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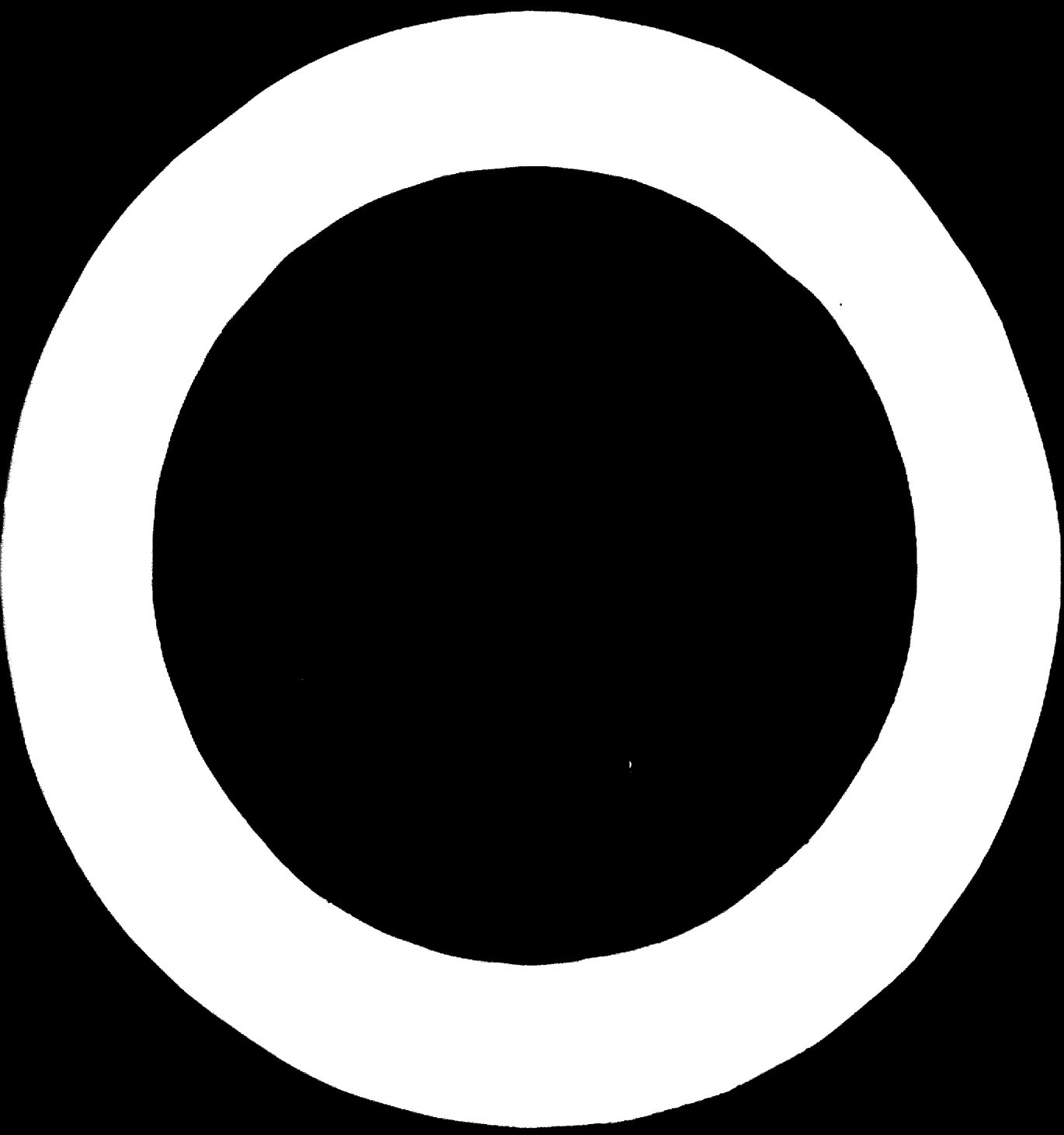

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Autumn 1970

PC2452

Computerized Information Systems and Development Assistance

By G. K. Thompson and W. D. Schieber

The Authors:

George K. Thompson received his training in librarianship in the U.S.A. at Western Reserve University. For several years he served on the staff of the United Nations European Headquarters Library in Geneva and subsequently moved to the International Labour Office in 1961. He became Chief of the Central Library and Documentation Branch of the ILO's Department of Research and Planning in 1967. He is a member of the International Committee for Social Science Documentation and has been active in efforts to co-ordinate the development of plans for the computerized storage and retrieval of bibliographical information in several UN agencies.

William D. Schieber a 1962 graduate of Northwestern University, Chicago, U.S.A. received his Master's degree from the Graduate Library School of the University of Chicago. After experience with a project on the organization and search of large files of computer stored bibliographical information at the Institute of Library Research of the University of California at Berkeley, he accepted his present assignment in charge of systems development and data processing in the Central Library and Documentation Branch of the ILO.

NO SINGLE INSTITUTION active in development assistance can afford to collect, analyse and record all of the information it should have at its fingertips to do an effective job. Only by sharing information resources with other organizations – national and international, public and private – can the task be adequately accomplished.

Possibly because it is difficult to define the economic value of information, few cost effectiveness studies have ever been made of operating information systems. This probably explains why very few people are fully aware of the staggering economic implications of the information problem. It may certainly come as a shock to learn that an estimated US$500,000 per day is wasted in American libraries alone because of the lack of centralized cataloguing of all new books published in the United States. As American books represent only a fraction of the total store of information, it is obvious that the lack of an organized information system is costing the world community billions of dollars annually.

Information required for proper programming and carrying out of development assistance work takes many forms and is extremely varied in nature. It may encompass information about country needs, available resources, institutions, consultants, projects, experts, equipment, products, industries and available technology. It may be found in published documents, statistical tables, equipment catalogues, candidates files, visible index files or recorded in someone's memory.

Development assistance work is characterized on the one hand by a paucity of funds available to further the aims of economic and social development and on the other by a widely expressed desire to channel more funds into the development process. The lack of a proper system for recording information on country needs, programming objectives and current or past projects hampers the entire process and creates, in effect, a vicious circle. Additional funds for development purposes could probably be obtained if sufficient information were available to enable donor countries and institutions to identify needs in a more systematic way.

A number of task forces and international commissions have recently delved into various aspects of development assistance (Jackson, Pearson, Tinbergen), and a number of proposals for national action have been formulated, notably in the United States by Asher and Peterson and in Canada through recently approved legislation establishing an international development research centre. At least two of these, the "Capacity Study" of Sir Robert Jackson and the Canadian proposal, contain sections dealing with the need for setting up an international information system on development assistance.

To be able to speak of sharing of information resources among agencies active in development, it is first necessary to decide on information priorities and agree upon ways of collecting the required data. To be interchangeable, these data must be processed in such a way that they can be easily transmitted from one agency to another, and they must be capable of manipulation in a variety of ways to serve a number of different purposes at the planning level, at the implementation level and at the research or transfer-of-knowledge level.

Several tools are required to do this. To make information readily accessible to many different types of users, it should be recorded in natural language – or something quite close to natural language – in order to limit manual coding and decoding operations to an absolute minimum. Indexing terms, called descriptors, taken from a vocabulary of commonly used terms in the field of development assistance, are employed for this purpose. (For a discussion of the technique, see Jean Viet's article "Documentation and Development" in *IRDN*, Vol. IV, No. 2, pages 32–35.)

Assuming that electronic computers will be necessary to process this vast amount of recorded information, a series of computer programmes will be needed to enable users to manipulate these data according to their individual requirements. These institutions should agree upon a well-defined division of labour so that they will not be analysing and recording the same data – an expensive task.

During the past few years there has been a marked increase in the use made of computers to store, manipulate and retrieve non-numeric data. Almost without exception, the computer programmes developed to handle these data have been tailored to each specific task. When a new file had to be created and used, a totally new set of programmes was written. With the realization that this practice was proving extremely costly, a number of computer manufacturers developed generalized systems for information retrieval. In concept these systems represent a significant step forward, but in practice they tend to be elaborate and to require large machines on which to be run. In addition, they impose rigid restrictions on input and output format and on the type of content that can be carried in the files.

The principal requirement of a general system is that it allow maximum flexibility for the institution using it. It should be easy to use existing computer programmes to accommodate new types of data and to prepare new types of output unforeseen at the outset, and it should be easy for one institution to exchange data with another.

Specifically, such a system should allow the user to input, edit, correct, store and update data and to retrieve and display data without having to write a new set of routines every time a different file is used. Files of personnel data or lists of equipment and spare parts, for example, could be processed with most of the same programmes that might also handle bibliographical or project data.

Furthermore, a general system should provide the user with a conceptual basis that would allow him to process data on any type of computer, in batch-processing or on-line mode, using any type of mass storage such as magnetic tape or disk. The system must also be capable of expansion and change. Programmes developed should be modular, so that as new techniques become available they may be incorporated into the system. The data files themselves must be easy to update, and it must be possible to add new data elements to an entire file with a minimum of effort.

The key to such a generalized system is the adoption of a general, logical record structure that is independent of the content of the data stored in the record. A particularly noteworthy structure for handling bibliographical records was developed for the United States Library of Congress. Called MARC-II (Machine-Readable Cataloguing), it accommodates bibliographical data, is extremely compact, and permits relatively easy retrieval of individual data elements from the record by means of control information stored in the record.

As soon as an institution standardizes its data format, it is in a position to share work done elsewhere. The advantages, therefore, of adopting an international standard data transmission format are extremely attractive. Since the data format is standard, the logic of computer programmes will be nearly identical, even though these programmes may be written in different programming languages or for different computers. Given a standard data transmission format, design of the component parts of a general information system can be done in different places by different co-operating institutions. When necessary, conversion programmes can be written to enable existing computer systems to interface with the International Standard Data Transmission Format by converting the standard transmission format to and from the format in use within individual institutions.

It is within this perspective of generalized objectives that the Integrated Scientific Information Service (ISIS) has been designed and is being implemented by the International Labour Office in Geneva. To date, the system has been used to record, display and retrieve information about documents. At present (mid-1970), nearly 40,000 biblio-

graphical records exist on magnetic disk and are being used to generate a variety of printed indexes and for document retrieval. A master cumulative index to all documents analysed in the five-year period from 1965 to 1969 has been prepared and will be published in late 1970. Interrogation of the file is done in conversational mode on-line *via* visual display terminals. Search results are printed out instantly on a teletypewriter or on th computer's high-speed printer.

Bibliographical records consist of a physical description of the document (date and language of publication, title, author, report number and so on), together with a subject abstract written in natural language. The abstract contains in the running text one or more tagged descriptors chosen from the *Aligned List of Descriptors*. The documents selected for recording in the system include new books received in the library, a selection of important journal articles, internal documents, technical reports or any other type of document deemed important enough to record.

A current-awareness bulletin, *International Labour Documentation*, containing some 150 bibliographical records is distributed weekly to 1,300 recipients, ILO research staff or other libraries and research institutes. A separate Bristol edition is cut up to make catalogue cards, which are filed in two locations in Geneva, forwarded to the Union Catalogue housed in the National Library in Berne, and also supplied on request to ILO researchers wishing to keep their own manual files. A sample bibliographical record is shown below in figure 1.

Each week new additions to the file are passed through a computer programme which assists in the detection of errors. After all errors have been removed, the new records are placed in standard transmission format and added to the master file. This master file is used in the production of different kinds of indexes. One of these is an alphabetical subject index that is published in each weekly issue of *International Labour Documentation*.

Although many searches for information can be satisfied by consulting either the printed indexes or the manual files of catalogue cards, more complex searches require the use of the computer. Search questions are formulated on a visual display terminal linked to the ILO computer. The simplest strategies permit searches by combinations of descriptors, language and date of publication in Boolean expressions of *ands*, *ors*, or *nots*. As each new element is typed on the terminal keyboard, the computer responds by displaying on the TV screen the number of records containing that element, together with the total number of "hits" (matches) with previous elements requested. At any point in the formulation, the user may ask to see a few bibliographical records displayed on the screen. In this way the search strategy can be modified if it is felt necessary to bring out more or fewer answers. The computer may also be asked to conduct a "free text" search for any string of characters, such as a word, group of words, journal title etc., appearing anywhere in the bibliographical record.

In many cases the search may be dealt with entirely on the terminal (see figure 2). If, however, the user requires the print-out of a bibliography, he can instruct the computer to record the question, and printing is done on the high-speed printer in batch mode at designated hours during the day.

The ISIS system has evolved gradually from a relatively simple punched card system to a system that utilizes interactive retrieval *via* remote terminals. Since experience has been gained in the pitfalls of mechanization and in the

Figure 1

```
34711      Engl          1968          14394--
Duerr MG
Greene J
National Industrial Conference Board, New York
Foreign nationals in international management - a survey.
[New York, 1968.] 50 p. diagrs. (Its - Managing
  international business, no. 2.)

Monograph on the /employment policy/ and practice of
/international enterprise/s in respect of /local/
/manager/ial talent with particular reference to the /role
of USA/ firms abroad - covers the /labour shortage/,
/recruitment/ and /in-plant training/ of /management/
personnel, /management development/, the role of /American/
staff, etc.
```

Figure 2
Sample dialogue with the computer

(*Question:* Unclassified publications of ILO or UNIDO on handicrafts or small-scale industries in any Asian country)

```
SEARCH NO. T-010.  ENTER QUESTION.

= HANDICRAFT
     P = 00274                    T = 00273
* SMALL SCALE INDUSTRY
     P = 00342                    T = 00501

+ ANY ASIA
     P = 02579                    T = 00152

( ILO PUB
     P = 01828                    T = 01828
* UNIDO PUB
     P = 00084                    T = 01912
)
     P = 01912                    T = 00024

# RESTRICTED
     P = 00228                    T = 00022

$
SAVE RESULT ?
NO, THANK YOU!
END SEARCH T-010.
```

production of various types of bibliographical services, the time has now come to consider how this type of system can be generalized. Two modes of generalization are foreseen: one of these is to broaden the coverage of existing bibliographical records to include those of other agencies and institutions that desire to participate, in other words to create a data network. The other way is to extend the scope of the system to accommodate other types of data. The ISIS system is now being extended in both ways.

An experimental network for exchange of bibliographical data is now in design by several co-operating international agencies, including FAO, ILO, OECD and UNIDO. Each collaborating agency has agreed to use a common vocabulary and to make its data base available to the others. In this way a significant first step has been taken to expand the system to achieve common purposes.

Expansion of the system to accommodate other types of data is also under way. ILO is now using certain modules of the ISIS system to accommodate data on research projects it is carrying out. This work will form the basis of a truly generalized system. Although much work still remains to be done in the expansion of the ISIS system, it could probably provide a framework for a computerized system for information on development assistance. The evolution of continuing co-operative arrangements between international agencies could permit access to a much broader data base, and this would help each institution to achieve its programme objectives.

EDITOR'S NOTE:

Based mainly on the approach and experience outlined in the article above, UNIDO has now set up its own Industrial Information System (INDIS) and is preparing its vast and growing collection of highly specialized documents for computer recording, storage and ready retrieval. The UNIDO programme, designed to form an integral part of the over-all United Nations information system, was launched in March and is expected, after an initial experimental period, to be in full operation this fall.

A team consisting of three indexers, a reviser, and a systems analyst has been assigned to this task. Following the ILO pattern, the indexers produce a brief description of each document, in form of a worksheet, listing the bibliographical data normally required in libraries, but also giving the essential statement of contents. This statement, or annotation (see samples below) contains the UNIDO descriptors chosen as most closely representing the subjects under discussion. It endeavours to give an exact indication of a paper's main theme and subsidiary topics, thus enabling the user to judge its aptness for his particular needs. With the co-operation of the International Atomic Energy Agency, which is located in Vienna, the INDIS programme is to be run on IAEA's computer, possibly with an attached UNIDO terminal allowing for conversational retrieval. The terminal might ultimately include a display screen for the fast projection of lengthier answers.

The types of documents now being processed originated within UNIDO. They include English language versions of printed publications such as major studies and reports, periodical publications and series, selected articles from IRDN *and the* Industrialization and Productivity Bulletin; *documents of expert working groups, workshops, and seminars, and those submitted to the Industrial Development Board; internal studies, technical assistance reports, including UNIDO feasibility studies; and answers to requests for information received by UNIDO's Industrial Inquiry Service. The processed material is to be microfiched. At a later stage, and as capacity becomes available, it may be possible also to process important unpublished feasibility studies deriving from outside the United Nations family. INDIS does not attempt to cover the world-wide published literature in science, technology and economics; this task has been left to existing abstracting services.*

It is envisaged that the INDIS team as presently constituted will process approximately five thousand documentary units per year. For the service to be of immediate use, the most up-to-date papers are being given priority, which means, in effect, that the current output containing the latest data will be made available first. This done, material from preceding years will be processed in reverse chronological order until the whole backlog of CID (Center for Industrial Development, the forerunner of UNIDO) and UNIDO documents has been indexed (the target date for this is 1973).

Through the provision of carefully maintained alphabetical indexes (organized by subject, author, title and country) and of the computerized search and retrieval services, INDIS aims to increase and facilitate the flow of industrial information vitally relevant to the developing countries.

Sample annotations

(Poncik J. Draft Final Report. Feasibility Study of a Tannery Industry in Uganda. Vienna, 1970.)
/Restricted/ /UNIDO pub/. Draft /final report/ containing /feasibility study/ on establishing two /tannery/s in /Uganda/
(1) discusses /production capacity/ and availability of /hide and skin/s for /processing/, also /working capital/, /capital goods/ /investment/, and /cost/ of /chemicals/ (2) presents /market/ and /economic analysis/ (3) makes /recommendation/s on production of /leather/, as /import substitution/ and for /export/, and on /purchase/ of /machinery/ and /equipment/. /Statistics/.

(Victorisz T. The Planning of Production and Exports in the Metalworking Industries. Vienna, 1969.)
/UNIDO pub/ on /planning/ of /production/ and /export/s in the /metalworking industry/ of /developing country/s
evaluates /industrial programming/ data, gained from a /research study/, with respect to /methodology/, /investment/s, /choice of product/s, /standardization/, /cost/ing, /market/s, /export promotion/, and criteria for optimal /foreign trade/ agreements./Factory layout/, /statistics/, /diagram/s, /bibliography/cal notes, photos.
/Conf/ Vienna 1969 Dec 12 to 19.

D02453

Capital Is Not Enough

IN MANY DEVELOPING COUNTRIES, the activities of commercial banks in the establishment and expansion of industrial ventures have been complemented by those of a special kind of bank, which may be called a corporation or an agency, which has been created to extend medium-term and long-term loans at low interest rates and to provide technical assistance and advisory services.

The *Industrial Research and Development News* is carrying a series of articles entitled "Capital Is Not Enough" showing how these institutions operate in various countries and regions. (See *IRDN*, Vol. IV, No. 4, pages 33 - 36, the Development Finance Corporation of Ceylon (DFCC); Vol. IV, No. 3, pages 16 - 18, the Industrial and Mining Development Bank of Iran (IMDBI), and pages 19 - 23, the Banco do Nordeste do Brasil, S. A. (BNB); Vol. IV, No. 2, pages 17 - 20, the Corporación de Fomento Industrial (CFI), Dominican Republic and pages 21 - 23, the Medium Industry Bank (MIB), Republic of Korea.

Economic Development in Asia: Asian Development Bank

By Douglas C. Gunesekera

The Author: *Douglas Gunesekera, born in 1917, received his education in Colombo and in London, where he graduated in sociology. He began his career in his native Ceylon with the Bank of Ceylon. He subsequently held government posts and was associated with the establishment of the Central Bank of Ceylon, of which he became Chief Accountant in 1955. Mr. Gunesekera joined the World Bank in 1957 as Alternate Executive Director, becoming Deputy Governor in 1962, an office he occupied for four years. His wide international banking experience led to his being appointed United Nations Project Manager for the establishment of the Asian Development Bank, of which he is now the Secretary.*

The Asian Development Bank (ADB) is a multilateral development finance institution established for the purpose of lending funds, promoting investment and providing technical assistance to "developing member countries", and "generally for fostering economic growth and cooperation in the Asian region".

Created as the result of Asian initiative and co-operation, with the close support of countries in other parts of the world, the establishment of the Asian Development Bank is an outstanding example not only of regional initiative but also of international co-operation.

The ADB has an authorized capital of US$1,100 million, of which $1,004 million has been subscribed by 21 nations from the Asian region and 14 nations from Europe and North America.

The presence of the developed countries as regional members or non-regional members of the ADB can, therefore, be regarded as recognition that economic development is the common concern of all countries.

While the value of bilateral aid is recognized by recipient countries, most developing countries may prefer assistance through multilateral organizations like the ADB, in which they participate and in which they have a voice in formulating policies. Although the ADB does not herald the obsolescence or the disappearance of bilateral aid, it does serve, in the words of ADB President Takeshi Watanabe, "as bellwether of an increasingly enlightened attitude on the part of the developed nations – one which facilitates the subordination of national self-interest to the pursuit of regional objectives". The ADB, he says further, has proven an attractive vehicle for the smaller developed countries, whose own resources would have made relatively little impact, but within the framework of a pool of resources, constitute a noteworthy contribution.

The ADB, with a major part of its capital subscribed by Asians is an expression of self-help by the Asians. It is considered by Asian countries as their own bank and is close to developing member countries not only geographically but also psychologically. It is also an international bank drawing resources from all parts of the world.

The ADB opened its doors for business at its temporary headquarters in Makati, a suburb of Manila, in the province of Rizal, Philippines, on 19 December 1966.

