INIS TODAY

AN INTRODUCTION TO THE INTERNATIONAL NUCLEAR INFORMATION SYSTEM

International Atomic Energy Agency, Vienna, 1979
For further information about INIS write to:

The Director
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International Atomic Energy Agency
P.O. Box 590
A-1011 Vienna, Austria

or contact your national INIS Liaison Officer, whose address appears at the end of this booklet.
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GENERAL INTRODUCTION TO INIS

WHAT IS INIS?

The acronym INIS stands for International Nuclear Information System. INIS was planned and is operated by the International Atomic Energy Agency (IAEA) in collaboration with its Member States. Its purpose is to provide a comprehensive nuclear information and abstracting service, using modern computer and micrographic techniques.

This includes:

1. processing input received from Member States,

2. providing Member States with output in a variety of forms for dissemination on a national basis, and

3. assisting Member States in improving their methods of information handling.

HISTORY

The origins of INIS go back to 1965. In that year the IAEA, recognizing that it had a statutory obligation to foster the exchange of nuclear information amongst its members, invited consultants from the USSR and from the USA to draw up an outline scheme for an international information system, that would cover adequately the expanding amount of literature on the peaceful uses of atomic energy.

The consultants proposed to the IAEA a cooperative system, one that would serve the information requirements of countries of varying levels of development and with different backgrounds and traditions in the methods and techniques of information handling. The system would make use of the latest computer and micrographic techniques.

During the next few years the consultants’ proposals were submitted by the Agency to a number of international panels of experts for discussion and elaboration into a detailed systems design. In February 1969, the Board of Governors of the IAEA approved the setting up of INIS on an experimental basis. The first output products of the new system were issued in April 1970 (Illustr. 1).
Illustration 1: This historic photograph shows the first output from the International Nuclear Information System (INIS) being displayed by Professor I.S. Zheludev, Deputy Director-General, Department of Technical Operations, IAEA Headquarters, Vienna, Austria.

STEPS IN THE DEVELOPMENT OF INIS

<table>
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<th>Date</th>
<th>Event</th>
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<tr>
<td>March-June 1968</td>
<td>A detailed systems design for INIS is drawn up by an international study team.</td>
</tr>
<tr>
<td>February 1969</td>
<td>The IAEA's Board of Governors agrees to the establishment of INIS on an experimental basis and with a limited subject scope.</td>
</tr>
<tr>
<td>April 1970</td>
<td>First output products issued on a monthly basis.</td>
</tr>
<tr>
<td>January 1972</td>
<td>INIS begins to operate on full subject scope; revised INIS Thesaurus introduced.</td>
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<tr>
<td>January 1973</td>
<td>End of experimental period. Full subject scope coverage compulsory for all INIS input centres. INIS output products issued twice per month.</td>
</tr>
<tr>
<td>September 1973</td>
<td>A subject index is introduced in INIS Atomindex.</td>
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<td>September 1975</td>
<td>Gradual introduction of printed abstracts in INIS Atomindex and machine-readable abstracts in INIS magnetic tapes.</td>
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<tr>
<td>January 1976</td>
<td>Conversion of INIS Atomindex into an international abstracting journal completed.</td>
</tr>
<tr>
<td>January 1978</td>
<td>Establishment of experimental INIS/AGRIS Direct Access Project</td>
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THE INIS PHILOSOPHY

The basis of INIS is international cooperation. It is the first international information system in which both the collection of input and the dissemination of output are completely decentralized (Illustr. 2): Only the processing, checking and merging of the data are centralized. This decentralized approach to input and output was selected because it should potentially:

1. result in the most comprehensive coverage of the nuclear literature;
2. provide the most effective method of handling information in different languages;
3. spread the cost of data gathering and processing equitably between large and small producers and users of the literature;
4. assist in improving the national information infra-structures in both developed and developing countries;
5. result in the most satisfactory services for users of the information.

HOW COUNTRIES BECOME INIS PARTICIPANTS

One of the first actions taken by the Director General of the IAEA to give effect to the decision to commence INIS operations was to invite each Member State to become a participant in the new system.

Illustration 2: The INIS Communications Structure

National INIS Centres \( C_6 , \ldots , C_k \) submit input to and receive output from the central element of the system \( C_c \) (INIS Section at IAEA Headquarters). Some countries find it a convenient strategy to channel information through a regional centre where the input is prepared. For example INSPEC \( C_2 \) produces input to INIS on behalf of some Scandinavian countries \( C_3 , C_4 , C_5 \), the Netherlands \( C_39 \), Switzerland, Austria, and others, in machine-readable form for conventional literature, whilst the Scandinavian countries \( C_3 , C_4 , C_5 \) themselves prepare the input for INIS for non-conventional literature. The diagram shows the structure of the interconnection of the system within the INIS framework.
The procedure that countries should follow if they wish to participate is very simple. All that is needed is a letter from the appropriate national authority (e.g. the national atomic energy authority, the Ministry of Foreign Affairs, etc.) to the Director-General of the IAEA expressing the country's wish to become an INIS participant, and undertaking to supply input regularly to the system. The letter should include the name of a designated person, the INIS Liaison Officer, with whom the IAEA can conduct all future correspondence of a technical nature regarding INIS.

