A worldwide network for scientific co-operation

A review of the growing role of IAEA's research contract programme

by Christopher Taylor

When the IAEA was set up in 1957, one of its main purposes was to help researchers throughout the world to use the new radioisotope techniques. National atomic energy authorities were already promoting these in their own countries. The Agency carried this a step further, bringing training and technical aid to research institutes in all its Member States.

Since that time, assistance worth more than US $225 million has been provided through the Agency's programmes. More than 14 000 people have been trained in subjects related to nuclear science, or through the award of fellowships, or by taking part in training courses or study tours. Scientific equipment worth more than US $100 million has been supplied and some 4000 experts have been sent out as advisers or lecturers.

In parallel with this massive programme, a more modest type of self-help has been developed. This grew out of interaction between technical people working in the Agency and researchers in its Member States. From this has come a worldwide network of research co-operation.

Responding to problems in the field

During the early period of the Agency, there were many problems in the field that had received insufficient attention, and a "contract" procedure was developed to encourage research work. This became known as the Agency's research contract programme. Initially, the problems lay mainly in fields associated with nuclear power, such as waste disposal or reactor safety, and the main "contractors" were institutes in the advanced countries.

With the growth of the radioisotope programme, however, emphasis shifted towards laboratories in developing countries and was directed towards isotope applications in fields of special interest to them. Thus, work in the agricultural and life sciences now makes up more than half of the Agency's research contract programme.

The value of a contract in this programme is quite modest — between US $5000 and $10 000 per year — with a typical contract running for 3 to 5 years. The money may be spent on equipment and supplies, or used for hiring staff. Topics are either proposed by a research institute or suggested by the Agency. Information about the programme is disseminated through a news sheet sent annually to the atomic energy authority in each Member State.*

Growth of the network

During the 1960s, the advantages of organizing these contracts into some form of network became apparent. The Agency began to award contracts in similar terms to 10 or more institutes, often in the same geographical region, and to organize regular meetings, usually every 18 months, in one or other of the participating institutes to enhance co-ordination between research teams.

An important element in each such group was the inclusion of some institutes in advanced countries. With these a research agreement, rather than a research contract, was drawn up. A research agreement carries no funding, except for travel to the co-ordination meetings. Its primary purpose is to bring expertise into the network, and at the same time it offers the advanced institute a widening of horizons that can be of great value.

The IAEA is co-ordinating more than 100 such programmes, engaging some 900 research teams. About two-thirds of these hold research contracts and the remainder hold research agreements (see chart, page 48). These Co-ordinated Research Programmes (CRPs) form a strong research network that is a most effective vehicle for the transfer of knowledge and experience.

The total annual cost of the scheme is about US $4.5 million, of which $3.5 million comes directly from the Agency's budget and the rest from contributions by individual Member States electing to act as donors for specific parts of the programme.

Backing up the scheme is the Agency's Laboratory at Seibersdorf, near Vienna, Austria, where a staff of 30 scientists with technical support provides a base for the programme. Here methodology is developed, equip-

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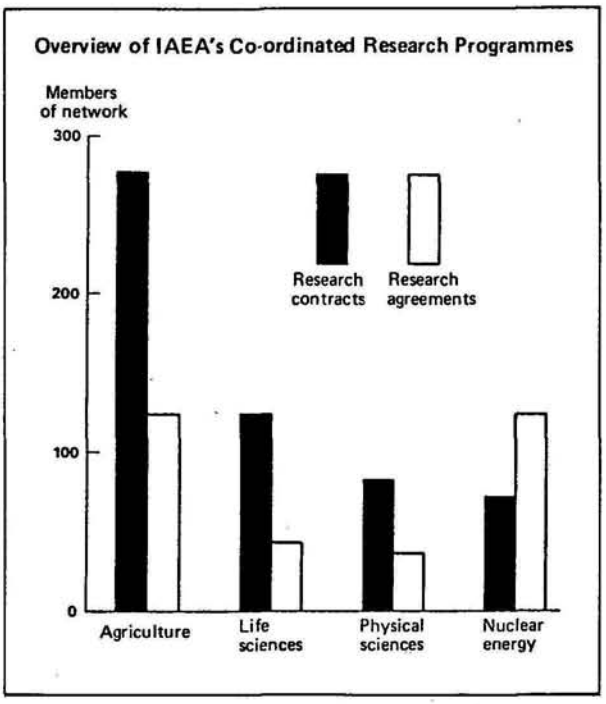
* Copies of news sheets are available by writing to the Agency's Contracts Administration Section, Department of Research and Isotopes.



ment is prepared, and scientists can come for training. Without this laboratory, which is unique in the United Nations system, the scheme would be much weaker and it would be very difficult to maintain the continuity necessary in research programmes lasting several years.

Networking in various fields

Co-ordinated Research Programmes are running in various fields. Agriculture heads the list with 40 programmes, 280 contractors, and 123 agreement holders.