Its first years were concentrated in constructing an appropriate organization and staffing it with capable personnel. In establishing its organizational framework, the ADB has been able to draw on the experience of such other international financial institutions as the World Bank and the Inter-American Development Bank.

To fulfil the purpose of contributing to the acceleration of the process of economic development in the region, the founders of the ADB envisaged that it should have at its disposal two main categories of resources: its ordinary capital resources, derived chiefly from its authorized capital stock and from borrowing on the international markets; and special funds, which can be created by setting aside up to 10 per cent of the unimpaired capital of the ADB and from separate contributions made for this purpose from donor countries.

The ADB is required by its charter to be guided by sound banking principles. President Watanabe said at the opening ceremony of the ADB: "There is only one basic policy to which I firmly adhere, namely, to insure that each loan conforms to the principles of sound banking. We will endorse only those projects which are conceived within the framework of valid economic precepts."

This is a legitimate requirement and reflects the fact that the ADB is, after all, a banking institution. As many of the Governors at the Inaugural Meeting of the ADB in Tokyo pointed out, it is the duty of the ADB to be circumspect in selecting sound projects. The resources of the Bank are obviously small in relation to the needs of the region and it must therefore rely on borrowing if it is to be able to channel additional resources from outside the region in amounts sufficient to fulfil the high hopes of its members. But to borrow successfully, the ADB must establish a sound reputation as a credit-worthy institution and this must be demonstrated in part by a sound loan portfolio.

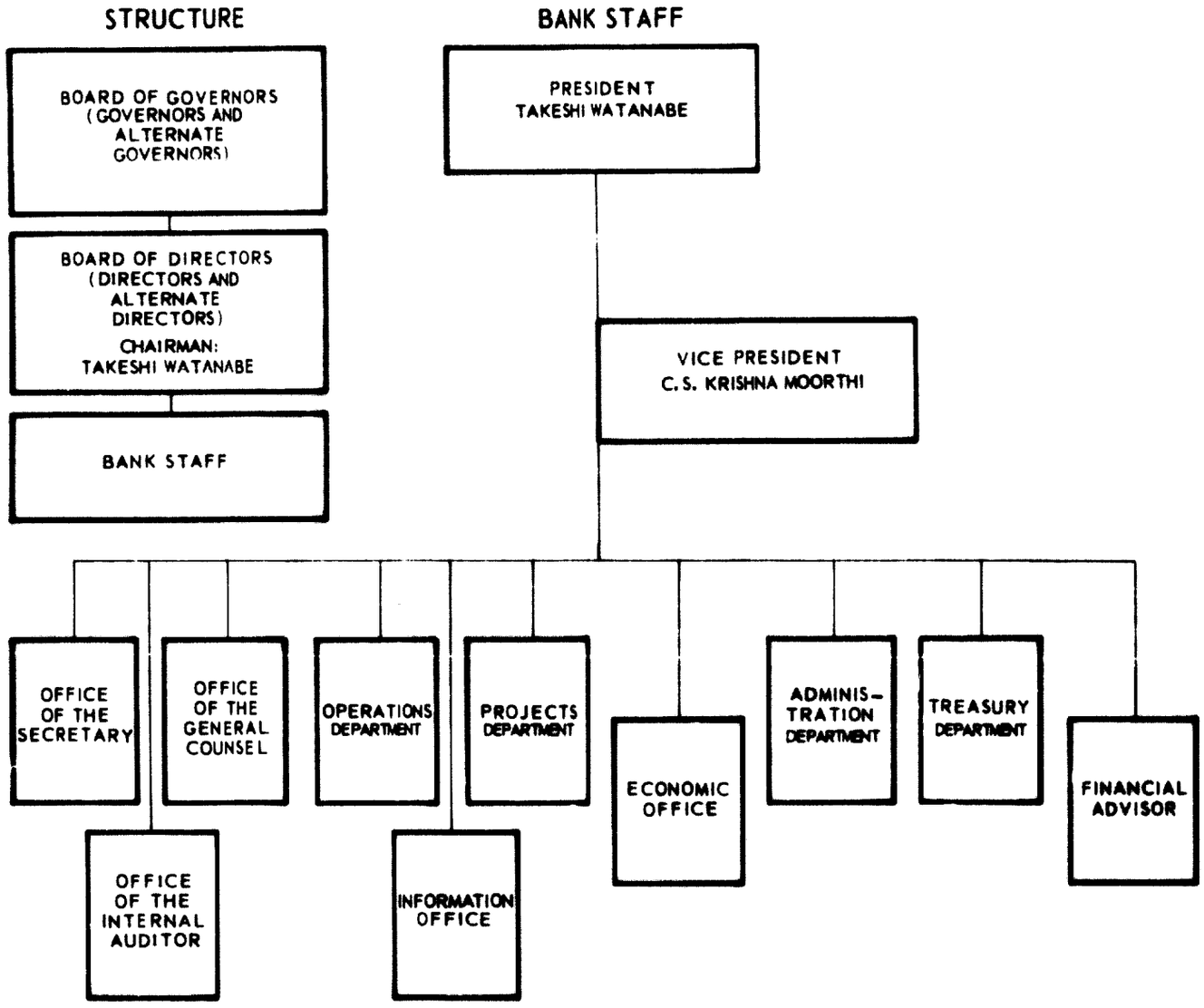
On the other hand, if the ADB is forced to restrict itself to making loans only for projects or programmes which can promise an immediate financial return, or only to countries which can support "conventional" terms, it runs the risk of failing to fulfil its wider role. It was, therefore, not surprising that, at the Inaugural Session in Tokyo, many Governors voiced the need for the ADB to be given the means of making loans on easier terms than those required for ordinary operations.

Several developing countries are currently caught in balance-of-payment situations where a significant per-

Members and subscriptions

Regional Members	*Subscriptions US $ millions*
Afghanistan	4.78
Australia	85.00
Cambodia	3.50
Ceylon	8.52
China, Republic of	16.00
Fiji	1.00
Hongkong	8.00
India	93.00
Indonesia	25.00
Japan	200.00
Korea, Republic of	30.00
Laos	0.42
Malaysia	20.00
Nepal	2.16
New Zealand	22.56
Pakistan	32.00
Philippines	35.00
Singapore	5.00
Thailand	20.00
Viet-Nam, Republic of	12.00
Western Samoa	0.06
	624.00
Non-Regional Members	
Austria	5.00
Belgium	5.00
Canada	25.00
Denmark	5.00
Finland	5.00
France	25.00
Germany, Federal Republic of	34.00
Italy	20.00
Netherlands	11.00
Norway	5.00
Sweden	5.00
Switzerland	5.00
United Kingdom	30.00
United States	200.00
	380.00
TOTAL	1,004.00

Organization of the ADB



centage of all new funds is already committed to the servicing of existing debts. Moreover, some projects do not provide appreciable benefits to a nation's economy until many years after the initial investment. There will thus be an ever-increasing need for money to be loaned at concessional terms, for the investment needs of Asia are still vast and will not diminish overnight.

The ADB's Board of Directors has adopted rules and regulations providing for "Consolidated Special Funds" of the ADB, under which general heading there is provision for an Agricultural Special Fund, a Multi-purpose Special Fund, a Technical Assistance Special Fund and such other special funds as the ADB may establish or accept from time to time.

In response to President Watanabe's appeals for special funds contributions from the developed countries within and outside the region, several of these countries have already contributed or pledged to contribute to one or more of the bank's special funds. As of 30 June 1970, the total available special funds resources amounted to $74,814,000.

Excluding the "set-aside" of $14,575,000 from the ADB's ordinary capital for the Multi-purpose Special Fund, as authorized by the Board of Governors at its Second Annual Meeting in Sydney in 1969, resources available in this Fund amounted to $49,400,000. These came from Canada, Japan and the United Kingdom.

Available resources in the Agricultural Special Fund, which were contributed by Denmark, Japan and the Netherlands, totalled $23,106,000.

For the Technical Assistance Special Fund, the amount of $2,308,000 came from Canada, Denmark, Finland, the Federal Republic of Germany, Japan, New Zealand, the United Kingdom and the United States.

In its desire to establish its credit-worthiness, preparatory to the raising of substantial funds on the capital markets of

the world for the purpose of supplementing its ordinary capital resources, the ADB took an important step by floating its first bond issue in the Federal Republic of Germany in September 1969. The issue, which consisted of DM60 million 7%, 15-year bonds, was placed through an international syndicate headed by Deutsche Bank AG. In April 1970, the ADB successfully sold another 7 per cent issue in Austria for AS130 million to an Austrian banking syndicate headed by Creditanstalt-Bankverein and Österreichische Länderbank AG.

"In both instances", Mr Watanabe said, "we were pleased by the co-operation we received from the banks in those two countries, and we were even more pleased that the Asian Development Bank was able to place these issues on such favourable terms. That we were able to do so was due to the fact that in our three and a half years of existence, we have firmly established ourselves as a sound financial institution."

The ADB has obtained qualification legislation in 12 states of the United States that would give its bonds as favourable a position with respect to regulated investors as that enjoyed by bonds of the World Bank and the Inter-American Development Bank. This programme of bond qualification, which is to be pursued in additional states in subsequent years, sets the basis for entry of the ADB into the American market when it seeks to issue its bonds.

In a little over three and a half years of existence, the ADB has rapidly expanded its activities in fulfilment of its role in promoting economic development in Asia.

Modern tea-withering machines which reduce withering time have modernized the tea factories in Ceylon. The ADB loan to Ceylon is designed to step up investments in factory modernization and development in order to improve and increase the capacity for processing green leaf

The most significant development of the year 1969 was the introduction by the ADB in June of lending on concessional terms. The bulk of the new special funds resources was made available to the ADB on significantly liberalized conditions; areas of procurement have been extended and the ADB is now in a better position to lend from the contributions for deserving projects on more liberal terms.

As of 27 July 1970, the ADB had approved 24 conventional loans amounting to $138,835,000 and 9 "soft" loans in the aggregate sum of $34,648,000. The countries that have received conventional as well as concessional loans from the ADB are Cambodia, Ceylon, the Republic of China, Indonesia, the Republic of Korea, Laos, Malaysia, Nepal, Pakistan, the Philippines, Singapore, Thailand and Western Samoa.

The projects to be financed, or being financed, by these loans cover a wide range of development activities that include: roadways, elevated railway design, water supply and irrigation schemes; a multi-purpose development scheme; the processing of agricultural products and the development of fishery fleets; electric power, fertilizer and other industrial plants; loans have also been channelled through national development banks for the establishment of small and medium scale industries.

The ADB has joined other international and bilateral lenders in financing projects. It has also financed projects which emerged from earlier studies undertaken by the United Nations Development Programme.

In the field of technical assistance to member countries, the ADB, as of 27 July 1970, had approved technical assistance grants to 13 developing member countries, which include Afghanistan and the Republic of Viet-Nam, covering more than 30 projects, involving a total of $4,704,950.

Technical assistance plays an important and at times indispensable role in the ADB's activities. It has proved particularly useful to member countries which are less experienced in preparing and managing an expanding range of developmental activities. Many of the projects financed by the ADB, both from ordinary capital and Special Fund resources, owe their origin to the technical assistance activities undertaken by the ADB in earlier years.

In some cases, associated technical assistance has been found to be necessary in the implementation of loan projects. Training of personnel and the strengthening of management have been other important features of the ADB's technical assistance.

The ADB also provides advisory services in certain fields of economic activity. It is, for example, helping to provide the basic material for the planning of overall economic development in several countries; it is supporting regional research institutions; and it is also carrying out surveys in fields of economic activity relevant to its own banking operations but not necessarily related in a direct way to individual projects.

Another field where the ADB is playing a vital role is in the promotion of regional co-operation.

One of the first major regional activities undertaken by the ADB was an agricultural survey in Asia which was completed in 1968. The results of the survey are now being

translated into action and given practical effect through the ADB's lending and technical assistance activities. As a follow-up to the survey and the publication of its report, a Regional Seminar on Agriculture was held in Sydney at the time of the Second Annual Meeting of the ADB Board of Governors. In his speech at the opening of the regional seminar, President Watanabe said: "The decision to conduct the Asian agricultural survey was the very first operational step taken by the bank and clearly illustrates the importance the Bank's Directors place on the accelerated development of agriculture in the region. However, it is important to state that we believe agriculture and industry are not distinct alternatives on the development agenda but are mutually complementary and interdependent. A healthy and prosperous agricultural sector can provide a sound base for acceleration of the whole process of economic development."

The ADB arranged a Regional Conference of Development Banks of Asia from 14 to 18 July 1969 in Manila. While three such conferences had been held before (in Bombay, Teheran and Tokyo), it was the first time the ADB assumed the responsibility for convening such a regional conference. This conference, where policy-level experts from financing institutions in developing member countries and Iran were the main participants, was also attended by representatives from institutions outside the region which have interest in the promotion and successful functioning of development banks in the region. The attention of the conference was focused on the practices and problems faced by them in project stimulation, appraisal, financing and implementation. Participants were able to exchange their experiences and thus fortify the working of national development banks as important catalysts of economic growth.

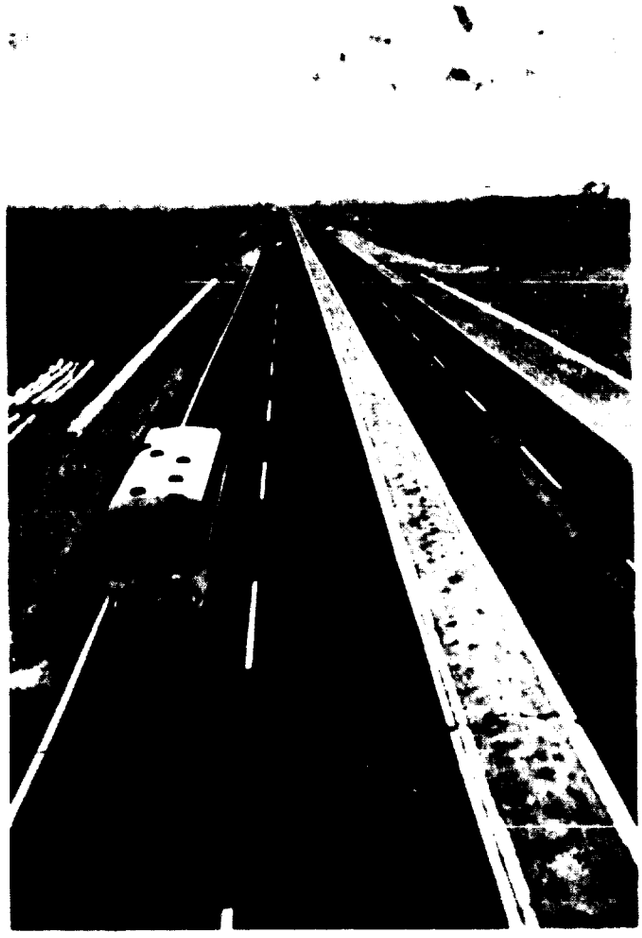
ADB-financed aluminium plant expansion of the Taiwan Aluminium Corporation in Kaohsiung. The expansion programme calls for an increase in its alumina plant capacity from 42,000 to 78,000 metric tons per annum in 1970 and its smelting plant capacity from 20,000 metric tons of primary aluminium to 38,000 metric tons per annum in 1971

The ADB is currently undertaking a regional transport survey of Southeast Asian countries. The over-all objective of the survey, which was requested by certain Southeast Asian countries, is to provide a basis for coordinated development of transportation in the Southeast Asian region and to inquire into how transport can promote regional economic development and co-operation. The survey is expected to be completed by March 1971. The ADB is anxious that the survey turn out to be a proving ground for projects for national and regional transportation development for Southeast Asia. The countries to be covered are Indonesia, Laos, Malaysia, the Philippines, Singapore, Thailand and the Republic of Viet-Nam.

Upon the request made at the Fourth Ministerial Conference for Economic Development of Southeast Asia in April 1969, in Bangkok, the ADB is now conducting a study of the key issues of economic development that will be faced by the participating Southeast Asian countries in the 1970s. The Ministerial Conference was attended by Indonesia, Japan, Laos, Malaysia, the Philippines, Singapore, Thailand and the Republic of Viet-Nam, with Cambodia sending an observer. The study is to "analyse the nature of the major problems that will confront the nations of the region in the 1970's and explore the possibilities of individual and co-operative action by the Governments to effect their solution". In proposing such a study to the conference, the Government of Thailand stated that the study was necessary in view of the rapidly changing economy of the region. It noted that agriculture of the region was being revolutionized and that there were significant possibilities for the development of the water resources of the region, such as those of the Mekong, and the development of the mineral resources and the industrial complexes based upon these resources. Among other factors which will influence the future economic development of the countries of Southeast Asia reference was drawn to the financial implications of the prospective end of the conflict in Viet-Nam and the withdrawal of British troops from two countries of the region.

The ADB is now acting as the administrator of the Law Association for Asia and the Western Pacific (LAWASIA), which is engaged in the carrying out of the first stage of its research programme involving a study of security arrangements available to national development banks and other financial institutions in developing member countries of the ADB for the purpose of supplying medium and long term credit for development purposes and the financing of working capital.

The ADB has agreed to provide financial assistance for the proposed Asian Vegetable Research and Development Center in the Republic of China. The Center itself is sponsored by the Republic of China, Japan, the Republic of Korea, the Philippines, Thailand, the Republic of Viet-Nam and the United States.



The ADB-financed 29.9 kilometer, four-lane Seoul-Inchon expressway in the Republic of Korea is now meeting the rapidly increasing needs of road transportation between the nation's capital and largest city, Seoul, and its only access to the sea, Inchon

Assuming satisfactory terms of reference and a programme of implementation, the ADB has agreed to provide financial support for the proposed ECAFE Asian Industrial Survey. The survey will assess the potential for industrialization of the whole area and make concrete proposals for industrial programs and projects based on the coordination of investment, production and trade policies between all or some countries of the area to be covered by the survey.

The ADB's record of performance thus far clearly reflects its mounting impact on the region. There is a growing appreciation of the fact that the ADB has a substantial and distinctive role to fulfil in the economic development of Asia.

It is in this context, that the ADB has been progressively building up a sound and resilient framework and a personality of its own in responding to the needs of its developing member countries.

D02454

The Author: *Graham Hulley was born in Leeds, Yorkshire, England, in January 1935. He holds a diploma in journalism and is a member of the Institute of Journalists, the British Association of Industrial Editors and the Institute of Public Relations. (His special concentration was on political and economic journalism.) He joined the East African Standard Newspapers in 1959 working on the then "Tanganyika Standard" in Dar-es-Salaam. Mr. Hulley left the United Republic of Tanzania in 1964 and was appointed by the British Government as deputy director of the British Information Services Office in Mauritius, later taking charge of the Office. In September 1968, he joined the Industrial Development Corporation of Zambia Limited (INDECO) as Industrial Editor. (Photo by Mike Sibthorp.)*

INDECO of Zambia

By Graham Hulley

WITH THE CREATION of the Zambia Industrial and Mining Corporation Limited (ZIMCO), a new structure has been established for the state participation sector of the Zambian economy, which thus now includes mining in addition to the industrial and commercial enterprises hitherto falling within the scope of the Industrial Development Corporation of Zambia Limited (INDECO). The Board of ZIMCO, representing a wide segment of Zambian opinion, consists of six members of the cabinet, trade union leaders, the President of the House of Chiefs and a member of the university economics department. The ministries represented are: Rural Development; Development and Finance; National Guidance; Trade Labour and Social Services; and Power, Transport and Works.

The Industrial Development Corporation, embracing over 80 companies, has been renamed INDECO Limited and becomes a wholly owned subsidiary of ZIMCO but will continue to operate according to the pattern established in 1969. A sister company MINDECO Limited is also a wholly owned subsidiary of ZIMCO concerned with the mining sector.

The announcement of the ZIMCO structure, together with the promulgation in January of the Mines and Minerals Act (1969) and the statutory instruments issued under it, has set the stage for the next phase in the development of the mining industry in Zambia, with a heavy emphasis on both increased production and the opening of new deposits.

Exploration of the country's mineral resources has only just begun; thousands of square miles covering belts of indicated mineralization have yet to be prospected with modern geophysical and geo-chemical techniques. Indicated copper mineralization, for example, stretches in a broad arc from the Zambesi district through the North Western Province and the Copperbelt and then southeast as far as the eastern Lusaka district. Iron is found extensively in the western Central Province with a significant deposit also in the Copperbelt at Kasumbalesa. The coal deposit at Maamba in the Southern Province is now believed to contain reserves of 80 million tons, while other deposits exist in the Luano and Luangwa valleys. Manganese occurs in the Luapula Province, although transport problems make exploitation uneconomic at present. Precious and semi-precious stones – emerald and amethyst – are now being mined at Luanshya and in the lower Zambesi valley, respectively, and tin is being recovered in the Choma district.

In a way, the mining groups operating in the Copperbelt have been "spoiled" because of its large deposits of high-grade ore – 13 per cent of the world's known reserves – and have tended to neglect deposits below 2 per cent copper

content. Now, with the increasing world demand for copper — estimated at 18 million metric tons a year by the end of the century compared with 4.5 million in 1969 — greater attention will be paid to the lower grade orebodies in Zambia, such as that at Lumwana in the North Western Province, which has a copper content of 0.9 per cent in a deposit of some 200 million tons. In the United States a recent project aims to win copper from an extensive deposit in Arizona grading at a mere 0.17 per cent. Thus, even if deposits as rich and extensive as those of the Copperbelt were not found elsewhere in Zambia, there is good cause for predicting a considerable growth in the mining of the "red metal". Indeed, there are signs of the development of a new mining complex in the North Western Province. Kalengwa is already in production, Kansanshi is due for reopening, a licence has been taken out for work at Chifumpa in Kasempa district and at Mufumbwe, south of Kalengwa, while prospecting continues elsewhere in the province.