THE INIS LIAISON OFFICERS

The INIS Liaison Officers play a key role: They are responsible for organizing the collection of information and the preparation of input on a national level. They are also responsible for setting up and maintaining national information services using the INIS products.

In addition the INIS Secretariat consults frequently with the INIS Liaison Officers on all matters relating to the administration and development of INIS. Consultation takes place by correspondence through the INIS Circular Letters and INIS Technical Notes and through the annual Consultative Meetings of INIS Liaison Officers (Illustr. 3). An important contributing factor to the success of INIS has been the spirit of mutual understanding and cooperation which has grown up between the individual Liaison Officers and between the Liaison Officers as a group and the INIS staff at the Agency. A quarterly INIS Newsletter (Illustr. 4) also assists in maintaining communication between the Secretariat and the Liaison Officers.
HAPPY NEW YEAR!

The staff of the INIS Section at the IAEA would like to take this opportunity to thank all those who were kind enough to send Christmas and New Year greetings and to wish all friends of INIS a happy, healthy and prosperous 1978!

NEW INIS PARTICIPANTS

The New Year has brought the news that four more Member States of the Agency want to participate in INIS. They are Kuwait, Madagascar, Malaysia and Venezuela, bringing the total number of countries participating to 54. The new INIS Liaison Officers are Mr. Abdulla Mohammed Al-Minayes (Kuwait), Mr. Justin Manambelona (Madagascar), the Librarian of the Tem Dr. Ismail Atomic Research Centre (Malaysia) and Mr. José de Jesús Santana Queirido (Venezuela). We welcome them and look forward to making their personal acquaintance perhaps at the INIS Liaison Officers meeting in May.

RETIREMENT OF MR. RAYMOND GUILLOUX

On 31 December 1977 Mr. Raymond Guilloux, Chef du Service de Documentation of the Centre d'Etudes Nucléaires de Saclay, retired from the French government service and hence also as INIS Liaison Officer for France, a position which he has occupied since the beginning of INIS. In his letter to the Agency in which he announced his retirement Mr. Guilloux recalls the hopes for improved dissemination of knowledge with which Member States regarded the foundation of the INIS project back in 1966-67, hopes which he says were not disappointed. The INIS community is very conscious of the personal contribution which Mr. Guilloux has made towards the realization of these hopes. In this context we would mention particularly Mr. Guilloux's chairmanship of the Plenary Sessions of the Panel on the Preparation of the Final Proposal for INIS in October 1968. Under his leadership the French INIS centre has always been one of the most reliable contributors of high quality...
GROWTH OF INIS

Year by year more countries have agreed to participate in INIS by sending input to the system and by disseminating its output products nationally. Illustration 5 shows the growth which has taken place in the number of participating countries since the system began; illustration 6 shows the amount of output produced by the system since 1970.

INIS AND OTHER INFORMATION SYSTEMS

When INIS first began some observers expressed doubt that a cooperative, decentralized information system could work. The success of INIS has refuted this scepticism.

INIS is one of the best examples of a system flourishing within the conceptual and operational framework of UNISIST* and according to its recommendations. INIS has made a significant contribution to all the objectives of the UNISIST work plan:

1. It has improved the tools of systems interconnection through its adoption of existing standards and the development of new ones;
2. It has stimulated the development of national information systems and improved the institutional components of the information transfer chain through its reliance on decentralized input and output;
3. It has assisted in the development of specialized information man-power through its training programme;
4. It has paid special attention to the information needs of developing countries.

The success of INIS has led the Food and Agriculture Organization of the United Nations (FAO) to adopt the same pattern for its own International Information system for the Agricultural Sciences and Technology (AGRIS). AGRIS has taken over the standards and procedures used by INIS with minor modifications only. This has permitted it to take advantage of INIS' experience and techniques, even to the extent of using the same computer software. A further extension of the INIS methodology into the area of the social sciences is under consideration in the planning of the Development Sciences Information System (DEVSIS).

* Inter-governmental programme for cooperation in the field of technological information.

Illustration 5: Growth in INIS participation by IAEA Member States and International Organizations

THE INIS PRODUCTS

The information collected through INIS is distributed in the form of three major output products:

THE INIS MAGNETIC TAPE SERVICE

This is a semi-monthly service, which provides magnetic tapes containing all records submitted to the system.

Magnetic tape output is available in a variety of formats, according to the needs of the recipient. Options available include 9-track tapes (recording density 800 bits per inch, 1600 bits per inch or 6250 bits per inch), and 7-track tapes (200 bits per inch, 556 bits per inch or 800 bits per inch). Tapes are recorded in NRZI mode except for the high density tapes (over 800 bits per inch) which are recorded in PE mode. All have odd parity. In addition the Agency makes available tapes containing INIS data in a format suitable for searching by the IBM STAIRS or IBM IRMS software. However, it should be noted that the INIS tapes are available only to participating Member States and international organizations.

