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Summaries of Feature Articles

Industrial Development Board Holds Second Session

UNIDO's 45-member governing body, the Industrial Development Board, held its second session from 17 April to 14 May in Vienna. After doing much of the work on the fifteen agenda items in two committees, the Board met in plenary session and adopted ten resolutions, including those on the 1968 and 1969 work programmes, a Working Group on Programme and Co-ordination, local costs of Special Industrial Services and the training of national personnel for industrial development.

La deuxième session du Conseil du développement industriel

L'organe directeur de l'ONUDI, le Conseil du développement industriel, qui comprend 45 membres, a tenu sa deuxième session à Vienne du 17 avril au 14 mai. Après examen des 15 points de l'ordre du jour par deux comités, le Conseil s'est réuni en séances plénières et a adopté 10 résolutions relatives notamment au programme de travail pour 1968 et pour 1969, à la création d'un groupe de travail du programme et de la coordination, aux dépenses locales encourues au titre des Services industriels spéciaux et à la formation de personnel national pour le développement industriel.

La Junta de Desarrollo Industrial celebra su segundo período de sesiones

La Junta de Desarrollo Industrial, órgano rector de la ONUDI compuesto por 45 miembros, celebró su segundo período de sesiones en Viena, del 17 de abril al 14 de mayo. Después de tratar la mayor parte de los quince temas del programa en dos comités, la Junta se reunió en sesión plenaria y aprobó diez resoluciones, entre las que figuran las referentes a los programas de trabajo para 1968 y para 1969, al Grupo de Trabajo encargado del programa y de la coordinación, a los gastos locales de los Servicios Industriales Especiales y a la formación de personal nacional para el desarrollo industrial.

Regional Science Co-operation: The Scandinavian Experience

by Elin Törnudd

For over twenty years the scientific and technological sectors of the five Scandinavian countries have been co-operating through the Scandinavian Council for Applied Research, called Nordforsk. Research committees carry out the major part of the two-year work programmes outlined by the governing body and administered by an executive committee.

La coopération scientifique régionale: l'expérience scandinave

par Elin Törnudd

Depuis plus de 20 ans, les milieux scientifiques et techniques des cinq pays scandinaves coopèrent par le truchement du Conseil scandinave pour la recherche appliquée, connu sous le nom de Nordforsk. Des comités de recherche exécutent la majeure partie des programmes de travail de deux ans définis par le Conseil d'administration et administrés par un Comité exécutif.

Cooperación científica regional: la experiencia escandinava

por Elin Törnudd

Desde hace más de veinte años los sectores científicos y tecnológicos de los cinco países escandinavos han venido cooperando por conducto del Consejo escandinavo para la investigación aplicada, denominado Nordforsk. Sus comités de investigación realizan la mayor parte de los programas bienales de trabajo trazados por el órgano rector y administrados por un comité ejecutivo.

Applied Research Serves a Country in Transition

by H. C. Yuan

The Union Industrial Research Institute, Hsinchu, Taiwan, carries out a broad programme of technological research, with current projects related to agriculture, construction, mineral resources and chemicals.

La recherche appliquée au service d'un pays en période de transition

par H. C. Yuan

Dans le cadre de son vaste programme de recherche technique, l'*Union Industrial Research Institute* de Hsinchu (Taïwan) exécute des projets intéressant l'agriculture, la construction, les ressources minérales et les produits chimiques.

La investigación aplicada al servicio de un país en período de transición

por H. C. Yuan

El Instituto de Investigaciones Industriales de la Unión, situado en Hsinchu, Taiwán, lleva a cabo un amplio programa de investigación tecnológica que comprende en la actualidad proyectos relacionados con la agricultura, la construcción, los recursos minerales y los productos químicos.

A French View of Consultants for Developing Countries

by Maurice de Longevialle and Roger Nancy

The authors discuss basic considerations in choosing consultants and review some specific projects undertaken in developing countries by French consultants, particularly those belonging to the Chambre Syndicale des Bureaux d'Etudes de France (SYNTEC).

L'emploi de consultants dans les pays en voie de développement vu par des Français

par Maurice de Longevialle et Roger Nancy

Les auteurs étudient les éléments déterminants dans le choix des consultants et analysent certains projets entrepris dans les pays en voie de développement par des consultants français, notamment des consultants appartenant à la Chambre syndicale des bureaux d'études de France (SYNTEC).

Una opinión francesa sobre los consultores para los países en desarrollo

por Maurice de Longevialle y Roger Nancy

Los autores discuten las consideraciones básicas para la elección de consultores y examinan determinados proyectos llevados a cabo en países en desarrollo por consultores franceses, especialmente los pertenecientes a la Cámara sindical de las oficinas de estudios de Francia (SYNTEC).

Stanford Research Institute: A Worldwide Resource

by Wilson F. Harwood

In little more than twenty years the Stanford Research Institute (SRI) has grown from a one-man organization serving local industrialists to a 3 200-employee institution serving some fifty countries. The Institute's international operations, which are centred in an internal management entity called SRI-International, average about $US 13 million per year and include projects in various branches of engineering, in the physical and life sciences and in economics and the management sciences.

L'Institut de recherche de Stanford — au service du monde

par Wilson F. Harwood

L'Institut de recherche de Stanford (SRI) a commencé par être l'entreprise d'un seul homme fournissant ses services à des industriels locaux. Un peu plus de 20 ans après sa création, cette entreprise est devenue une institution employant 3 200 personnes et fournissant des services à une cinquantaine de pays. Les activités internationales de l'Institut, centralisées par un organe directeur appelé le SRI-International, représentent une valeur de 13 millions de dollars par an et englobent des projets intéressant les différentes branches du génie, des sciences physiques et naturelles, de l'économie et des sciences de la gestion.

Instituto de investigaciones de Stanford — Una institución de carácter mundial

por Wilson F. Harwood

En poco más de veinte años el Instituto de investigaciones de Stanford (SRI), que era al comienzo una empresa a cargo de una sola persona al servicio de los industriales locales, se ha transformado en una institución de 3.200 empleados que presta servicio a unos 50 países. Las actividades internacionales del Instituto, centralizadas en una entidad administradora interna llamada la SRI-Internacional, representan un volumen medio de operaciones de unos 13 millones de dólares por año y comprenden proyectos relacionados con distintas ramas de la ingeniería, las ciencias físicas y naturales, y las ciencias económicas y administrativas.

An International Food Irradiation Research Project

by K. Kaindl

Concerned with the world food shortage and the food waste resulting from inadequate preservation and storage methods, international and national groups are sponsoring research into the possibilities of preserving food through ionizing radiation. The Department of Biology and Agriculture of the Reactor Centre in Seibersdorf, Austria, has been conducting experiments for this international project since 1965.

Projet de recherche international concernant l'irradiation des produits alimentaires

par K. Kaindl

Sous l'égide de groupes internationaux et nationaux ayant constaté avec inquiétude la pénurie alimentaire mondiale et le gaspillage qui résulte de l'application de méthodes inadéquates de conservation et de stockage, des recherches ont été entreprises sur les possibilités de conservation des aliments par les rayonnements ionisants. Depuis 1965, le département de biologie et d'agriculture du Centre atomique de Seibersdorf, en Autriche, procède à des expériences dans le cadre de ce projet.

Un proyecto internacional de investigación sobre irradiación de productos alimenticios

por K. Kaindl

Preocupados por la escasez de alimentos en el mundo y las pérdidas de alimentos debidas al empleo de métodos inadecuados de conservación y almacenamiento, algunos grupos internacionales y nacionales patrocinan investigaciones sobre la posibilidad de utilizar radiaciones ionizantes para la conservación de alimentos. El departamento de Biología y Agricultura del Centro Atómico de Seibersdorf, en Austria, realiza experimentos para este proyecto internacional desde 1965.

The Role of the African and Malagasy Industrial Property Office

by Denis Ekani

Under the Libreville Agreement of 1962, a regional group of developing countries set up the African and Malagasy Industrial Property Office (OAMPI), a joint system for securing and protecting industrial property rights. OAMPI's functions include receiving and centralizing applications from member states, registering and issuing patents and certificates, publishing an official journal and collecting annual patent fees.

Rôle de l'Office africain et malgache de la propriété industrielle

par Denis Ekani

En vertu de l'accord de Libreville, signé en 1962, un groupe régional de pays en voie de développement a créé l'Office africain et malgache de la propriété industrielle (OAMPI), organisme commun pour l'obtention et le maintien des droits de propriété industrielle. L'OAMPI a pour fonctions, notamment, la réception et la centralisation des demandes provenant de ses Etats membres, l'enregistrement et la délivrance de titres, de brevets et de certificats, la publication d'un journal officiel et la perception de droits annuels de brevets.

La Oficina Africana y Malgache de la Propiedad Industrial

por Denis Ekani

En virtud del acuerdo de Libreville de 1962, un grupo regional de países en desarrollo formó la Oficina Africana y Malgache de la Propiedad Industrial (OAMPI), instituyendo un sistema común para el establecimiento de los derechos de la propiedad industrial. Las funciones de la OAMPI consisten en recibir y centralizar solicitudes procedentes de los Estados miembros, registrar y expedir patentes y certificados, publicar un diario oficial y cobrar derechos anuales de patentes.

Industrial Development Board Holds

THE SECOND SESSION of the Industrial Development Board, UNIDO'S governing body, opened on 17 April in the Hofburg Conference Centre, Vienna, and closed shortly after midnight on 14 May. Delegations representing forty-four of the forty-five Board members, observers from twenty-two Member States and representatives of thirteen United Nations bodies and specialized agencies, four intergovernmental and nine non-governmental organizations attended the meeting.

The Board elected the following Bureau: President, Heinrich Standenat of Austria; Vice-presidents, Mohamed Warsama of Somalia, G. M. Richards of Trinidad and Tobago, and Tenu Petrov of Bulgaria; Rapporteur, Mohammad Ali Aghassi of Iran. As the Board conducted its work not only in plenary sessions but also in two committees, Mr. Standenat presided over the Board when it met in plenary session while Mr. Warsama acted as chairman of Committee I and Mr. Petrov served as chairman of Committee II.

After electing officers, Board members approved a fifteen-item agenda, conducted a general debate, considered five agenda items in Committee I and four in Committee II and concluded by meeting as a whole to approve the committee reports, discuss the remaining agenda items and adopt ten resolutions.

Working Group on Programme and Co-ordination

The Board adopted two resolutions relating to the establishment of a Working Group on Programme and Co-ordination. The major resolution on this topic states that, in view of the Board's functions and powers and the complexity of the questions it must consider, the Board requests the Executive Director, I. H. Abdel-Rahman, to convene a Working Group of government representatives open to all members. The second resolution states that the group shall be a subsidiary organ of the Board.

The Working Group will elect its own officers and will consider the documentation prepared for the Board session with a view to: examining the report on past activities and the current and proposed work programmes; assessing the financial implications thereof; and identifying and commenting on problems of co-ordination in the industrial development field.

Beginning in 1969 the Working Group will meet at the seat of the Organization about two weeks prior to the Board's annual session.

Co-ordination of activities

One of the major concerns of the Board is expressed in an eleven-point resolution on the review and co-ordination of activities in the field of industrial development. Recognizing "the primary responsibility that devolves on it in exercise of the central co-ordination role of UNIDO with regard to all activities of the United Nations system in the field of industrial development", the Board requests the Executive Director to intensify UNIDO'S efforts, either alone or in co-operation with interested agencies, in areas where gaps exist and to continue consultations with relevant specialized agencies, regional economic commissions, the United Nations Economic and Social Office in Beirut, and international, regional and national financial institutions in order to speed up industrial development in the developing countries, and give impetus to the promotion of financing of industrial projects in these countries.

Another part of the resolution invites the Executive Director to consult with the administrator of the United Nations Development Programme (UNDP) on the preparation of a detailed analysis of UNDP's experience in dealing with co-ordination problems with a view to making recommendations on measures and procedures for co-ordination of technical assistance.

The resolution also "invites the attention of Governments to the desirability of harmonizing their own positions in the field of industrial development in the various organs of the United Nations and related agencies". Other points

Second Session

include endorsement of the Executive Director's intention to contribute to the elaboration of the preliminary framework of an international development strategy for the 1970's being prepared by the Secretary-General and to utilize industrial field advisers for purposes of co-ordination at country level.

Two other resolutions deal with related topics: activities of the UNIDO regional advisers and co-operation between UNIDO, the regional economic commissions of the United Nations, and the Economic and Social Office in Beirut (UNESOB).

The first of these asks that the Executive Director continue to consult with the bodies concerned in order to maintain "closer co-operation which would utilize the regional industrial development advisers with a view to assuring harmonization of the activities of UNIDO and the regional economic commissions and the United Nations Economic and Social Office in Beirut in the field of industrial development". The second emphasizes the importance of co-operation between UNIDO and these bodies and invites the Executive Director to continue his activities for the development of this co-operation. Both resolutions request the Executive Director to report to the Board on progress in the area concerned.

Work programme

The Board adopted a resolution on the work programme of UNIDO which takes note of the reports on UNIDO's 1967 activities and the International Symposium on Industrial Development and approves the 1968 and 1969 work programmes, subject to observations in the Board's report on the second session.

Committee I recommended to the Board that the Executive Director of UNIDO be requested to use his good offices to obtain the United Nations Secretary-General's 1969 budget estimates to be made available to the Board at its second session. The Board unanimously endorsed this recommendation, and the Executive Director communicated it to the Secretary-General. In his reply, the Secretary-General stated that for both legal and practical reasons the 1969 budget estimates could not be made available to the Board during the second session. Committee I referred the matter to the final plenary sessions of the Board.

Such possibilities as scheduling the annual session later in the year when estimates would be available were discussed before the Board included in the resolution on the work programme a request that the Executive Director:

> secure the agreement of the Secretary-General for submitting to the next and successive sessions of the Board the budget estimates of the Executive Director for the year or years for which the Board is expected to consider and approve the Organization's Programme of Work in order that such consideration and approval can be given in the knowledge of the likely financial implications.