The fact remains, however, that Zambia has to look ahead to the time when the country will no longer be able to rely on mining to sustain its economy. Mining must be seen not as an end in itself, but as the source of capital for investment in the creation of a permanent and self-generating industrial and agricultural economy. This diversification of industry is the task of INDECO, which has grown from a development bank type of organization with assets of Kwacha 1 million (US$1.00 = Kwacha 714) in 1964 — Zambia's year of independence — to be the controlling body of a large industrial group with assets of more than Kwacha 120 million. The organization has just completed a shake-up of its administrative and operational system involving the regrouping of its subsidiaries to fit into the new economic order being wrought by the successful state participation policy.

To understand the logic of INDECO's changes, it is first necessary to examine briefly how large-scale state participation in commerce and industry evolved in Zambia and how it fits into the economy. The process involves the marrying of the professionalism of private enterprise to the wider aims of national ambition as reflected by government policy and planning. It really got under way in 1968, when, after President Kaunda's Mulungushi reforms, INDECO acquired control of a number of major enterprises and culminated last year with the moves to bring the mining industry under state control.

The situation that brought about Zambia's revolutionary economic changes is a result of the influences on the country both before and after independence and the need to find an economic system relevant to the needs of Zambia. The National Policy of State Participation is expected to harness all the forces and resources in Zambia towards the goal of real economic freedom. It will promote reinvestment of excess profits and speed up development. It is also important that some of the development forces represented by large-scale industry are, wherever possible, used to improve the

Long-hole drilling at the Mufulira Mine

quality of life in the rural areas and thus prevent the drift of labour to the towns. At the same time the opportunities for outside investment will flourish from the general stimulation of economic activity resulting from the changes.

To ensure success, however, quick and efficient channels of communication are essential from the top government level down to the "grass roots" level of individual enterprises. INDECO's new organizational set-up is designed to achieve just this and is a good example of how the State can participate in industry and commerce without any of the sacrifices of efficiency and successful operation that too often occur. The INDECO Group has been divided into small subgroups operating in the fields of building supplies, manufacturing, transport, consumer trading, rural enterprises and property.

Each of these subgroups is headed by a chief executive who is answerable directly to the main INDECO board. These chief executives operate from holding companies. INDECO's shares in its various subsidiaries are held by the appropriate holding company, each of which is 100 per cent owned by INDECO.

Almost all the chief executives have served for some time in INDECO's central organization and are thus well equipped and well aware of the Corporation's policies as well as the way in which their particular subgroup fits into the over-all pattern. From these chief executives the "vertical" chain of command descends through general managers, branch managers, department heads and so on. At the same time "horizontal" co-operation is being developed between INDECO subsidiaries. The intention is that inter-company assistance will generate increased enthusiasm and efficiency and, through the exchange of ideas, act as a spur to continued progress.

Links with the Government are at INDECO board level. The composition of the board, including as it does senior civil servants, ensures that the economic policies of the Government are reflected in the activities of companies in which the State has an interest.

One of the most valuable aspects of INDECO's establishment of subgroups is that it will facilitate the eventual placing of shares for sale to the public through Zambia's new Stock Exchange. It is expected that a portion of the shares in the various holding companies controlling INDECO's subgroups will be made available for sale through the Stock Exchange, with a view to encouraging individual Zambian participation. INDECO's main role, and indeed its major contribution to the economy, is in helping to diversify Zambia's manufacturing base.

It is worth noting that the index of manufacturing production soared to 243 for the first half of last year from 124 in 1964 from a base of 100 in 1961. Since the over-all industrial production, which includes mining, increased at a much lower rate, it is clear that the new factories being developed by INDECO are having a profound effect on widening the country's industrial base. What these figures mean in simple terms is that manufacturing production has doubled, and the contribution to the national income of manufacturing has risen from 6 per cent in 1964 to about 12 per cent in 1969.

INDECO's operations include logging. Here an indigenous Brachystegia tree is being felled, the wood of which provides pit props for Zambia's copper mines

Several important projects that will broaden the country's economic base reached "agreement" stage during the first weeks of 1970. In January, formal documents were signed by INDECO and Fiat for the establishment of a motor car assembly plant at Livingstone. The plant will employ some 300 Zambians who will produce an initial 5,000 cars a year beginning in 1972. The plant's ultimate capacity is 12,000 vehicles, and the Fiat 500, 850, 124 and 125, with their station wagon equivalents, will be built from "completely knocked down" kits imported from Italy. The agreement stipulates that local components will be used wherever possible – a stipulation that will be to the advantage of other industries in Zambia, particularly, to start with, the manufacturers of batteries and tires. Construction of the Fiat plant will begin in the middle of the year.

Two other important agreements have been signed with Italian interests. INDECO and Ente Nazionale Idrocarburi (ENI) are to build and operate the INDENI oil refinery at Ndola to process crude oil imported through the Tazama pipeline from Dar-es-Salaam. INDENI will produce all Zambia's needs for regular and premium petrol, illuminating paraffin, aviation turbine fuel, diesel oil, heavy fuel oil, liquefied petroleum gas, and bitumen. The refinery will cost about Kwacha 24 million in all, and its products will be on sale late in 1972.

INDECO has also gone into partnership with the ENI subsidiary Azienda Generali Italiana dei Petroli (AGIP), by taking a 50 per cent stake in AGIP (Zambia) Ltd., which will now expand its activities as a petrol marketing company as well as erect a chain of motels. The first of these will be at Ndola, followed by two others in the Copperbelt helping to relieve the shortage of accommodation in that part of the country.

In recent years INDECO has launched an impressive number of new projects. These include an oil pipeline, hotels of international standard, a textile mill, a new industrial town, a copper tube and wire plant, and a sewer pipe and brick factory. On the drawing board, apart from the car assembly plant and oil refinery mentioned earlier, are plans for an iron and steel complex and a glass bottle factory.

INDECO is also playing its part in the government campaign for increasing rural development. In a number of rural centres, through its Rural Enterprises Group, it is establishing or has established maize mills, bakeries, garages, dry cleaning establishments and fully serviced premises for various small-scale industrial activities. One excellent example of a very useful agro-industry is the canning factory just being completed at Mwinilunga in the North Western Province. Mwinilunga is an excellent pineapple-growing area, but hitherto farmers have had difficulty in disposing of their crop because of transport problems. The cannery should solve this problem and also encourage the production of other crops suitable for canning. The first cans are expected to come off the production line soon.

Two of INDECO's new projects which came into production earlier this year will also provide a boost for agricultural development. The industrial fabrics factory at Kabwe will provide an outlet for locally grown kenaf fibre. The nitrogen fertilizer plant at the new industrial estate at Kafue will, apart from saving foreign exchange, ensure there are no gaps in supply, as can occur when goods are imported. The plant will be operated by Nitrogen Chemicals of Zambia Ltd., in which INDECO has a 90 per cent shareholding.

More than 70 per cent of the population lives in rural areas; despite mining and industrial activity, Zambian life is still very much geared to agriculture. President Kaunda has repeatedly stressed that efforts must be made to avoid splitting Zambia into two groups the privileged urban residents and the less privileged rural dwellers. There is already a sizable drift of population from rural to urban areas, and the only way of curbing this is to make rural life as rewarding and as full of opportunity as town life.

Nitrogen Chemicals will meet Zambia's need for ammonia nitrate, both as a fertilizer and as raw material for the manufacture of mining explosives by Kafironda Ltd., which has its factory near Mufulira on the Copperbelt.

Nitrogen Chemicals, with an investment of Kwacha 18 million, and a textile mill costing Kwacha 8 million are at present the two largest projects on the industrial estate being developed by INDECO at Kafue, 27 miles from Lusaka, but very soon they will be overshadowed by INDECO's and Zambia's biggest industrial undertaking, excluding the copper mines. The Minister of Finance has announced in the National Assembly that it has been decided to go ahead with the establishment at Kafue of an integrated iron and steel mill costing more than Kwacha

President Kaunda and his party leaving the main access tunnel at the Kafue hydro-electric project

30 million. The plant will have a capacity of about 120,000 tons and will use ore from the deposit at Sanje, about 30 miles from Kafue.

For industrialists, the word Kafue has two connotations: it can mean either the estate and the large projects located there, or the hydro-electric project ten miles downstream where the Kafue river enters the gorge and begins its rapid descent to the Zambezi. The rock-fill dam is now rising from the river bed, and in 1971, power initially, 300 megawatts will surge from the turbines to join the national grid and help feed mines and industries with the energy they require. However, the electricity from Kafue will not be enough to satisfy Zambia's growing needs, and a 900 megawatt generating station is to be built on the north bank of the Kariba Dam.

A team of World Bank experts arrived in Lusaka early in March to tie up financial arrangements for this extension to Zambia's hydroelectric capacity. Work on the Kwacha healthy inflow of foreign exchange to the Zambian treasury occasioned by the continuing high price of the metal on the international market. Although it is impossible to predict prices in coming years, the indications are that a figure of about Kwacha 900 per ton has been accepted as a foreseeable median price. Although this is considerably less than the 1969 average, it is a figure that will allow the Zambian economy to continue to expand.

To make the whole spectrum of state participation clear, it is necessary to look briefly at other forms of activity in which the Government is involved. In addition to having ultimate responsibility for INDECO, the Ministry of State Participation is also the overlord of Zambia Airways Corporation. Under the umbrella of the Ministry of Rural Development are the new Rural Development Corporation, the National Agricultural Marketing Board, the Dairy Produce Board, the Cold Storage Board of Zambia and the Tobacco Board of Zambia.

Aerial view of an INDECO project, the fertilizer factory at the new industrial town of Kafue (Photo by Mike Sibthorp)

35 million project financed by the World Bank is expected to begin this year. When it has been completed, Zambia will have an independent source of power. Other developments in the production of electricity include the commissioning of the Lusiwashi hydro scheme in the Serenje district. Power will be led from the waterfall generators to Serenje, with a later extension in the Mkushi district, agriculturally rich and with several mining prospects, and across the Luangwa valley to centres in the Eastern Province. Meanwhile, the installation of diesel power stations at Zambezi, Kabompo, Kasempa and Mwinilunga continues.

In view of the importance of copper to the economy, the production figures for 1969, released in February and showing an all time record at 747,000 metric tons, were an encouraging indication that the difficulties arising out of fuel shortages have been overcome, not to mention the

In the field of power supplies Zambia has at present four organizations; the Central Electricity Corporation Ltd., Central African Power Corporation, Victoria Falls Electricity Board and Northern Electricity Supply Corporation (private) Ltd. Moves are under way, however, to rationalize this situation by merging these bodies into one Zambia Electricity Corporation. Other important government-backed bodies are the Zambia Railways and the Zambia Housing Board.

Since 1964 Zambia's manufacturing and commercial sector has made rapid progress, largely owing to the added impetus given by INDECO. If the same rate of progress is maintained during the 1970s, clearly the nation will achieve that full economic independence it seeks and at the same time demonstrate that State participation is an economic system suited to the needs of a developing country and one which pays dividends in every sense of the word.

D02455

Danish Technical Information Service

By M. Meedom

Industrial background

MOST PEOPLE think of Denmark only as a farming country producing high-quality agricultural products. During the last 25 years, however, Denmark has become an industrial country. More than 38 per cent of the population is engaged in industry and the building trades and only 13 per cent in agriculture. Of Denmark's exports, 60 per cent derive from manufacturing industries; machinery and instruments represent Denmark's largest single category of export.

Raw materials, however, must be imported. The country's only chance of competing internationally is to utilize effectively scientific and technological knowledge in the manufacturing industries. Erik Ib Schmidt, Secretary of the Economic Secretariat under the Danish Ministry of Economic Affairs, stressing the importance of utilizing information, has declared: "If we in this country stopped all research, our standard of living could still be raised by at least 50 per cent provided we are able to utilize already existing knowledge in the best possible way."

Based on the thought underlying this statement, the Danish Technical Information Service *(Dansk Teknisk Oplysningstjeneste DTO)* was established in 1955 as a private independent institute affiliated, at first, to the Academy for Technical Sciences and, since 1961, to the newly established Danish Council for Scientific and Industrial Research. As an independent institution, DTO is able to operate freely, choosing the projects and enterprises it considers most likely to lead to success.

To carry out its task, DTO undertakes the following main activities: *(a)* contact and liaison service; *(b)* question-and-answer service; *(c)* active information service and *(d)* conference and course activities.

Contact and liaison service

The technical staff of DTO visit, on their own initiative, the top managers of industrial enterprises or research institutes throughout the country.

The competitive position of the individual firm is determined by its fund of knowledge and its ability to convert knowledge into salable goods, and only firms that steadily develop and follow a definite programme of expansion have a chance of survival.

By asking questions about the firm's commercial, financial and technical policy in the near future, the DTO information officer helps to reveal the need for a well-defined long-range policy. He also stresses the advantages of an internal information system that receives and distributes all kinds of information. During the discussion or the inspection of the factory that usually follows, the information officer calls attention to the specialized auxiliary services at the disposal of the company, and sometimes he is requested to arrange for these services to give assistance in implementing research or development projects, literature searches etc.

These visits make the DTO staff member familiar with the fields of interest and needs of the company and with its potentialities for development. The liaison service thus provides the basis for all the other services that DTO renders to industry.

Question-and-answer service

Joel Lundberg of the Swedish Textile Research Institute has referred to investigations showing that even very large firms produce only 2 per cent of the knowledge necessary for the manufacture of their new products within the firms. These 2 per cent are important if the final product is to be competitive, but it is obviously vital for the individual firm, as well as for the country, to use effectively the remaining 98 per cent of knowledge originating from sources outside the firm. The purpose of the DTO question-and-answer service is to encourage utilization of information from all sources.

As a result of the liaison service and other DTO activities requests for assistance are received and dealt with by DTO staff members on a confidential basis.

In the field, DTO usually acts as a switchboard transferring the requests to the sources of information competent to answer the questions raised. The information officer examines the inquiry, establishes personal contact between the inquirer and the specialist and follows up the matter to ensure that the request is fulfilled. He often deals with the question himself, either because the answer can be found immediately in the files of DTO or because the relevant information must be sought outside Denmark.

It should be emphasized that in many cases literature is no substitute for personal contact between the man with the problem and the man with the knowledge to solve it.

Active information service

An active, selective information service is provided, based on the fields of interest of the individual companies as specified during the visits of the DTO liaison officers. It is not the aim of this service to act as a current-awareness

service covering all new literature; this is a task that should be left to specialized information centres meeting the needs of a specific branch or a special field, such as corrosion or packaging.

The purpose of the DTO active information service is: *(a)* to send, uninvited, articles as a gift or publications on a loan basis that by their content and presentation can serve to stimulate further use of information within the company; *(b)* to supplement the information work being carried out in the companies by scanning abstract journals and similar literature of importance to industry but so broad in coverage that the companies would not normally receive them. Typical examples of such literature are foreign surveys of reports from government-sponsored research and development, lists of translations pooled at the European Translation Centre, and indexes of published conference proceedings.

The abstracts are sent uninvited and, therefore, free of charge, but in 20 to 25 per cent of all cases the recipients request DTO's assistance in procuring the original material mentioned in the abstracts. A fee is charged for this service.

To assist in procuring specific documents and in searching for information about specific subjects, a Scandinavian Documentation Center (SCANDOC) was set up in 1960 in Washington, D.C. to serve science and industry in Scandinavia. DTO acts as the national bridgehead for the use of SCANDOC.

Conference and course activities

The bottleneck usually occurs at the top level; therefore, DTO participates actively in top-management courses run in co-operation with the two Danish societies of engineers or organizes such courses itself. Seminars lasting two and a half days have been arranged for top managers on the importance of information for the development and growth of industrial enterprises and on the advantages of establishing an information policy and an information system in individual firms.

In enterprises where the top management has accepted the idea of using technical knowledge to strengthen the competitive ability of the company and wishes to convince its staff, DTO arranges one-day orientation courses on "Technical information and the enterprise".

Consulting service

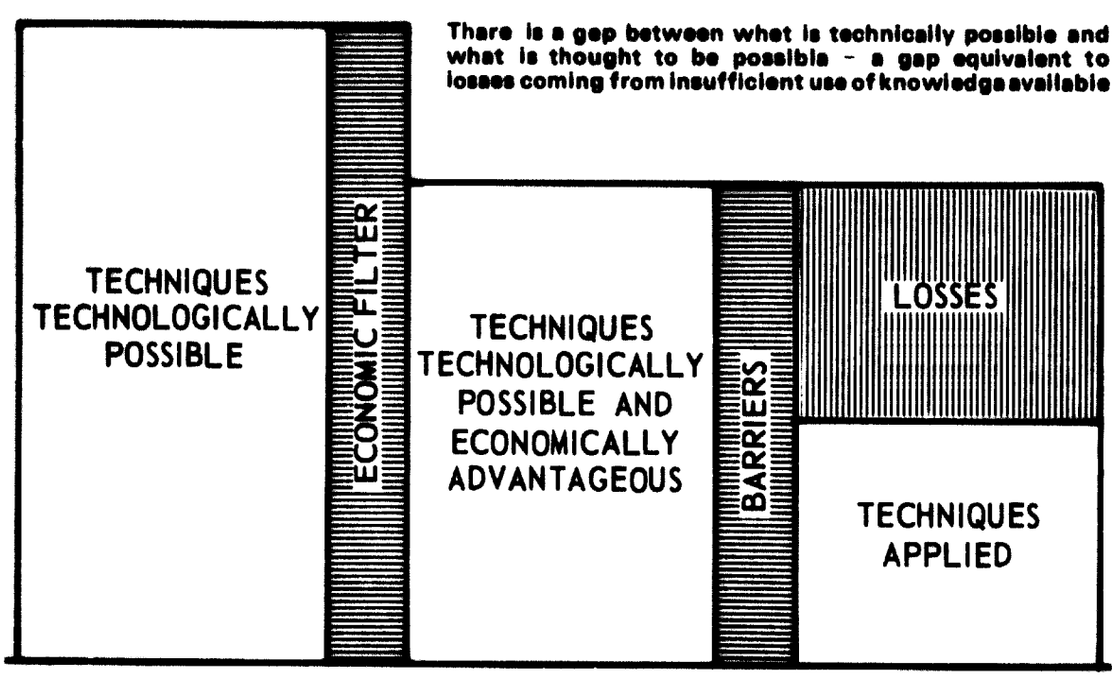
As soon as top managers realize their need for an individual information policy and a tailor-made information and communication system, DTO is consulted on how to establish and run such a service.

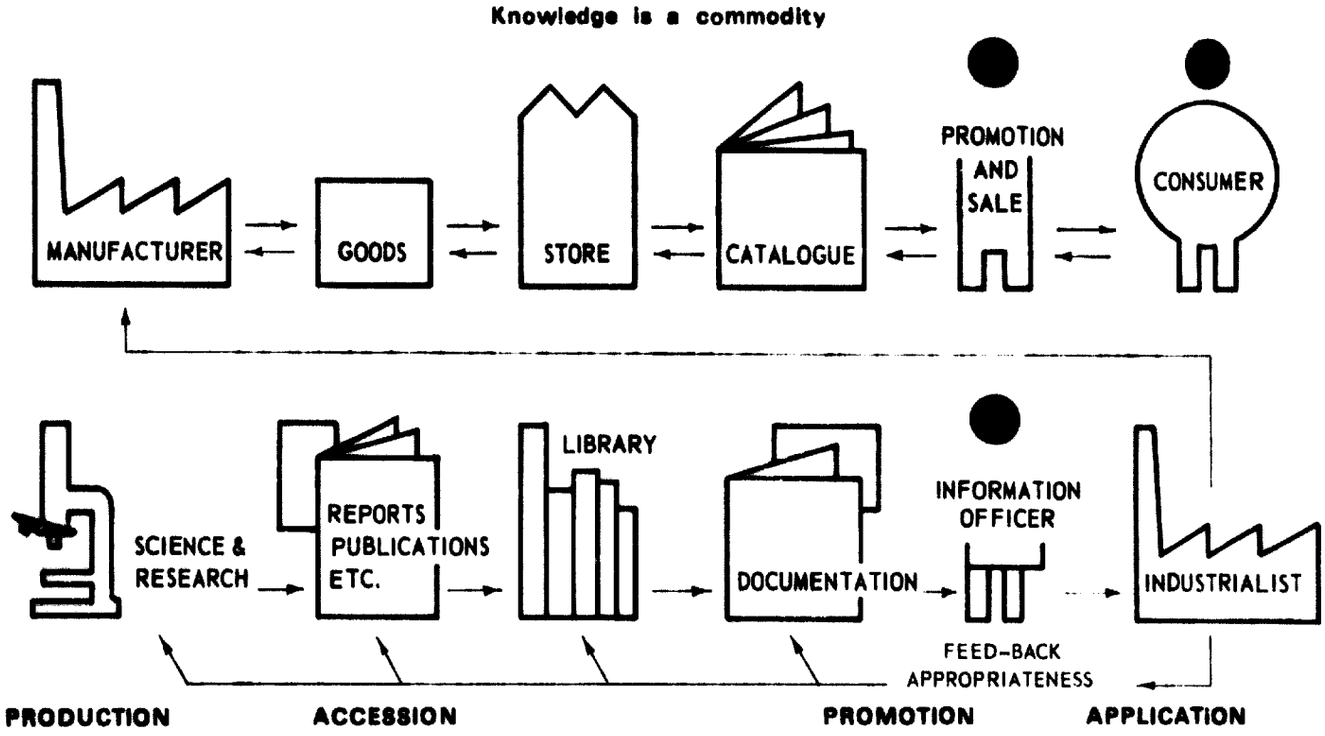
Whenever DTO arranges conferences on research and development services for different sectors of industry, a demand is created for specialized information and consulting services in those sectors. The Danish Council for Scientific and Industrial Research considers that in most sectors of industry there is a greater demand for auxiliary information services than for new research establishments. Such services should have a working programme similar to that of DTO but tailored to the special needs of companies in each sector of industry.