National INIS Centres in many countries are utilizing the tapes in the provision of national information services. Available services vary from country to country, according to each country’s needs, priorities and degree of technical advancement. Thus individuals and institutions that are interested in taking advantage of the services that could be provided from the INIS magnetic tapes should always direct their enquiries to their national INIS Liaison Officers, who will advise them in detail of the services available in their country. A list of INIS Liaison Officers is included at the back of this booklet.

INIS ATOMINDEX

This is a semi-monthly abstracting journal, available to the public on subscription. (Illustr. 7) INIS Atomindex is prepared from the INIS magnetic tapes by computer-driven photocomposition. The bulk of the information contained in the magnetic tapes is printed in INIS Atomindex.

Each issue consists of a main entry section and a number of indexes. The main entries are arranged by subject categories to permit users to scan quickly through the sections that are relevant to their subject interests in order to locate new information in their fields (Illustr. 8).

The most appropriate quantity for the measurement of external beta and photon radiation is discussed and a unified method for both beta and photon radiation to conform with revised ICRP recommendations is proposed. It is suggested that beta and gamma radiation survey instruments should be constructed to indicate the quantity of absorbed dose or dose rate to tissue at two depths below the surface of the ICRU sphere and that these depths should be 5±0.05 cm and 800 ± 50 cm. Over the range of radiation energies considered, the thickness of these dose limits is appropriate to the skin and the depth dose equivalent index will ensure compliance with the ICRP dose limits to within the accuracy needed for radiation protection purposes.

A DISPLACEMENT WINDOW could, if provided with a removable window cover of 360 µg cm~2 and 800 mg cm~2, be utilized for both beta and photon radiation measurements. The values of the depth dose equivalent index will ensure that the lens of the eye is protected. An instrument with thick walls and a thin front half of the separative stage, i.e. upstream of the gas cooling system. Increase of the temperature of the separation nozzle systems from 40°C to 120°C, for instance, would decrease by about 5% (+- 2%) the specific suction volume, and by about 25% (+- 7%) the specific suction volume. These are all integral parts of the solid state isotope separation procedures and are discussed in terms of the overall process proposed. LASER ISOTOPE SEPARATION: research programs; URANIUM 235: laser isotope separation; URANIUM 235: isotope separation; URANIUM ISOTOPES: separation nozzle method.

Gig. Tr. Prof. Zaboi (Nov 1975), p. 1-5. Since we were actively able to work on this project, we have been engaged in three and a half years of research. Each of these has been related to laser-induced isotope separation of uranium in the solid state. The three areas are: (a) improved reaction chemistry for both host materials (BH₄)₂ and (BH₄)₄; (b) improved spectroscopic techniques in order to obtain sharper spectra; and (c) solid state photonochemical investigations to study U(BH₄)₄ photodecomposition mechanism and yield as a function of wave length. These are all integral parts of the solid state isotope separation procedure and are discussed in terms of the overall process proposed.

14 - Production of Enriched Uranium


The influence of temperature on the separation of the uranium isotopes in the separation nozzle was investigated experimentally in a temperature range between 23°C and 130°C, using an H₂/UF₆ mixture as a process gas. The measurements show that the optimum inlet pressure Pₜₜₜ for isotope separation increases with the absolute temperature T of the gaseous mixture (Pₜₜₜ approximately Tₜₜₜ (1.4) - sup(0.2)). Moreover, a slight increase of the temperature dependence of separation can be described accurately by model calculations which are based on the gas kinetic scaling relations of transport phenomena. The calculations are not restricted by the nozzle geometry and the composition of the gaseous mixture, respectively. The specific expenditure of the separation nozzle process might be reduced by inserting the separation nozzle elements in the hot part of the separative stage, i.e. upstream of the gas cooling system. Increase of the temperature of the separation nozzle systems from 40°C to 120°C, for instance, would decrease by about 5% (+- 2%) the specific suction volume, and by about 25% (+- 7%) the specific suction volume. These are all integral parts of the solid state isotope separation procedure and are discussed in terms of the overall process proposed.

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The following indexes are provided in each issue:

1. personal author index
2. corporate entry index
3. subject index
4. conference index
5. report, standard and patent number index

These indexes are cumulated every six months. The cumulative indexes are also available on subscription.

THE INIS NON-CONVENTIONAL LITERATURE ON MICROFICHE

Literature reported to INIS may be subdivided into two categories, conventional and non-conventional. Conventional literature is that literature which is commercially available through the normal distribution channels, such as the book and magazine trade or publishing houses. Non-conventional literature comprises all other forms of literature, including scientific and technical reports, patent documents, non-commercially published theses and dissertations, and standards.

The INIS Clearinghouse, a sub-unit of the INIS Section of the IAEA, supplies on request microfiche copies of most of the non-conventional literature announced in the INIS magnetic tapes or in INIS Atomindex (approximately twenty percent of all items reported to the system). Microfiche copies are produced on photographic film in a standard size of 105 X 148.75 mm. A microfiche reader is required to read them. Each fiche can contain up to ninety-six pages of original text, reduced at a ratio of 24:1 (Illustr. 9).

The report, standard and patent number index of INIS Atomindex serves as a catalogue of the documents available from the INIS Clearinghouse.