Among other points in this resolution were requests that the Executive Director: take the necessary steps to appoint at the earliest possible date an adequate number of industrial field advisers; submit to the third session proposals for accelerating and modifying the recruitment process; develop programmes of assistance, at the request of governments concerned, to regional and sub-regional groupings of developing countries; encourage developing countries to exchange experience and expertise; and lay greater emphasis within the developing countries on the creation and strengthening of national and regional specialized financial institutions and organizations aimed at stimulating a greater inflow of capital into existing and new industries.

In connexion with the last point in the resolution, the Board considered "that UNIDO should be entrusted with the responsibility of executing a larger number of projects related to Industrial Development under the two components of UNDP".

Regular Programme of Technical Assistance

In addition to the resolution on the work programme in general, the Board adopted a resolution on the Regular Programme of Technical Assistance. In this resolution, the Industrial Development Board

Recalling resolution 2298 (XXII) adopted by the General Assembly on 12 December 1967, and its own resolution 2 (I) of 4 May 1967 recommending the establishment of a separate section in part V of the United Nations budget to provide for the Programme of Technical Assistance in Industrial Development at an appropriate level commensurate with the expanding requirements of the developing countries;

Noting the Executive Director's report (ID/B/26/Add.11/Rev.1), in which he recommends a planning of $US 1.5 million for section 14 of the United Nations budget (Regular Programme of Technical Assistance) in 1969 and also states that this planning level figure of $US 1.5 million falls short by $US 750 000 of the total cost of requests received from governments;

Having regard to the need to satisfy as far as possible the requests for assistance made to UNIDO by certain governments under the Regular Programme of Technical Assistance, in view of the great urgency with which the developing countries regard the hastening of their industrial development;

Recommends the sum of $US 1.5 million as the planning level of the Regular Programme of Technical Assistance for industrial development in 1969 and 1970;

Approves the revised Programme for 1969 presented by the Executive Director under the Regular Programme of Technical Assistance (ID/B/26/Add.11/Rev.1);

Stresses the importance of that part of the Regular Programme of Technical Assistance which is utilized as a means of promotion whereby greater direct assistance in industrial development can be given to the developing countries and *requests* the Executive Director to draw up guiding principles for the execution of the Regular Programme in this spirit.

Local Costs of Special Industrial Services

The Board also adopted a resolution on Special Industrial Services, a programme designed to furnish assistance to developing countries at short notice. After taking note of the widespread feeling that the payment of local costs for Special Industrial Services projects should be completely waived, the Board asked the Executive Director to take the necessary steps to have this question examined in conjunction with the United Nations Development Programme (UNDP) and to inform the Board of the results at its 1969 session.

Voluntary contributions

The Board adopted a resolution calling for the Executive Director to solicit voluntary contributions, and stating that such contributions made to UNIDO under the provisions of Section II, Paragraph 23 of General Assembly Resolution 2152 (XXI) should be utilized for the financing of projects under the UNIDO Programme.

This resolution requests the Executive Director to take the necessary steps to promote appropriate voluntary contributions to UNIDO for its operational programmes through direct contacts with the governments of developed and developing countries.

Two countries announced contributions during the session. Switzerland made a voluntary contribution of one million Swiss francs for training purposes, and Czechoslovakia stated that it would double its annual contribution of 500,000 crowns in 1969.

Training of national personnel for industrial development

In another resolution, the Board recognized that the training of national personnel at all levels plays a decisive role in the industrial development of developing countries. Noting with appreciation the numerous in-plant training programmes being planned by various countries in co-operation with UNIDO, the Board expressed the hope that more programmes of a similar nature would be undertaken on the basis of the actual needs of developing countries.

Included in the resolution are: a request that the Executive Director consult with interested countries, UNDP and other relevant United Nations organizations on the further development of existing and new training programmes; a recommendation that steps be taken to ensure effective co-ordination with existing relevant international programmes and institutes; and a request that the Executive Director prepare after consulting with the International Labour Office, other specialized agencies, the regional economic commissions and the United Nations Economic and Social Office in Beirut an outline for a detailed long-term programme for the various kinds of technical training in the field of industrial development.

International non-governmental and inter-governmental organizations

Among the recommendations made by Committee II and endorsed by the Board were those involving international non-governmental and inter-governmental organizations.

The Committee recommended to the Board the adoption of rules of procedure governing the granting of consultative status to international non-governmental organizations. Under these new rules of procedure, consultative status was granted to the International Confederation of Christian Trade Unions; the International Christian Union of Business Executives; the European Centre of Overseas Industrial Development; the International Association of Crafts and Small and Medium-sized Enterprises; and the International Association for the Protection of Industrial Property.

The Committee also recommended to the Board that three inter-governmental organizations be associated with the activities of UNIDO. These are: the Standing Consultative Committee of the Maghreb; the International Agriculture and Food Industries Committee; and the Common Afro-Malagasy Organization.

The Committee also proposed that the Board include the People's Republic of Southern Yemen and Mauritius in List A of states annexed to the United Nations General Assembly resolution establishing UNIDO.

Participants

The following countries which are members of the Board participated in the second session: Argentina, Austria, Belgium, Brazil, Bulgaria, Cameroon, Canada, Chile, Colombia, Cuba, Czechoslovakia, Federal Republic of Germany, Finland, France, Ghana, India, Indonesia, Iran, Italy, Ivory Coast, Japan, Jordan, Kuwait, Netherlands, Nigeria, Pakistan, Peru, Philippines, Romania, Rwanda, Somalia, Spain, Sudan, Sweden, Switzerland, Thailand, Trinidad and Tobago, Turkey, Union of Soviet Socialist Republics, United Arab Republic, United Kingdom, United States, Uruguay and Zambia.

Observers were present from: Australia, Bolivia, China, Costa Rica, Dominican Republic, Guatemala, the Holy See, Honduras, Hungary, Iraq, Lebanon, Libya, Niger,

A visitor, Prime Minister Thanom Kittikachorn of Thailand, is greeted by Almamy Sylla, Secretary of the Board.

Norway, Poland, Portugal, the Republic of Korea, the Republic of Viet-Nam, South Africa, Upper Volta, Venezuela and Yugoslavia.

Also represented were: the Department of Economic and Social Affairs of the United Nations Secretariat, the Economic Commission for Africa (ECA), the Economic Commission for Europe (ECE), the United Nations Conference on Trade and Development (UNCTAD), the United Nations Development Programme (UNDP), the World Food Programme (WFP), the International Atomic Energy Agency (IAEA), the International Bank for Reconstruction and Development (IBRD), the International Labour Organisation (ILO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), as well as the General Agreement on Tariffs and Trade (GATT), and the following inter-governmental organizations: the Common Afro-Malagasy Organization (OCAM), the European Communities, the Organization of American States (OAS), and the United International Bureaux for the Protection of Intellectual Property (BIRPI).

Non-governmental organizations represented were the following: the Afro-Asian Organization for Economic Co-operation (AFRASEC), the European Centre for Industrial and Overseas Development (CEDIMOM), the International Association for the Promotion and Protection of Private Foreign Investments (APPI), the International Chamber of Commerce (ICC), the International Committee for Scientific Management (ICSM), the International Confederation of Free Trade Unions (ICFTU), the International Federation of Christian Trade Unions (IFCTU), the International Organization of Employers (IOE) and the World Federation of Trade Unions (WFTU).

The Board decided that its third session would be convened in the second half of April 1969 for a maximum duration of three weeks; the Working Group would meet prior to the opening of the Board session.

The Author: *After receiving a degree in chemical engineering from the University of Technology in Helsinki and a Master's degree in library science from the Carnegie Institute of Technology in Pittsburgh, Elin Törnudd became a scientific information officer of the Central Chemical Association in Finland. In 1952 she received an American-Finnish grant for post-graduate studies in the United States. As a British Council visitor in 1955, she studied the United Kingdom's science information system. At the end of 1956, Miss Törnudd joined Nordforsk to set up a permanent secretariat, and she now serves the organization as secretary general.*

Regional Science Co-operation:

By Elin Törnudd

SCIENTIFIC ADVANCES in a country depend on a series of factors, among them its science policy, educational standards, the organization of its research activities and the structure and type of industry. Unfortunately, the size of the country is also an important factor; with the increasing specialization in science, small countries find it more and more difficult to mobilize experts in all the different scientific fields.

Regional and international co-operation in scientific research is one of the methods used to overcome the handicap of smaller countries. The aim of co-operation is to foster a more differentiated and more rapid development in the sciences.

Scientific co-operation among the Scandinavian countries – Denmark, Finland, Iceland, Norway and Sweden – has evolved through personal contacts between colleagues. These contacts were strengthened after the First World War when a series of Scandinavian conferences and symposia were initiated. Informal co-operation between scientists probably advanced further in the five Scandinavian countries than in other regions of the world; the main reason for this was the one-big-family feeling among the Scandinavian peoples resulting from their cultural and political traditions, similar economic conditions, commensurability in size, proximity and linguistic bonds.

Co-operation in research involving decisions by parliaments, governments or other public authorities was initiated about twenty years ago, when inter-Scandinavian bodies were founded. One of these bodies is Nordforsk, the Scandinavian Council for Applied Research. This is an expert body within the scientific and technological sector and is maintained by national research councils and academies.

Early phases of co-operative efforts within Nordforsk

After the period of extremely limited communications during the Second World War, the Scandinavian countries felt very strongly the need to strengthen their contacts. In 1947 the central scientific and technical research organizations in the five countries established the Scandinavian Council for Applied Research, Nordforsk.

The first programme of action, formulated at Nordforsk's initial plenary meeting, covered exchange of information on research administration and research programmes; arrangements of symposia and conferences in different scientific fields; a common labour market for scientists in Scandinavia; and co-ordination of visits from abroad.

During the first decade Nordforsk was basically a scientific club for the members of academies of engineering sciences and of the scientific and technical research councils. In Nordforsk meetings scientists and research administrators were able to exchange experiences concerning both scientific and organizational problems. Nordforsk's Plenary Assembly, which consisted of the chairmen and directors of its member organizations, discussed research policy.

The Scandinavian Experience

At the end of the first decade Nordforsk established its permanent secretariat and made its first budget proposal, which consisted of contributions from Denmark, Finland, Norway and Sweden.

The second decade might be characterized as the development phase during which the organization of research co-operation was initiated. The statutes adopted in 1960 specify: "The task of Nordforsk is to promote and organize Scandinavian co-operation in questions concerning technical and allied scientific research, and utilization of research results."

Organization of Nordforsk

Nordforsk consists of the ten member organizations (see Figure 1) and is governed by a Plenary Assembly consisting of the presidents and directors of these organizations. Every second year the Assembly holds an ordinary plenary meeting to outline a two-year work programme.

As indicated in Figure 1, the Plenary Assembly delegates the administration of the work to an Executive Committee consisting of one representative with a personal deputy from every participating country. The Executive Committee meets once a month.

The work is carried out through Scandinavian research committees appointed and dissolved according to need. There were 25 committees and working groups with more than 200 members at the end of 1967. At the beginning of 1968 one third of these committees and groups were disengaged in accordance with the Nordforsk policy of limiting the time of its sponsorship in order to be able to launch co-operation within new fields.

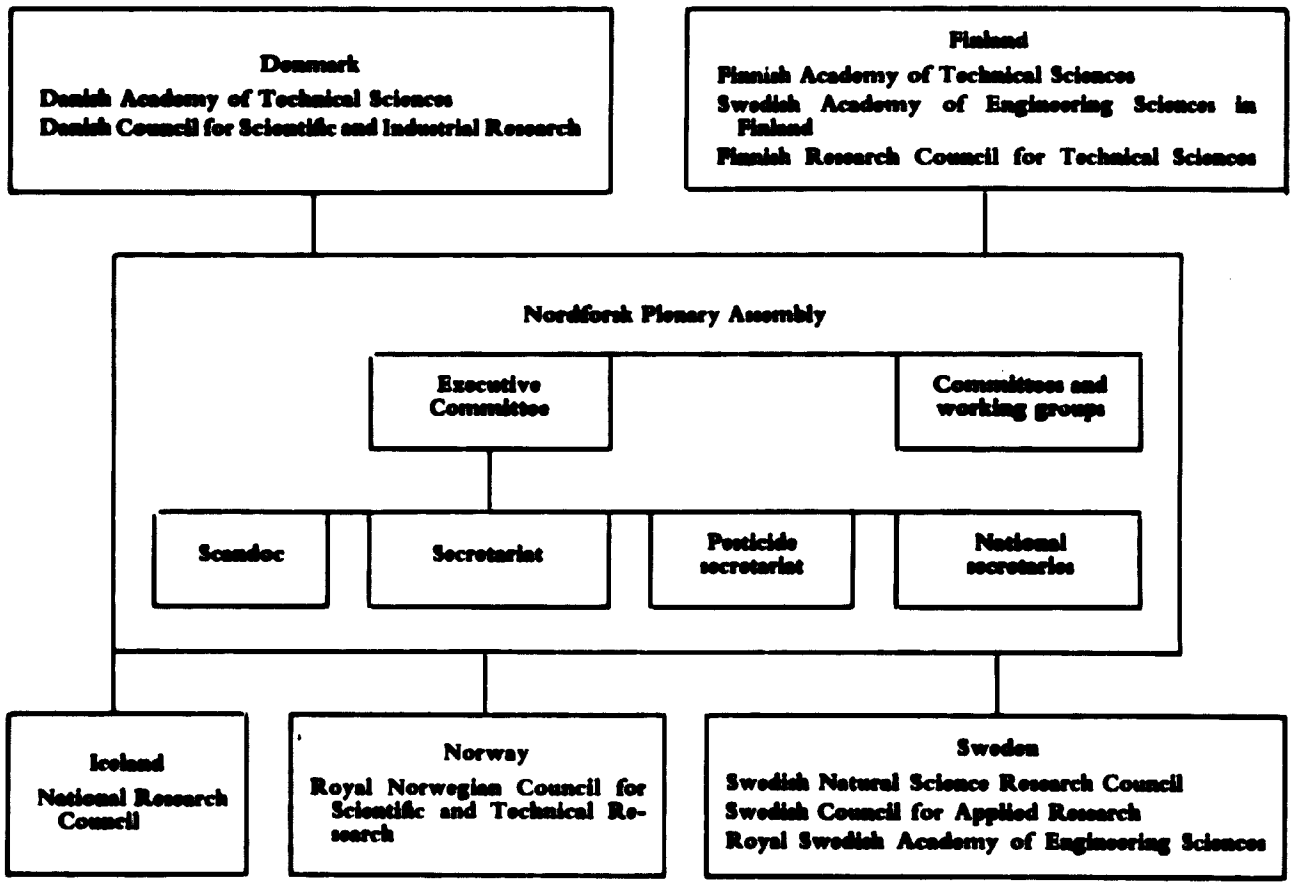
Administration of Nordforsk

While as a rule Scandinavian co-operative bodies have decentralized the secretariat function, since 1956 Nordforsk has maintained a permanent main secretariat, the staff of which consists at present of seven full-time employees. This secretariat has moved from one Scandinavian capital to another at intervals of three or four years. It is presently stationed in Helsinki, having already been in Stockholm, Oslo and Copenhagen. Practical difficulties have limited the moving of personnel, and so far continuity has been provided only through the head of the secretariat. When the rotation has been completed in 1970, the secretariat will be stationed permanently in Stockholm.