DTO offers such services free accommodation and also trains the staff members for their work on condition that the services are established for a trial period of three years and paid for as well as managed by the sectors of industry concerned.

Barriers to innovation

It is significant that the last few years have seen the emergence, within industry, of a completely new specialist expertise in the shape of the information scientist whose function is not to discover new things but, equally valuable, to find out what has been discovered elsewhere that could





Just as a commodity is of no use to producer or consumer until it has been sold and has met the consumer's demand, so knowledge obtained through research is of no value until it has been converted into measurable results in production.

be relevant to his own company or organization, and to ensure that research being done in his company is not duplicating work done elsewhere.

The development and growth of the company – private or public – will depend upon the fruitful utilization of existing technical knowledge.

It has been shown that nearly all the knowledge necessary for the manufacture of even very advanced products is available and waiting for the demand to appear. A fundamental activity of the industrial company is, therefore, to investigate the market for new products and determine how much of the market the company should satisfy.

In view of changes in demand and in conditions within different sectors of markets, combined with the enormous development of technical knowledge, the industrial company has continuously to alter its current and long-term plans. Decisions at all levels of management and supervision must be based on the best and most up-to-date technical, commercial, economic and organizational information available.

Technical innovation is belated owing to barriers that can be expressed in the two phrases: "Don't know" and "Don't want to know". There is a gap between what is possible and what is thought to be possible. J. K. L. Thompson of the British Ministry of Technology has suggested "that introducing technological change to industry is like mating two elephants. The mating process is difficult since one is dealing with two awkward beasts. Moreover, after conception there is a gestation period of twenty months or more before the results of the match appear and are capable of assessment".

Putting information to use within the company

The ways in which DTO attacks the problem of putting knowledge to use emphasize that to-day knowledge is a commodity that should be sold, distributed and consumed like all other articles. Knowledge is produced in the research and development laboratories and stored for future use in libraries in the form of literature. Abstract journals and bibliographies are the sales catalogues announcing what is in stock. Just as a commodity is of no use to producer or consumer until it has been sold and has met the consumer's demand, so knowledge obtained through research is of no value to an enterprise or to the community until it has been converted into measurable results in production, and the responsibility for the "sale" of knowledge lies with the information officers.

In each company the manager of the information service is responsible for acquiring knowledge and for its internal storage, distribution and consumption. He must, however, make sure that the knowledge acquired is utilized. To this end, regular meetings should be held at least once a month, when representatives of the various departments examine new information having a bearing on the company's policy. An atmosphere should be created that will encourage the staff to do their reading with the eyes of the company, asking: How can we use this? Who within the company can utilize this?

There is a gap between what is technically possible and what is thought to be possible – a gap equivalent to losses coming from insufficient use of knowledge available.

D02456

The Dutch Central Institute for Industrial Development

By Paul Catz

THE *Centraal Instituut voor Industrieontwikkeling* (CIVI) is the Dutch Central Institute for Industrial Development. It was founded by the Minister of Economic Affairs in 1937 during the great depression. The Minister was of the opinion that, as the Netherlands could no longer find work for the unemployed in agriculture, shipping, fishing and service activities, the future of the country would depend on industrialization. Realizing that at that time industry and government officials spoke a different language, the Minister established CIVI as a liaison office and manned it with technicians and economists. To avoid a too formal approach, this office was not made part of the Government, but was set up as a separate institute with a board composed of industrialists and government officials, but financially supported by the Ministry.

The shadow of the coming war, the grim restrictions of the war itself and its aftermath forced CIVI to concern itself with such matters as: raw materials distribution and allocation; settlement allowances; and substitute materials. When the war was finally over and industry started to stand on its own feet, the need for government intervention and support declined. But, at the same time, industry itself felt the need for experienced consultants to determine the most profitable ways of developing enterprises.

The director of CIVI rightly felt that CIVI had the necessary skills and know-how to perform this task with great success but that it could enjoy industry's full confidence only if it could cut financial links with the Government. Initially, government officials doubted the wisdom of such a move, but finally it was agreed that it should be given a trial. The experiment was very successful from the start, and in 1957 full independence was achieved, owing in large measure to the enthusiasm of the staff.

The form chosen for the independent institute was that of a foundation working on a non-profit basis with a board including leading industrialists and representatives of the departments of the Ministries of Economic Affairs and of Agriculture and Fishing.

Did it work? Was the country ready for this? Contrary to the opinion of the pessimists CIVI has developed with great success. In less than fifteen years its production index has soared from 100 in 1956 to 1,500 in 1969.

To find the reason for this outstanding success, one must examine the actual functions CIVI performs.

In its new form, CIVI undertakes the following activities: industrial market research; plant location studies; feasibility studies; diversification studies; product development; assistance in licensing co-operation; assistance in partner search in joint ventures; settlement of foreign industries; literature surveys; statistical surveys; evaluation of patents; and technical co-operation.

This is almost the entire "preliminary industrial package" required by an industry in the process of establishment or expansion. In selling such a package to an applicant, the institute should have at its disposal several experienced experts, good documentation and excellent contacts in the Netherlands and in other parts of the world, especially Europe. CIVI satisfies all of these conditions. It has specialists working in fields such as chemistry and affiliated industries, the metal and metalworking industry, the packaging industry. In addition it has several first-class economists who are able to supplement the technical investigations.

The Author: *Paul Catz was born in Rotterdam. He studied law at Leiden University, where he obtained his degree as a doctor of laws on a thesis on forgery of bills. While working in London, Hamburg and Cape Town his interests began to centre on financial-economic journalism, and after his return to the Netherlands he made a journalistic career as Dutch correspondent for several foreign papers such as the* Financial Times *of London, the* Wall Street Journal *and the* New York Times *of New York. At present, he is the Netherlands correspondent for the McGraw-Hill organization of New York,* The Times *of London and other foreign publications; he is also a regular contributor to* Elseviers Weekblad *of Amsterdam.*

Industrialists establishing a new plant or manufacturing a new product or expanding existing production facilities require guidance on a host of subjects such as: the project's or product's potentialities; the processes known in the field; the optimum plant size; the standards of quality and design; the investment required; the potential supply of raw materials; the extent of competition; the availability of subcontractors; the problems relating to by-products; questions such as labour laws, building codes, marketing practices, national or regional economic outlook and the like.

Needless to say, a company could, theoretically, do all this work itself. Some in fact do so, but even among the big industrial companies there are several that prefer to hand this assignment to an institute that is somewhat more detached and likely to be free of what the Dutch call "business blindness".

CIVI is generally recognized as being better fitted than an individual enterprise to advise on the broad economic setting for a new venture because it does not confine itself to the Netherlands but includes in its research at least the countries of the Common Market. To preserve its competence in this sphere, liaison is maintained not only with other Dutch organizations operating in allied fields, but also with similiar institutes abroad.

Dutch industry has recognized the value of working with CIVI and with its technical experts and economists, who, through years of experience and through their own work in industry, fully understand and speak the "industrial language". In the realization of certain projects, many Dutch industries, and a number of foreign ones too, have benefited from the temporary addition of the necessary specialized staff and have not had to increase their own staff or divert existing staff from their normal work.

CIVI has assisted in the establishment of many industries in the Netherlands; for example, the Royal Netherlands Soda Industry of Delfzijl and the AKU-Goodrich synthetic rubber plant CIAGO of Arnhem. It has also been consulted by foreign clients from Belgium, Finland, Israel, the Netherlands Antilles, Surinam, the United Kingdom and the United States.

In every case, CIVI's working schemes are drawn up in close co-operation with the client. This means that the scheme and the report are not ready-made but tailor-made, fully adapted to the special needs and wishes of the industry in question. Before making a start with the work, CIVI provides an estimate of the costs, based on the anticipated hours required to complete the entire investigation. But even during the study CIVI keeps very close contact with the customer, so that the company can at any time request modifications in the investigation or even withdraw it.

The following is an example, chosen at random, of a working scheme for the manufacture of a mechanical product.

Introduction:

- Description of the project and product;
- Summary of the problems of the project (product).

The Product:

- Its properties;
- Its uses.

Manufacturing:

- Competing methods and products;
- Discussion of advantages and disadvantages;
- Raw material and components position;
- Site selection;
- Cost price calculation;
- Patents on manufacturing methods.

The Market:

(Note: potential market to be specified and agreed upon by the commissioner) e.g. Benelux; Common Market; free trade countries; Western Europe; World.

Duties

Sales conditions:

- Prices;
- Test procedures and requirements;
- Quality groups;
- Trade uses.

Competition:

- Main suppliers;
- Manufacturers' associations.

Future prospects

Advice

Summary and conclusions

Appendices

It should also be mentioned that all assignments are treated by CIVI as absolutely confidential. The Institute is well aware that only extreme discretion can lead to profitable contacts, and it avoids alerting competitors. Even the board of the CIVI foundation is never informed of the nature of assignments under consideration.

One cannot stress too much that CIVI is not a government institute. It is an independent, non-profit body, financed by the fees charged for its investigations. Most of the assignments now come from private, large and medium-size industry; the rest come from government and public bodies.

What can CIVI offer to developing countries? Most developing countries have reached the point where they need no longer be solely dependent on agriculture and allied activities but can consider setting up industries. This situation is very similar to that of the Netherlands in the 1930s.

At present, the Netherlands needs to attract industries with advanced techniques and advanced products to extend and fortify its economy. CIVI is still playing its role in this industrial development and is continuing to acquire the basic experience needed by countries now in the process of industrialization. CIVI is, however, aware of its practical limitations and does not hesitate to subcontract parts of a study to others who are better fitted and equipped for a particular operation.

Reports and advice supplied by CIVI are given in a form that can be easily read and understood by those concerned with the realization of the projects. It must be borne in mind that CIVI is a consulting office, which can only explain the feasibility, the possibilities, the merits, the drawbacks and the problems of a project. The actual realization of a project depends, however, on the entrepreneur, and full value can be derived from a report only if he is willing and able to carry out its recommendations.

UNIDO Projects Around The World

Rehabilitation of the Steel Mill at Tjilegon (Krakatau Steel Corporation), Indonesia

During the period 1960 - 1965, equipment for a steel plant was supplied in Indonesia under bilateral arrangements. Although equipment and machinery were available, the steel mill did not reach the operational stage. In 1968, as a result of short-term SIS assistance, the Government of Indonesia accepted UNIDO's proposal that the erection of the mill be completed in phases.

The first phase began in January 1969. With the guidance and assistance of a UNIDO expert, the entire assembly of a cold wire drawing mill has now been accomplished, and it is expected that all test trials will have been carried out by the end of 1970.

The actual operation of the mill will be the aim of the second phase, and in this UNIDO will again assist and advise the Government.

Indonesia: The wire-drawing bay at the Tjilegon steel mill

National Institute of Technology and Standards, Paraguay

Paraguay's geographical location is such that freight costs for both imports and exports are high. In promoting exports, the authorities must therefore give special consideration to quality. The National Institute of Technology and Standards (INTN) has contributed substantially to demonstrating the export possibilities of selected products.

INTN, housed in a permanent building covering 2,500 m², one half of which is laboratory space, is staffed by UNIDO experts and local personnel. Its five major areas of operation are wood, food and essential oils, construction materials, leather and textiles. Each department is guided in its work by an advisory committee composed of representatives of both the public and private sectors.

The Institute has achieved particular success in the export of wood. Forests constitute the largest single national reservoir of raw material immediately available for processing, and it is estimated that the potential export market will have reached a value of US$50 to 60 million by 1980.

The functions performed by INTN toward the achievement of this export potential include: testing of wood qualities and standards; setting and certifying of wood exports to buyers' specifications; development of new wood-processing technologies and use of new products; and documentation and dissemination of findings. INTN has also been responsible for the preparation of a work programme designed to maximise the revenue derived by wood processors and the Paraguayan economy from wood exports. Part of the programme is devoted to the expansion of INTN's current activities in applied research and grading woods, and a part to anticipated changes in and expansion of the forestry industry.

As a result of the Inter-American Development Bank's

ABOVE: Institute staff grading Lapacho for use as flooring in refrigerated food rail wagons
RIGHT: Determination of proteins in soy flour at the National Institute of Technology and Standards

mission to Paraguay in April 1970, it appears probable that a global forest industries investment fund will be established in the order of $5 – $10 million and that total technical assistance could amount to $2 – $3 million. INTN's contribution to the technical assistance structure, which would be financed from these funds, would consist of testing and quality control facilities, know-how in processing Paraguayan species and technological feasibility studies.

Survey of Printing Establishments in Jordan

The Jordan Ministry of National Economy wished to make a survey of printing establishments in Jordan to determine what measures might be required to enable some of these establishments to do the printing required by the Ministry of Education and other organizations in the country. It was hoped that this survey would indicate the action that could be taken to raise the general level of efficiency and productivity of the Jordanian printing industry.

At the beginning of 1969, a UNIDO expert was sent on a three-month mission to Amman to survey the existing printing establishments in Jordan, to recommend measures to improve their efficiency, and to make a plan for the long- and short-range development of the industry, taking account of the above-mentioned survey as well as present and future demand.

After making a preliminary study of the existing industry, the expert subsequently visited some of the neighbouring countries in order to assess their utilization of modern printing machinery and their capability of training Jordanian personnel. In the course of his mission he visited many of the printing establishments in Jordan, providing immediate advice where feasible.

His final report included a detailed analysis of spare capacity and under capacity as well as projections for equipment needed to cover the estimated demand for the period 1970–1975. The expert also outlined short- and long-term training schemes for the Jordanian printing industry. It has now been announced that the World Bank will provide funds to Jordan for the creation of a printing works for the production of textbooks.

United Nations Celebrating Twenty-fifth Anniversary

The United Nations came into being on 24 October 1945 when China, France, the Union of Soviet Socialist Republics, the United Kingdom, the United States and a majority of the other 46 nations which were signatories of the Charter had filed their instruments of ratification. Now, as it celebrates its twenty-fifth anniversary, the UN has 126 members. The general objectives of the UN are expressed in the Preamble to the Charter (this page).

In addressing the first meeting of the Committee for the Twenty-fifth Anniversary, Secretary-General U Thant noted that during debate in the General Assembly "it became abundantly clear that all the speakers were in agreement that the anniversary should be more than a ritual, and that it should not be an occasion for self-congratulation alone. In 1970 the United Nations will need to take a very serious look at itself, its past record, its present position and its tasks ahead. . . . The anniversary should be a solemn occasion for reflecting and stocktaking in the middle of our long pilgrimage for consolidation of the progress already made and for renewed dedication to the fulfilment of the ideals enshrined in our Charter".

The theme of the anniversary is "Peace, justice and progress".

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brought untold sorrow to mank

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PEOPLES OF
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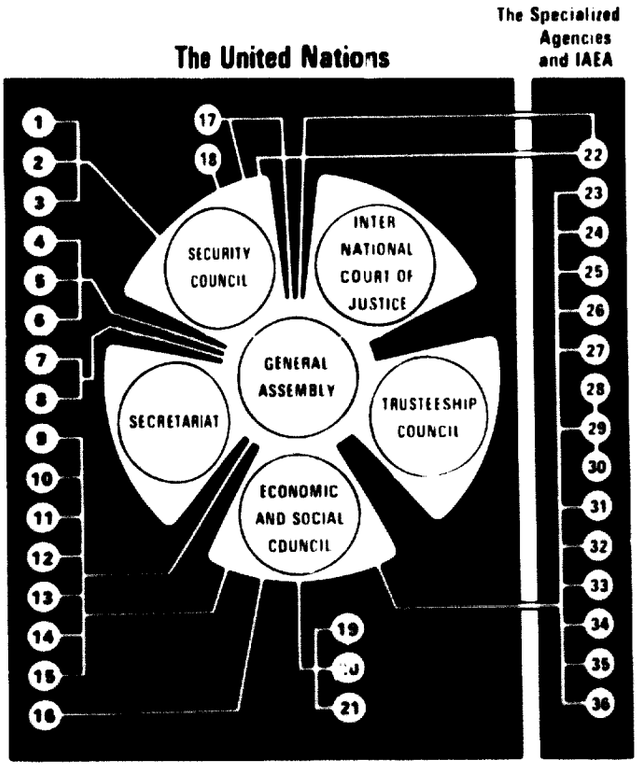
THE UNITED NATIONS SYSTEM



THE UNITED NATIONS

1 United Nations Truce Supervision Organization in Palestine (UNTSO)
2 United Nations Military Observer Group in India and Pakistan (UNMOGIP)
3 United Nations Peace-keeping Force in Cyprus (UNFICYP)
4 Main Committees
5 Standing and Procedural Committees
6 Other Subsidiary Organs of General Assembly
7 United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA)
8 United Nations Conference on Trade and Development (UNCTAD)
9 Trade and Development Board
10 United Nations Development Programme (UNDP)
11 United Nations Capital Development Fund
12 United Nations Industrial Development Organization (UNIDO)
13 United Nations Institute for Training and Research (UNITAR)
14 United Nations Children's Fund (UNICEF)
15 United Nations High Commissioner for Refugees (UNHCR)
16 Joint United Nations-FAO World Food Programme
17 Disarmament Commission
18 Military Staff Committee
19 Regional Economic Commission
20 Functional Commissions
21 Sessional, Standing and *Ad Hoc* Committees

THE SPECIALIZED AGENCIES AND IAEA

22	IAEA	International Atomic Energy Agency
23	ILO	International Labour Organisation
24	FAO	Food and Agriculture Organization of the United Nations
25	UNESCO	United Nations Educational, Scientific and Cultural Organization
26	WHO	World Health Organization
27	IMF	International Monetary Fund
28	IDA	International Development Association
29	IBRD	International Bank for Reconstruction and Development
30	IFC	International Finance Corporation
31	ICAO	International Civil Aviation Organization
32	UPU	Universal Postal Union
33	ITU	International Telecommunication Union
34	WMO	World Meteorological Organization
35	IMCO	Inter-Governmental Maritime Consultative Organization
36	GATT	General Agreement on Tariffs and Trade

Options and Priorities in Scientific Research for Romanian Industry

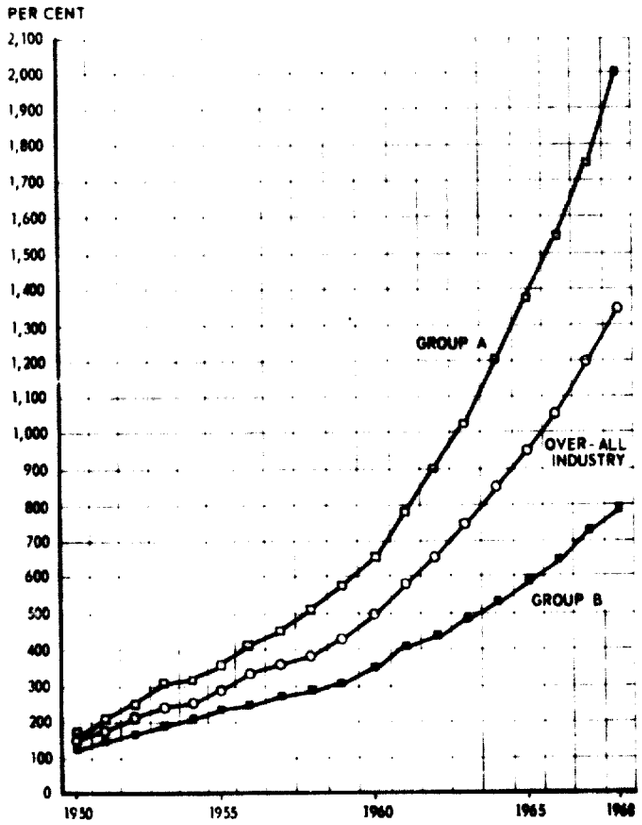
By Stephan Birlea

ROMANIA HAS BEEN steadily working towards socialist industrialization during the last two decades. The country's natural resources have been directed towards this end to a much greater extent than previously, and co-operation with other countries in purchasing machinery, equipment, raw materials, licences and scientific and technical documentation has been broadened considerably.

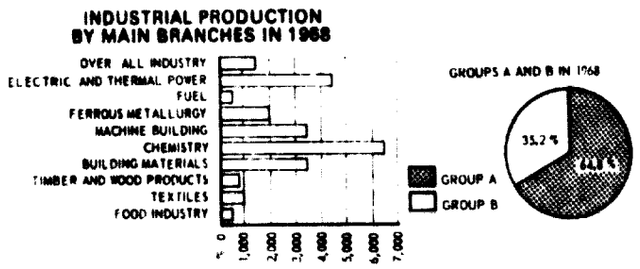
The growth rate of the Romanian economy as a whole and of industry in particular has been very high according to international statistics. Figure 1 shows that Romanian industry was 13 times larger at the end of 1968 than it was in 1938. This achievement required great effort. Romania's intensive industrialization programme stressed heavy industry and particularly the machine-building industry. Previously, light industry (processing), based on the use of imported machinery and equipment, was predominant.

Figure 1.