PRICES OF INIS PRODUCTS

The subscription prices of INIS Atomindex and of the INIS documents on microfiche are subject to some fluctuations. The ruling prices at the time that this edition of this booklet went to press are shown on the inside back cover, together with full ordering information.
Illustration 9: An INIS microfiche can contain up to 96 pages of the original text.
HOW INIS OPERATES

THE INIS REFERENCE SERIES

In a system such as INIS, for which the input is prepared by information workers in many countries and with varied backgrounds and traditions in bibliography, it is obviously essential to work to precise standards and rules if the consistency of the resulting information files is to be assured. During the development stage of the system, therefore, a series of manuals was prepared known as the INIS Reference Series. (Illustr. 10) These cover all aspects of the system, including:

- the subject scope
- the subject categorization scheme
- the various elements of bibliographic description
- the information retrieval language
- the machine-readable record formats etc.

The various volumes in the INIS Reference Series are reviewed regularly as improvements and alterations are made to the system. When INIS began operations there were not many international standards available for computerized information exchange. Nevertheless, the decision was made to follow international standards as much as possible and to implement new ISO standards as they became available. This has proved to be a suitable working procedure and is still INIS policy.

THE INIS SCOPE

The subject scope of INIS includes information on every aspect of the peaceful uses of nuclear science and technology. The subject fields covered are as follows:

- General Physics
- High Energy Physics
- Neutron and Nuclear Physics
- Chemistry
- Materials
- Earth Sciences
- All effects and various aspects of external radiation in biology
- Radionuclide effects and kinetics
- Tracer studies in life sciences
- Applied life sciences
- Health, safety and environment
- Isotope and radiation sources
Illustration 10: The INIS Reference Series consists of the following volumes:

IAEA-INIS-1  INIS: Descriptive Cataloguing Rules
IAEA-INIS-2  INIS: Descriptive Cataloguing Samples
IAEA-INIS-3  INIS: Subject Categories and Scope Descriptions
IAEA-INIS-4  INIS: Instructions for Submitting Abstracts
IAEA-INIS-5  INIS: Terminology and Codes for Countries and International Organizations
IAEA-INIS-6  INIS: Authority List for Corporate Entries and Report Number Prefixes
IAEA-INIS-7  INIS: Magnetic and Punched Paper Tape Codes and Character Sets
IAEA-INIS-8  INIS: Paper Tape Specifications and Record Format
IAEA-INIS-9  INIS: Magnetic Tape Specifications and Record Format
IAEA-INIS-10 INIS: Transliteration Rules for Selected NON-Roman Characters
IAEA-INIS-11 INIS: Authority List for Journal Titles
IAEA-INIS-12 INIS: Manual for Indexing
IAEA-INIS-13 INIS: Thesaurus
IAEA-INIS-13 (F) INIS: Thésaurus, version français
IAEA-INIS-13 (D) INIS: Thesaurus, Deutsche Ausgabe
IAEA-INIS-14 INIS: Description of Computer Programs
IAEA-INIS-15 INIS: Self-Training Manual for Descriptive Cataloguers
IAEA-INIS-16 INIS: Subject indexing Samples
Isotope and radiation application
Engineering
Nuclear Reactors (general)
Reactor types
Instrumentation
Waste management
Economics
Nuclear law
Nuclear documentation
Safeguards and inspection
Mathematical methods and computer codes

The subject scope and subject classification scheme for INIS are defined in detail in the publication IAEA-INIS-3, INIS: Subject Categories and Scope Descriptions (Illustr. 11). Subject specialists in INIS reporting centres refer to IAEA-INIS-3 when they are selecting documents for input; documents are reported to the system only if they contain a significant amount of information which falls within the INIS subject scope.

The selected documents are subject-classified according to the INIS subject categorization scheme. The subject categories that have been assigned to the document descriptions are then used to arrange the entries in INIS Atomindex. One or more appropriate subject categories are also recorded on the INIS magnetic tape record for each document.

THE INIS WORKSHEET

INIS reporting centres may send their input to IAEA Headquarters in Vienna in a variety of forms, machine-readable or not machine-readable. However, most, if not all, centres start by entering on worksheets the details of the documents they wish to report, even if they then transfer their records locally to a computer medium.

Normally the INIS record for a piece of literature consists of three main components:

1. A bibliographic description. This is recorded on the front of the INIS Bibliographic and Indexing Worksheet (Illustr. 12).

2. A set of descriptors, identifying the subject content of the piece of literature. Descriptors are selected from the INIS Thesaurus and are recorded on the reverse of the INIS Bibliographic and Indexing Worksheet (Illustr. 13).

