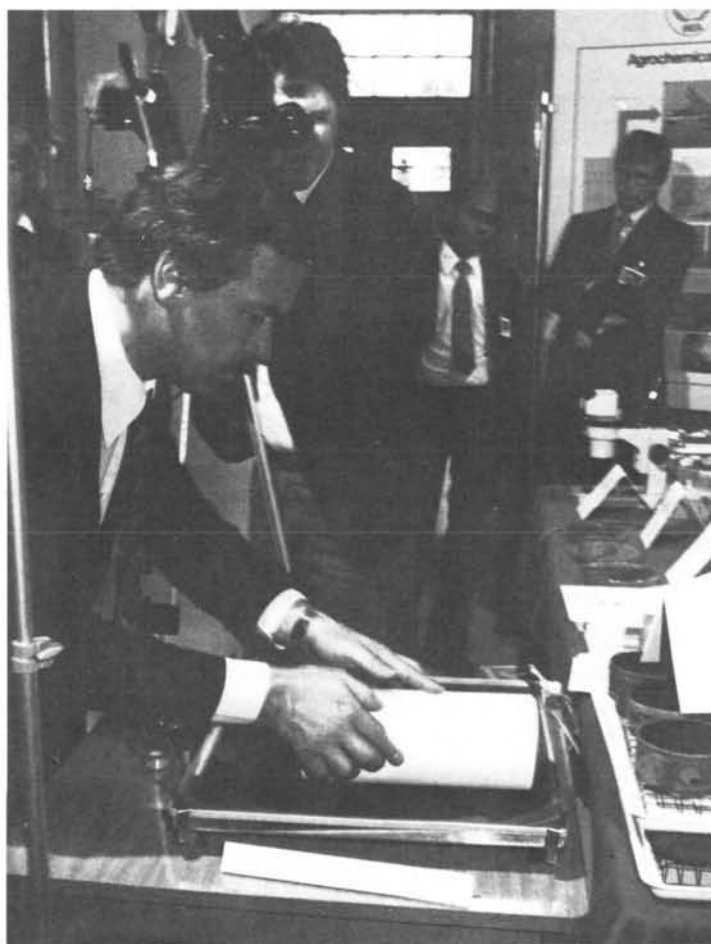
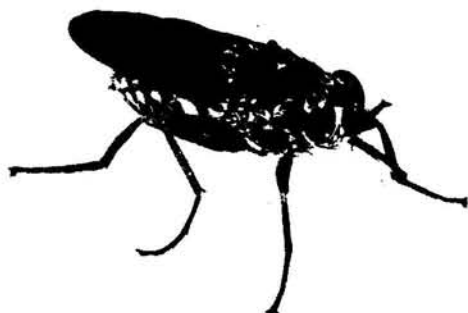
Despite repeated attempts to control insects, food losses from tropical pests in Africa remain extremely high, amounting to 42 to 43% of potential crop production, Dr Odhiambo reported.

Although some single methods – such as pesticides – have held great expectations, they have fallen short of hopes for various reasons, including environmental concerns and insect resistance, he stated.

In his view, the approach known as Integrated Pest Management (IPM) is “the way open in the future for effective, long-range, ecologically acceptable pest control.” IPM is a co-ordinated approach that essentially seeks to maximize gains from naturally

* Copies of the three scientific papers are available from IAEA’s Division of Public Information, P.O.Box 100, A-1400 Vienna, Austria.

A “live” scientific exhibit from the Agency’s Laboratory at Seibersdorf, Austria, vividly illustrated insect and pest control projects and drew high media and delegate interest at the Conference. Here, tsetse flies – tropical pests that normally feed on humans and animals and cause sleeping sickness – are fed blood through artificial skin to demonstrate lab-rearing techniques developed at Seibersdorf. Reared by the millions, male flies (below) are later sterilized by ionizing radiation, then released in infested areas to serve as roaming birth-control agents, thus curbing the threatening fly population.