Over-all industrial production (1938 = 100 per cent). Group A – production of industrial goods; Group B – production of consumer goods



The Author: *Stephan Birlea, engineer, born in 1934, is a graduate of the Polytechnical Institute in Bucharest. He is First Vice-President of the National Council for Scientific Research in Romania, a specialist in economic cybernetics and has published various papers in scientific journals in this field of research.*



Intensification of scientific research

In promoting technical progress in the Romanian economy as a whole, domestic scientific research has played an important role. During recent years measures have been taken to encourage scientific research in industry. Figure 2 indicates the priorities granted to various branches of science. Appropriations for these sciences have grown continuously throughout 1968–1969 to support the expansion of industry. The highest number of new research units was recorded in machine building and chemical industry sectors.

Romania's economic and social expansion programme for 1971–1975, as well as the 1976–1980 prospective plan, anticipate an over-all industrial growth of 50 to 57 per cent as against the 1970 output. Allotments for scientific research in the industrial field are being increased accordingly.

Romania is relatively rich in natural resources but still must choose subjects for research and work out priority programmes in accordance with current requirements. Fields of scientific research that are certain to contribute efficiently to the country's economic and social development have been carefully selected and granted priority.

In the planned research schedule the foremost place has been reserved for sciences such as automation, cybernetics, information science, electronics, nuclear energy, precision mechanics and optics. The modernization of the technical basis of industry will be accomplished by installing the most up-to-date machinery and equipment.

The present development rate of industry calls for wide automation of production processes. With a view to modernizing industrial production and management and planning, computing techniques will be promoted and a national data processing system set up. A national information and documentation institute, organized on modern principles, will provide technical and scientific documentation. Cybernetics and information science will be promoted in production and management, and modern computing and data processing equipment will be provided according to the 1967–1975 programme.

Scientific research schedules

If science is to contribute effectively to the development of industry, its programme must be scheduled over periods of at least ten years in order to keep ahead of production. The 1971–1975 state plan for scientific research and the 1976–1980 main lines of expansion establish priorities for research topics and expansion programmes. Establishing these priorities is a difficult task.

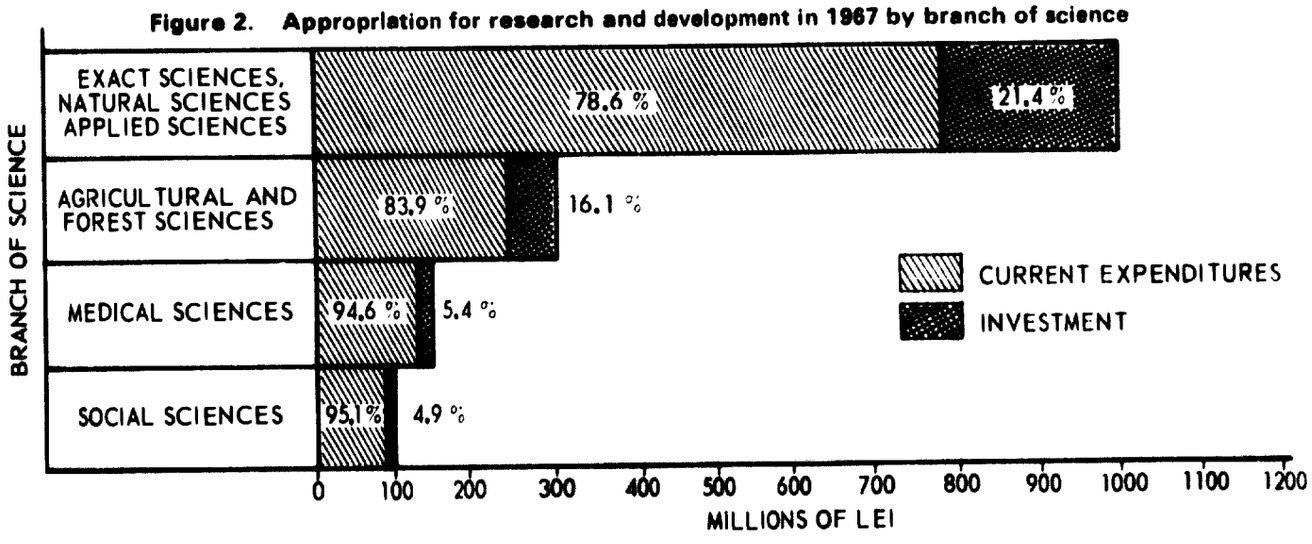
Research programmes that are vital to industry can lead to positive results only if research is co-ordinated with investment planning. Experience has demonstrated that research activity separated from investment planning does not produce rapid results. In one instance a series of research achievements could not be applied in production and therefore licences had to be purchased abroad.

Co-ordinating scientific research with industrial production has been a constant concern of the state in recent years. Nicolea Ceausescu, the President of the State Council of the Socialist Republic of Romania, has stated that "research must be developed in all spheres of science, the social and humanistic sciences included; yet the main efforts will have to be focused on the lines where we can obtain utmost results in ensuring the progress of our country".

Perfecting the juridical framework

With a view to directing the country's entire research potential towards the urgent requirements of the national economy and turning to better account the material basis of research, the Great National Assembly of the Socialist Republic of Romania passed a law in December 1969 on the organization of scientific research activity in Romania. The law sets up the juridical framework for scientific research activity. On the basis of this law the Council of Ministers has made several decisions with respect to the application of the contractual system in scientific activity and has taken steps to improve the organization of the scientific research departments of some ministries and central agencies, including those of the Academy. Another decision provides for an increase in salaries for the staff of scientific research and designing organizations.

Figure 2. Appropriation for research and development in 1967 by branch of science



Priority programmes

The law has established the principle of options and priorities. Article 12 states that problems of particular importance for the economic and social development of the country, or problems whose solution calls for a concentration of forces from various branches and fields of science and technology are to receive priority attention in research programmes worked out by the National Council for Scientific Research, by ministries and by other central agencies, and approved by the Council of Ministers.

Each priority programme is based on a preliminary basic survey. The survey may be concerned with the design of an industrial enterprise, investigations and solution of an important problem, or development of a branch of the economy. Figure 3 which gives a diagram of a survey of electrical engineering development, indicates the following: lines of research, research on concrete problems, special fields and techniques and economic assessment of likely results.

Some of the priority programmes that have been or are going to be drawn up concern: rational management of power; depth drilling; exploitation of non-ferrous ore deposits; extended application of mathematics in the economy; research in the field of synthetic resins and plastics; securing raw materials for the aluminium industry; programme-controlled machine tools; catalysis and catalysts; synthetic yarns and fibres; corrosion problems; coke economy; water and air pollution; building of Romanian-designed internal combustion motors and assimilation of modern computing techniques.

The organization and supervision of priority programmes is carried out by the National Council for Scientific Research, the state agency that guides and controls investigations in the technical sciences. Research projects must be scheduled over a period of years, the material basis secured and research institutes designated to implement them.

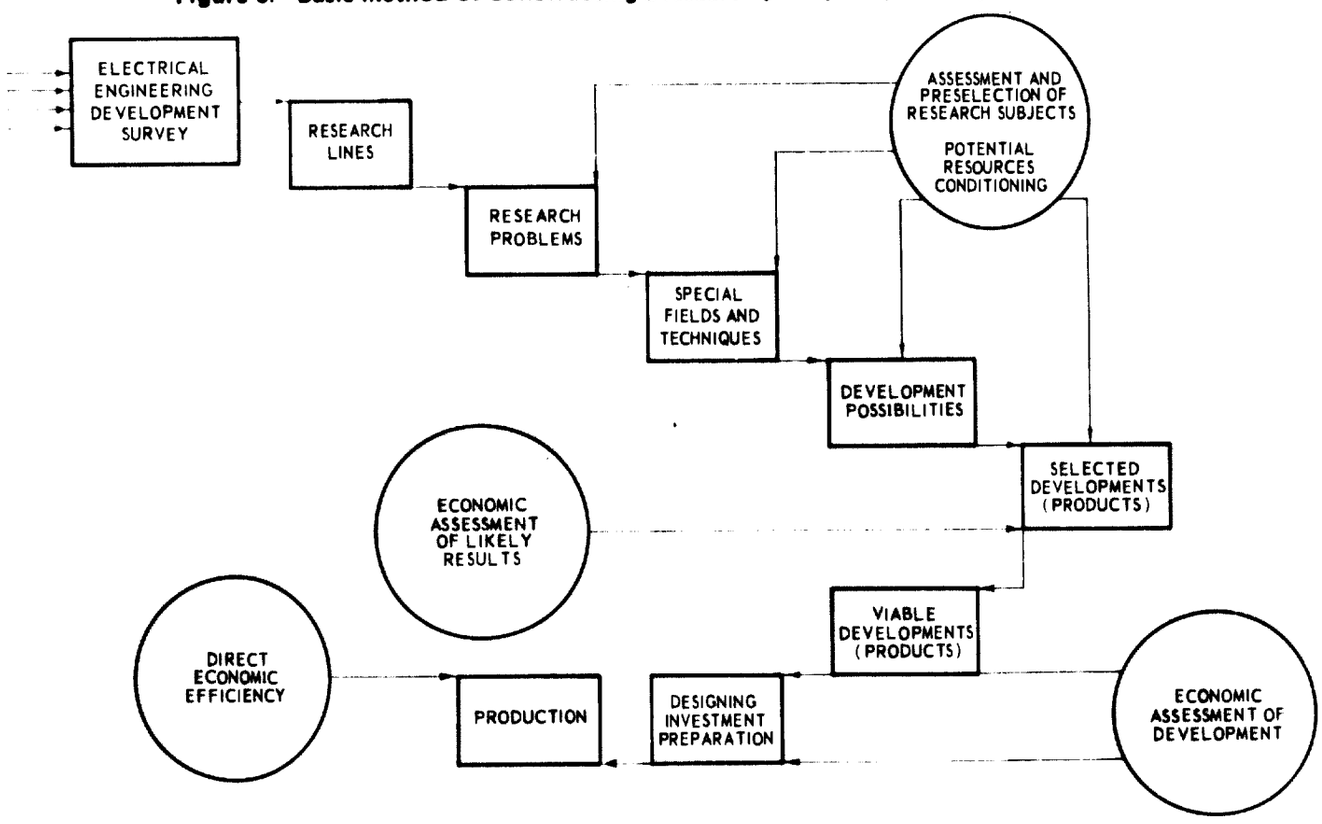
Programmes concerned with nuclear energy and electronic computing equipment are already under way and those concerning deep drilling, coke production, metal economy, and water pollution are in an advanced stage.

The contract system in research

Relationships between research bodies and users of research findings, such as industrial centres, enterprises, district councils, etc., are established on a contractual basis. The scientific research contract stipulates the rights and obligations of both parties, sets the limits within which the funds are to be used, and establishes procedures for solving any legal disputes that may occur.

Options and priorities are constantly reviewed with the aim of improving the selection system. At present studies are under way on the extraction of crude oil from exploited deposits; and exploitation of a fast means of shipping goods based on the "Coanda effect". The competent advice of the Romanian-born scientist Henri Coanda has helped greatly in establishing these programmes.

Figure 3. Basic method of constructing a research plan (analysis and preselection)



By Bharatan Thiagarajan

The Regional Research Laboratory, Hyderabad

IN INDIA it has long been realized that a prerequisite for attaining self-reliance in all branches of industry is the provision of adequate research and training facilities. To this end, a large network of laboratories was set up under the auspices of the Council of Scientific and Industrial Research (CSIR), and funds were made available for research and development. In 1967/1968, the annual contribution by the Government of India to the CSIR laboratories was of the order of US$24 million, spread over about 34 institutes. These funds were mainly to provide infrastructure and to meet running expenses; the institutes are encouraged to seek supplementary sources of revenue by rendering services to industry.

CSIR administers and supervises some 34 research institutes, based either on specialization in a particular field of science, such as the National Chemical Laboratory or the National Physical Laboratory, or on research and development work on commodities, such as the National Metallurgical Laboratory. A few of the laboratories concentrate their efforts on the utilization of raw materials and development of industries in the region in which they are located. Those in this category are multipurpose laboratories. The largest of the institutes of this type is located at Hyderabad.

The decision to establish a research laboratory at Hyderabad was originally made by the Government of the Nizam of Hyderabad in 1944. In 1948, Hyderabad became part of the Indian Union, and in 1956, the laboratory came directly under CSIR and was renamed the Regional Research Laboratory, Hyderabad (RRL). It then embarked on an extensive programme of expansion and modernization and is now one of the leading research institutions in the whole of Asia.

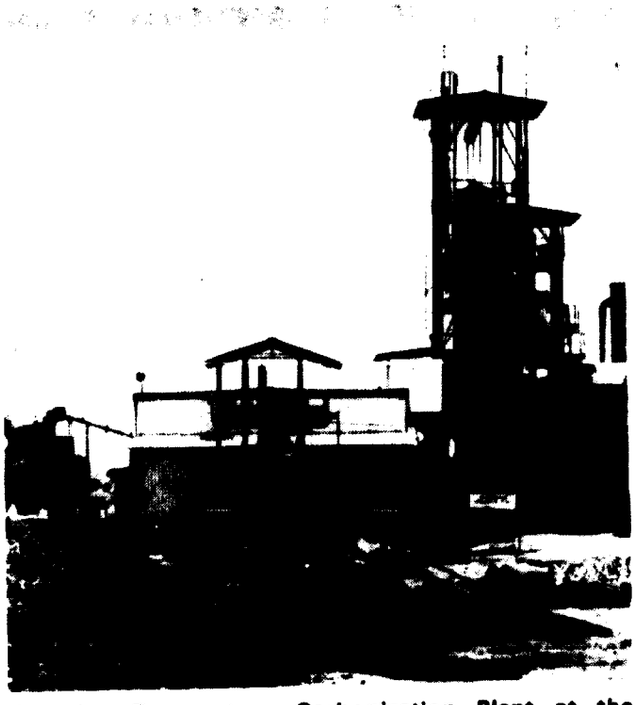
The Author: *Bharatan Thiagarajan was born in India in 1916 and was educated at Royal College, Colombo; University College, Colombo; and Emmanuel College, Cambridge, England. He received his B. Sc. from London in chemistry. His research on boron hydrides at Cambridge University was interrupted by the outbreak of the Second World War. He joined the Ceylon Civil Service and served mainly in technical departments. In April 1963, he joined the United Nations Centre for Industrial Development. In 1969 he retired from UNIDO in Vienna and is now an industrial consultant in Secunderabad, India.*

Following the present-day trend in the United States, the United Kingdom and in other developed countries, RRL is situated in large grounds in open country on an estate of more than 230 acres. It is recognized that scientists respond to congenial surroundings and environment, and the expense involved in maintaining the grounds, which are adjacent to the campus of Osmania University, is considered justified. The RRL library is one of the best in India, serving an area of 100,000 square miles. Three large semi-permanent buildings house the pilot plants and items of plant and equipment that are too large to be accommodated in the laboratory rooms in the main block. Other pilot plants operate on a slightly larger scale, producing some products for the local market. Outstanding in this group is the low-temperature carbonization plant processing coal from the region's only coal fields and operated by the Singareni Collieries Company Limited.

RRL's total staff of about one thousand is classified as follows: scientific research professionals, approximately 20 per cent; technical auxiliaries, about 18 per cent; pilot plant staff, 12 per cent and professionals working on sponsored research, about 20 per cent. Administrative employers and non-technical workers, about 18 per cent. Thus, about 70 per cent of the staff is concerned with actual research.

An assessment of the institution made fifteen years ago enumerated the main aims and objects of RRL as follows:

- To help and encourage, through organized scientific and industrial research, the industrial development of Hyderabad State by *(a)* the exploration of the possibilities of industrial utilization of its indigenous raw materials; *(b)* devising methods for the expansion of existing industries and formulating plans for the beginning of



The Low-Temperature Carbonization Plant at the Regional Research Laboratory, Hyderabad

new industries by carrying out experimental work in the laboratory on pilot plant scale;

- To provide the facilities of a central and well-equipped scientific and industrial research laboratory for the existing and future industries of the state;
- To render wherever possible help and advice to the various government departments and industries in matters of scientific interest;
- To perform routine analytical work for various departments of Government and industry;
- To inculcate among the industrialists and the public of Hyderabad through precept and example, the value and advantages of scientific research for industries;
- To provide a centre for the supply of personnel trained in modern methods of industrial processes and applied scientific research, necessary for the industrial progress of Hyderabad State.

With the substitution of "the region" for "Hyderabad State", these objectives still apply today.

The main areas in which RRL is actively engaged include: oils and fats; surface coatings; pesticides and organic intermediates; mineral products and catalysts; biochemistry; coal; industrial ceramics; paper and cellulose products; and process evaluation, design and engineering.

Currently the annual budget of RRL is about $1.5 million. Of this amount, roughly 84 per cent is a direct contribution from the Government. About 8 per cent is contributed by beneficiaries of sponsored research, and the remaining 8 per cent is earned by sales of the products of pilot plants—mainly domestic coke, activated carbons, standard pyrometric cones, speciality paper, fatty acids etc. Of the total sum of about $1.5 million, roughly 16 per cent is spent on capital items; staff salaries and allowances account for about 30 per cent, chemicals and apparatus about 11 per cent and the remainder goes for contingencies.

A noteworthy feature of the institution is its broad coverage of subjects. It deals with pulp and paper manufacturing, coal processing, ceramics, surface coatings, pesticides, organic intermediates and biochemistry; it also provides engineering consulting services. A happy blend of the academic and the strictly practical research on technical problems has been achieved. For instance, research on academic subjects such as "stereo-chemistry of the A-nor sterols" may be found side-by-side with research on the manufacture of protein-rich flour for human consumption. These two branches supplement and support each other with a sort of synergistic effect.

During its two decades of existence, RRL has published nearly 700 research papers and taken out nearly 120 patents. At least 60 doctorates have been awarded for work done in RRL; some 50 processes have been taken over by industry, and hundreds of technical problems have been worked on by RRL. RRL has earned over one million rupees (US$1 Rupees 7.50) for technical consultancy. Its work has resulted in a saving of foreign exchange to the extent of 20 million rupees. These results, highly gratifying as they are, spur the research workers to give more and more to this research service.

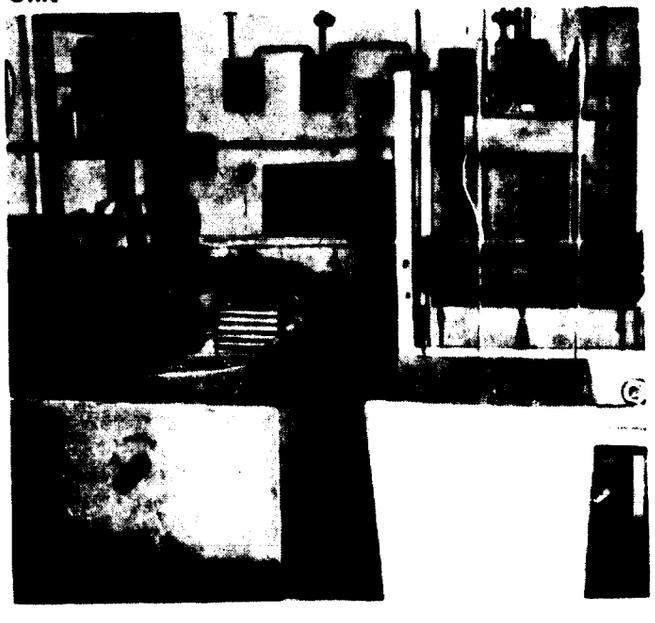
One of the main research problems being dealt with in this institute is the carbonization of coal. India is one of the large coal-producing countries of the world, but all the coking coal deposits are concentrated in the north-eastern region. The southern part of India has only deposits of non-coking coal. The Singareni Collieries Company Limited (a state-owned coal-mining concern) produces about three to four million tons of coal per year and has the capacity to double this amount. This coal is devoid of coking characteristics and because of its high ash content is rated as a low-grade coal. As early as 1949, RRL conduct-

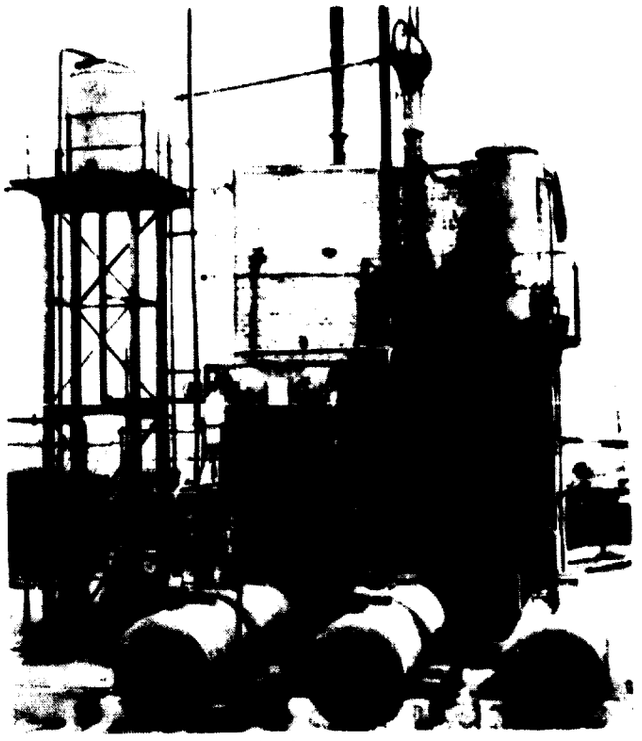
The RRL's Speciality Paper Unit

ed investigations and soon concluded that the best way to process this coal was to subject it to low-temperature carbonization (LTC), thus producing a semi-coke and a valuable by-product tar. After a certain amount of initial evaluation, it was eventually decided to establish a pilot plant based on the well-known and conventional Lurgi-Spuelgas system that was developed in Germany and found to be particularly suited for non-coking coals. Whereas in most coking systems the coal is packed into ovens that are heated externally, in the Lurgi-Spuelgas system the required heat is supplied by heating gases coming into direct contact with the lumps of coal without the intervention of coke-oven walls. According to Martin's *Industrial Chemistry*, this method "permits a high rate of heat transfer to the fuel and imposes no limits on the size of the carbonizing chamber. In consequence, units with a very high throughput can be built. The high rate of heat transfer, and the small heat loss result in a high thermal efficiency".