The main secretariat is assisted in each of the participating countries by a national secretary who is an administrator employed by one of the member organizations.

At the moment Nordforsk maintains one special Scandinavian secretariat, the Scandinavian Pesticide Secretariat, which is stationed in Stockholm. In addition Nordforsk is maintaining a Scandinavian Documentation Center in Washington, D. C. This centre, Scandoc, assists research and industry in the Scandinavian countries with the

Fig. 1. Organization of Nordforsk



acquisition of the so-called literature of difficult access from Canada and the United States. The personnel of Scandoc consists of one qualified documentalist and two secretaries.

Finances

The activities of Nordforsk are financed by its member organizations in the four largest countries, the costs being divided in a ratio of 1 : 1 : 1 : 2 among Denmark, Finland, Norway and Sweden. In 1968 the costs of the main secretariat and of Scandoc will amount to $US 97 000.

Since 1965 Nordforsk has had at its disposal a co-operation fund to intensify the work:

1. Through surveys and investigations of problem areas common to the Scandinavian countries, with reference to possibilities of co-operative measures for their solution;

2. Through the arrangement of symposia, conferences etc. aimed at increasing Scandinavian research co-operation;

3. Through partial financing of joint research projects.

This fund will amount to $US 130 000 in 1968 and will rise to $US 170 000 in 1969.

The above economic means do not include costs for the actual research activities carried out within co-operative programmes. The research projects are financed mainly by national funds from research councils, foundations, the participating research institutes and industry.

Research co-operation within Nordforsk

In Figure 2 Nordforsk's co-operative programmes are listed in three groups. The list on the left covers fields which were taken over by other organizations at the beginning of 1968; the middle column lists fields in which co-operation is well under way and which will continue for some time; the column to the right lists new fields for co-operative action.

Fig. 2. Fields for Research Co-operation

Ended	Continuing	New fields
Production engineering	Foundry technology	Research administration
Corrosion	Food aroma	Interaction research/industry
Fat chemistry	Air pollution	Polymers
Transport economy	Water pollution	
Surface chemistry	Pesticides	
	Technical audiology	
	Computer-based documentation	
	Technical information	

Normally the governing bodies of Nordforsk take initiative in new fields after conducting a screening process. Less frequently Nordforsk receives proposals from national groups or institutes. The policy to limit sponsorship to short periods is enforced strictly for projects and less strictly for large problem areas of national importance. In the first instance the activities can be characterized as catalytic and educational. Who does not need training in co-operation in general?

In each of the fields for research co-operation there is a Scandinavian committee which has one or more working groups for specific projects. For both completed and continuing projects, the working parties have made good contacts among the participating countries and have carried out inquiries on current research and research resources. Information is exchanged freely, division of work is agreed upon and differentiation of the national research programmes is a goal. Joint representation in international organizations has been organized in several instances, one participant being delegated to represent several countries.

Production engineering serves as a good example of the fields disengaged from Nordforsk at the beginning of 1968. In 1962 Nordforsk appointed a committee for *production engineering research*. The first finding of the committee was that one of the greatest problems within production engineering research was the lack of interaction between research institutes and the metalworking industry. In order to contribute to the creation of better contacts, four large Scandinavian conferences were organized on the topic "Utilization of production engineering research within the metalworking industry". Each of the national associations of metalworking industries took turns in sponsoring these conferences for Nordforsk.

The committee also organized a series of symposia on special problems in metalworking and published numerous reports, reviews of current research projects, summaries of papers from international conferences and dictionaries. Several working groups have been active in the areas of metal cutting and metal forming.

As a result of the co-operation initiated by Nordforsk, all associations of metalworking industries in Scandinavia have appointed research committees and have made research part of their working programmes, following the example of the Swedish association. Recently the industrial associations established a Scandinavian research committee which has taken over the work launched by Nordforsk.

The *food aroma project* is an example of the continuing projects. Though aroma research may be considered too unimportant and too specialized a field for co-operation in many parts of the world, in Scandinavia it is of great interest, for the export possibilities of food industries depend greatly on maximum conservation of the food aroma in vegetables and fruits which, grown under Northern conditions, become especially tasty.

Nordforsk founded the committee on aroma research two years ago. It began by carrying out an inquiry on current research activities and research resources in the Scandinavian countries. This inquiry, "Survey of Current Food Aroma Research in Scandinavia", is available free of charge from the Nordforsk secretariat. In August 1967 the committee established a Scandinavian research group at the Swedish Institute for Food Preservation Research in Gothenburg. This group, maintained by Nordforsk and the Swedish Council for Applied Research, specializes in food aroma analysis by means of gas chromatography followed by mass spectrometry. The group renders services to all of Scandinavia.

Another part of the committee's work has been organizing seminars and conferences on aroma research for scientists and representatives of the food industry.

Co-operation in documentation and information

World research and development expenditures in all fields total approximately $US 40 000 million; the Scandinavian countries' share is no more than $US 400 million. If scientific output is directly proportional to the input in time and money, the major problems in Scandinavian documentation concern utilization and dissemination of knowledge produced in other parts of the world. Dissemination of domestic research results entails considerably smaller problems.

For the dissemination of research results, use is made of international journals or joint Scandinavian journals and monograph series, many of which have the title "Acta ..... Scandinavica". *Acta Polytechnica Scandinavica* is published under the auspices of Nordforsk and constitutes an amalgamation of five national series formerly published by the engineering academies.

Information on questions of research policy, research organization, national inquiries etc. is usually published only in the language of the country. To contribute to the dissemination of information of this kind, Nordforsk carries out a rather extensive publication programme, including the handbook *Scandinavian Research Guide*, which is a directory of research institutions in technology and physical sciences. The second edition of this handbook was published in 1965, and the third edition will be published early in 1970. A modest bulletin, "Scandinavian Research Informations Notes", is published twice a year

and distributed free of charge to interested organizations abroad. Twice a year Nordforsk publishes and distributes gratis *Scandinavian Research Projects*, a list of current research work carried out under grants of research councils and foundations. In addition several conference reports and inquiry reports are published every year, some of them in English and some in a Scandinavian language.

Since 1953, the Nordforsk Committee on Technical Information has been active in promoting co-operation in documentation and information services. The committee has acted as a consultative liaison body on programmes in documentation and information on the international level and has dealt with questions for the International Federation for Documentation, UNESCO, the Organization for Economic Co-operation and Development, and the Committee for Research Co-operation Advisory Group for Scientific Information Policy. The use of automatic data processing in documentation and libraries has been the topic of two seminars, and combined efforts are being made to develop a co-ordinated computer-based information system for Denmark, Finland, Norway and Sweden. The latter project has high priority because none of the Scandinavian countries has enough users, for example, of the chemical abstracts system on tape.

The committee recently concluded a comprehensive inquiry into communication of information in Scandinavian industry. This inquiry analyzed information needs of industrial users.

General experience

Nordforsk's twenty years of experience clearly show that it is by no means easy to promote co-operation in research. Progress has often been frustratingly slow. On the political level, the benefits of co-operation are sometimes misunderstood to mean quick substantial savings of finance.

Scientists are not always keen on co-operation when it assumes organized forms. It is not difficult to achieve a state where exchange of information flows in an excellent manner, but psychological barriers arise if resignation is required, e.g. in the changing of the emphasis in one's research programme or in delegating responsibility for a project to somebody else. These psychological barriers become especially strong when it is proposed to create joint facilities in another country or in an institute other than one's own.

Regarding the most far-reaching method for co-operation – establishment of Scandinavian research groups or institutes – Nordforsk has formulated the policy that co-ordination is to be preferred to the creation of joint centres in fields where prospective consumers of research results are more easily reached by national centres.

Where common facilities prove to be the best solution, the host country should bear at least 50 per cent of the costs and the other participating countries the remaining part. This is considered justified because, in the long run, the host country of the joint centre will benefit most from the activity. Naturally the joint centre has to be built around the most advanced and dynamic scientist without considering the geographical conditions.

Future plans of Nordforsk

In January 1966 the Nordforsk Plenary Assembly decided to carry out an inquiry to formulate a long-term plan for its activities. It delegated this task to a one-man committee who submitted a report to the Ninth Plenary Assembly in January 1968. In this "Stenstadvold Report" an expansion of the Nordforsk co-operative programme was recommended, especially in concrete research co-operation involving co-ordinated efforts toward a joint goal. Special attention will be paid to bilateral and trilateral projects to avoid diminishing returns resulting from increased numbers of participants.

The report also points out the importance of stimulating and influencing the large national power groups within industry and national technical authorities to take action for all Scandinavia. The proposals which were endorsed by the Plenary Assembly also include experimentation with new methods of co-operation.

In short, Nordforsk will increase its efforts to expand scientific co-operation in Scandinavia.

Experts on Industrial Co-operatives Meet

UNIDO convened a Meeting of Experts on Industrial Co-operatives in New York in November 1967 to examine in depth the nature and role of industrial co-operatives in developed and developing countries and the part they play in the industrial development process. The experts formulated guidelines for the implementation, through UNIDO, of an effective technical assistance programme for strengthening these institutions.

The experts discussed industrial co-operatives in advanced countries, emphasizing those characteristics which are relevant to conditions in developing nations. Recognizing that many possibilities exist for forming co-operative industrial enterprises in developing countries, the group recommended that UNIDO draw up a programme of action for the promotion of co-operative industrial production as an essential part of the industrialization process and offer technical assistance in this connexion. The group also recommended that UNIDO's Industrial Promotion Service be used to locate sources of financial aid with a view to obtaining multilateral and bilateral capital for industrial co-operative production.

UNIDO is currently studying ways and means of implementing the recommendations made at the Expert Meeting.

D 01132

Applied Research Serves a Country in Transition

By H. C. Yuan

THE UNION INDUSTRIAL Research Institute in Hsinchu, Taiwan, Republic of China, is a multi-discipline industrial research organization which dates back to August 1937 when the Japanese set up the Natural Gas Research Institute. After the Second World War, the Institute became the Hsinchu Research Institute of the Chinese Petroleum Corporation. In November 1954, the Ministry of Economic Affairs decided to enlarge the Institute's scope and gave it the present name.

The central task of this Institute is to carry out a broad programme of technological research in science and engineering for the successful development of domestic natural resources and for the needs of industry.

Located in the eastern outskirts of Hsinchu, about 80 kilometres south of Taipei, the Institute occupies 34.4 hectares, consisting of a research complex of 9.7 hectares and an employees' village of 24.6 hectares. The total floor space of the research area is 11 000 square metres.

Near the Institute are two famous universities, the National Chiaotung University, which specializes in both graduate and undergraduate training in electronics, and the National Tsinghwa University, which provides graduate and undergraduate education in the physical sciences and nuclear engineering. The academic atmosphere enables the Institute and the universities to co-operate closely in sharing facilities, such as computers, the nuclear reactor and library collections. In fact, the Government has been planning a research park in this district in order to enlarge this research complex.

Currently the Institute's staff consists of 75 researchers with a supporting force of 55 administrators and clerks and 300 technicians. The distribution of research staff in the various disciplines is as follows:

Organic syntheses	8	Industrial application of radioisotopes	5
Plastics	8	Agricultural products	4
Inorganic chemistry	6	Chemical engineering	4
Ore dressing	8	Pilot plant	9
Ceramics	4	Instrumentation	8
Building materials	6	Technical information	5

Research programme

Current research topics and their relationship to prospective industries are summarized as follows:

The Author: *Before becoming director of the Union Industrial Research Institute in 1965, Hong Chien Yuan served the Taiwan Alkali Company as a research chemist, group leader, director of the research and development department and vice president. He also has taught part time in various universities and is now adjunct professor of chemical engineering at the National Taiwan University. He has represented his country at a number of international technical conferences and recently visited the United States of America to discuss Sino-American co-operation in scientific and technological research programmes.*

Project related to:	Research topics	Major industries or organizations involved
Agriculture	Granulation of PCP-urea formulations	Fertilizer, Alkali
	Asphalt mulch for sandy soils	Petroleum
	Reduction of spoilage of bananas during storage	Joint Commission of Rural Rehabilitation (JCRR)
Construction materials	Sawdust brick from lumber mill wastes	JCRR
	Brick and tile from red mud	Aluminium
	Graft polymerization of softwood, bagasse or bamboo with vinyl monomers	JCRR, International Atomic Energy Agency (IAEA)
Mineral resources	Separation of sulphur from low-grade ore	Mining
	Separation of zircon and monazite from heavy sands	Mining
	Magnesium oxide based refractories from bittern and dolomite	Salt
Chemical industry	Activity of co-reforming catalyst in fertilizer plants	Fertilizer
	Synthesis of hexachlorophene	Petroleum, Alkali
	Unsaturated polyesters	Plastics
	Polyvinyl butyral	Plastics

During the past three years, the Institute has made an intensive effort to strengthen its research infrastructure.