After his lecture, Dr Odhiambo was interviewed by IAEA's film crew.

operating population regulators (such as predators and parasites), selective use of insecticides, and effective monitoring and surveillance. Upon such a foundation, he said, newer methods – such as genetic control mechanisms – can be “superimposed” for greatest benefit and assurance of crop and animal protection.

In reviewing genetic control methods, Dr Odhiambo saluted the work of the Joint FAO/IAEA programme in developing the Sterile Insect Technique (SIT), which uses radiation sterilization to curb pest populations. SIT successes over the past decades, he noted, include control of screwworm (in Curaçao, the Southeastern United States, and Mexico), the Medfly (in El Salvador and Mexico), and the oriental fruit fly (in Guam and Okinawa).

The technique has proved most effective, he said, under certain preconditions and when used mainly as a preventive pest control measure.

Recently, he said, the use of SIT to control the tsetse fly in Africa has shown positive results, despite facing special scientific and technological problems. In particular, he noted three SIT projects in Tanzania, Nigeria, and the Central Guinea Savannah zone of Burkina Fasso, all of which involve the Joint FAO/IAEA Division.

In summarizing the use of SIT for tsetse control, Dr Odhiambo described the technique as “environmentally acceptable” and “species specific” and as one that “can be stretched in time to operate on an area-wide basis, can be used as a quarantine measure, and is most effective at low or very low population density levels.”

Although questions remain for ongoing work in research and development, SIT “is already proving highly cost-effective and is gaining an edge over conventional tsetse control,” he stated.

“The Use of Nuclear Techniques to Increase Plant and Animal Productivity,” by Dr M.S. Swaminathan, Director General of the International Rice Research Institute (IRRI), Los Banos, Philippines.

In reviewing selected applications of nuclear techniques for crop development, Dr Swaminathan pointed out that radiation breeding has helped improve production around the world. Specifically, he cited IAEA data to note that “336 improved cultivars of cereals, other grain crops, vegetables, forage crops, fruits and industrial crops, and more than 250 ornamentals” have been released for cultivation in more than 33 countries.

He commended the co-operative role of the Joint FAO/IAEA Division in bridging atomic energy and agricultural research – generating what he described as a “symbiotic interaction” beneficial to many countries – and in developing nuclear tools that have become “valuable supplements” to conventional methods.

Dr Swaminathan referenced extensive scientific research in radiation mutation breeding to achieve various desirable traits, including reduced maturity time, increased resistance to disease, expanded varieties, and greater yield. Among examples he cited were new varieties of rice successfully introduced in Burma and California, USA, showing improved yields, and a new variety of castor bean that matured in 120 days rather than 270 days, thus enabling India to harvest the crop before the dry season.

Regarding efforts to increase overall grain production, radiation-induced mutations hold potential to widen the genetic base and to identify new genes for semi-dwarfness in rice and wheat varieties, Dr Swaminathan stated. “The commercial cultivation of varieties dependent on a single gene could lead to genetic vulnerability to diseases and pests,” he said.

The productivity of modern semi-dwarf and high-yielding rice varieties also could be enhanced further, he said, through nuclear techniques. Specifically, they would be useful to identify parents with superior photosynthetic characteristics.

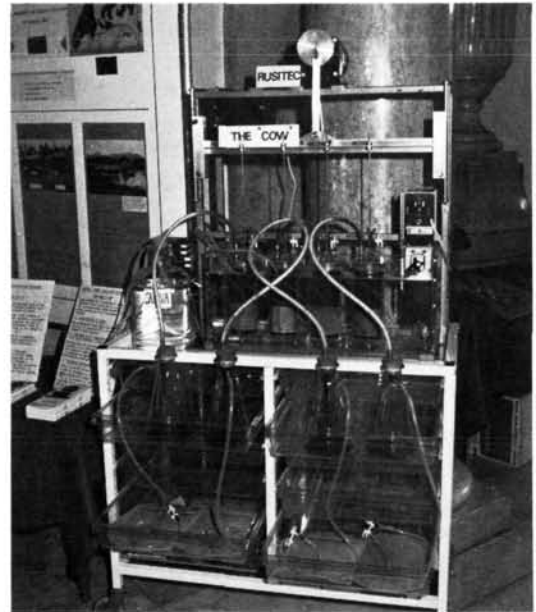
For gene transfer, he reviewed a number of specific irradiation techniques under research at various institutes and laboratories, including IRRI and IAEA’s laboratory in Seibersdorf, Austria.