Using this system of LTC, which is of importance to the southern part of India and also to several other countries, particularly in Africa, the coal is first crushed to a size of from three to twelve centimetres and lifted to the top of a processing tower. This tower has three sections: dryer, carbonizer and cooler. The heat necessary for carbonization is generated by combustion of non-condensable gas produced in the carbonization itself. This combustion gas provides the heat coming into direct contact with the coal. The process is very simple: all that is needed is to keep watch over the movement of the coal and coke and the temperature reached in various parts of the plant. The carbonization takes place at about 600° to 650°C (high-temperature carbonization needs 1,000° to 1,200°C), and the coke is discharged from the cooling zone at about 80°C and quenched with a water spray. The semi-coke is screened into different sizes and marketed. The figure on following page shows a flow diagram of the process.

Experimental beater and vat in the Speciality Paper Unit





LTC Tar Distillation Unit

At an initial cost of about $140,000 for a rated capacity of 25 tons per day, the plant was erected and commissioned in 1953 and is now being operated on a semi-commercial basis. The objectives of the pilot plant, which have for the most part been achieved, were as follows:

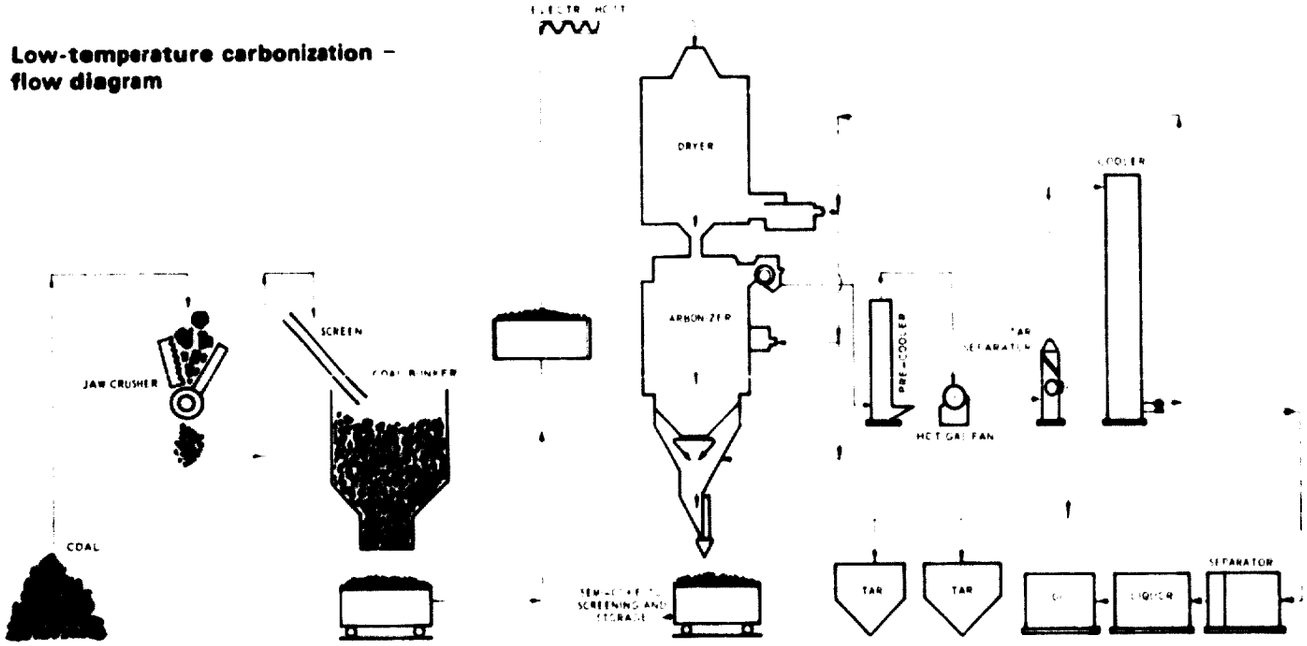
- To establish whether Indian coals were suitable for low-temperature carbonization;
- To popularize the semi-coke product as a domestic fuel;
- To study the economics of processing the by-products;
- To collect data for the design of commercial plants;
- To train operating personnel in LTC techniques.

Based on the working of the pilot plant, in 1964, RRL prepared a project report for Singareni Collieries Company Limited to process 2,700 tons of coal per day in a three-phase programme starting with 900 tons per day. The capital cost of the 2,700-tons-per-day plant was estimated at about $12.5 million. Later, a project report for a 900-tons-per-day plant was prepared for the Government of Maharashtra State. Another proposal for a medium-sized plant of 120 tons capacity was made to the Industrial Development Corporation of Orissa Ltd. These proposals are under consideration by the respective organizations.

The coal research group, with a team of 38 highly qualified research workers, is dealing with many other problems as well, including production of road tar, disinfectant creosote, timber preservatives and tar acids; hydrogenation of coal tar, briquetting of coal and char fines.

Another major field of RRL interest is vegetable oils and fats. Both basic and applied research are being con-

Low-temperature carbonization – flow diagram



ducted by a team of 29 scientific workers. Basic research is conducted on fatty acid and glyceride structures of unusual fats. Methods of detecting adulteration of edible oils are worked out. Many of the applied projects are concerned with the utilization of castor and cottonseed oils, which are regional materials.

RRL has done extensive work on the processing of cottonseed oil and cake, especially on rendering the cottonseed cake edible. Nearly two million tons of cottonseed are available annually in India, and previously its only use was as cattle feed. Stimulated by research conducted over a period of twenty years by RRL, the oil-milling industry now uses annually over 400,000 tons of seed for extracting oil. An interesting aspect is that some oil millers are reluctant to use cottonseed on the grounds that it will deprive cows of their legitimate food!

A pre-press solvent extraction method has been developed for the production of edible-grade flour, which brings down the gossypol content to safe levels, at the same time keeping the denaturation of proteins to a minimum. The flour satisfies the FAO/WHO/UNICEF specifications. It is rich in proteins (50 per cent) and in lysine (3.8 per cent of proteins), an essential amino acid required for children. In common with many other tropical countries, India is desperately short of protein foods. Cottonseed flour is destined to become an important source of protein, especially for vegetarians. Meanwhile, the flour produced in the pilot plant of the laboratory is in great demand by the antibiotics (tetracycline) industry for use as a fermentation medium in place of imported material. A liquid-cyclone separation technique to improve edible flour production is under development.

In the field of organic intermediates and pesticides, a team of 36 scientists headed by the Director of the Laboratory is placing the main emphasis of its work on development of process know-how for the production of organic chemicals and intermediates required by the chemical industry of the country. A number of such processes have been developed for the following chemicals: benzyl chloride, benzyl alcohol, benzyl acetate and related chemicals, phenyl acetic acid, acetanilide, chloroform, monochloroacetic acid, and the like. Many of these processes are either in production or at the plant-erection stage.

One of the notable achievements of RRL is its handling of the "Orgaroma" project, to manufacture aromatic chemicals from toluene. It is the first time RRL (or probably any other research institute in India) has undertaken and successfully executed a project on a complete turn-key basis. The plant was declared open on 2 April 1970 by the Chief Minister of the State of Andhra Pradesh and has gone swiftly and smoothly into production.

Solvent Extraction Plant (for cottonseed)

Work has also been undertaken on the synthesis of drugs with analgesic, hypnotic, diuretic and other similar properties. One of the compounds synthesized here, a quinazolone derivative, is in commercial production in several countries and is used as a non-barbiturate hypnotic. At present, pesticides are being developed.

A number of chemicals and other products have also been developed under the Division of Mineral Products and Catalysts.

The most notable among these are activated carbons and bleaching earths, which are being produced commercially by private concerns and replace imported materials. In 1962, when an urgent call came from the Defence Department for the supply of sodium azide (used in detonating materials), within a short time RRL developed the process and satisfied the entire requirements of the department for this material, which had earlier not been manufactured in India.

The Division of Mineral Products and Catalysts has turned out several other products of high commercial value. The product of reaction between chlorine and turpentine turned out to have a powerful insecticidal effect, and the process has been sold to a private promoter. Another piece of research resulted in a valuable vanilla-like flavour from cinnamon leaf oil, and this process was also taken up by private industry.

One product of major interest and importance is silicon carbide, popularly known as carborundum. This substance, discovered in the United States 70 years ago, has assumed great importance in metallurgy, where it is used as a high-class refractory and abrasive. India alone imports several thousand tons of silicon carbide at a cost of nearly $1 million per year, but, with the exception of Japan, there is not a single silicon carbide plant in the whole of Asia. Silicon carbide is manufactured by only a few firms in the world, and the technology for its production is a closely guarded secret. RRL has been studying this problem and has succeeded in working out the optimum manufacturing conditions. A set of laboratory furnaces provided the data for a larger furnace, which has just come into operation, yielding three tons of silicon carbide per run. RRL is in a position to provide the entire know-how for a fully fledged commercial plant. Estimates are ready for two sizes of plant, one producing two tons per day and one producing ten tons per day. The capital cost of the larger plant is estimated to be of the order of $1.5 million. The plant can be completely fabricated in India and little foreign exchange is needed. This is an outstanding example of the evolution of an indigenous technology that has been advocated in India for years.

The Industrial Ceramics Division has tackled the problem of manufacturing standard pyrometric cones. A pilot plant has been set up, and its products have been successfully marketed. The production has been taken over on a commercial scale by a private firm and now meets almost the entire requirements of the country.

There are many other interesting and useful types of research being conducted by RRL. Extensive research is being carried out on cashew-nut shell liquid to extend its range of usefulness. A paint has been developed to protect ships against corrosion in seawater. The Paper Division has produced a variety of specialty papers such as filter papers and document papers, some of which have been put into commercial production. The various aspects of the preparation of catalysts are being studied and two have been developed, one for ammonia synthesis and the other for conversion of benzene to cyclohexane. This is a highly profitable line, and the products can command a large market within India itself, not to speak of large export markets. Microwave ferrites have been developed for use in radar components. The Chemical Engineering Division provides scaling up and design help to all the other divisions. The General Engineering Division undertakes the actual fabrication, repair and maintenance of the various plants.

RRL has already created its own hagiology. One of the legends is the success story of a photographer, without formal qualifications but reputed to be one of the foremost technicians in India, who was charged with the duty of reproducing a theodolite collimator scale photographically. So successful was the outcome that he delved deeper into the subject and eventually produced an invention for scribing slide rules by a photo-engraving process - the first of its kind in India. With the encouragement and support of RRL, a private business house took up the process, which promises to become a great success.

A similar success story is that of the laboratory's glass-blower. He, too, had no formal qualifications but had an inventive mind. One of his inventions is a flowmeter adapted to liquids with a wide range of viscosities. There was so much commercial promise in this invention that it was taken over by a business firm, and the terms of collaboration are now being drawn up.

These and other similar success stories led RRL to encourage its staff to go out into business on their own, and this is likely to produce very successful results.

The main emphasis of RRL's philosophy rests on the following:

- Technological research on specific and well-formulated projects, backed by objective basic research;
- The application of modern operational research methods in analysing a particular problem before it is accepted for specific study; laboratory researches are followed into the field by the use of the same tools;
- Pilot plant research and even semi-commercial demonstration before commercial exploitation by a promoter.

In the whole process extending from the conception of an idea to its full commercial exploitation, formalities are disregarded, work teams are carefully selected to serve the objectives fully and exactly, and personal credit is freely given to create a feeling of personal involvement. The emphasis is on hard work, devotion to duty and social consciousness. It is realized that work is done best only in an atmosphere free of tension and rivalries. Thus, every attempt is made to create a happy, pleasing and attractive environment, and all RRL employees are encouraged to take part in recreation as fully as in research work. The result is a co-ordinated, dedicated team that has produced a mass of research work that will form a strong base for the future development of industry in India.

By Myra Ockrent Kaye

Dissemination of Scientific Information

THE CURRENT TREND in information dissemination is to develop the use of sophisticated hardware such as time-sharing computers for information retrieval. The concept of such complicated and costly systems in small institutes, or for developing countries, is not a realistic one at the moment. Moreover, present international information retrieval systems, even if they could be used effectively by developing countries, can deliver only information that is at least one year old, and in the competitive world of science this can be too old to be really useful. There is little indication that this situation will change radically in the near future. Thus it would seem worth while to consider other technologies than retrieval for science information processing.

An interim trend in information dissemination has been towards the setting up of specific information sources dealing with discrete subjects and providing information in various forms, often on a commercial basis. New sources are constantly announced, but it has been estimated that a new information source is not fully utilized by the world scientific community until three years after it has been set up. This may well be because, while these sources have been listed in various directories, no one comprehensive or up-to-date world-wide compilation is available.

Scientists, in general, prefer a direct personal approach to their sources of information when they need the information, rather than processed material that they seldom have time to scrutinize. In developing countries this information is needed in a form as simple as possible, and the techniques for obtaining this information must also be simple. This points to the use of communications technology, that is, using systems whereby the inquirer can communicate directly with the specific information source and ask specific questions, rather than retrieve references to data from a communal store.

The present scheme envisages uniformly classifying into areas of research the sources listed in directories of information sources, and of currently announced new sources, on a continuing basis. Multiple card copies are then prepared, detailing subject, cost, availability and form of information available from these sources, and these cards (or punched cards) are distributed to individual scientists on the basis of their interests. A scientist may hold as many fields as he wishes, and in addition a master file can be held centrally in each institution or country. The scientist then has at his fingertips a small, easily handled file to which he can refer when he wants to identify sources to which he can address specific questions, as well as access to a broad central file. This system provides easily packageable, readily understandable units of information that can be sent to the client on a current, continuous, personal-to-the-scientist basis. In Sweden a similar system is now being planned for trial on a national basis.

Communications technology may be utilized to provide a media for a continuing interchange of current information and, indeed, of discussion between laboratories working in closely connected fields. Such an interchange could be carried out through an exchange of audio or video cassettes.

The Author: *Myra Ockrent Kaye has served as head of the Research Contracts Programme at the SOREQ Nuclear Research Centre of the Israel Atomic Energy Commission since 1963. Previously Mrs. Kaye was Head of the Commission's Information Department and Library, and her present activities include developing a new scientific information exchange system and a card index system for science information services. Other experience includes being a scientific information officer for the Imperial Chemical Industries, Welwyn Garden City, United Kingdom, and an experimental physicist at the Atomic Energy Research Establishment, Harwell, England.*

Systems requirements

A science information service for developing countries should be:

- Simple and understandable in concept and operation – it should keep complicated equipment to a minimum (at the receiving side preferably no equipment at all, or at most, a typewriter); it should keep trained staff to a minimum as well (at the receiving side, preferably no staff at all, or at most, clerical staff);
- Inexpensive;
- Flexible and adaptable – it must be able to provide information comprehensible at different levels, including answers to simple queries and background information in depth in a particular area, and be able to select answers suitable for an agricultural instructor who has had only two weeks of training as well as for a Ph. D. in nuclear physics from an outstanding university;
- Derivable from existing information systems or networks;
- Easily distributable and easily translatable in to a multitude of languages – this presupposes a system comprised of a number of discrete units.

These requirements are dictated by the obvious needs of developing countries, with their inadequate budgets and their scientific staff at all levels of sophistication and knowledge. An information system to meet the needs of developing countries must be flexible in the extreme and capable of being adapted.

To find a system derivable from existing systems or networks, the general picture of information dissemination must be examined together with methods for retrieval of information. This picture should be considered in its relation to the needs of scientists generally. A considerable amount of research and development work is being carried out on highly sophisticated and automated systems; scientists are now being repaid in their own coin by the amount of research that has been devoted to analysing them, their methods of obtaining information and their needs.

A very curious phenomenon emerges. While all are agreed that the information explosion, the exponential growth of material, and, much more importantly, the diffusion of what were once distinct fields of knowledge into one another, urgently require the setting-up of new information-handling systems, the scientist quite definitely prefers to utilize the most primitive mode of communication conceivable.

Many studies have shown that scientists prefer to obtain information by gathering around the old campfire in some exotic city, while the drums beat (or the coffee cups are handed round) and the wise old elder of the tribe unfolds the ancient tale of how the DNA helix was uncoiled. This is the oldest method of communication in the world. Moreover, this preference expresses a value that is real and cannot be imitated – the stimulus of live exchange between creative minds that offers different approaches to mutual areas of interest. The question arises, however, is this enough? How should this means of disseminating information be supplemented? One thing is certain – as a method for developing countries, with their geographical remoteness and lack of funds for scientists' travel – it is entirely unsuitable.

Automated information retrieval systems

There is reason, apart from personal inclination, to support the preference of scientists to gather together and exchange information, rather than utilize some of the services provided by automated retrieval systems available now. Computerized information retrieval systems have not fulfilled their rich promise of the 1950s, and today, twenty years later, they seem no nearer to it than then. The dream of the 1950s was a universal system in which all knowledge would be stored. Scientists, sitting at their teletype consoles, could convey their "questions" directly into this system, and the matched "answers" would be returned in a matter of seconds, automatically translated into any language. What happened to this dream, and why does it seem farther off than ever? Why, for instance, are there practically no studies being conducted in machine translation today, against the scores of the 1950s?

The answer is that the machine system cannot be all things to all men. For example, a very simple object such as a table, has many aspects. One aspect might be its design; another its age; another its history – who made it, to whom it belonged, to whom it was sold and when; another, its value (actual and sentimental). The wood of which it was made is another aspect, or the chemicals in the polish with which it was finished. Thus, each language term has an infinite number of retrieval characteristics, and it is impossible to design a single system in which all the various "meanings" can be assigned by which a piece of information can be retrieved.

The following chart illustrates that even the simplest abstract term such as "word" can have at least ten or eleven different interpretations, depending on the context in which it is used. Such is the connotative and associative nature of semantics. It has not yet been possible to teach the most sophisticated computer to read and comprehend.

Another problem arises in the design of computerized information retrieval systems: a system is being designed to retrieve a science that is not yet born. The concepts of science are in a state of dynamic flux – not only are new concepts constantly appearing but ideas on known ones undergo continuous, radical change. How, therefore, can an effective system be designed from which one can retrieve according to ideas not yet conceived?

Moreover, in science the very disciplines are said to have different orientations. Physics is considered to be concept-oriented, chemistry structure-oriented, and biology function-oriented. This, again, would seem to exclude a single, universal system.

Of course, other methods can be used to bypass the need for comprehension. The machine can certainly be directed to count. It can perform a statistical analysis of the recurrence of words on a page – and even of co-occurrences, skipping "simple" words such as "and", "a" or "by". Thus a machine could count the number of times the word "DNA" appears on a page, or "methylation of DNA",

Multiple meanings in context of an abstract "word"

Signal	*Use in context*	*Meaning*
WORD	1. This is the last **word**!	Latest fashion
	2. I would like a **word** with you!	Admonition, brief talk
	3. Give me your **word**.	Promise
	4. I would like to say a **word**.	Brief comment
	5. I will give you a **word** of warning.	Caution
	6. I got **word** of it.	News
	7. What is the **word**?	Password
	8. My **word**!	Interjection of surprise
	9. My **word** is law.	Statement of authority, dictum
	10. I'll give you the **word**.	Sign, decision
	11. The **word** is sacred.	Scriptural dogma
	12. I will have the last **word**.	Decision

and the information content of the page is "read", assuming that these words, as they are mentioned frequently, truly describe the subject matter of the document. Optical scanning is another method for analysing document content.

But it is only too clear how crude these tools are compared with the simple human ability to read and understand; and information services based on computer systems still employ people to scrutinize the documents that form the input and ascribe to them the descriptors, the keys to their retrieval from the system by its matching process.

This introduces a time-lag, and it is a serious one. No matter how efficient the hardware – the ferrite ring "bits" can change their state in billionths of a second – the great speed of the search procedure is nullified by the time (some months) needed to prepare the input. In the competitive world of science this is very serious indeed, and especially so when the other delay times inherent in retrieval systems are added to the in put preparation time. Thus, if a system input consists of scanning papers or titles of papers published in the journal literature, the average delay time is three months from completion of the experiment to preparation of the paper, plus perhaps six months until it appears in the journal.

Thus, automated retrieval systems are "slow" – i.e., one can retrieve from them, comparatively speaking, only rather old information. Moreover, they are crude. One might say that in the document analysis stage, when the paper or the abstract – and/or in some cases only the title – is read and descriptors which "represent" the subject content, and which will be used as the retrieval markers, are assigned, almost as much is abstracted out of the system as is abstracted in.

While the major automated retrieval schemes certainly have their place in the world of science information, what that place is has to be rather carefully assessed. They are not the "wonder drug" that they were first conceived to be. That the scientist is fully aware of this is apparent in his failure to make great use of them.

Information needs of scientists

Roughly speaking, a scientist requires two kinds of information. First, he needs to know what other scientists working closely in his field are doing, and he needs this information currently – that is, perhaps even before the experiments are carried out, before he performs his own perhaps similar experiments. That is, what he needs is a stimulating exchange – and, as has been shown, he prefers a live "conversational" exchange – with his colleagues at other laboratories as he and they work on different aspects of a topic. Second, a scientist may at times require information on a specific topic. He may want an answer to a simple query or he may want a resumé or a detailed picture of the "state of the art" in a particular field.