In the chemical process development phase, for example, the problem is being studied from the viewpoint of applied kinetics. Emphasis has been on the selection of reactors, mixing phenomena, thermal effect and catalysis.

The control of chemical reactors and physical separation equipment can best be realized through process dynamics, which reveals the characteristics of the piece of equipment in question. Process dynamics is one of the factors linked to pilot plant activities.

The Institute undertakes to couple the attack on the research problem with analysis of the development and operation of the processes involved. The goal is to find quick, reproducible methods whenever possible.

The installation, test runs and operations of pilot plants form the centre of the process development theme. The main functions of the pilot plant include working out engineering details and testing to determine whether the proposed model can fit the real situation. The pilot plant also produces trial quantities of new products for sample distribution and evaluation. Furthermore, the pilot plant operation provides opportunities for training of personnel and for making staff members familiar with the process in development. The technical know-how gained through such training would be of valuable assistance to some small and medium-size industries.

A pilot plant study of the oxidation of aromatic hydrocarbons illustrates the research methodology used. The study involved the search for optimum conditions through a mathematical model, the gas chromatographic analysis of reaction mixture, the diffusivity of air-hydrocarbon mixture, the viscosity of reaction media, the vapour-liquid equilibria and the selection of construction materials by corrosion tests.

The research topics included the gamma-ray induced graft copolymerization of cellulosic materials with vinyl monomers. Using a 3 000 curie cobalt-60 source, the Institute has investigated the polymerization technique in order to upgrade low quality wood, bagasse board and bamboo, to products with better strength, low moisture absorption and dimensional stability. The success of copolymerization with vinyl chloride monomer has imparted a sufficient degree of fire retardant properties to the finished products.

The Institute has pioneered in the studies with bagasse board and low quality soft wood with cheap monomers, and its work received wide interest in a recent IAEA symposium on impregnated fibrous materials held last December in Bangkok. It is hoped that this kind of investigation may lead to a solution of the problem of devising low-cost building materials.

Another field of application is in the wood carving industry; the treated wood has proved to be an economical material from which to get better products with less effort than with conventional stock. Because of the promising results with wood and bagasse, IAEA has contracted with the Institute for studies related to bamboo and arranged to increase the cobalt-60 source to 5 000 curie. A pilot plant for the treatment of large amounts of board is also in the planning stage.

The Institute is very eager to adapt to process development a systems engineering approach with extensive applications of computer simulation techniques which will provide a better understanding of chemical processes. As a result the pilot plant trial runs could be more meaningful and could put less emphasis on the operational phase. It would also be possible to do optimization studies in order to provide better economic justifications.

Technical services

With respect to technical services, the Institute has undertaken the following activities: chemical analysis, supply of reagent chemicals, processing of petroleum products, materials testing, boring and soil testing, maintenance and calibration of instruments and documentation.

The boring and soil testing service has been active for the past twelve years, notably in foundation exploration, dam site selection and harbour construction.

Though the original boring service was concerned primarily with inland activities, in the recent harbour expansion programme the Institute contracted to do underwater boring at sea. Facing rough winds and adverse tides, the work crews found drilling very difficult. Under favourable weather conditions and with skillful operation, however, the exploration along with a simple installation can proceed fairly smoothly.

As to the construction service, the Institute is well equipped with facilities and equipment, including a compressometer and a sonometer, for testing such materials as cement, concrete, ceramics and structural steels.

Instrumentation has become the focal point of the research and development network and has gained recognition as an integral and vital part of modern manufacturing. The Institute has maintained keen interest in the design of instruments for use in chemical analysis and has developed – through independent research programmes or as a part of other research projects – typical prototype instruments, such as a chopper type pH meter, a Geiger counter and an analytical and preparative gas chromatograph.

Currently, a major interest of the Institute is the application of ultrasonics and radioisotopes in physical measurements. A portable X-ray fluorescence analyzer for mineral survey is being developed.

The layout and assembly of this panel for the control of glass melting pot at Cheng Teh Glass Company, as well as regular maintenance, was contracted to the Institute.

The Institute has co-ordinated its industrial instrumentation activities with the national industrialization programme by incorporating into its work schedule the repair, maintenance and calibration of various gauges and electronic instruments for local industries. Last year a service group visited 73 mushroom canning factories and carried out calibrations and minor repairs of temperature recorders and pressure gauges *in situ*. Recently, the Institute has completed the design and assembly of a control panel for a multi-million dollar kiln in a plant which manufactures glass bottles.

As regards the supply of reagent chemicals, the Institute has accumulated from past research experience the methods for purifying suitable raw materials into final products which can meet the specifications of the American Chemical Society. Batch production involves different operations, such as chemical treatments, ion-exchange, crystallization and distillation. A rigid quality control programme has been applied to all products. With a total of some 80 important inorganic reagents and organic solvents on the market, this supply service has become a dependable source for meeting the demand of local academic research and educational institutions and industries.

In 1967 the income from various technical services accounted for 27 per cent of the total expenditure. Most of these services were non-routine in nature and could be regarded as short-term research topics.

The Institute hopes that the promotion of various services will facilitate better contact between the Institute and potential clients and, through mutual understanding and recognition of technical problems, will be the prelude to contract research.

Future plans

The economic growth of the Republic of China has reached a transitional stage. The accumulated potential from the previous effort, which helped the country attain a growth rate of 9 per cent *per annum*, will continue to support future growth, but the major breakthrough for accelerated growth will depend on the application of technological achievement by local talents. It is anticipated that indigenous research and development effort will match the role of imported technical know-how for the strengthening of productivity.

Research efforts may focus on two different facets. The first is the transfer of foreign technology with subsequent improvement or modification. This transfer not only helps bridge the gap between the calibre of local and international technical skills but also is very effective in avoiding the trend towards technical obsolescence. The second objective is to stimulate technical research to a level of sophistication at which it can deal with the demand for process development or innovation of new products.

A general survey of some leading local manufacturing industries has indicated that the transition from transfer of technology to innovation has gradually been taking place. The following aspects are particularly noteworthy:

This fluorescence analyzer uses β-rays from a radioisotope for the excitation of X-rays.

1. An understanding of the basic phenomena and criteria of operating conditions is necessary for process improvement.
2. Large manufacturers have not yet undertaken analyses of engineering economics and market potential, but the need for these tools of decision-making is a natural consequence of an industry's expansion.
3. As the supply of skilled labour has gradually decreased, labour-saving devices and more logical layout of plants should be considered in anticipating future demands.
4. Although the concept of quality control has been well established in most big industries, a further advance in research on reliability of components is desirable. There is also room for improving quality control practices.
5. The over-all economy has become highly sensitive to power supply and water resources. Long-range planning of power supply, allocation of energy resources, and recognition of the role of environmental science are essential for the propagation of industrial growth.
6. Transportation engineering has become a critical problem for the social and economic structure. Its impact on rural and industrial development will affect the production costs as well as the marketability of highly perishable agricultural products.
7. Proper channelling for small and medium-sized industries is essential for the limited domestic market. Intensive standardization of quality products and diversification to new products may alleviate the growing pains of some industries.

Research and development efforts must take into account not only the short-range and long-range needs of industrial plans but also the changing pattern from agriculture to manufacturing and then to research in intensive fast-growth industries. Considering the present status, the new era of economic growth will inevitably depend upon the use of modern techniques, such as systems engineering and operations research, for big industries. It is desirable to conduct a research programme which will support and foster indigenous industrial capacity in such a manner that it can become the driving force for the future growth of the country. The Institute is prepared to cope with this situation and will undertake the following measures for better service:

Organization of team effort — Emphasis will be put on leadership, co-operative spirit and schedule controlling.

Training — Intensive training of technical personnel at all levels, particularly in process scale-up and process control, techno-economic studies, instrumentation, material science, precision machinery and applied statistics, will be continued in order to raise the calibre of research.

Industrial liaison — Contract research and other extension work will receive increasing attention in order to strengthen the ties between research, development and application. Measures such as the exchange of visits, seminars and exhibitions for the promotion of mutual understanding and the transfer of technology will be emphasized more and more. Some extension work may be arranged jointly with manufacturing associations.

A potential field of service will be techno-economic studies which seek to intertwine technology and management and lead to an integrated decision-making effort.

Expansion of the Institute's activities has won support from the Government in the form of special grants of half a million dollars along with regular support from leading public enterprises. These, in combination with the earned income, have increased the total budget for 1968 to close to $US 1.2 million. A further increase in budget in the next few years will enable the Institute to take up more responsibilities in the economic growth of the country.

Periodical on Activated Carbon Available

A semi-annual periodical, *Activated Carbon Abstracts*, is now being published by Witco Chemical Company. The abstracts are based on articles chosen through a review of more than 150 publications, most of which are issued in the United States. Subjects range from theory and manufacture to analysis and applications.

Activated carbon is used for purification, separation and recovery systems in such industries as petroleum, metallurgy, sugar refining, and water and waste treatment.

Copies of *Activated Carbon Abstracts* may be received regularly at no charge by writing to Activated Carbon Department, Witco Chemical Company, Inc., 277 Park Avenue, New York, New York 10017.

D 01133

A French View of Consultants for Developing Countries

By Maurice de Longevialle and Roger Nancy

ANY INDUSTRIALIZATION process requires a large number of detailed surveys covering every stage of the operation, beginning with the general economic development of a country, region or enterprise, and proceeding to the actual establishment and operation of a particular industrial unit. These surveys, which are essential anywhere and in any circumstance, are of particular importance in areas which are still little developed, for policy mistakes, waste, bad workmanship and delays have even more damaging consequences when resources are limited. It is important, therefore, for the less developed countries to take due precautions and, in particular, to be sure that those whom they consult offer the necessary guarantees, particularly as to the *means* at their disposal, their *competence* and their *independence*.

The disappointing experiences of some developing countries prove not the futility of surveys by consultants but rather the difficulty of choosing the persons to carry them out. We wish to draw attention to certain principles regarding the role of consultants, the lines on which they should work and the conditions for their use, and then to indicate more specifically what France has to offer and certain distinctive features of its contribution in this field.

Maurice de Longevialle *is president of the Chambre Syndicale des Bureaux d'Etudes Techniques de France, also known as SYNTEC, which includes the majority of the French consulting firms in the industrial, civil engineering and management fields. Mr. de Longevialle holds degrees in literature, law and political science.*

Roger Nancy, *a graduate of the Ecole Polytechnique, is head of the Bureau of Studies and Engineering of the French Ministry of Industry. His duties include the handling of international relations and responsibility for liaison between the French Government and French industrial consultants. He is president of the Committee on Chemical Products of the Organisation for Economic Co-operation and Development and of the chemical expert group of the European Economic Commission.*

Means, competence and independence

We believe that the vital question of *means* is too often underestimated. The consultant should be able to indicate precisely what resources he has and will actually use. These must accord quantitatively and qualitatively with the scale of the consultant's mission. Though the help of an individual outside expert may be justified at a very preliminary stage or when choosing between two competing proposals, normally a consultant should not work in isolation. He should be in a position to take advantage, even from a distance, of the documentation and experience built up by the organization from which he comes.

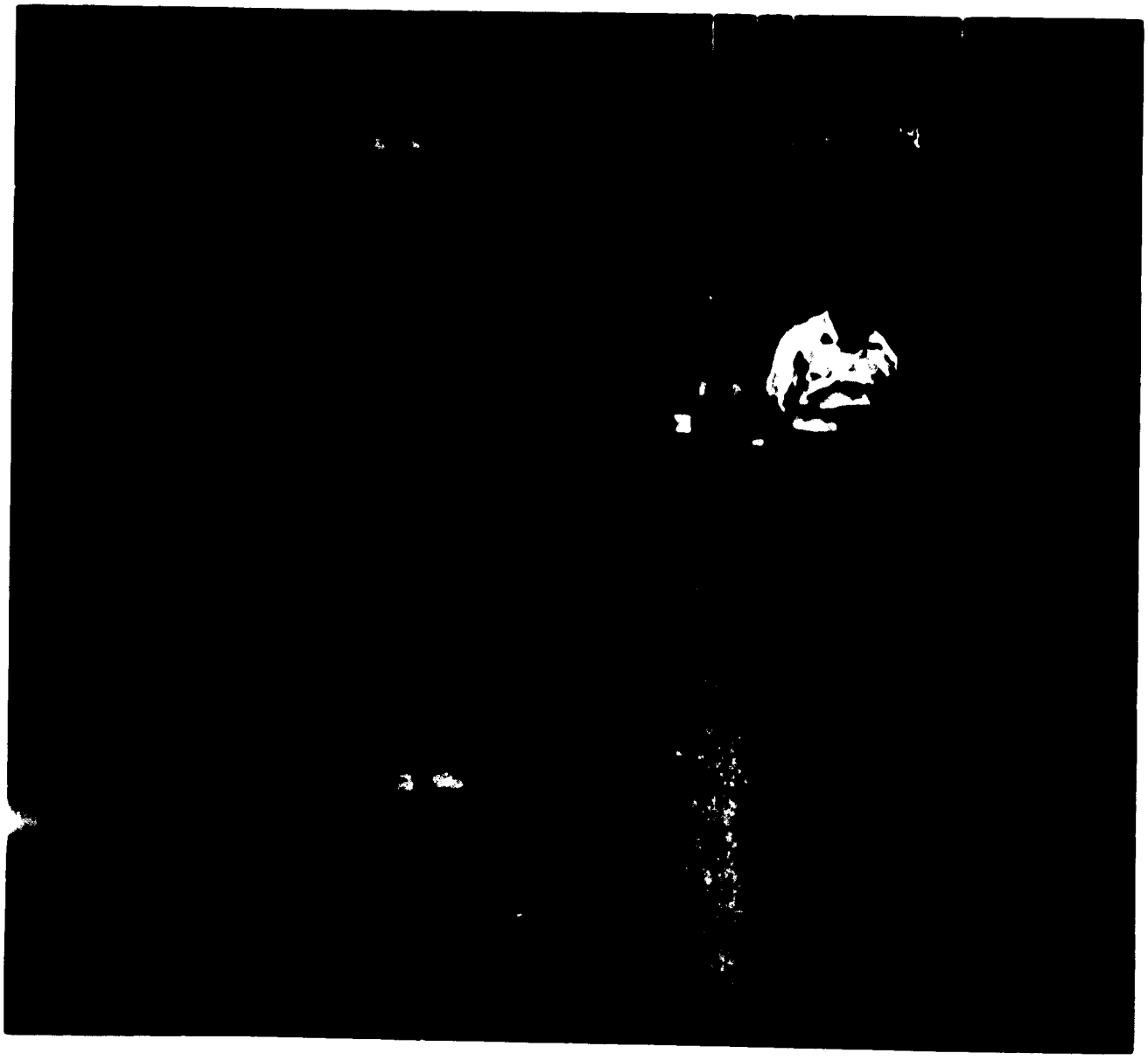
One can judge a consultant's *competence* on the basis of his concrete experiences attested to by verifiable references.