Dr Swaminathan also explained the vital role of radioisotopic tracers in other areas of plant productivity. These include using isotopes to improve the efficiency of fertilizer and pesticide use, to better understand nitrogen fixation, and to improve irrigation water management.

Animal productivity. Nuclear techniques are being used to improve animal productivity – namely, meat and/or milk output – in three basic ways, Dr Swaminathan reported, referencing efforts of the



Another Conference "working lab" exhibit from the Agency's Seibersdorf Laboratory demonstrated *in-vitro* plant breeding techniques (top). Over the years, scientists have successfully used radiation to breed improved varieties of crops and plants that today are being harvested in dozens of countries. Below, Mr Bjoern Sigurbjoernsson, Director of the Joint FAO/IAEA Division, briefs Directors General Saouma of FAO (right) and Blix of IAEA (center) on RUSITEC – a Seibersdorf Laboratory "cow" used in isotope tracer studies to improve animal nutrition. Serving as an artificial digestive system, the machine (front view at right) enables researchers to monitor rumen functions and study the breakdown of low-quality feeds, thereby helping them develop ways to enhance nutrition and minimize feeding costs.



Joint FAO/IAEA Division and others. These are to improve reproductive efficiency, the nutritive value of feeds, and disease control.

In many developing countries, animal productivity is low, he noted, even though developing countries as a group have the largest proportion of the world's live-stock (65% of cattle, 51% of sheep, 94% of goats, and almost all the world's buffaloes).

For improving livestock reproduction, radioimmunoassay (RIA) and related techniques have proved to be "very successful" tools in studies of cattle, buffalo, sheep, and goats, he said. RIA requires only a small amount of blood or milk "without administration of radioactive substances to the animal," he noted, with samples sometimes collectable by farmers themselves. Progesterone, the reproductive hormone, is measured. Sexual maturity, oestrus, and pregnancy thus can be monitored accurately and methods devised to improve reproductive efficiency, he explained.

To improve animal nutrition, radiation is being used to make feeds more digestible and to reduce pathogenicity in waste products, while radioisotopic tracers are "ideal" for studying animal digestive systems, he reported.

He described isotopic techniques as "unique" for measuring the rates of production of volatile fatty acids and the rates of synthesis of microbial matter in the rumen – "the major sources of energy and protein for the host animals."

A key emphasis, he reported, is to increase the nutritional value of low-quality local feeds, such as straw or forage, common in developing countries. He briefly noted results in several countries, including Korea, Peru, the Philippines, and Sri Lanka.

Animal health and disease control also are benefitting from nuclear techniques used in conjunction with standard parasitological and immunological methods, he said. In particular, the techniques use radiation-attenuated organisms as potential vaccines against parasitic infections; labelled substances in immunoassay tests to diagnose infections; and radiation and radioisotopes to study animal immune responses to parasites.

He noted "significant progress" in controlling parasitic infections using vaccines. In India, a vaccine against lungworm infection in sheep has been developed and further studies are being conducted in Argentina and Ethiopia. In Sudan, "encouraging results" with vaccine development is helping control schistosomiasis in cattle. Control of babesiosis, a tick-transmitted disease, also is being advanced with irradiated vaccine, he said, since "irradiated parasites are not transmitted by tick vector and thus cannot revert to virulence." Previously, the disease was controlled mainly with drugs or pre-immunization.

"Progress in Food Irradiation," by Dr Dick de Zeeuw, Director General, Agricultural Research, Ministry of Agriculture and Fisheries of the Netherlands.

While some barriers still remain, food irradiation is gaining increasing acceptance among food and health authorities as an effective method to safely preserve food, reduce food losses, and enable wider distribution of otherwise perishable items, such as seafood, Dr De Zeeuw reported.