Current communication by audiovisual methods

Some experiments have been conducted in Israel on introducing audiovisual methods into scientific information exchange. Planning sessions, discussions and seminars of particular scientific groups have been recorded on audio cassettes, which are then exchanged with second "paired" groups in another country. Groups are paired on the basis that they are working on similar topics, on the same topics

from different approaches, or in different disciplines but using the same techniques. The cassettes are then interchanged, re-recorded by the partner group, and the members of each group can interpolate their comments and ideas into the discussions and then re-exchange the cassettes.

Thus a system is established in which partner groups can carry on a continuous communication and discussion of interrelated problems. Each group is participating in and contributing to the work of the other, and at the stage when such contributions can be applied constructively, i.e., when the work is being done.

The system is simple in operation; inexpensive, and as fast as the air mail service can make it. Moreover, it follows the preferred mode of communication by scientists, that of "conversation". There is some other interesting "fallout" – by providing the scientist with a simple means to register "private communications" and record preliminary experiments in a semi-permanent form, the need to rush into print in order to establish "legal" priorities is eliminated, and this can perhaps cut down the amount of relatively useless publication. A scientist need only publish when his hypothesis is confirmed, and not at some early undefined stage so that he can be accredited with the original idea.

This method employs communication rather than retrieval technology. It follows, in a natural sequence, some of the scientists' own attempts to keep a current communication system going – for example, the preprints exchange system, like the one formerly organized by the United States National Institutes of Health – but goes one stage further in permitting group-to-group as well as person-to-person communication. It is clearly also applicable as a means of communication in industry, especially when a parent-daughter type of relationship exists between industrial organizations that are geographically remote. The use of a videotape system will add a further degree of sophistication and should solve the problems of conveying pictorial information and blackboard notes.

Exploitation of information sources

As regards the second need of scientists, there has been an interesting development in the last few decades. To cover the information gap between the widely available "comprehending" information storage and retrieval systems that it is hoped to develop in the future, and the existing humanly operated systems at diverse levels of sophistication and automation, a rather new phenomenon has emerged.

Arising perhaps from the frequent gatherings of scientists in particular disciplines, the "Gentlemen's Clubs" have been formed, consisting of organizations set up to provide a flow and exchange of information on discrete subjects – tumours, fertilizers, titanium – or more general subjects – cancer research, agricultural field trials, metals and so on. These clubs have the disadvantage that they further separate the disciplines and narrow the areas in which the scientist looks for information, a trend directly contrary to the natural diffusion between disciplines. They have, therefore, rather a straightjacket effect. They do, however, provide the addresses to which scientists can turn for answers to questions in their specific fields.

Special problems of developing countries

Professor Wayne Meinke has stated that in general a source of information is not usually fully exploited by scientists until two years after it has been set up. If this is true for the well-advertised National Bureau of Standards information services, and in a country like the United States, the lag period before a service emanating from Romania or Bulgaria becomes known in a newly developing African country, must be considerably greater. A further source of difficulty is that even if there is a library well-stocked enough to have compilations of such services and a librarian competent to use them, there is no single system of subject classification used in these compilations.

A common maxim impressed on business executives is "think big". Because of the difficulty of obtaining funds in developing countries, one must learn to think not only "small", but sufficiently small. In any series of operations in which $1,000 would be a problem in a developed country, $1 could be a problem in a developing country.

Long delays are another problem frequently encountered in developing countries. If, for example, a scientist in a developing country is interested in fire retardance, how can he find information on this topic? If it is assumed that he has no local information services or library conveniently available, he could write to the United States Library of Congress Referral Center, and would be referred, *via* the Center, to an appropriate address from which he could obtain this information. He would then write again to the given address (e.g. the Stanford Research Institute in California), where presumably he would obtain the information he wanted. This is certainly not an impossible procedure, but it does have some features that require closer scrutiny.

First, the framing of the initial query may be difficult. What results may not be fully intelligible, and this necessitates a time-consuming exchange of correspondence to clarify or to render more specific the query, so that the appropriate address can be selected. The researcher is writing, presumably to a documentalist, in a language not his own; in such cases, in the author's experience, there is a tendency to use "impressive" language, which may obscure the meaning. Moreover, the technicalities of having the letter typed may pose a formidable problem – it is very unlikely that a typist working in a foreign language is available. Delays may be introduced owing to the sheer mechanics of getting out such a letter.

Psychological problems

Even more serious than money or time problems, there seems to be a definite psychological block against the use of such indirect systems. The reason would seem to be

simply the requirement to prepare an adequate letter in a foreign language, where not only the language is difficult but the correct form for letter writing is not always known. Scientists from developing countries, especially those in which tribal customs are important and much stress is laid on form, are highly apprehensive of making ludicrous errors.

On the other hand, direct communication with the information source is psychologically less hazardous. Here, the scientist falls naturally into the language of science; he feels he is talking to his confrères, and form is less important. Science has a common language, and the scientist is experienced in its use. More importantly, the scientist at the receiving end can gauge the level of the query, and can fit his answer to this level. He is communicating directly and can often build a relationship of lasting benefit.

Card index scheme

A scheme that offers a practical approach to the solution of these problems, especially with reference to developing countries, involves the compilation of a comprehensive card index of information sources, classified according to subject areas. Most but not all of these centres are listed in a number of compilations, which are generally held in scientific libraries and known to any competent librarian. In developing countries, however, and small institutes, there is often no competent librarian. Indeed, there are often no libraries. A fair estimate of the number of "addresses" would be about two thousand. They could include research and information groups of industrial firms, which, while not normally supplying scientific or technological information on a routine basis, nevertheless are approachable.

The cards should describe the area of scientific interest covered by the information source, the type of service provided, the cost, if any, special user qualifications, and the address to which queries are to be made. The format of the cards is quite flexible and subject classification is amenable to any known system, including keyword classification.

The compilation agency would prepare a central file of information sources on cards in many replicates. This agency could be a university or research institution, or a group of such, interested in the scheme for its own internal needs, or a commercial agency interested in profit, or a philanthropic agency interested in aiding the developing countries or the progress of science generally. The compilation would be continuous, that is, new services as they are set up would be added on a current basis.

The scientist, for example, the molecular biologist who needs information in an unfamiliar field, perhaps the behaviour of a metal under unusual conditions, can be referred to the most specific information service in this area. The man who wants a literature search on a proposed new project can be directed to one ready-made or to the people most qualified to make one for him.

Naturally, scientists working in a specific field are aware of sources that cater for their own area of research. But in small institutes and in developing countries very often only one man may be working in a particular field in the whole country. He is responsible for developing himself as a scientist without the benefit of a leader, or colleagues, or that continuous dialogue with his confrères that makes for scientific advance. He may have a language difficulty. The seemingly inexhaustible pile of foreign journals on his desk may only add to his confusion. What he needs is a direct line of contact with his scientific world, and conceivably such a scheme, exploiting the existing pattern of information dissemination, would provide this direct contact.

A further section of the community to which such a scheme can be of vital interest is the small industry that either employs no scientific personnel at all or only a lone chemist in an ill-equipped laboratory. Such enterprises may require and greatly benefit from technical information, but their managers are often at a complete loss as to how to obtain it. Access to scientific libraries is usually difficult. Moreover, the kind of questions raised are often precisely of the technological single-answer type the system is well able to supply. Here, it is also important that the level of the answer is automatically geared to the level of the question, because of the direct contact involved.

It would be an interesting experiment, using a test sample, to try to gauge to what extent such a system answers the information needs of scientists in a small institute or in a group of institutes. Does it act as a filter and how good a filter is it? How much of "hard core" information needs does it leave unanswered? Does such a card index, together with an audiovisual current communication system of the type described, answer the science information needs of developing countries, providing both continuous, current communication in a searcher's specific field with a "sister" group, and answers to specific questions or broad information in other fields? If these two systems are adequate, they are certainly simple, inexpensive and based on principles applicable to the needs of the countries emerging into the technological era.

Research Projects

A new idea in low-cost building

The enormous, increasing world population forces experts and inventors to find new solutions for the basic requirements of man: food, clothing and housing. A contribution in this respect was made by S. Deligari, engineer in Thessaloniki, Greece. He is the inventor of the constructional cell, an outcome of long research and experiments with the objective of producing a form into which suitable materials could be easily pressed or moulded in order to give maximum strength for minimum weight and cost, and to be used as a multipurpose building unit.

The basic use for this product could be for "do-it-yourself" construction of temporary or semi-permanent buildings and for developing countries it could function as a "modern brick" or an element of housing programmes that would provide shelter for the rapidly growing population.

The form of the unit is a square sheet 1,070 mm × 1,070 mm pressed or moulded so as to have 25 equidistant alternating rises and depressions symmetrically distributed over the sheet, the height and depth of rises and depressions being 40 mm each from the neutral plane. Allowing for 70 mm joining laps, the module of construction is thus 1,000 mm.

Although the units are normally to be manufactured from thin sheet steel, they can be made from aluminium, plastics, fibro-cement or eventually from cardboard or from layer combinations of those materials. If steel sheet is used, corrosion protection can be provided by galvanizing, metallic spraying, painting etc.

The constructional cell has the following important advantages: cheapness of production; simplicity of erection, dismantling and subsequent re-erection can be performed by unskilled labour; minimum bulk for transportation; versatility of use; absolute minimum of variety of standard parts. Furthermore, the surface absorbs noise and diffuses light.

By placing two sheets back to back and screwing them together at contact points of rises and depressions, a sandwich panel unit is formed, which has a strong resistance to

Easy assembly by bolts and nuts

Injection of foam insulation

No tools for thin C-Cells (1 mm)

bending in all directions, while the multiple pocket cross-section will result in excellent heat insulation properties.

The edges of the sandwich units can be joined to each other so that a resulting wall panel of any length or width can be constructed. Furthermore, load-bearing strength is obtainable by increasing the thickness of the assembly by the addition of one or more constructional cell sheets. Each additional sheet thus placed increases the effective thickness against bending by 80 mm.

Alternatively, the effective thickness of the individual unit material can be doubled or trebled by adding more units in "nesting" formation.

A further possible variation, if for aesthetic or other reasons the normal undulating surface is undesirable, is either substitution of a flat sheet for one of the normal cell units or the addition of such a sheet. The connecting media, depending on the unit panel material, can be either bolting, spot welding, cold rivetting or adhesive.

Although in double or multiple use the panel unit has considerable resistance to bending, the single unit in metal can be manually bent without difficulty. Owing to its formation, bending automatically always takes place along a line parallel to an edge and mid-way between a rise and a depression. A panel can thus take up to four parallel bends each to any desired angle. This not only eliminates the need for special corner units but allows angle channel and box profiles to be formed which when attached to the normal panel construction, add very considerably to their strength.

The production costs of the cell are comparatively low, as the conversion from the sized steel sheet involves only one combined pressing and punching operation. One standard press machine will produce at an estimated rate of 150 constructional cell units per hour. However, the rate per hour will depend on the scale of equipment and degree of production automation.

There are no material losses, since the processing operation has been designed to produce a finished size of 1,070 mm square from a flat sheet of the same dimensions.

Owing to the unique press tool design, it is possible to produce constructional cells in a variety of material thickness from 0.5 mm to 2.0 mm without changing the tool and without production stoppage, with the exception of changing material.

The investment for the necessary processing machinery, including auxiliary equipment and buildings of a minimum-scale plant, was assessed by S. Deligari in a feasibility study in 1969 to amount to US$170,000. Such a plant, actually a pilot plant, would be capable of producing up to 700,000 square-metre units per year if a two-shift operation is assumed.

Potential uses for constructional cell units

The basic use of the constructional cell units is in the rapid and cheap erection of prefabricated buildings of single storey construction. In its cheapest form the undulating surface would be exposed inside and out. For a more pleasing appearance for permanent structures, this could be covered with a flat surface panel in a variety of possible materials. The constructional cell unit is thus foreseen as the building unit for both permanent prefabricated dwellings and temporary or semi-permanent dwellings for emergency (e.g. earthquake) relief, for contractors' workers in remote regions, military camps etc.

The constructional cell unit lends itself readily to the very rapid construction of small- and medium-span buildings for workshops, stores, offices, garages etc. Its erection by unskilled labour and its reuse potential make it most interesting in this field. In the industrial sphere, natural lighting can be obtained by inserting constructional cell panels of translucent materials in the walls or roof.

There is a continual demand, particularly in cold or wet climates for cheap structures for storage of crops and for implement storage. Being cheap and of a simple "do-it-yourself" nature, the constructional cell unit should be most attractive to the farming community. In addition, it can be used to build animal shelters, silos, cereal containers etc.

The constructional cell unit may also be used for curtain wall panels, roofing-elements, insulation material (if made from paper cardboard) and for decorative and anti-echo concrete wall shuttering.

REPORT FROM THE CEYLON INSTITUTE OF SCIENTIFIC AND INDUSTRIAL RESEARCH

Ligno-plastic wood

A new process has been developed by means of which inferior species of wood, such as rubber-tree wood, can be treated, without the use of chemicals, to give a product of enhanced physical and mechanical properties.

The process consists of the controlled compression of wood at elevated temperatures, and the product is known as ligno-plastic wood. Among its attractive features are improved colour, high gloss, resistance to fungal decay and insect attack and enhanced durability and dimensional stability. Although comparable in quality with other high-grade natural woods used in the furniture industry and the building trade, such as teak, satin and nadun, ligno-plastic wood is appreciably cheaper. It can be produced in sufficient quantity to meet domestic needs and export requirements.

Bottling coconut milk

A process for bottling milk of young coconuts has been developed at the Ceylon Institute of Scientific and Industrial Research. It is likely that this process will be available for commercial exploitation when testing has been completed.

A process which conforms to the Pure Food and Drugs Laws applicable to soft drinks, ensures the preservation of the natural characteristics of the milk, which otherwise would ferment shortly after its removal from the nut. Further laboratory tests are being made on milk several months old to ensure that it will keep satisfactorily for long periods.

The optimum age of the coconut for purposes of bottling the milk has been found to be from six to seven months.

Passion-fruit seed oil

Nearly all the passion-fruit, *Passiflora edulis*, grown in Ceylon forms the basis for the manufacture of a popular beverage. Its seed, however, contains an oil rich in linoleic acid. As much as 70 per cent of this diunsaturated fatty acid has been found in passion-fruit seed oil, which has been used successfully in the laboratory preparation of an alkyd resin paint of high gloss and good weathering properties. When refined, the oil can also be used for edible purposes. The quantities of seed are as yet insufficient for industrial exploitation.

REPORT FROM SHRI RAM INSTITUTE, DELHI

ABS plastics development

ABS plastics are made from three basic monomers, acrylonitrile, butadiene and styrene, either by grafting styrene-acrylonitrile onto a butadiene-based elastomer or by blending a styrene acrylonitrile copolymer with butadiene-acrylonitrile elastomers. ABS polymers are tough, hard and rigid. They possess an excellent combination of mechanical, thermal and electrical properties as well as chemical resistance. In view of these properties, ABS polymers are versatile materials for engineering and thus belong to the family of engineering plastics. Being relatively inexpensive and having good fabrication and mechanical properties, these plastics can replace metals, wood and ceramics in many machine parts. The widely used applications of ABS include the manufacture of telephones, pipes, household appliances, refrigerators, typewriter bodies and automobile parts. Moulded parts from ABS plastics can be electroplated and thus replace non-ferrous metals in many applications.

The various grades of ABS polymers developed at the Shri Ram Institute can be processed by most of the conventional techniques. The material flows well and is stable thermally over a wide range of processing temperatures. It does not corrode tools and releases easily from mould surfaces.

The general process developed at Shri Ram Institute consists of the following:

Preparation of butadiene-based elastomer. To a reactor with an agitator, water, emulsifier, initiator, modifier and then butadiene are transferred. For certain grades of ABS, the elastomer employed is a copolymer of butadiene with styrene or acrylonitrile. In such cases, the requisite amount of vinyl monomer is added with butadiene. The polymerization is conducted in an oxygen-free atmosphere at temperatures varying from 5°C to as high as 75°C, depending upon the nature of the product required.

Grafting styrene acrylonitrile monomers onto butadiene-based elastomer. To the elastomer prepared in this manner are added styrene and acrylonitrile monomers as well as extra emulsifier, initiator and modifier. The reaction is carried out at 60°C - 70°C. Special grades of ABS are prepared by grafting styrene and acrylonitrile onto the elastomer in solution.

Blending, coagulation and drying. The latex which results from the above is stabilized with an antioxidant and blended with styrene-acrylonitrile copolymer. The product is coagulated, washed and dried at 80°C. It is then blended with other additives, extruded and pelletized.

Various grades suitable for injection moulding and extrusion are prepared by adjusting the physical and chemical structure of the elastomeric part, the resin to elastomer ratio, the molecular weight of the graft, degree of grafting and molecular weight of styrene acrylonitrile copolymer used for blending.

The following raw materials are required to produce one ton of standard ABS material:

Acrylonitrile	160	200 kg
Styrene	640	700 kg
Butadiene	150	220 kg

The specifications for styrene, butadiene and acrylonitrile are the same as those for the same materials used to produce polystyrene, synthetic SBR rubber and acrylic fibres.

Readers are invited to submit for publication brief reports of industrial research projects which they have recently completed or are carrying out and which may be of interest to their counterparts in developing countries.

Answers to Industrial Inquiries

The UNIDO Industrial Inquiry Service receives requests from developing countries for possible solutions to a wide variety of industrial problems. To give readers an idea of the range of the topics covered, each issue of the Industrial Research and Development News *carries a selected list of questions recently received by the Service in addition to an answer to a specific inquiry.*

Readers are invited to write to the Industrial Inquiry Service for further information on answers to any of the questions published below, quoting the reference number, or to submit inquiries on similar or other industrial problems.

Information has been requested on the following:

Sources of supply of machinery for the manufacture of medical adhesive plasters and of machinery for packaging in spools and strips under sterile conditions; specifications of the cotton material used in the manufacture of these adhesive plasters.
A company in Pakistan (Q 770)

Recent developments in the techniques of washing handicraft carpets in single pieces; sources of supply of machinery that can increase the output of individual carpet washing.
An organization in Turkey (Q 777)

Suppliers of machinery for slitting and roll-winding cellophane for 2.4 –2.6 mm opening strips for cigarette packages.
A company in Turkey (Q 780)

Recent developments in processes and production machinery for the wool industry.
A company in Turkey (Q 784)

Present trends in and evaluation of documentation classification systems; the availability of a thesaurus system for industrial documentation and for scientific economic systems.
An industrial centre in Tunisia (Q 788)

Production of activated charcoal for bleaching purposes from coconut shells.
UNDP, Ceylon (Q 789)

Suppliers of machinery suitable for extracting essences from flowers.
A company in Ceylon (Q 812)

Utilization of rice by-products.
A company in Indonesia (Q 818)

Extraction of pine oil from the sawdust of the Monterey pine *(pinus radiata)*.
A company in Chile (Q 821)

Diatomite production from local natural diatomite.
A company in the UAR (Q 827)

Know-how and cost of equipment for a universal laboratory pilot plant. A multipurpose unit for research and development in polymerization, alkylation, distillation, hydrogenation, saponification and other related processes used in the petroleum and petrochemical industries.
A request from the ECAFE region (Q 825)

The manufacture of synthetic or artificial camphor; suppliers of suitable small plant for the production of synthetic camphor.
A Company in Ceylon (Q 833/834)

The manufacture of cement and sulphuric acid using gypsum as raw material.
An industrial centre in the United Republic of Tanzania (Q 835)

Visual display systems for production planning.
A company in Colombia (Q 838)

Industrial process of detoxication of castor oil cake for use as animal feed.
An industrial centre in the United Republic of Tanzania (Q 846)

The production, consumption and marketing of ready-made clothing in Europe; equipment and machinery manufacturers for this industry.
A company in Turkey (Q 857)

Automatic and semi-automatic factories and equipment for the production of bricks; technical and techno-commercial information on the operation of such factories.
Madagascar, Tunisia, Turkey (Q 864)

Suppliers and prices of control equipment for electric or oil- and gas-fired boilers and furnaces to achieve maximum heating efficiency.
A research institute in the Sudan (Q 881)

Documentation on the present technical efficiency and economic interest in desiccation (freeze-drying).
A bank in Portugal (Q 892)

Suitable equipment for the processing of cassava.
A company in India (Q 904)

The correction of errors on belt conveyor weighing machines.
A company in South America (Q 908)

The processing of macadamia nuts.
A company in Kenya (Q 922)

Problems encountered in the weaving process

Two questions have been received from a company in India concerning problems encountered in the weaving process.

The first question was on the problem of migration of ends in the sizing of warp yarn. This migration results in "crossed ends" on the weaver's beam at a frequency of 5 to 10 per 1,000 metres between two consecutive beams. The company wished to find a method of minimizing this frequency.

Farbwerke Hoechst AG of Frankfurt/Main, Federal Republic of Germany suggested the following preventive measures:

- Reducing to a minimum the distance between the deflecting members;
- Fitting the deflecting rolls as grooved rolls;
- Passing the threads through an expanding reed before beaming;
- If there are no crossed threads, carefully sticking or clamping the warp together;
- Working carefully when tying the warp to the machine;
- If the crossing of ends is due to electrostatic charging, rinsing of the sized warp or fitting an ionizer.

The second question concerned the detection and elimination of shuttle marks in terene (terylene) fabric.

In this case Farbwerke Hoechst AG indicated that the shuttle marks were probably what are known as pinched wefts, which occur when the work is pinched by the shuttle in the shuttle box and becomes soiled in the process. The following possible causes were suggested:

- Empty shuttles;
- Inadequate braking of the yarn in the shuttle;
- Wrong adjustment of the shuttle box, the mechanism for catching the shuttle, the pick motion etc.