The importance of *independence* varies according to the stage of the process. In the preparatory stages, when decisions of principle have to be made, the merits of a project have to be assessed and the most appropriate solutions have to be found, independence may be crucial. In the operational phase, independence may take second place, and one may give priority to the advantages of wide practical experience, financial guarantees and full assumption of responsibility. When all other factors are approximately equal, however, an independent consultant offers the investor the best chances of obtaining optimum results at the lowest cost. In the final stages of the process (personnel training, organization and management), there is less danger of interference by extraneous interests.

In any event, those who employ consultants should bear in mind that independence is a moral and psychological rather than a legal characteristic, that it is not incompatible with any organizational structure and that no organizational structure can guarantee it.

What is essential is that the investor (whether public or private) know *with whom* he is dealing, realize that a free offer is not necessarily a disinterested one, and distinguish between structural independence and independence of mind and behaviour.

A French consulting group helped establish this bicycle factory in Mozambique.



French consultants

Owing to historical circumstances, French consultants often have a good knowledge of the culture and economy of a number of developing countries. During the last twenty years in France, a number of specialized firms which concentrate on overseas activities have been set up or have been considerably expanded. Most of these firms are members of a professional organization, *Chambre Syndicale des Bureaux d'études de France* (SYNTEC), which has undertaken to gather together the whole "brain industry", whether public or private, whether competent in infrastructure or in industry (the frontiers of which are not, of course, always clearly defined), whether considering technical problems in the strict and usual sense of the word or economic, management or training problems.

This organization of consulting firms includes some 120 firms or offices, with some 15 000 employees in all and with a total income from consultancy studies alone of about 1 000 million francs, 40 per cent of this amount coming from outside France. Some twenty *bureaux* belonging to an association, ABETEX, and comprising the main exporters account for the major part of this 40 per cent.

Etudes et Réalisations, the French engineering review, regularly publishes significant examples of consultancy services, showing both their geographical coverage (practically the whole world, including both developed and developing areas), and their diversity training activities, assistance in operation and management, feasibility studies, studies on the general development of an area, region or country, and studies for the planning and establishment of industrial units of all types. The latter include such turnkey delivery arrangements as electric power stations in Algeria, the Ivory Coast, Turkey and Pakistan; a ball-bearing factory in Mexico; breweries in the Central African Republic and Gabon; chemical fertilizer plants in Turkey; a textile factory in Ghana; ammonia plants in Kuwait and Mexico; iron and steel works in Algeria, Chile and India; and television networks in Iran and Kuwait.

One example of the scope of consultancy services is the planning study for the region of Man, in the Ivory Coast. This involved a whole series of surveys on population and migration, social structures, school attendance, cottage industries, marketing and the general economy, and led to a modernization project which was begun in 1966 and is expected to continue until 1975.

An example of consultancy service for a single industrial project is the work done on the establishment of a factory for the production of cider and apple juice in Madagascar. The first step was a national study of the possibilities for the industrial processing of fruit; the second, the development of a production process suited to the variety of apples available. A factory plan was then drawn up, its feasibility having been verified, and operations began in 1967, one year after the decision to set up the factory.

Studies on electrification in Iran entailed not only the solution of technical problems raised by the anticipated expansion of consumption (from 2 236 million kilowatt hours in 1970 to 10 500 million kilowatt hours in 1985) on the basis of existing installations but also the training of local managerial and supervisory personnel and technicians. This series of operations is especially noteworthy in that it was made possible only by close Franco-Iranian co-operation in the detailed preparatory studies to determine whether the considerable investments required would be economically justified. The same co-operation, continued through the later stages, made it possible to avoid a simple transposition of purely French methods, which would have been unsuitable.

Much the same was true (in Kuwait and again in Iran) of the establishment of television networks. The studies were not limited to the planning of the network and of the necessary buildings but included a complete analysis of the economic and demographic data related to the problem.

Sometimes the initial decision has been made but the whole of the actual operation remains to be carried out, as in the setting up of the iron and steel works at Annaba, Algeria. Sometimes the problem is more limited, if not more simple: it may involve the development of methods and apparatus for the storage, packing and shipment of chemicals, as for the complex at Pulawy, Poland. Sometimes it is a question of setting up a factory of modest size, such as the brewery at Bangui, but using original processes suited to local needs and facilitating subsequent expansion.

The arrangements for remuneration are as varied as the geographical areas and technical fields in which services are provided. According to circumstances and to possibilities and needs, the basis for payment may be the time spent on the operation, certified expenditures, cost-plus fees, a lump sum, a percentage etc.

Approach of French consulting firms

The following statement by the founder of one of the major French *Bureaux d'études* not only describes its most recent work but illustrates the attitude with which the French consulting firms approach the problems referred to them by their clients in industrialization: "All these projects were examined from the various relevant viewpoints: investments, the characteristics of the machinery, manpower, forecasts of operating accounts and from the point of view of their influence on the general welfare of the economy of the country concerned, and particularly its trade balance."

The authors recommend two papers which were prepared for the first United Nations International Symposium on Industrial Development, 29 November to 19 December 1967: "Industrial Consultation Services in Europe" (ID/CONF.1/B.10/French only) by J. Vavasseur of the French Ministry of Industry and "Use of Industrial Consultants in Developing Countries" (ID/CONF.1/5) by Stanley C. Hollander of Michigan State University. A limited number of copies are available from Documents Distribution, UNIDO, Rathausplatz 2, A-1010 Vienna, Austria.

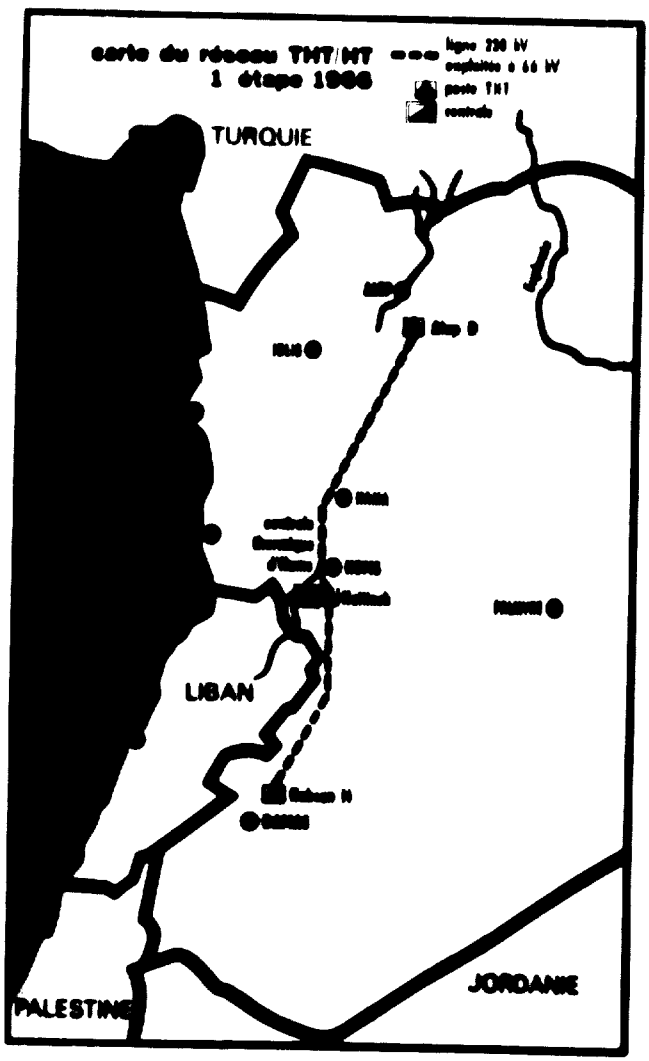
A monograph on a factory producing wooden crates shows the same kind of concern with the problem under study. It reads, in part, "In the choice of equipment, preference was given to all-purpose machines adaptable to several different types of manufacture, because one had to find a technique appropriate to the size of the market without resorting to production of the cottage industry type, and it was desirable to reduce each stage of manufacture to simple operations, making it possible to use local workers who were not used to factory conditions. Each nailing machine inserts a single row of nails, so that constant regulation is possible and accurate work can be obtained however inexperienced the worker may be."

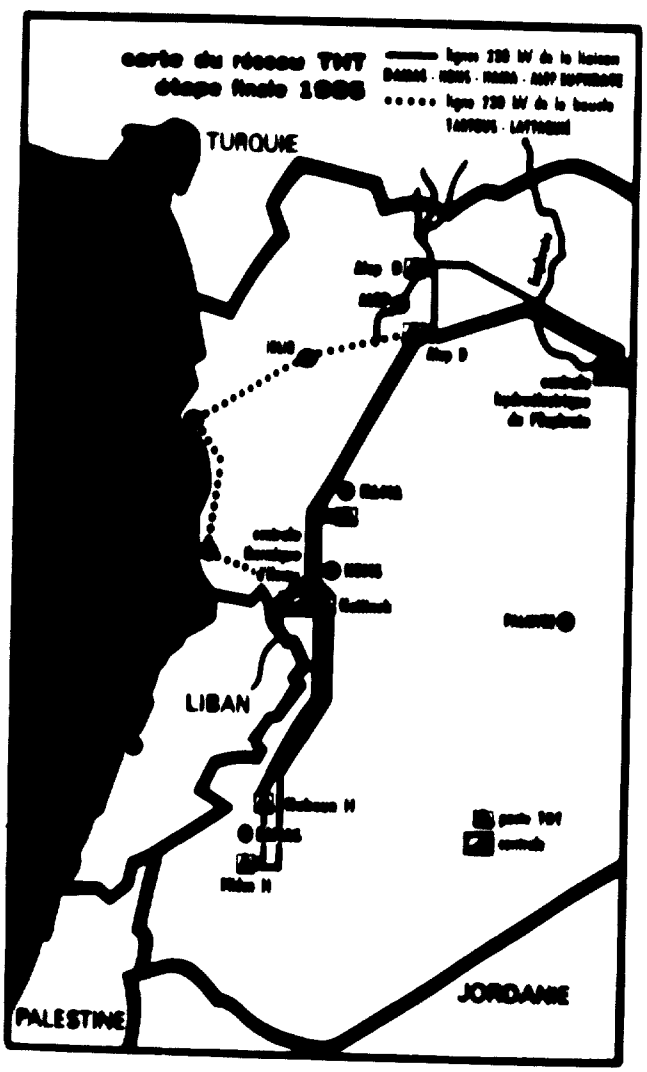
Another report, relating to the manufacture of wire netting, notes that careful study showed that "there was an advantage, in the case of a production amounting to a few hundred metric tons, in combining mechanized wire-crimping techniques with hand looms for constructing the netting".

Elsewhere, this time in connexion with a cellulose plant producing for export, the need to use machinery identical with that used in the industrialized countries is conceded, but efforts are being concentrated on the adaptation of accessory equipment which, though secondary, has a great influence on over-all production costs. The products required for the process, such as bleaching agents and lime, are manufactured, as far as possible, in the factory. "Such an arrangement proves economical because the lime manufactured in the factory costs one third as much as that imported from Europe and local electrolysis costs can be cut by nearly ten per cent."

These examples suffice to show how aware the French *Bureaux d'études* are of their responsibilities in the transfer of technology. They have learned to extend their services in the *earlier* stages by collecting general economic data and in the *later* stages by offering assistance in training and management techniques.

Whether acting purely as consultants or supplying plants on a turnkey basis, clearly these are no "fly-by-night" salesmen anxious only to sell machinery that may or may not be suitable or a more or less abstract piece of advice — what Mr. Pierre Masse, when he was Commissioner-





General for Planning, called "an empty shell", the export of which would be "worse than a sin against logic – a sin against hope".

It is possible that in the past, and even today, this sin may have been or may be committed, but those who have been or could be the victims of its consequences should know that they can guard against such consequences now by having recourse to the appropriate institutions (commercial advisers, national professional organizations, the *Service des Bureaux d'Etudes* of the Ministry of Industry) and tomorrow, it is sincerely to be hoped, by relying on sound advice from UNIDO.

UNIDO Establishing Advisory Service for Supply of Industrial Equipment

IN ACCORDANCE with resolution 1183 (XLI) of the Economic and Social Council (ECOSOC) and the report of an Expert Group which met in New York in November 1967, UNIDO is establishing the Advisory Service for the Supply of Industrial Equipment to Developing Countries.