There are good reasons why networking has become so popular in agricultural research. A new strain or method may be developed in a major research centre, but adaptation is often necessary for the conditions of soil, climate, and social structure in each country where it will be used. This is work for local agricultural research stations, of which there are several hundred in the developing countries. Networking on a regional basis is a very good way to reduce the isolation of staff at these stations.

Crop modification using mutation breeding is the objective of several of these programmes. Examples are improved grain legume production in Southeast Asia (9 contracts, 2 agreements), and improvements in oil seed crops in Latin America (7 contracts, 2 agreements). Development of skills in methodology, for example in tissue culture techniques, can be an important part of these programmes.

Nitrogen fixation, and economy in the use of nitrogen fertilizers, are studied using the stable isotope nitrogen-15. Methods of isotopic analysis developed in the Agency's Laboratory are used. During the early stages of a programme, before all contractors are equipped for this type of analysis, plant samples may be sent to the Laboratory for assay. Several thousand such service analyses are done each year. Contractors may spend some weeks working at Seibersdorf during this period, learning analytical techniques.

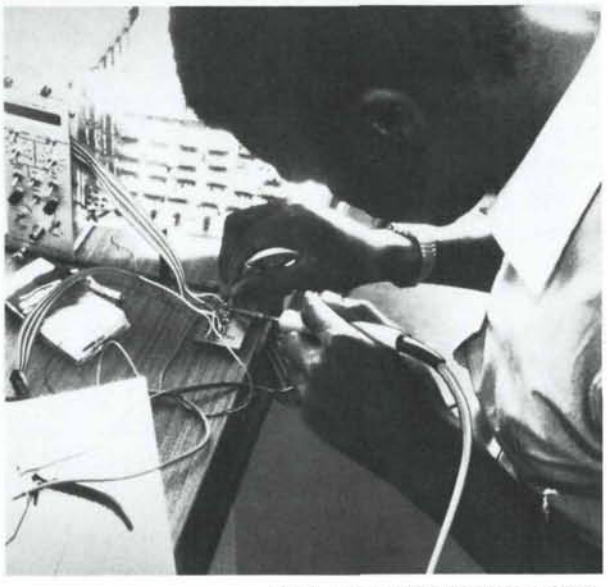
The rate of production of farm animals can be optimized by studying their reproductive cycle. Radioimmunoassay (RIA) is an effective way of doing this. One CRP applies this method to the production of buffalo in Southeast Asia, using radiolabelled materials dispensed at Seibersdorf and dispatched to the research contractors. Animal diseases, and the fate of therapeutic chemicals in livestock, also are studied by this method.

A specialty of the Agency's Laboratory is pest control by the sterile insect technique, in which large numbers of insects are reared and sterilized before being released to mate with the pest population. One CRP relates to the control of the tsetse fly by this means. Another seeks to develop, by genetic manipulation, strains of fruit fly in which only male insects are brought to maturity. Only the males are required for pest control, and suppression of the females brings important practical advantages.

Several CRPs are concerned with pollution of the environment and the effects of residual agrochemicals in food. Radiolabelled compounds are used to study chemical degradation in natural systems, in studies aiming to minimize the quantities of agrochemicals that must be used.

A similar concern for trace element residues underlies several medically-oriented programmes. Problems in nutrition and occupational health are being studied. Other programmes relate to the use of radiation to sterilize medical products or to extend the storage life of food. Others are investigating aspects of radiotherapy.

At Seibersdorf, training is given in construction and repair of electronic circuitry. (Credit: J. Daglish, IAEA)



Plant breeding: Work at Seibersdorf's glasshouse.
(Credit: J. Daglish, IAEA)

The frequent breakdown of electronic equipment is a hindrance to the use of advanced techniques in developing countries. Erratic electric supply can be very damaging to microprocessor-based equipment. Investigation of the pattern of instrument failure was the subject of an important CRP in Southeast Asia, and it gave rise to others designed to introduce better repair and maintenance procedures. This is networking not for research, but for improving the infrastructure on which research depends. The success of such a programme can lead to a local repair network centred on a national service centre, which may typically be in a national atomic energy research establishment.

Last in this brief review comes the central science of atomic energy: nuclear physics. CRPs bring together users of research reactors, providing an impetus towards better reactor management, improvements in instrumentation, and better methods of radioisotope production. In particle physics there are programmes for measuring and evaluating nuclear and atomic data, and for developing the relevant instrumental and measurement techniques. A start is being made in plasma physics.