Given the extent and urgency of annual world food losses in developing regions – up to 50% of cereals and seeds in Latin America, 60% of grains and beans in Africa, and 30% of grains, potatoes and onions in India – food irradiation holds far-reaching benefits to extend food supplies, he said.

Nearly all countries in South and Southeast Asia, he said, are "greatly interested" in the process, expressing special concern for improving fish preservation by irradiation. Economic advantages, improved food trade, and reduction of health hazards are prime motivating factors, he added.

He noted that studies have shown that food irradiation could be competitive with conventional methods. Irradiation's unit cost is only a few per cent of the value of the product treated, he reported, citing work done at the International Facility for Food Irradiation Technology (IFFIT), which is jointly supported by FAO, IAEA, and the Netherlands.

Although capital costs for food irradiation facilities are high, labour and energy requirements are low, he said. Irradiation of potatoes and onions, for example, requires about 16 times *less* energy than refrigeration of those vegetables over the same storage time, he said.

He emphasized that the wholesomeness of irradiated foods is no longer at issue. International food and health authorities, he noted, have concluded that irradiated foods (exposed to an overall average dose of up to 10 kilograys) are safe for human consumption, neither presenting toxicological hazards nor introducing special nutritional or microbiological problems.

To facilitate commercialization, general standards for irradiated foods also have been adopted by the Codex Alimentarius Commission, which encompasses 122 member countries. Under these standards, food processed by irradiation will be subject to general food regulations applicable to any other food.

Dr De Zeeuw noted there has been "considerable" regulatory progress in many countries and a "renewed" interest in food irradiation among commercial companies, associations, and governments.

While commercial applications have increased, barriers still exist relating to required legislation, consumer acceptance, and the lack of realistic economic and technological feasibility studies by the food



After the scientific lectures, Directors General Saouma of FAO (left) and Blix of IAEA (center) were among the dozens sampling irradiated foods at a featured "international" buffet: Bangladesh and Indonesia supplied irradiated shrimp and froglegs, while Japan sent potato chips made from irradiated potatoes. Also on display (top photo) were irradiated mushrooms, onions, potatoes, and strawberries from the Netherlands. Flanking the food were orchids from Thailand that had been irradiated for insect control.

industry. He commended efforts of IFFIT to overcome such obstacles, and specifically cited activities in research, training, and technology transfer, noting that 50 projects have been presented over the past five years.

He urged continued support of such work in calling for strengthened international co-operation to broaden

practical applications. Positive signs of collaboration, he noted, were the May 1984 formation of the International Consultative Group on Food Irradiation by Member States of FAO, IAEA, and WHO, and the more recent formation of a scientific consultancy group by the European Society of Nuclear Methods in Agriculture.

Nuclear safety panel

Experts see further improvements ahead

Even as the world's 300-plus operating nuclear power plants are maintaining an industrial safety record second to none, several developments carry the potential for further improvements ahead, based on the general views of top international safety experts who participated in an open panel discussion during IAEA's General Conference.

The panel included 30 senior safety officials from 23 IAEA Member States where nuclear power is playing an important role in energy production and planning. Among them were Mr Nunzio Palladino, Chairman of the US Nuclear Regulatory Commission, as well as Mr Yevgeny Kulov, Chairman of the USSR State Committee for Nuclear Safety and Supervision, and Mr Jiang Shengjie, Director of China's National Nuclear Safety Bureau.

The meeting, which brought the world's leading nuclear regulators together for the first time, was not intended to produce particular conclusions. Rather, its main purpose was the informal exchange of views on important safety topics and the strengthening of contacts, since major safety decisions in one part of the world undoubtedly have repercussions internationally. Such meetings are intended to become a regular feature of future Agency General Conferences.