3. An abstract summarizing the information contained in the piece of literature. This is recorded on the INIS Abstracts Worksheet (Illustr. 14).
F00 OTHER ASPECTS OF NUCLEAR ENERGY

F10 ECONOMICS
(Note: the application of a secondary category will often be required in this subject field)

F11 Nuclear Power Economics
Economic aspects of nuclear energy, except those specific to an individual fission reactor, to fusion reactors or to direct energy converters
Economic comparison of reactors with alternative power sources or of different reactor types
Supply of heat from nuclear plants (including multipurpose plants) for district heating and for industrial processes, e.g. water desalination etc. – where no reactor type is specified
Nuclear power growth, comparative studies of energy consumption, energy supply, costs of different energy sources, and their future trends
Financing of nuclear power
Methodology of comparative analysis of nuclear energy and other energy costs
General economic planning of nuclear power and its integration into regional power supply systems
For: economics of thermonuclear reactors use A14
   economics of direct energy conversion use A16
   economic materials specific to individual reactors see E31–E38
   economic materials specific to reactor fuels use F12

F12 Fuel Cycle Economics
Cost categories of uranium resources
Economics of prospecting, mining, and conversion of uranium and thorium ores
Economics of uranium enrichment
Economics of plutonium recycling
Economics of transport and reprocessing of irradiated fuel
Economics of spent fuels and waste disposal
Economics of multifuel systems involving breeders and converters
Forecasts of fuel requirements
Fabrication costs of fuel elements
For: resources of uranium and thorium use B31
   fuel management specific to an individual reactor see E31–E38

F13 Economics of Isotopes and Radiation Applications
All economic aspects of production and utilization of radioactive and stable isotopes and other radiation sources in power production, radiometric industrial applications, radiation processing and tracer techniques, but not of reactor fuels
Economics of heavy water production
For economics of reactor fuels, including uranium enrichment use F12

F20 NUCLEAR LAW
(Note: this series covers texts of treaties, conventions, international and national statute and case law, etc. in the nuclear field, and related literature)

F21 Radioactive Materials
Legal aspects of prospecting, mining and fabrication of radioactive materials
State monopoly, concession, private ownership
Authorization, registration, notification, national competent authorities, right of inspection or intervention
Legal aspects of trade in and transfer and supply of radioactive materials
(Note: radioactive materials subject to safeguards are excluded)
For legal aspects of radioactive materials subject to safeguards use F28

Illustration 11: A page from the INIS Subject Categories and Scope Description shows the system of categorization adopted for INIS.
<table>
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<tr>
<th>Tag</th>
<th>Date (enter by typewriter only)</th>
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<tr>
<td>100</td>
<td>Tataronis, J.A.; Grossmann, W. (4656000US)</td>
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**Corporate Entry/Assignee**

**Acad. Degree**

**Primary Title**

*On Alfvén wave heating and transit time magnetic pumping in the guiding-centre model of a plasma*

**Primary Subtitle**

**Conf. Title**

**Conf. Place**

**Conf. Date**

**Original Title** (transliterated)

**Original Subtitle** (transliterated)

**Edition**

**Report/ Patent Number**

**Sec. Numbers**

**ISSN/IPC**

**Place of Publication**

**Publisher**

**Date of Publication**

**Collation**

**Language**

**Notes**

**Availability Note**

**Title Augmentation (Optional)**

**Affiliation Code**

**Corp. Entry Code**

**Series/ Journal Title**

*Nucl. Fusion*

**Series/ Journal Subtitle**

**ISSN**

**Date of Publication**

*1976*

**Collation**

*v. 16 (4) p. 667-678*

**Notes**

Illustration 12: The INIS Bibliographic and Indexing Worksheet (front) provides numbered fields for all elements of bibliographic description.
<table>
<thead>
<tr>
<th>Link Indicators</th>
<th>Descriptors</th>
<th>Main Heading and/or Qualifier Labels</th>
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<td>1</td>
<td>INHOMOGENEOUS PLASMA</td>
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<td>MAGNETOHYDRODYNAMICS</td>
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<td>HIGH-FREQUENCY HEATING</td>
<td>M2</td>
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<td>10</td>
<td>EQUATIONS OF MOTION</td>
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<td>DISTRIBUTION FUNCTIONS</td>
<td></td>
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<tr>
<td>12</td>
<td>RESONANCE</td>
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</tbody>
</table>

Illustration 13: Indexers enter descriptors on the reverse of the INIS Bibliographic and Indexing Worksheet.
A theoretical investigation of the use of the guiding-centre plasma (GCP) model to describe RF absorption in a non-uniform plasma is made. The absorption is studied in the transit time magnetic pumping (TTMP) and Alfvén wave frequency ranges. An externally applied RF source is assumed with a frequency range lying in the continuous spectra of the linearized GCP equations of motion describing the plasma dynamics. Absorption arises from local resonances which characterize the continuum. The total GCP spectrum is composed of components which are found in ideal MHD and Vlasov kinetic theory. The effective impedance of an external coil assembly is calculated for tokamak and scyllac configurations in both the TTMP and Alfvén wave regimes. Very optimistic results are obtained for both configurations indicating that effective coupling of an external source to the plasma is possible in the Alfvén wave regime. The results also show that better coupling is possible with Alfvén frequencies than with TTMP. The results are compared with similar calculations using only the ideal MHD-model; similarities and deviations are pointed out. (author)
PARTICIPATING IN INIS
OWN APPROXIMATELY ONLY)
THE INIS DESCRIPTIVE CATALOGUING RULES

The bibliographic description of each item of information submitted is prepared according to the INIS Descriptive Cataloguing Rules (IAEA-INIS-1). These rules were first developed by a group of consultants in 1967. They reflect the consultants' concern that INIS should be compatible with other existing systems, with a view to achieving ultimate standardization of bibliographic descriptions between systems. These original objectives of preserving compatibility with other systems and international standards have never been lost sight of, even though, inevitably many changes have been made to the INIS rules since they were first formulated. The changes reflect the experience that the Secretariat and the Member States have accumulated over the years, and perhaps even more importantly, the inevitable changes and improvements to the system made on the recommendation of the INIS Liaison Officers.