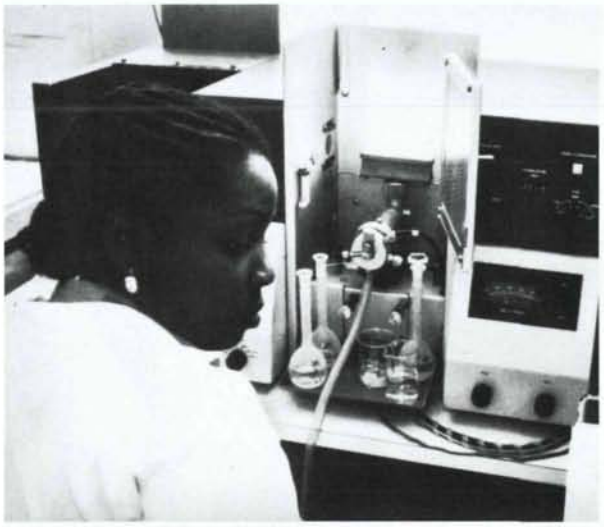
Broader mission has evolved

The breadth of subject matter covered by these programmes shows that the Agency has moved forward from its original task (to promote radioisotope techniques) and now has an altogether wider mission. In doing so, it is following a route developed by many national atomic energy research centres, some of which now contribute very broadly to the application of advanced techniques in their countries. They began with radioisotopes and radiation, but now they make available their many other skills, putting these at the service of government, research institutes, and industrial concerns.

These skills include modern methods of trace element analysis by various instrumental means; microprocessor techniques applied to measurement problems; and quality control, including non-destructive testing. Thus, skills developed to support nuclear industry now are applied in other fields as well.

Common to many of the programmes described here is a need for accurate measurement of some parameter that requires work with the sophistication of a research laboratory if the measurement is to be meaningful. Equipment that was originally developed for scientific research now is available in commercial form, often partly automated, but to use it well still requires a disciplined research approach. This is so for analytical apparatus used in pollution studies, or for on-line analytical systems for industry, or in studies of fertilizer utilization in agriculture. It is the flexible scientific approach of the nuclear research establishment, not just its use of radioisotopes, that the Agency's CRPs now make available for national development.

It is characteristic of the networking described here that it can help small research teams, or even individual research workers, with a flexibility hardly possible in larger schemes. Bureaucratic procedures are kept down, quick adaptations can be made. An idea picked up at a scientific conference can quickly be developed into a topic for a CRP, and the modest funding necessary to create a new branch of the network can soon be mobilized. People who have taken part in one programme are a frequent source of ideas for another.



Testing to determine heavy-metal pollution in rain-water samples. (Credit: J. Daglish, IAEA)

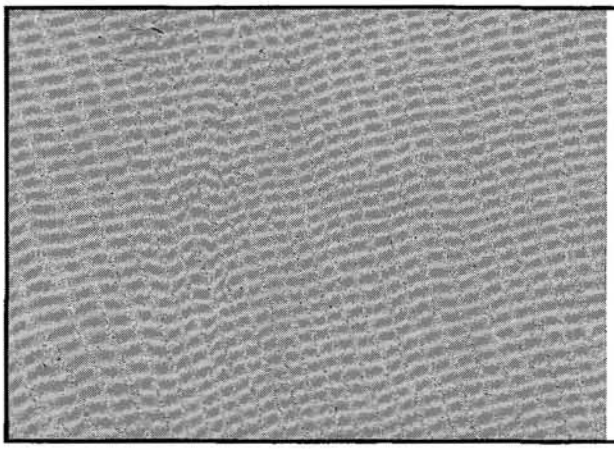
The management of such a network needs a combination of scientific and administrative skills. The IAEA was fortunate in that it already had staff who were used to administering the larger, more formal types of technical aid, and were ready to formulate contracts, hire experts, buy equipment, arrange meetings, and so on. The Agency's information services print and distribute proceedings of meetings.

New avenues of co-operation

The simple idea that underlay the creation of the Agency's research network was the realization that the disciplined form of a contract, expressing clearly what is to be done in return for a stated payment, could be adapted to build up a flexible programme of assisted research. A contractor entering the network knows exactly what is expected of him, and is assured of modest financial support, within the time span of the programme, as long as he continues to contribute towards its stated goal. Part of his commitment is to produce regular research reports. These are opened to criticism and comment at the co-ordination meetings, which are an essential part of the scheme.

The other contracting partner, the Agency, provides an administrative secretariat, and its technical officers co-ordinate the scientific work. Their newsletters announce proposals for further networking, inform participants of developments at the Agency's Laboratory, and report on results obtained. Some members of the Agency's technical staff first came into international work through the network itself, taking part in its activities while still working in their home laboratories.

The IAEA's research contract programme is an effective form of networking that offers many opportunities to researchers in developing countries. Operating in parallel with other forms of technical aid, it is creating new avenues for worldwide co-operation.



Cost of service

Initiation of IDAS has met positive official response from many Member States, and a number of facility operators have shown interest in participating. Service provided under the agreement has been well accepted by participants, and so far no problem has arisen on either organizational or technical aspects.

So that interested facilities may better test the usefulness of IDAS, the Agency has decided to extend its cost-free operation until the end of 1986. Accordingly, from January 1987 onwards, the Agency will introduce charges to recover part of the costs incurred for provision of the service. The cost for participants at each dose check would be about US $100.

Further information about the programme may be obtained by contacting the IAEA Dosimetry Section, Division of Life Sciences, A-1400 Vienna, Austria.