For Your Information...

The following publications may be purchased from: United Nations sales distributors, through local book dealers, or directly from: Sales Section, Room 1059, United Nations, New York, N.Y. 10017, United States of America, or Distribution and Sales Section, Palais des Nations, CH-1211 Geneva 10, Switzerland. Prices are given in US dollars but payment may be made in other currencies.

A Study of the Capacity of the United Nations Development System.

Vol. I, 69 pages and Vol. II, 510 pages (Document DP/5, $1.00 and $6.50).

After one year of study of "probably the most complex organization in the world", Sir Robert Jackson has made a 600-page report in which he appeals for a "considerable number of Heads of State and governments" to combine for decisive action to give increased impetus and vigour to the United Nations system for development co-operation.

In the study commissioned by the Governing Council of the United Nations Development Programme (UNDP), Sir Robert said this was "imperative" if the developing countries were to get the kind of "pre-investment and technical assistance" they need and want from the United Nations.

He declared that the United Nations "despite its present limitations, has demonstrated conclusively that it is the ideal instrument to do the job". The study emphasizes the need to "keep possible achievements of the UNDP" constantly in mind. "Not only does it exist as an active programme, it operates in a hundred countries, brings help of the most varied kinds to the solution of an astonishing range of problems – in fact *is* the embodiment of the United Nations to villagers and townspeople, as much as to senior civil servants and ministers. It demonstrates – and universally – that the UN system can and does act".

The report may be considered as complementary to *Partners in Development*. Whereas the latter deals with the broad perspective of problems of development aid, the former tackles the more specific question of the actual and potential capacity of the UN system to make an effective contribution to world economic and social development. It is also closely related to the work undertaken on the Second Development Decade.

Prepared after consultation with more than 100 governments and the many organizations in the United Nations system, the report comprises two volumes divided into five parts. Volume I, which constitutes the first part, is entitled "The Commissioner's Report" and contains the essence of the Study's findings and proposals, together with an implementation plan for the main recommendations.

Volume II contains nine further chapters divided into three sections: Part II deals with the character and content of the activities of the UN system in the field of development co-operation (Chapters 2, 3 and 4); Part III considers procedures for planning and operating the programme (Chapters 5 and 6); and Part IV is concerned with organization, administration and finance (Chapters 7, 8, 9 and 10). A summary of the principal recommendations is given, as appropriate, at the end of each chapter. Part V consists of appendices giving the statistical and other background material on which the Report is based.

Sir Robert Jackson, who comes from Australia, has had over three decades of experience in development work, both inside and outside the United Nations. In his report he stresses that "the first and foremost requirement is for governments to adopt consistent policies towards the various aspects of development co-operation offered through multilateral channels, a process that could be greatly assisted by the reduction and rationalization of the occasions and places in which policies for the numerous components of the UN development system are laid down. This would need to be accompanied by the simplification and concentration of the organizational structures and of the interrelationships of the various components of the UN system dealing with development at the headquarters, regional and country levels, so that all their activities and policies are properly co-ordinated.

"Within this organizational framework, a true country approach should be developed. It should be based on deep and comprehensive understanding of each country's over-all problems and on a long-term, integrated programme for the co-operation of the UN system in the solution of those problems, dovetailed into the national development plan and subscribed to by *all* concerned. This, in turn, would demand greater decentralization of actual operational activities, with proper authority centred on the government and, so far as the system is concerned, on the Resident Representative."

At one point in his exposition of the problems and the opportunities for effective United Nations assistance to "the Third World", Sir Robert declares: "We have come to the crossroads. Two ways lie ahead. One is a familiar, well-beaten track – the *ad hoc*, tinkering methods of the past. The other beckons to new horizons."

The study, he writes in his foreword, left him with several strong impressions. And the first was positive. "I am convinced that technical co-operation and pre-investment are one of the most effective ways of assisting the developing countries in achieving economic and social progress."

However, he critically examines factors which have led to a situation in which "the developing countries aren't getting as good a technical assistance service as they should" and in which "the future progress of the UN system is threatened".

Referring to the complexity of the United Nations system, the report notes that its machinery is under the control of no less than 30 separate governing bodies; that the machine is at present so organized that effective managerial direction is very difficult.

An immediate remedial step, he suggests, would be to give the machinery "a strong, central co-ordinating organization by re-structuring the UNDP" and giving it "greater power and independence". The UNDP should be "the recognized central body for consolidating and expanding co-operation with all the developing Member States", and governments should "continue to provide UNDP with the necessary financial resources while it is being re-structured".

The report emphasized that the United Nations specialized agencies "have an exceptional contribution to make, but that their work in the field of development co-operation must be co-ordinated (through a modified UNDP) like any department in government". The agencies, the report continues, should "receive the financial support necessary for them to perform their constitutional functions".

The study finds justified the criticism that the system is slow and is not yet making the best use of UNDP resources. Impediments to capacity exist at the central, field and regional levels, the study states. But while these constraints on capacity "must give cause for concern, they should not give cause for despair . . . Today's problems should, under no circumstances, be permitted to cloud either the achievements of the past or the challenging opportunities that now exist for the future". And that future should be viewed "above all with imagination and with confidence and determination".

While the World Bank Group should be the United Nations chief arm in the field of capital investment, the UNDP should perform the same function for basic technical co-operation and pre-investment; and, the report adds, "it is self-evident . . . that UNDP's operations must expand at about the same rate as those of the Bank".

Outlining a plan of action to achieve optimum benefit to developing countries, the study, among major innovations, proposes an integrated United Nations Development Cycle covering programming, project formulation, implementation, evaluation and follow-up; and a comprehensive information system covering three types of information – technical and scientific, economic and social, and operational and administrative.

Sir Robert has proposed a phased implementation over the next five years of the plan he suggests. He states: "Governments now have the Study. They have Mr. Pearson's Report. They have the outline proposals for the Second Development Decade. As I have said, this offers them an unprecedented opportunity for reviewing their policies towards the developing countries, and for taking deliberate and sustained action to resolve what we all know in our hearts is *the* problem of our time. Yet, tragically, too many people – including too many leaders in the affluent states – now appear to believe that the plight of two-thirds of mankind can be safely swept under the political rug and left there."

The plan of implementation for the Study's proposals envisages two stages 1970–71, and 1972–75. The end of the second stage would thus coincide with the mid-point of the Second Development Decade. Progress should be reviewed both in 1972 and 1975. As to cost, it is reckoned that the proposals would require an increase of about

US$7 million in the annual budget of UNDP, but this ought to be very largely offset by a corresponding saving in the regular budgets of the Specialized Agencies.

The Capacity Study's proposals are not limited to the next five years, however. True to the longer perspective adopted from the outset, they have been conceived in such a way as to constitute the first steps in a long-term process of consolidation and rationalization of the organs of the UN system dealing with economic and social development, if this were desired by governments.

The final decision as to whether the Study's proposals should be adopted depends on governments. Some preliminary discussions took place at the regular session of the Governing Council in January 1970, but decisions were made only at the meeting called specifically for the purpose of considering the Capacity Study in March 1970 (the results of which are reported below). The Governing Council's recommendations will be submitted to the summer session of ECOSOC which, in turn, will report to the General Assembly in the autumn of 1970. It may be possible to start preparing the practical application of some of the proposals during 1970 so that they can be put into effect early in 1971.

Consultants' Comments on Sir Robert Jackson's Report

The eight consultants who advised Sir Robert Jackson, Commissioner, during the preparation of the "Study of the Capacity of the United Nations Development System" have now presented their own comments on his report.

The consultants, appointed in a personal capacity on the basis of their qualifications and experience, were: Mr. Bunchana Atthakor, Minister of Economic Affairs, Thailand; Mr. Ali Attiga, Former Minister for Economy and Trade, Libya; Mr. Mamadou Ly, Former Minister for Planning, Equipment and Industry, Mali; Mr. David Bell, Executive Vice-President, the Ford Foundation, United States of America; Mr. Ernst Michanek, Director-General, Swedish International Development Authority, Sweden, who acted as Chairman of the Panel of Consultants; Mr. Janos Szita, Deputy Minister, Secretariat for International Economic Relations of the Council of Ministers, Hungary; Mr. Aleksei V. Zakharov, Deputy Permanent Representative of the Union of Soviet Socialist Republics to the United Nations. Mr. Raul Saez, Chairman of the Board of International Power Enterprise, Chile, replaced Mr. Manuel Perez-Guerrero as consultant when the latter became Secretary-General of the United Nations Conference on Trade and Development.

The consultants found themselves in agreement with the main findings of Sir Robert Jackson's report, and felt that these findings did not exaggerate the seriousness of the situation. In their opinion, the recommendations contained in the report provide a comprehensive framework for a reinforced, integrated and efficient United Nations development system. Some individual objections were raised with regard to the role the study assigned to the International Bank for Reconstruction and Development (IBRD) in United Nations co-operation activities.

Turning to the specific recommendations of the report, the consultants concurred with the Commissioner's proposal to introduce a United Nations Development Co-operation Cycle comprising: programming, project formulation, implementation, evaluation and follow-up. They stressed that the centre of gravity for programming should be transferred to the developing countries; that the present project-by-project approach should be replaced by a programme approach; and that multi-year programmes synchronized with each country's own planning cycle should be introduced. A subregional approach was advocated when the individual country represents an area too narrow to permit effective action.

It was felt that the United Nations system should assume a larger responsibility for assistance in development planning and for removing bottlenecks that limit the capacity of the developing countries to utilize external available knowledge and financial resources efficiently.

To make the fullest use of all available resources for development co-operation, the consultants were of the opinion that the implementation of projects within programmes should be contracted to the Specialized Agencies or to executing agencies outside the United Nations system such as universities, research establishments, public institutions, as well as public, co-operative and private enterprises. In this process, the United Nations agencies should play a leading role, and no national, sectoral or private interest should be allowed to influence the nature and scope of the operations.

The need for strong co-ordination and centralization of policy decisions in UNDP was emphasized, and the report's recommendation of a maximum degree of decentralization of the planning and implementation at the field level was endorsed. The consultants stressed the vital role of the Economic and Social Council as the main co-ordinating body of the economic and social activities of the United Nations system.

To increase the effectiveness of the programming process, the consultants advocated sound organization at the field level and great authority for the UNDP Resident Representative. They also felt that to improve the quality of international personnel, a more thorough system of selection, training and briefing was required.

The consultants noted that action is required urgently and recommended that the Governing Council establish a programme of work for the implementation of the report, creating, if necessary, special machinery for that purpose.

Following a series of regional symposia in 1965 and 1966, the International Symposium on Industrial Development was convened by UNIDO in Athens in 1967. It was the first major international meeting devoted exclusively to the problems of industrialization of the developing countries and paid special attention to the scope for international action and for co-operative efforts among the developing countries themselves in order to solve these problems.

The series entitled "UNIDO Monographs on Industrial Development Industrialization of Developing Countries: Problems and Prospects" comprises 21 monographs devoted to the main issues of the Symposium agenda. Some monographs deal with specific industrial sectors, some with

general industrial policy and others with aspects of international economic co-operation. All of them are based on the discussions in Athens and the documentation prepared for the meeting. Since economic, technological and institutional aspects of each subject are described with particular reference to the needs of developing countries, it is hoped that the monographs will make a distinctive contribution in their respective areas and, in particular, will prove useful to Governments in connexion with the technical assistance activities of UNIDO and other United Nations bodies concerned with industrial development.

In *IRDN* Vol. V No. 2, pages 45–46, brief summaries were given of *Fertilizer Industry*, No. 6; *Promotion of Export-Oriented Industries*, No. 19; and *Small-Scale Industry*, No. 11.

Notices of the following monographs are published below: *Construction Industry*, No. 2; *Building Materials Industry*, No. 3; *Manpower for Industry*, No. 14.

Subsequent issues will contain notices of the remainder of the 21 monographs.

Construction Industry.

Monograph No. 2, 98 pages (Sales No.: E.69.II.B.39, Vol. 2, $0.50)

This monograph is a broad study covering the salient features of the construction industry with particular reference to conditions in developing countries. It should be read in conjunction with monograph No. 3 on the *Building Materials Industry*, which is reviewed below.

In chapter 1 the place of construction in the national economy is discussed. The relation of construction to the gross domestic product (GDP), to the gross domestic capital formation (GDCF) and to fixed capital formation is analysed.

The significance of data on the amount of employment provided by the construction industry is considered.

The patterns of inputs and outputs in developing and industrialized countries are compared, showing that developing countries are greatly dependent on direct and indirect imports and materials, components, plant, equipment and skilled manpower and managerial staff. This comparison also demonstrates that a much smaller proportion of the output in developing countries is directed into maintenance and repair work than in industrialized countries.

The importance of construction in national economic development plans is discussed, and it is recommended that the construction industry be given more consideration than it receives at present. Finally, a development profile for the construction industry is outlined.

Chapter 2 is a qualitive assessment of the construction process. It numbers the main participants in the construction process and describes the contractual relationships linking them. The main stages of the process are analysed and considered in relation to the participants and their contractual relationships. Different patterns of building are also described with an indication of the circumstances in which each can be applied.

The role of the Government in construction is dealt with. It is noted that the Government should be prepared to establish an explicit policy to promote the future technical and organizational development of the construction industry.

Chapter 3 deals with the product of the construction industry. For the purpose of analysis, this is broken down into four sections covering respectively: new work and maintenance and repairs; residential building, non-residential building and other construction works; public sector and private sector; and modern and traditional categories. In conclusion, some recommendations are made for the future planning of the construction industry.

Chapter 4 considers the questions of manpower, equipment and finance. Manpower in this instance is viewed qualitatively. The requirement for different skills and the variation in this requirement according to the type of construction are discussed. The problem of the uneven distribution of professional manpower is mentioned and recommendations made for suitable counteraction on the part of the professional institutions at national and international levels.

It is noted that the mechanized equipment used in the construction industry is relatively expensive. Careful organization of the construction process is required if the use of this equipment is to justify its high cost.

It is suggested that developing countries might themselves undertake the production of some construction machines of relatively simple design rather than import them. The establishment in developing countries of planned pools for more complex and less frequently utilized construction machines is recommended and the possibility of importing second-hand machines explored.

In the last part of chapter 4, which deals with finance, analyses are given of the financial relationships among clients, contractor and building-materials merchant; of unit costs; of functional elements, and of non-building costs.

Chapter 5 presents the main issues discussed at the Athens Symposium and the recommendations approved.

Chapter 6 outlines the scope for United Nations action to assist the construction industry in developing countries. This includes suggestions for field activities, supporting activities and new areas of activity.

Building Materials Industry.

Monograph No. 3, 77 pages (Sales No.: E.69.II.B.39, Vol. 3, $0.50)

Chapter 1 begins by outlining the scope of the monograph in view of the difficulty in establishing an accepted definition of building materials. It discusses trade in building materials, and gives evidence of the attempt on the part of the developing countries to reduce imports and increase production in order to offset the disproportionate amount of foreign exchange being spent on building materials. An outline is given of the factors to be considered before deciding on local production: cost of transport; production costs; and consumption requirements.

Chapter 2 is devoted to the trends in consumption of building materials. An analysis of key materials is presented, using *per capita* consumption (by weight or volume) as an index. The materials considered are cement, steel, brick, sawnwood, wood-based panels and plastics. In the section giving an interpretation of the trends, mention is made of the difficulty in drawing conclusions from an analysis that refers to only one year. However, it can be expected that there will not be very much change within a period of ten years, and an over-all picture of the situation in many countries of the world provides a pattern from which individual countries can benefit in developing their plans. In conclusion, a statistical analysis is presented of the data discussed in the chapter using a computer programme for polynomial regression.

Chapter 3 suggests another approach to the problem of assessing consumption of building materials. Materials inputs into new buildings can be evaluated by surveying existing construction. The importance of the possibility of substitution of materials in the assessment of the total requirements per unit of construction is mentioned. The substitution of materials in the construction of roofs, main structure, walls and floors is discussed. The chapter concludes with a brief description of the materials used in civil engineering.

Chapter 4 considers the problems of the building materials industry itself in the light of the analysis of the use of building materials in the first three chapters of the monograph. First, the stages of industrialization of building materials and components are discussed, with sections devoted to the pattern of industrialization, to building elements and to a survey of specific building materials. This is followed by a consideration of the production characteristics of building materials giving tables of building materials graded according to selected production criteria. Finally, the chapter deals with the most important production criteria, such as raw materials and plant location, size of market, labour skills, and value added by the building materials industry.

Chapter 5 deals with the planning and organization of the building materials industry and points to the importance of establishing a mechanism to procure information on which to base plans and forecasts. Mention is made of the various problems that arise in the course of implementing plans, such as inadequate transport networks, lack of technical know-how, lack of financial incentives. The establishment of technical institutions for the provision of advisory services and research laboratory facilities according to the needs of specific countries is recommended. Such institutions should also set up the required quality standards and codes of practice. The chapter concludes by outlining some financial incentives that have application to the development not only of the building materials industry but to industry in general.

Chapter 6 deals with the issues discussed at the Athens Symposium and the recommendations approved.

Chapter 7 describes the action of UNIDO and other United Nations organs towards the promotion of the building materials industry in developing countries.

Manpower for Industry.

Monograph No. 14. 54 pages (Sales No.: E.69.II.B.39, Vol. 14. $0.50)

Chapter 1 is concerned with the determination of goals to be achieved in the education and training of skilled industrial manpower. It is pointed out that the target for each of the various sources of industrial skills must be set by the Government. The factors to be taken into consideration in the setting of short and long-term targets are enumerated, and the important part played in this field by data on manpower requirements is demonstrated.

Chapter 2, which deals with the efficient use of manpower for industrial development, suggests measures that should be undertaken to channel young people into the proper educational and training facilities; outlines steps to be taken towards directing qualified persons to the required jobs; and shows what might be done to improve the performance of industrial manpower.

Chapter 3 is devoted to systems of education and training in developing countries. An outline is given of the structure of skills required for industrialization. To meet the needs and combat the problems of setting up education and training programmes for industry, a four-phase apporach is suggested. The phases are: general elementary education; general secondary education; initial job training combined with further education; and upgrading, refresher courses and retraining schemes combined with further education. A description is given of what can be required and expected of each of the phases. The chapter concludes with a section on the training of specific categories of workers: lower-level industrial personnel, including skilled workers; middle-level industrial personnel; and higher-level industrial personnel.

Chapter 4 deals with the administration and financing of industrial training schemes. Ideas and principles are suggested that may be adapted to specific needs. Suggestions are made for the establishment of an industrial training organization, outlining its possible functions and noting the priorities. The main sources of financing of education and training programmes are given. A suggested means of sharing of the costs of the four phases of education described in chapter 3 between national education systems and industry is described. Finally, there is a section on the association of industry with training programmes.

Chapter 5 reviews the issues discussed at the Athens Symposium and the recommendations approved.

Chapter 6 is devoted to a description of United Nations activities to promote industrial manpower development with particular mention of UNIDO activities.

Calendar of Meetings

Conference of the International Iron and Steel Institute

Paris, France, 12—14 October. International Iron and Steel Institute, 5 Place du Champs de Mars, Brussels 5, Belgium.

Industrial Research Institute Annual Meeting

Washington D.C., 13—16 October. Mr. G. W. McBride, Industrial Research Institute, 100 Park Avenue, New York, N.Y. 10017, U.S.A.

Fifth Congress on Material Testing

Budapest, 19—24 October. Scientific Society of Mechanical Engineers, Szabadság tér 17, Budapest V, Hungary.

Seventh International Conference on Reinforced Plastics

Brighton, 20—22 October. Mr. T. Wells, British Plastics Federation, 47 Piccadilly, London W. 1, United Kingdom.

World Symposium on Mining and Metallurgy of Lead and Zinc

St. Louis, Missouri, 21—23 October. Mr. J. C. Fox, Society of Mining Engineers of AIME, 345 East 47th Street, New York, N.Y. 10017, U.S.A.

Conteinerization 70 (System and Methods)

Munich, 21—24 October. Munich Fair Authority, Theresienhöhe 13, D-8 Munich 12, Federal Republic of Germany.

Sixth International Machine Tool Congress

Budapest, 24—26 October. Scientific Society of Mechanical Engineers, Szabadság tér 17, Budapest V, Hungary.

Eighteenth Annual Joint Engineering Management Conference

Chicago, Illinois, 29—30 October. Group on Engineering Management, Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, N.Y. 10017, U.S.A.

International Symposium on Industrial Wastes

Stockholm, 2—6 November. Mr. B. Goransson, c/o Swedish Water and Air Pollution Research Laboratory, Drottning Kristinas Vag 47D, 114 28 Stockholm O, Sweden.

Electronics 70

International Trade Fair for Electronic Components and Related Production and Measuring Equipment, Munich, 5—11 November. Munich Fair Authority, Theresienhöhe 13, D-8 Munich 12, Federal Republic of Germany.

Eleventh International Conference and Exhibition on Automation and Instrumentation

Milan, 20—26 November. Federation of Scientific Associations (FAST), Piazzale Rodolfo Morandi, 2-20121 Milan, Italy.

Engineering Materials and Design, International Exhibition and Conference

London, 30 November—4 December. Industrial and Trade Fairs Limited, Commonwealth House, New Oxford Street, London, United Kingdom.

Third Symposium on Problems of Electroplating

Budapest, 1—3 December. Mr. L. Prockl, Scientific Society of Mechanical Engineers Szabadság tér 17, Budapest V, Hungary.

Meeting of the American Society for Testing and Materials

Kansas City, Missouri, 6—11 December. Mr. J. B. Bidwell, American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania, U.S.A.

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