It is a requirement of INIS that literature submitted for inclusion in the system should be analyzed into its smallest bibliographic component. For example, journals are analyzed to the level of individual articles; books are generally analyzed to the level of chapters; monographic series are analyzed to the level of volumes and within this into individual chapters or sections. The INIS Descriptive Cataloguing Rules provide for this degree of analysis by providing rules for the description of documents at particular Bibliographic Levels. For example, an article in a journal is described both at the analytical level and at the serial level; a chapter in a book or a paper in a volume of conference proceedings is described at the analytical and the monographic level, etc.

For each analyzed part full bibliographic information must be given. This includes author (personal and/or corporate), title, edition, identifying numbers, if any, imprint, collation, language, if other than English, and appropriate bibliographic notes. For conference proceedings, the title, date and place of the conference concerned are also supplied.

To ensure consistency of input, the INIS Descriptive Cataloguing Rules give detailed explanations of how the various items of information (bibliographic data elements) should be entered on the INIS record.

Certain data that are part of the bibliographic descriptions of documents are standardized. These include the form of the names of corporate bodies, report number prefixes, abbreviated form of journal titles and names of countries. The authorities which lay down these standardized forms are IAEA-INIS-6, INIS: Authority List for Corporate Entries and Report Number Prefixes; IAEA-INIS-11, INIS: Authority List for Journal Titles and IAEA-INIS-5, INIS: Terminology and Codes for Countries and International Organizations.
THE INIS INDEXING SYSTEM

The bibliographic record for each item of literature included in INIS contains a set of descriptors which indicate its subject content. The descriptors are selected from the INIS Thesaurus by subject specialists in the inputting centres. The descriptors as they ultimately appear on the INIS record can be used in a variety of ways for the purpose of retrieving documents from the file. For example, a set of descriptors can be combined together at retrieval time to express a concept which can be made the topic of a mechanized search (post-coordination). In searching, the descriptor set is matched against the descriptors that have been assigned to the individual records on the INIS file (Illustr. 15). Or descriptors can be combined together by the indexer.

Illustration 15:

Sample Query

**Title:** Non-neutron data on energy levels of the nuclei.

The query is graphically represented on the above diagram. The three partly overlapping circles marked 01, 02, and 03 correspond to the classes of documents indexed with descriptors of groups 01, 02, and 03 respectively. The triangle includes the documents to which the descriptors of group 04 were assigned. The shaded area is the class of documents to be retrieved.

- **Group 01** DATA or DATA COMPILATION or TABLES
- **Group 02** BOUND STATE or EIGENSTATES or ENERGY LEVELS or NUCLEAR CASCADES or NUCLEAR STRUCTURE
- **Group 03** NUCLEI
- **Group 04** NEUTRON REACTIONS

**QUERY:** (01 AND 02 AND 03) NOT 04
at the time that the record is created to form one or more headings which describe
the topic of the document as specifically as possible (pre-coordination). A version
of this technique, known as "two-level flagging" is used in the construction of the
subject index to INIS Atomindex.

THE INIS THESAURUS

The terminology of the INIS Thesaurus was derived from the 1969 edition of the
EURATOM Thesaurus, but its structure is substantially different, being based on
three types of inter-relationships between thesaurus terms: preferential,
hierarchical, and affinitive. (Illustr. 16).

Preferential indicators identify preferred terms in cases when some semantic
ambiguity may exist. For example: "HAZARDS UF (used for) risks."

Hierarchical indicators identify the semantic relationship between descriptors on
different levels of specificity in the same hierarchy of concepts. For example:

\[
\begin{align*}
\text{ARC WELDING} & \\
\text{BT1 welding} & \\
\text{BT2 joining} & \\
\text{BT3 fabrication} & \\
\text{NT1 gas metal-arc welding} & \\
\text{NT1 plasma arc welding} & \quad \text{Broader terms}
\end{align*}
\]

\[
\begin{align*}
\text{ARC WELDING} & \\
\text{BT1 welding} & \\
\text{BT2 joining} & \\
\text{BT3 fabrication} & \\
\text{NT1 gas metal-arc welding} & \\
\text{NT1 plasma arc welding} & \quad \text{Narrower terms}
\end{align*}
\]

Affinitive indicators identify descriptors which have a semantic relationship other
than the hierarchical. For example:

\[
\begin{align*}
\text{DATA PROCESSING} & \\
\text{RT computers} & \\
\text{RT data} & \\
\text{RT information theory} & \\
\text{RT recording systems} & \quad \text{Related terms}
\end{align*}
\]

The INIS Thesaurus is continuously edited and new terms are added in parallel with
the processing of INIS input. A completely new revision of the Thesaurus is
published twice per year. The latest revision contains approximately 15,000
accepted terms (descriptors) and 4,500 forbidden terms. The terminology covers
not only nuclear physics and reactor technology, but also related topics, such as
isotope technology, fabrication and use of nuclear materials and instruments,
radio-chemistry, radiobiology and administrative and legal aspects of the management
and control of nuclear energy.