On the Agency's proposal, attention was focused on several specific issues drawing well-defined research and development efforts and that, together with accumulating operating experience, carry potential to enhance safety. Among topics of attention:

Source-term studies. Of considerable interest ever since the accident at Three Mile Island in the USA in 1979, source term refers to the amount, timing, and type of radionuclides that might be released into the environment during severe types of nuclear plant accidents. There is not one standard source term, but rather a variety of terms depending on the specifics of the accident scenarios. Participants seemed to share views summarized by Mr Palladino of the USA and Mr H.P. Bochmann, Head of the Ministry of Interior's Department of Safety of Nuclear Installations in the Federal Republic of Germany, that the source-term issue has more relevance for consideration of severe accidents than of traditional design-basis accidents. Based on work being done, a reduction of radiation release data by a factor of 10, even more under certain conditions, can be assumed. The influence of containment design was underlined, since the time of containment failure is the most important factor in determining any off-site consequences. Consensus surfaced that improved source-term definitions do not require major design changes, and that more data are needed before any major regulatory revisions can be

considered. The studies hold key importance, it was noted, for emergency planning purposes. Stressed was the Agency's role in organizing an international exchange of information on the topic, and in assessing the wealth of material originating from many research programmes for its applicability to rulemaking, as further ways of supporting countries with small nuclear power programmes.

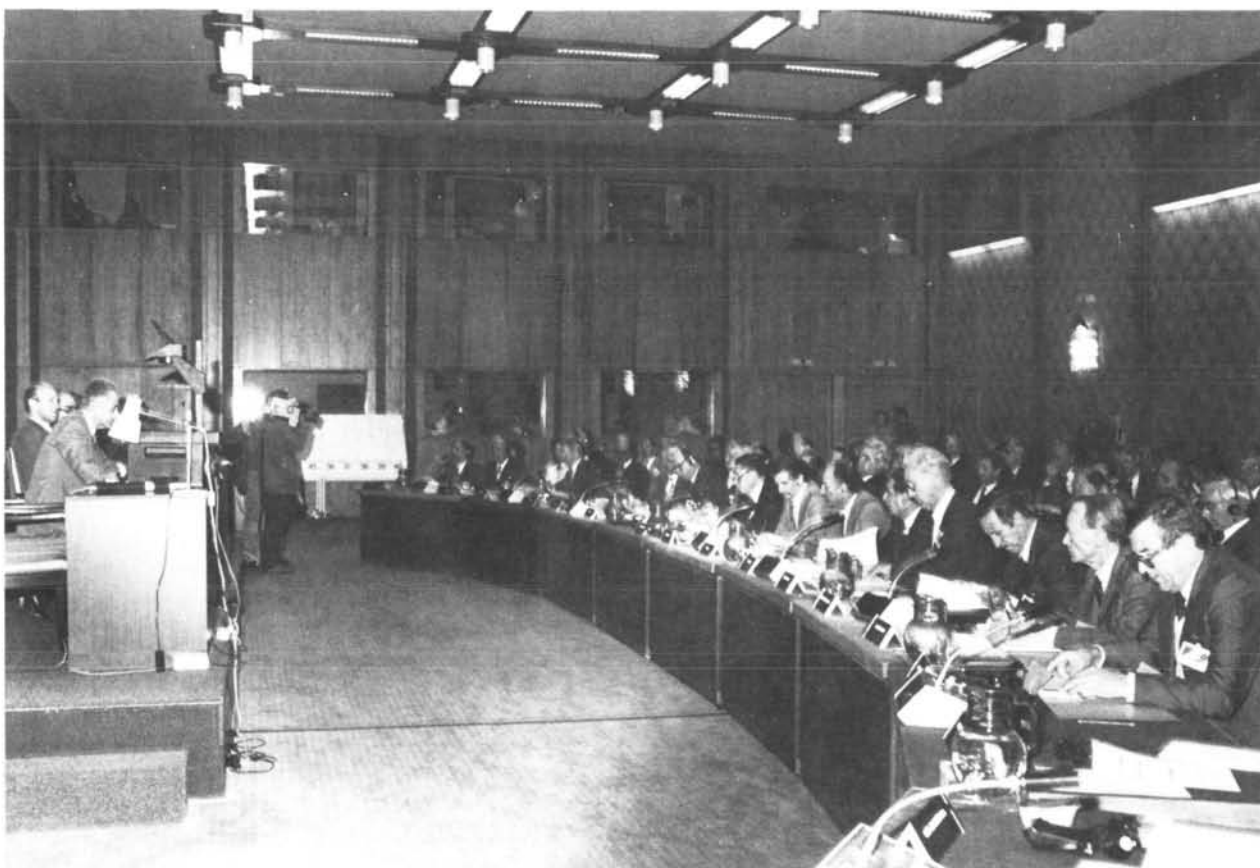
Probabilistic risk assessment (PRA). Positions varied little on this topic. In their summaries, Mr Z. Domaratzki, Director General of the Reactor Regulations Directorate in Canada's Atomic Energy Control Board, and Mr P. Tanguy, Director of France's Institute of Nuclear Safety and Protection, emphasized that PRA techniques are not new, and that probabilistic elements always are part of deterministic judgements. PRA techniques, then, are properly regarded as an additional tool to existing methods. Their main application is still seen in design reviews to identify weaknesses, for example in electrical systems. They also may be used as an aid when deciding backfitting requirements and when assessing priorities of research projects. Further improvements of PRA techniques are expected from the continuous checking of results against the accumulating experience in the operation of nuclear power plant equipment.