Resolution 1183 (XLI) requested the Secretary General to study the feasibility of setting up "an advisory service which could provide information to the developing countries on the sources of supply, the cost and the quality of equipment needed for their development".

Working on the basis of this statement, the Expert Group discussed the need for such a service and recommended that it undertake specific tasks.

The Group's report outlines some of the special difficulties developing countries often face in procuring equipment. Some of these are linked to financing. When the buyer country finances purchases through loans or credits from outside sources, these loans or credits may carry conditions restricting the buyer's choice of suppliers. This limits the buyer's scope for negotiation, and he may pay more than he would on the open market. Some contracts carry escalation clauses which take into account rising prices. Although usually reasonable, these contracts sometimes tend to operate against less experienced buyers.

Other difficulties arise because developing countries often lack both the organization and the trained personnel necessary to ensure effective procurement policies and procedures and their implementation. When developing countries buy manufacturing equipment from developed countries, the buyer commonly has less expertise and experience than the seller and is at a disadvantage in negotiations. He may have difficulty in assessing the technical level of the equipment offered, analysing costs, assessing values, applying checks and comparing offers.

Developing countries also lack many of the sources of specialized information available in industrially advanced nations and have no way to find out about all the possible suppliers.

Once equipment has been purchased, developing countries have special problems in maintaining it because of a shortage of spare parts and adequate service.

After considering these points, the Export Group recommended that a UNIDO Advisory Service be established to give both direct and indirect help to developing countries in purchasing equipment and in supply management.

The Group suggested that direct help be given through a centre at UNIDO headquarters which would provide on request: comprehensive and/or selective lists of suppliers; information about the firms on selective lists and their products; advice or assistance (from the field as well as headquarters) in specifying requirements, selecting suppliers, and assessing and comparing offers and tenders; information derived from reports of developing countries on the performance records of particular products and suppliers.

Indirect means of assistance recommended by the Group included the provision of facilities for training supply managers and purchasing staff and endeavouring to bring influence to bear on certain matters outside UNIDO's scope, such as the reduction of restrictions to free purchase associated with loan and credit arrangements.

UNIDO is doing the preparatory work for setting up the Advisory Service along the lines recommended by the Expert Group. In the early stages, the Service will concentrate on building up comprehensive and selective lists of suppliers and their products. The Service is expected to be in operation early in 1969.

UNIDO Provides Answers

FOR MORE THAN two years UNIDO'S Industrial Inquiry Service has been answering requests for free information in such diverse areas as investment promotion, intermediate technology and quality control and on such specific subjects as fish processing and the feasibility of establishing steel works. So far the Service has handled several hundred inquiries.

Among those who have taken advantage of this programme within the last few months are an industrial engineer from India's National Productivity Council, the secretary of Ghana's Capital Investments Board, a Syrian cabinet minister, an official from the Ministry of Commerce and Industry of the Republic of Korea, a lecturer from the University of the Philippines and a divisional chief in the Nepal Development Bank.

In answering the wide range of questions on industrialization problems which it receives, the Industrial Inquiry Service not only gathers information from UNIDO's data bank and technological experts but also seeks the assistance of outside specialists and organizations. The International Iron and Steel Institute in Brussels, the National Research Council in Ottawa, Canada, the Japan Information Centre of Science and Technology in Tokyo, the Tropical Products Institute in London and the International Organization for Standardization in Geneva are among the many respected institutions which have agreed to act as correspondents for the Service.

In a recent request, for example, a medium-sized developing country interested in establishing an iron and steel industry using local raw materials and available energy resources wished to receive information on various methods of pig iron production and on integrated small- and medium-capacity iron and steel industries in other countries. UNIDO sent the inquirer a description of the production methods used at a newly established steel works in Mexico, requested technical information from the British Iron and Steel Institute and suggested that the country consider sending a participant to a UNIDO symposium, to be held in Moscow in December, on the techno-economic principles of the development of the iron and steel industry in developing countries.

A question the Service is now handling comes from a large developing country faced with over-population in its rural areas. The village industries commission wants to know whether it is advantageous to develop cottage industries rather than large-scale industries and, if so, whether to base them on intermediate technologies. As intermediate technology is not a well-documented subject, the Service is consulting, in addition to UNIDO's data bank and staff experts, several outside correspondents.

Some inquiries ask for assistance with technical problems which have arisen because of unique local conditions or materials. From the United Arab Republic came a request for guidance in improving the traditional methods of processing rice-bran oil so that it could be used for the manufacture of toilet soap. The local oil mills were not equipped to produce oil of suitable quality, so tallow had to be imported.

UNIDO consulted a number of specialist organizations, including the Soviet All Union Institute of Scientific and Technical Information and the American Clearinghouse for Federal Scientific and Technical Information. The file built up from various sources included information on a Japanese company's equipment for the continuous extraction of rice bran oil and a digest on a filtration extraction process which permits simultaneous recovery of wax and oil from rice bran.

Another common type of inquiry came from Thailand. At the time the Service received the request, this nation produced more than 40 000 tons of castor beans and had the capacity to produce much more. No industry, however, existed to crush the beans and use their oil for industrial purposes. The question, sent in by the local United Nations Development Programme (UNDP) representative, concerned information needed in order to establish the feasibility of setting up a castor oil industry. The specific requests were for:

to Industrial Inquiries

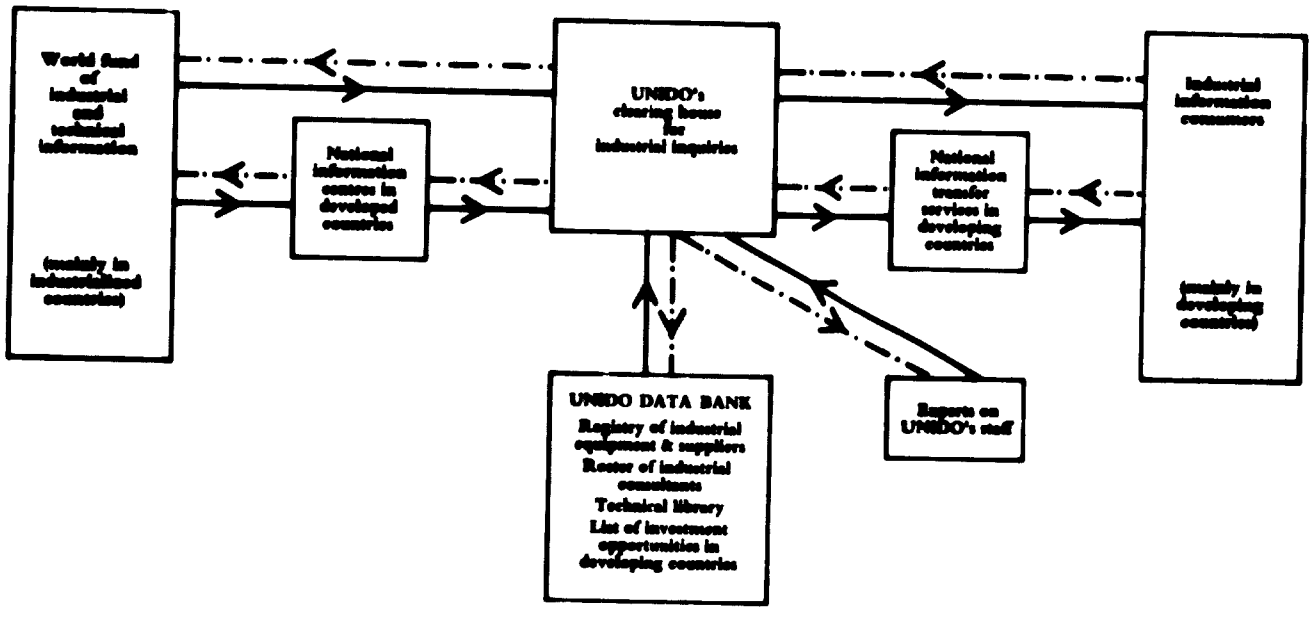
A design of a minimum-size, efficient, oil extraction mill for 50 to 100 tons of castor seeds per day;
Process details and plant designs for dehydrating castor oil and making a drying oil suitable for paint;
General information on other industrial processing of castor oil; and
Addresses of appropriate chemical plant manufacturers.

With the help of correspondents in Asia, Europe and North America, the Service supplied, in addition to other pertinent information, the names of some twenty firms manufacturing suitable equipment.

Whatever type of industrial information may be requested, the job of the Industrial Inquiry Service is to track down and transfer that information as rapidly as possible to those who need it.

Address inquiries to: Industrial Inquiry Service, UNIDO, Rathausplatz 2, A-1010 Vienna, Austria.

Industrial Inquiries and Information Flow Chart



"By expanding and strengthening its international operations, Stanford Research Institute can make a major contribution to world economic and industrial development and to the peace and prosperity of mankind. It seeks to be a leading international institution with high quality in all its endeavors."

SRI Board of Directors
March 27, 1968

D01134

Stanford Research Institute:

THE RISE OF Stanford Research Institute from a one-man organization in the autumn of 1946 to its present size, scope and worldwide influence is a history of growth unmatched among institutions of its kind. Twenty-two years ago, a group of business leaders on the West Coast of the United States wanted to provide the region's industry with a centre that could perform diversified research. In co-operation with the trustees of Stanford University, they founded Stanford Research Institute (SRI) and located it in Menlo Park, California, about three miles from the University and 30 miles south of San Francisco.

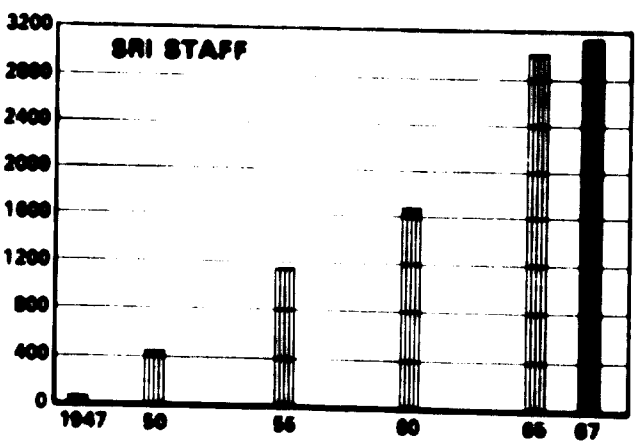
Today, SRI works on an international scale to amass new knowledge, to apply science and organized research for useful purposes and to enhance economic and industrial development throughout the world. These objectives are pursued through contract research and a broad programme of activities in the public interest.

The Institute has some 3 200 employees, including 1 500 professional staff members engaged in about 800 research projects in various branches of engineering, the physical and life sciences, and in economics and management sciences. These projects are carried out for clients throughout the United States and in more than 50 other countries.

Organization

The trustees of Stanford University are the general members of the Institute corporation and elect its Board of Directors. In this way, the Institute is affiliated with the University; however, SRI operates separately with its own full-time staff and physical facilities. This affiliation encourages and facilitates co-operative activities, such as those with the University's engineering and chemistry departments and the Graduate School of Business.

The chief executive responsibilities of the Institute are vested in its president, Charles A. Anderson, formerly president of J. I. Case Co. of Racine, Wisconsin and for several years professor and associate dean of the Graduate School of Business at Stanford University. He assumed the new post at SRI on 1 March 1968. Under his broad direction the various research programmes are grouped under three vice-presidents concerned with the physical and life sciences, engineering sciences, and economics and management sciences.



The Author: *As administrator of the International Development Centre of Stanford Research Institute, Wilson F. Harwood plans and co-ordinates the Institute's development research for Africa, Asia and Latin America. After joining the Institute in 1962, he served as a team leader in Pakistan and as a resident representative and project leader in Peru. Previously Mr. Harwood held executive positions in several United States Government agencies. He also has been a senior consultant on the structure of government in Puerto Rico and the Philippines and the director of management, manpower economics and cultural studies in Iran.*

A Worldwide Resource

By Wilson F. Harwood

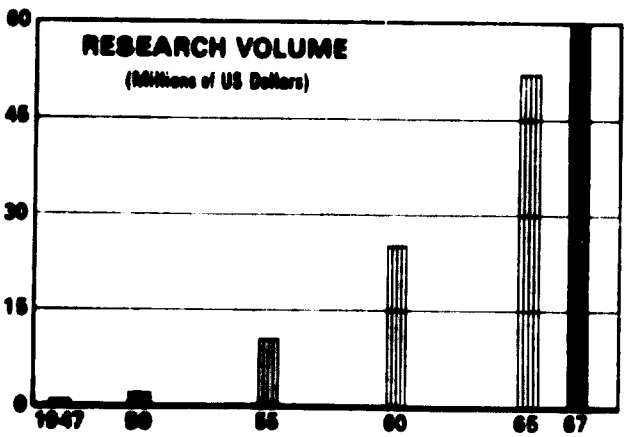
SRI's home offices and laboratories are still in modern facilities on an 80-acre suburban site in Menlo Park. These facilities include over one million square feet of building space and over $US 10 million in equipment. As the Institute expanded, additional research facilities and offices were established elsewhere in the United States and in many other countries. Principal overseas operating bases are in Zurich (SRI-Europe), Stockholm (SRI-Scandinavia), Paris (SRI-France), Tokyo (SRI-Japan), and Bangkok (SRI-Southeast Asia). SRI representatives are located in Lisbon and Milan, and temporary project offices are scattered around the world. A new research office is scheduled to open in London (SRI-United Kingdom) later this year.