Translations of the Thesaurus into the French, German, and Russian languages now
have been prepared by the INIS Centres in France, the Federal Republic of
Germany, and the USSR, respectively, and have been published by the IAEA as part
of the INIS Reference Series.
Illustration 16: A sample page from the INIS Thesaurus showing the structure of the terminology.
THE ABSTRACTS

It has always been a requirement of INIS that all items reported to the system should be accompanied by an abstract, the only exception to this rule being short communications. Prior to Volume 7, 1976, abstracts were generally not included in the output magnetic tapes, nor were they printed in INIS Atomindex. Instead they were published on microfiche. Commencing with Volume 7, 1976, abstracts in the English language have been included on the INIS magnetic tapes and printed in INIS Atomindex. For many items the magnetic tape record contains a second abstract in another language, usually the language of the original document. If this second abstract is in French, Russian or Spanish, it is also printed in INIS Atomindex following the English language abstract. A volume in the INIS Reference Series entitled INIS: Instructions for Submitting Abstracts (IAEA-INIS-4), lays down practical guidelines to the input centres on how the abstracts should be formulated and submitted.
INPUT

Input is submitted by national INIS centres either in machine-readable form or in the form of worksheets. A number of different forms of machine-readable input can be accepted, provided that their format conforms to the INIS rules, as follows:

1. **Magnetic tape**
   - either (a) in the INIS magnetic tape format as described in IAEA-INIS-9 (INIS: Magnetic Tape Specifications and Record Format),
   - or (b) in the INIS alternate input format, i.e. in the form of a paper tape image on 9-track tape (Illustr. 17);

2. **Paper tape**
   - in the INIS paper tape format as described in IAEA-INIS-8 (INIS: Paper Tape Specifications and Record Format) (Illustr. 18);

3. **in a form suitable for OCR (Optical Character Recognition) processing** (Illustr. 19).

Worksheet input is converted to machine-readable form within the Secretariat, using on-line data entry techniques (Illustr. 20). Input in a form suitable for OCR processing is converted to magnetic tape using an optical character reader which can convert into machine-readable form texts in both the Latin and Cyrillic alphabets (Illustr. 21). Copies of non-conventional literature submitted with the input are sent to the INIS Clearinghouse for microfilming and preparation of microfiches (Illustr. 22).

COMPUTER PROCESSING

Machine-readable data is converted by program into an internal working format. Each record is split up into two components; i.e., (i) bibliographic data and abstracts, and (ii) subject descriptors. Each component is then processed by the appropriate set of checking programs. Whenever the computer detects errors in the input these are flagged on a reference list which displays all the records processed. The data are then split off into four major files, as follows:

1. **Bibliographic and abstracts file** — containing formally correct records (i.e., records in which the computer did not detect any errors in the bibliographic description), and all abstracts, regardless of whether errors were found in them or not.

2. **Bibliographic error file** — containing records in which the computer detected at least one error.

3. **Indexing file** — containing all descriptors which have been assigned to the records in accordance with the INIS Thesaurus.
Illustration 17: INIS input on magnetic tape arrives from the four corners of the world.

Illustration 18: Paper tape as a form of input is now less frequently used.
| Illustration 19: Input in a form suitable for optical character recognition can be prepared with relatively inexpensive and simple equipment. |
Illustration 20: Input is entered directly into computer memory storage via CRT terminals.
Illustration 2.1: The optical character reader can convert texts in Latin and Cyrillic alphabets to magnetic tape form.
Illustration 22: The automatic step and repeat camera in the INIS Clearinghouse used in the preparation of microfiche masters.
4. **Indexing error file** — containing index terms which have been assigned to the records but which are not listed in the INIS Thesaurus as valid descriptors (e.g. forbidden terms). It also contains errors in subject index information (M/Q pair assignment) and in the subject categorization (invalid subject categories).

The correction of errors in the bibliographic description and of formal errors in the abstracts is performed by the INIS Bibliographic Control Unit. The INIS Subject Control Unit corrects the errors in the indexing. The corrections are then keyboarded and batch-processed against the error files. At the end of each processing cycle the four files are brought together and a final consolidated output file is created. This final file becomes the input to further programs which:

1. create the INIS output tape in the INIS distribution format;
2. create a photocomposition tape from which photocomposed pages of INIS Atomindex are produced;
3. create inverted file copies of the INIS data base for use in retrieval by means of either STAIRS (Storage and Retrieval of Information System) or IRMS (Information Retrieval and Management System).

A generalized flowchart of the INIS computer processing cycle is reproduced as Illustration 23.