Standardization. Although standard plant designs hold some drawbacks since a deficiency in one unit affects all others, standardization generally is seen as a positive influence on nuclear safety. In particular, it was stressed that safety concerns once identified can be quickly remedied for the entire series of units, and safety reviews can more easily draw upon past experiences.

International co-operation. Improving mechanisms for exchanging operating information worldwide, such as IAEA's Incident Reporting System (IRS), are regarded as important components of safety management, it was noted. They serve to establish centralized data bases and communication networks strengthening global co-ordination of safety analysis and awareness of serious safety issues.

Station blackout. According to experience reported by Mr J. Beranek, General Inspector for Nuclear Safety in Czechoslovakia, and Mr M.R. Srinivasan, Chairman of India's Nuclear Power Board, station blackout is not a major safety concern, at least for reactor units up to 600 megawatts, whose existing systems can overcome the problem. The extended loss of all on-site and off-site power is a very low-probability event, it was noted. Studies are ongoing, particularly for larger reactors, while improved diesel generator reliability and operator training also are contributing to better future management of the problem.

District-heating plants. Among new trends in nuclear power are dual-purpose plants providing both electricity



Convening at an open panel discussion, international nuclear safety experts pointed to several initiatives holding potential to improve the industry's good safety record in years ahead.

and steam for heating and industrial needs. (See separate articles in this issue). Mr Kulov, Chairman of the USSR State Committee for Nuclear Safety and Supervision, offered a perspective on plants under construction at Gorky and Voronezh. Due to siting in metropolitan areas, additional safety features were developed to cope with even remote events, such as damage to major vessels, aeroplane crashes, and chemical explosions. A vessel/vessel design was adopted to prevent any core melting, major components were integrated, and large diameter pipes were eliminated. The emergency core-cooling system has three independent loops, and there are no safety valves on the primary circuit. Two different types of containment are used – a reinforced above-ground building and a partly submerged building for protection against external events. A three-circuit design prevents the escape of radioactivity to the customer in the event of primary-circuit leakages.

Approach in China

Also drawing interest was the Chinese approach to nuclear safety, which was reviewed by Mr Shengjie, Director of China's National Nuclear Safety Bureau, which is the central regulating body. Main emphasis is

being placed on making the Bureau fully operational, developing safety codes and guides (based on IAEA's NUSS programme), studying advanced safety evaluation techniques, and co-ordinating nuclear safety research in the country. Additionally, he noted that co-operative agreements that include matters of nuclear safety have been concluded with Brazil, France, the Federal Republic of Germany, and the United States.

How safe is safe enough?

One question propelling the discussion was whether existing nuclear plants are safe enough. Apparent from the general discussion was that nuclear safety has achieved a high level and that no dramatic changes in approach, or in design, were required. However, steps to consolidate achievements and to exchange experiences and overall research results can be expected to widen safety margins.

Caution was expressed in determining backfitting requirements, to avoid changes or modifications that could prove counterproductive to overall safety. In general, valuable future gains could be expected to come from continuing operating experience and well-defined research and development efforts.