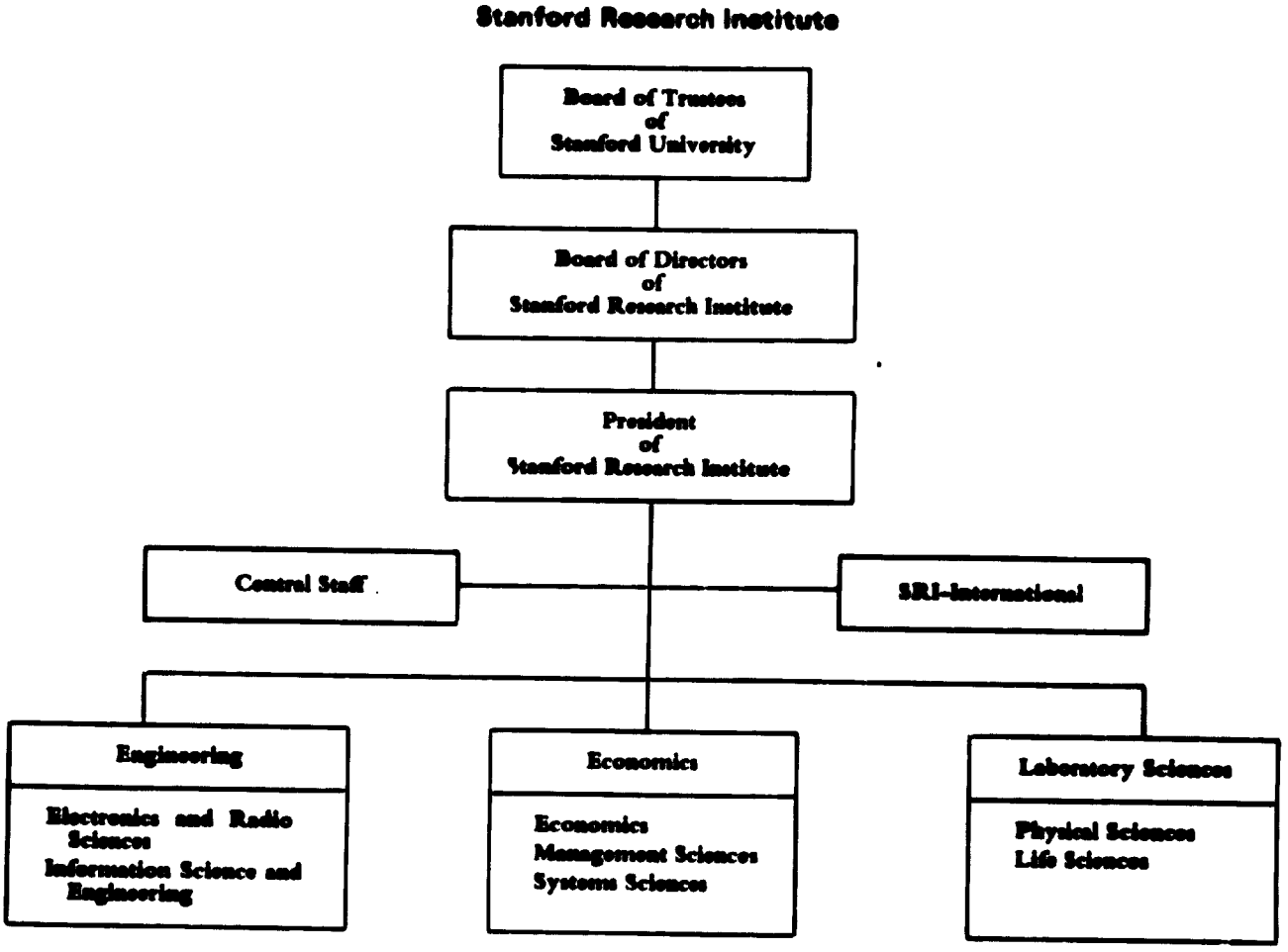
Roughly two thirds of SRI's professional staff members have advanced academic degrees. A wide variety of fields are represented, including physics, chemistry, electronics, electrical and mechanical engineering, meteorology, biology, industrial economics, marketing, operations research and business management. As the staff includes a number of people proficient in various aspects of economics and business affairs as well as in a wide range of technical disciplines, the Institute is able to undertake research on problems requiring both technical and economic considerations.

The Institute is a nonprofit organization and has no endowment. Operating income, estimated at $US 65 million for 1968, comes from research contracts and grants. These sources, together with contributions made under the *Associates Plan*, provide also for investment in the Institute's growth and improvement of its research capabilities. Under this plan, companies and individuals contribute funds to aid in the expansion and over-all effectiveness of the Institute.

Research programmes

Some 250 research programmes are active within the Institute at any given time. Their emphasis changes over a period of time as a result of interaction between these programmes and the needs they serve. The interaction is twofold. On the one hand, SRI is responsive to the research needs of its clients; on the other, it seeks to create programmes where changing conditions and developing technology indicate new, productive research opportunities. In initiating and terminating programmes, as well as in undertaking specific research projects, SRI seeks the unusual, the creative, the unique.





The flexible nature of the programme framework facilitates the use of research teams tailored to the specific problem to be solved. Such teams may apply the skills of the scientist, the engineer and the economist in an interdisciplinary approach.

In industrial research, SRI assists both the public and private sectors in identifying, developing, and allocating the resources of manpower, technology, modern management tools and methods, finance, facilities, land and materials required for economic advancement. SRI's industry specialization is particularly strong in chemicals, energy, electronics, extractive industries, metals, machinery and metal fabrication, food and agriculture, forest products and transportation.

Each year SRI assists several hundred client companies in identifying obstacles to successful growth and in developing strategies and methods for improvement of operations, competitive positions, sales and profits. The research approach may entail the assessment of companies against a background of their capabilities and of the competitive business environment in which they operate, and the development of plans for sustained profitable growth. The research may also concern the behaviour and properties of matter in terms of industrial processes and products – the production of materials with desirable properties, natural resource development and new sources of raw material.

Several programmes sponsored on a multi-client basis are designed not only to provide technical and economic information on business developments, industry and product trends and manufacturing processes but also to develop improved management and planning techniques. For example, the Long Range Planning Service identifies and evaluates the impact of technological, economic, social and political changes on long-range growth possibilities within various industries. Detailed worldwide data on products, markets and processes of the chemical industry are compiled in the *Chemical Economics Handbook*, and the *Directory of Chemical Producers*, and by the Process Economics Programme.

SRI-International

In 1950 SRI made its first move abroad – a study for the World Bank on possible economic development programmes in Cuba. Soon thereafter a major project was

started in Italy—a study of post-war recovery problems of the nation's heavy mechanical industries. This led to a series of projects on the future development of scientific research in Austria, France, Germany and Italy. Gradually, the Institute's international programme increased in size and scope to include countries on all the continents.

In 1963 the Institute adopted a plan for substantial increase of its international activities. Subsequently an internal management entity was created, SRI-International, with responsibility for planning, developing and co-ordinating, through established programme groups, all international operations. The stated policy objective was to make SRI a significant international institution. Weldon B. Gibson, executive vice-president of the Institute, was recently appointed to the additional post of president of SRI-International. The appointment reflects an increasing emphasis on SRI's international operation, which has more than doubled in the past two years and now averages about $US 13 million per year.

In several instances within the SRI-International framework, the Institute operates in co-operation with local research organizations. For example, close affiliations exist with the Nomura Research Institute located near Tokyo and *Compagnie d'Etudes Economiques et de Gestion Industrielle* (CEGI) in Paris. SRI also has a co-operative arrangement with SyCip, Gorres, Velayo & Co., an accounting and management consulting firm in Manila. SRI and the Pacific-Indonesia Business Association (PIBA), a group of business leaders organized by the Institute in 1967, are jointly interested in the development of Indonesia. Another outgrowth of SRI activity is the newly-created Southeast Asia Business Committee concerned with the role of private enterprise in regional planning.

Research projects for more advanced industrialized nations are similar to those undertaken for businesses and government agencies in the United States. Special emphasis is given to projects to advance private enterprise. These projects include studies on corporate strategy, resource utilization, marketing and distribution, and long-range business planning.

Many projects for industrial companies, especially in the Scandinavian countries, the United Kingdom and Japan, are concerned with applications of advanced management science techniques to analyse and control company opera-

A worker spins aluminium cooking pots at the Comilla Industrial Estate in East Pakistan.

In Peshawar, West Pakistan, SRI staff members give technical advice on a thresher which makes it possible for two bullocks to do the work of six.

tions. Typically, SRI specialists work with company task forces to identify priority problems and to develop improved systems and procedures. These often require applications of mathematical simulations and are based on electronic data-processing techniques.

Programmes in developing countries

A specialized group of SRI-International programmes deals with social change and economic growth in developing countries. SRI's International Development Centre is the focal point for planning and co-ordinating these research and technical assistance activities. Among areas of particular interest are: developing and utilizing natural resources, forming manpower and educational strategies, increasing agricultural and industrial productivity, promoting the growth of local private enterprise, determining investment requirements for essential industrial infrastructure systems, enhancing tourism and recreational facilities, and development programming.

SRI'S early work in economic development was focused on India where, for a number of years, specialized staff was assigned to the National Council of Applied Economic Research for the advancement of the government's programme to encourage small-scale industry. Both of these major projects were financed through the Ford Foundation. On completion of its work in India, the Institute assumed a similar role again with Ford Foundation support—in Pakistan.

In recent years—and today in Ethiopia, Pakistan, and Thailand—SRI staff members have been engaged in sustained large-scale projects requiring combinations of several disciplines. Other projects of similar scope have been completed or are nearing completion in Bolivia, Cameroon, Honduras, Morocco, Peru and tropical Africa.

For example, over a five-year period starting in 1963, the United States Agency for International Development (AID) retained SRI to help expand the industrial sectors of Peru and to develop the economy of the southern region. In addition to the long-term resident team of up to eight staff members, some fifteen SRI specialists in various fields worked in Peru to assess the infrastructural requirements for development and the growth potential of selected industries.

Clients concerned with development include United Nations agencies, AID, private foundations and host governments as well as private industrial companies desiring to make sound investment decisions in the developing countries.

International conferences

A special feature of SRI's international programme is a series of international industrial conferences held in San Francisco and regional conferences held in other major cities throughout the world. The first international conference, in 1957, was co-sponsored by SRI and Time-Life International; the 1961 and 1965 conferences were co-sponsored by the Institute and the National Industrial Conference Board of New York. Each of these week-long events was dedicated to advancing economic and industrial development and particularly private enterprise. About 500 senior executives of business and industry from 60 countries attended each conference. The next international industrial conference will be held in San Francisco in the fall of 1969.

In addition to these worldwide quadrennial conferences in San Francisco, SRI sponsors regional meetings, such as those on Pacific trade in Sydney, Indonesian economic development in Djakarta, and North Atlantic trade and industrial expansion in Seville, all in 1967. The 1968 schedule includes a meeting of SRI International Members in Menlo Park, a conference devoted to East-West trade in Vienna and a meeting in Singapore concerned with the role of business leaders in economic planning in Southeast Asia. Regional conferences devoted to encouraging the development of private enterprise will be held in Manila and Lima in 1969 before the next major San Francisco event. Attendance at all conferences is by personal invitation, with participants sharing the costs.

A recently developed international activity is a series of week-long seminars in Zurich for top management personnel of industrial companies. These seminars deal with such subjects as long-range company planning, marketing management, financial control and the functions and responsibilities of senior executives.

The *International Membership Plan* is another SRI-International activity. Companies and individuals throughout the world can become International Members and thus maintain a continuing affiliation with the Institute. Members may attend the various SRI-sponsored conferences, receive SRI publications and discuss matters of emerging scientific, technical, economic and management development with SRI personnel. The annual fee for company membership is $US 500 and for personal membership $ 300, payable in the currency of the country.

Research objectives and policies

Since 1946 when the Institute undertook its first project the development of rubber from the guayule plant it has devoted its main energies to applying science for useful purposes, especially for the advancement of industry. The concept of stimulating economic and industrial development in the western part of the United States was dominant in the early history of SRI.

By now this pattern has been substantially modified; SRI has evolved from a western United States to a worldwide orientation, from emphasis on research for industry to emphasis on research in the public interest for both government and industry, and from small, simple beginnings to a large, complex institution with broad, diversified activities. In today's environment, criteria for evaluating possible new projects include the extent of research content, the degree of innovation required, the capabilities and availability of staff, the potential usefulness of results and possible conflicting commitments. There are growing requirements for interdisciplinary research. Emphasis continues to be placed on the expansion of international research activities and on the needs of industry.

With more rapid transportation, distant lands are becoming closer neighbours. With the rising population, the world is becoming more crowded. With expanding industrialization, the complexities of life increase. As a result of these trends, the nations of the world are facing new and more intricate problems: food and nutrition, disease, pollution of air and water, diminishing resources and increasingly pressing social issues. The world must vigorously seek the answers to these problems. A vast amount of research is necessary. Stanford Research Institute is a worldwide resource working towards progress in this dynamic atmosphere.

Ad Hoc Expert Group Meets at Headquarters

An Ad Hoc Expert Group from Fertilizer Deficit Countries met at UNIDO headquarters, Vienna, 6 10 May, to discuss factors inhibiting indigenous growth of the fertilizer industry in developing countries. The Group found the lack of internal and external financing to be the most important inhibiting factor.

Members endorsed the recommendation of the United Nations Symposium on Industrial Development that the International Bank for Reconstruction and Development treat fertilizer projects in the same way as infrastructure projects and advance loans for fertilizer development on a soft-term basis.

Experts from five developing countries and consultants from five developed countries attended the meeting. A full report of their conclusions and recommendations is being printed and will be distributed later this year.

By K. Kaindl

An International Food Irradiation

If food supplies were equitably distributed among the world population, the present total food production would not be sufficient to meet minimum *per capita* calorie requirements. The Food and Agriculture Organization of the United Nations has estimated that in order to ensure adequate food supplies, world food production must be increased by 50 to 100 per cent for the present population; to meet the needs of the total population in the year 2000, present production would have to be increased 400 per cent.

One way of combating food shortage is to decrease the wastage of food. On the average, about 20 per cent of the food produced spoils before it reaches the consumer; in certain areas inadequate storage and distribution facilities may lead to 50 per cent wastage.