**DOCUMENTS PROCESSING**

All full-size copies of items of non-conventional literature submitted by the INIS centres with their input are microfilmed in the INIS Clearinghouse for distribution in the form of microfiche. Some INIS centres already provide microfiche copies of their non-conventional literature in preference to supplying INIS with full-size copies. In those cases the INIS Clearinghouse prepares additional copies of the microfiches and takes care of the distribution. A full set of all the microfiches ever made by the INIS Clearinghouse is kept permanently on file and copies of any of them can be supplied on demand and at a nominal fee.

**QUALITY CONTROL**

The quality and consistency of the INIS products is dependent on a careful application of the INIS rules by the national centres. If systematic errors are found in the input received from a particular country the INIS Secretariat draws this to the attention of the INIS Liaison Officer concerned, so that corrective action can be taken. Such errors are discovered partly by computer checks, and partly by visual checks. Particularly the indexing and abstracting submitted to INIS is subjected to a continuing quality checking procedure. For this purpose input is selected at random and scrutinized by the INIS subject specialists. In a further effort to ensure consistency of subject indexing the Secretariat has coordinated a number of Indexing Consistency Tests in which most inputting centres participate. Finally the INIS Training Programme plays a major role in improving and maintaining the quality of the INIS products.
ERRORS FOUND IN FINAL PROCESSING

BIB. ABS FILE

BIB. ERROR FILE

INDEX FILE

INDEX ERROR FILE

ERRORS FOUND IN FINAL PROCESSING

INIS CYCLE COMPLETION PROGRAMS

INIS MASTER FILE

INIS ATOMINDEX PRODUCTION

PHOTO COMPOSITION TAPE

PHOTO COMPOSITION

INIS ATOMINDEX

TO SUBSCRIBERS

INIS OUTPUT TAPE

INIS OUTPUT TAPE

INIS OUTPUT TAPE

TO MEMBER STATES

INIS COMPUTER PROCESSING – GENERAL ORGANIZATION (Part 2).
INIS has regularly conducted training seminars for staff from the national INIS centres since 1970. All aspects of the INIS operation are taught in the seminars, including descriptive cataloguing, abstracting, indexing and retrieval. In recent years the INIS training programme has been executed in cooperation with FAO/AGRIS. In addition to the annual training seminar, workshops for users of the INIS tapes have been organized from time to time. These are aimed particularly at systems analysts and programmers in national INIS centres. They serve as a means of exchanging experience in the use of INIS output tapes (Illustr. 24).

The INIS training methodology is mainly of the workshop type. There is a minimum of formal teaching; ample opportunity is provided for student participation, including preliminary set work for seminar participants.

INIS also makes available to the IAEA Member States technical advice on the establishment, operation and management of modern information systems. It assists national INIS centres in developing the software necessary to exploit fully the INIS magnetic tapes. One form which this assistance takes is the in-house training of Fellows or Trainees who spend varying lengths of time working in the INIS Section, the Agency’s Computer Section or the Library. Another form of assistance in solving technical problems is provided by staff of the INIS Section spending short periods at national INIS centres to give advice on the preparation of input or the utilization of output products.

Illustration 24: Participants at a recent INIS/AGRIS Training Seminar came from 33 different countries.
RECENT DEVELOPMENTS

DATA FLAGGING AND TAGGING

At its present stage of development INIS is concerned with the storage and retrieval of information regarding available literature in the nuclear field. In other words, INIS is a "bibliographic" information system. More and more the demand amongst scientists is for the expansion of bibliographic information systems into systems that provide direct answers to questions, i.e. into "fact" or "data" retrieval systems. The transition from bibliographic to data storage and retrieval increases the cost and complexity of an information system by several orders of magnitude and is therefore probably feasible only on a step by step basis. It is generally agreed that the first transitionary step should be the "flagging" or labelling of the bibliographic records in the information system files to indicate which of them relate to publications that contain data. INIS is one of the first information systems in the world to take this initial step towards what may eventually be its conversion into a data retrieval system. As from the beginning of 1979 it will introduce a system of data flagging that will indicate both the kinds of data contained in publications (e.g. experimental data, evaluated data, theoretical data) and the form in which the data are presented (e.g. as tables, graphs, etc.).

ON-LINE ACCESS TO THE INIS DATA BASE

In 1977 the IAEA commenced work on the establishment of an experimental cooperative system for direct access to the INIS data base, the aim being to create a facility that provides centres in various countries with the possibility of searching the INIS files directly, using computer terminals. The terminals are connected to the Agency's computer by dial-up telephone lines; installed at the IAEA Headquarters computer are the accumulated files of INIS references and the software which permits users to search those files in question and answer mode. By the middle of 1978 a number of European countries were making use of this facility. These include Austria, Czechoslovakia, France, Hungary, the Netherlands, the Nordic countries, and the United Kingdom. As yet this project is experimental. Its effectiveness will be assessed early in 1979 but, given a positive evaluation, it is hoped to expand the project further and to make the facility available also to countries outside Europe, in particular to the developing countries. Meanwhile the Agency is also cooperating with the Space Documentation Service of the European Space Agency and the International Institute for Applied Systems Analysis, exploring ways of further improving and developing the service.
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