As millions of people could be fed if only half of this wasted food were saved, a crucial problems is finding economical food preservation techniques which will facilitate longer storage and worldwide food distribution.

Major preservation techniques

The major food preservation techniques are in two groups: those that change organoleptic characteristics (odour, flavour, taste, colour) and those that have a minimal effect on the organoleptic quality of foods. The former group includes such methods as heat pasteurization, canning, cooking, smoking, curing and drying; and the latter, such methods as refrigeration, deep-freezing and the use of chemical preservatives.

The final products of the major processing techniques, which fall into the first group, may not be equally acceptable in all parts of the world. The second group also has disadvantages: cold storage techniques call for high technical standards, and chemical preservation can be utilized only in special cases. Furthermore, the present trend among such responsible bodies as the Commission of the Codex Alimentarius is to recommend a reduction of the use of chemicals in food preservation.

None of the preservation techniques so far developed fills all the requirements for the worldwide distribution of food. Some techniques are limited to certain foodstuffs or to specific geographical areas and some are too expensive.

An ideal preservation technique should keep the food as nearly as possible in its natural state; make possible the distribution and storage of the preserved food under normal conditions, such as ambient temperatures and humidity; be widely applicable to the food products in consumer areas; and be economically attractive.

Ionizing radiation

Ionizing radiation is a new and promising technique for food preservation. Such radiation of high energy can penetrate a food product and kill or inhibit the growth of micro-organisms while creating only minimal changes in the food components.

Though up to now research work in this field has been relatively limited in comparison with the efforts in other fields of atomic energy, the results of the experiments on a number of food products are promising. Table 1 shows some representative examples.

By combining irradiation with temperature treatment one can preserve a variety of food products that normally require a number of different conventional techniques. The work in irradiation has resulted in petitions to the health authorities in certain countries which have given

Research Project

The Author: *Karl Kaindl has been Director of the Institute of Biology and Agriculture at the Reactor Centre, Seibersdorf, Austria, since 1961 and leader of an International Project on Food Irradiation at the Centre since 1965. He is also a professor at the University of Vienna. Other positions he has held include Secretary-general of the Österreichische Gesellschaft für reine und angewandte Biophysik (Austrian Society for Pure and Applied Biophysics); scientific head of the Isotope Laboratory, Division of Biological Research, at the Österreichische Stickstoffwerke AG; and editor of* Atompraxis, *a scientific journal.*

clearance to some irradiated foods for human consumption. Table 2 shows the list of foods and packaging materials that have been approved so far. Responsible authorities in several countries are now considering many petitions for clearance of additional irradiated food products.

Because of the health factors involved, the effect of irradiation on food components and on micro-organisms, such as bacteria, moulds and yeasts, is a subject for careful basic studies. Such studies have to be undertaken in order to improve the irradiation techniques available at present, to develop new techniques and to support research on the wholesomeness of food. In wholesomeness research, one has to consider the technical feasibility data which are deduced from basic research.

Wholesomeness is the key problem in food irradiation. This most important part of the food irradiation work is related mainly to animal feeding studies involving the whole irradiation product, irradiated components and certain radiolytic products. To assess the acceptability of irradiated food, researchers have to carry out a great number of physiological, cytological and biochemical investigations. They must also consider the nutritional value of irradiated food. Methods for identifying the dose with which a food product has been treated would be most useful in controlling the correct use of radiation.

Because of the research work needed if food irradiation is to be a tool for reducing food wastage, only the combined work of many scientific disciplines can lead to success in

Table 1. Experiments on food products

Product	Purpose	Irradiation Treatment	Conventional Treatment
Potatoes	Sprout inhibition	8—10 kilorads	Chemicals
Grain and grain products	Insect disinfestation	Below 50 kilorads	Chemical fumigation
Fruits	Delay of ripening mould control	200 kilorads	Cold storage
Fish	Extension of storage time	200—300 kilorads	Deep freezing
Chicken	Extension of storage life	Below 300 kilorads	Cold storage
Fruit juice	Pasteurization	Up to 500 kilorads combined with slight heating	Heat pasteurization, chemicals
Egg products	Control of food poisoning bacteria (salmonella)	300 kilorads	Heat pasteurization in special cases
Meat	Sterilization	4.5 megarad	Canning, deep freezing

Table 2. Approved foods and packaging materials

Country	Product	Purpose of irradiation	Radiation source	Dose permissible range (megarad)	Date of approval
Canada					
	Potatoes	Sprout inhibition	Cobalt-60	0.010 max.	9 November 1965
			Cobalt-60	0.015 max.	14 June 1963
	Onions	Sprout inhibition	Cobalt-60	0.015 max.	25 March 1965
Israel					
	Potatoes	Sprout inhibition	Cobalt-60	0.015 max.	5 July 1957
Union of Soviet Socialist Republics					
	Potatoes	Sprout inhibition	Cobalt-60	0.010	14 March 1958
	Grain	Insect disinfestation	Cobalt-60	0.020	
	Dried fruits	Insect disinfestation	Cobalt-60	0.100	15 February 1965
	Dry food concentrates	Insect disinfestation	Cobalt-60	0.070	6 June 1956
	Fresh fruit and vegetables (experimental batches)	Radurization	Cobalt-60	0.200—0.400	11 July 1964
	Semi-prepared raw beef, pork and rabbit products packed in plastic bags (experimental batches)	Radurization	Cobalt-60	0.600—0.800	11 July 1964
	Poultry eviscerated and packed in plastic bags (experimental batches)	Radurization	Cobalt-60	0.005	4 July 1965
	Culinary prepared meat products (fried meat, entrecôte) packed in plastic bags (experimental batches)	Radurization	Cobalt-60	0.005	1 February 1957
	Onions (experimental batches)	Sprout inhibition	Cobalt-60	0.005	28 February 1957
United States					
	Bacon	Radappertization	Cobalt-60	4.5—5.6	8 February 1963
			Electron beam (5 MeV)	4.5—5.6	23 August 1965
			Cesium-137	4.5—5.6	20 January 1964
			X-rays from electron beam (5 MeV)	4.5—5.6	15 December 1964
			Electron beam (10 MeV)	4.5—5.6	15 April 1965
	Wheat and wheat products	Insect disinfestation	Cobalt-60	0.020—0.050	21 August 1965
			Cesium-137	0.020—0.050	2 October 1964
	White potatoes	Sprout inhibition	Cobalt-60	0.005—0.010	30 June 1964
			Cesium-137	0.005—0.010	2 October 1964
			Cobalt-60 and Cesium-137	0.005—0.015	1 November 1965

a reasonable time. The crosslinking of these different fields of research requires, furthermore, that this fundamental work should be concentrated as much as possible at the same institute. Most countries have difficulty in obtaining specialists in different disciplines. Even if these specialists are available, concentrating them in one research centre is difficult. If food irradiation research is to be carried out in the most effective way, co-operative work seems to be not only desirable but necessary.

In 1962 the Study Group on Food Irradiation of the European Nuclear Energy Agency was aware of this situation and proposed a co-operative fundamental research study on a specific food as a model for the acquisition of basic knowledge of broad application in food irradiation. The group decided, on the proposal of the Austrian delegation, to choose fruit juice as such a model because the components of fruit juice are easy to separate and such components as sugar and proteins are also present in other

foodstuffs. For example, the main constituents of apple juice are

	grams/litre
Sugar	60 – 160
Protein and amino acids	2 – 4
Organic acids	2 – 20
Vitamins	0.1
Aroma substances	0.01 – 0.08
Minerals	1.5 – 5
Polysaccharides (e.g. pectin, cellulose)	0.2 – 11

Another reason for choosing fruit juices as a model was that the micro-organisms, yeasts and moulds, which spoil fruit juice are well known.

Many countries expressed an interest in a research programme on fruit juice and in 1964 the Organization for Economic Co-operation and Development (OECD), the International Atomic Energy Agency (IAEA) and the Austrian Society for Atomic Energy signed an agreement for setting up this project.

Seibersdorf project

The three bodies agreed that this international project should be carried out in Austria, starting in January 1965. The Austrian Society made available laboratories, working rooms and equipment in the Department of Biology and Agriculture of the Reactor Centre in Seibersdorf, near Vienna.

The irradiation plant has two chambers. One is designed for about 100 000 curies; at present 30 000 curies are installed. The main purpose of this facility is to irradiate the foods for the animal-feeding tests and for basic work on technical feasibility.

The other chamber is designed for 10 000 curies, though at present only approximately 1 100 curies are installed. This facility serves mainly for basic research.

In all about 2 500 square metres of working rooms, offices and auxiliary areas are at the disposal of the project.

Two main activities have to be included in such a research programme: working out basic technological feasibility data and confirming the wholesomeness of the irradiated food.

Storage tests, organoleptic investigations and routine microbiology will define the technological conditions under which the product has to be treated. To optimize these conditions, researchers need feed-back from basic research. These optimal conditions are the basis for wholesomeness studies.

Animal-feeding tests are a main part of these studies. Such tests include not only a number of fundamental investigations but also studies of the reactions of animals which have been fed certain irradiated food components or certain degradation products which might show interesting effects.

Oriented basic research

Microbiological studies on yeast and mould. One possible way of reducing the dose required to adequately inactivate yeasts and mould is to sensitize the cells to radiation. The radio-sensitivity of a cell is associated with its cytoplasmic as well as genetic constituents.

The lethal effect can be enhanced by combining irradiation with other treatments. In other words, a satisfactory preservation process may be achieved by combining a comparatively low-dose treatment, which by itself is insufficient for preservation, with some other process (physical, chemical or biological), which is also insufficient on its own but which interacts synergistically with radiation.

A basic study of the effect of irradiation on the protein and nucleic acid metabolism of micro-organisms may lead to an understanding of the mechanism of sensitization, which might allow the full commercial exploitation of the radiation process.

Yeasts. The fermentative capacity of yeast is the most important factor in fruit juice spoilage and, as such, was the first to be considered.

Researchers isolated and identified yeasts present in apple and grape juice and determined those most resistant to cobalt 60 irradiation. One of the most resistant organisms proved to be a strain of *saccharomyces cerevisiae*, variety *ellipsoideus*, and this was used in many investigations as an "indicator" strain. Under an IAEA special research contract these problems will continue to be investigated in Spain, using different strains of yeasts from various European countries.

Though the indication is that the dose necessary to inhibit yeast multiplication depends on the original concentration of the yeasts, researchers have continued to investigate the radiation response to determine whether any other parameters may influence the dose required.

The dose necessary to reduce the viable yeast population to a satisfactory level is generally so high that adverse changes occur in the quality of irradiated fruit juice. A combined treatment could be a means of reducing the dose, and this possibility has been investigated. For example, a combination of irradiation with moderate heat is a promising process.

Special attention has been given to the time of heating in relation to that of irradiation, and it has been observed that simultaneous heating and irradiation had the greatest effect. In order to optimize this treatment, researchers are conducting special investigations of the influence of heating and radiation on the survival of different yeast strains.

Studies on the combination of chemical preservatives and irradiation show, in many cases, that such a treatment can reduce the concentration of these chemicals considerably, thus inhibiting the yeast's multiplication.

Studies on other combined treatments have been included. The permeability of cell walls plays a role in radiosensitivity. The sensitivity of the cells can be enhanced if the permeability is changed by treatment with an enzyme

From the entrance to the 30 000 Ci-chamber one can see the tubes in which the Co-rods are moved by air pressure.

capable of partly degrading the cell walls. Another factor in radio-resistance which has been investigated is the content of certain inorganic ions in yeast cells.

In biochemical research, special attention has been given to the inactivation of enzymes and to protein synthesis by heat and radiation.

Moulds. Different mould strains isolated from juices have been identified and treated by radiation and heating. Generally the combined treatment is more effective than radiation or heating alone. The radio-resistance of mould spores is relatively low and can easily be controlled by the dose required to inhibit fermentation.

Chemical research. The work deals with studies of the effect of irradiation on volatile and non-volatile components of the juices.

Aroma components in unirradiated and irradiated juices have been analyzed by gas-chromatography. Special research work carried out in Spain contributed to this research.

Attempts are being made to correlate the judgement of a taste panel considering the organoleptic quality of the irradiated juice and the gas-chromatographic analysis.

As some evidence exists that the origin of the "irradiation taste" in higher irradiated grape juice comes from the protein component of the juice, the effect of irradiation on soluble grape protein is a matter for careful study. Possibly the kind of protein complex rather than the concentration of the protein is important for the undesired effect.

Project workers also have carried out detailed investigations of the degradation of glucose by irradiation to confirm that no compounds which could lead to a harmful physiological effect will be created at such a concentration.

Technological feasibility data. On the basis of microbiological and chemical research project staff members have worked out technical feasibility data which can serve as a foundation for further technical development in the participating countries. It is beyond the scope or the philosophy of this project to carry out complete feasibility studies, for every country has different food products, economic conditions, techniques and production plants.

The following table shows the present preliminary feasibility data for apple and grape juice, established on the basis of storage tests:

Table 3. Present feasibility data

	Apple juice	Grape juice	
Dose	0.2—0.3 megarad	0.3—0.5 megarad	
Heat	50° C	50° C	
Heating time	10—20 minutes	20—30 minutes	
Storage time (room temp.)	Over 200 days	Over 200 days	
Organoleptic quality (control: deep frozen stored)	Equal to control	Almost equal to control	Worse than control

The technique devised for fruit juice preservation is suitable for some other products, for example soft drinks and bread. A combination of heat and irradiation can keep bread mould-free for many weeks. This combined treatment also may work against mould infection in flour.

The combined treatment necessary for fruit juice preservation serves for the wholesomeness tests on irradiated fruit juice. Wholesomeness will become the main part of the project's activity. The general importance and necessity of this research work is closely related to the future industrial application of food irradiation.

Wholesomeness tests. Since both rodents and non-rodents have to be used as test animals, the project staff has chosen mice, rats and miniature pigs. The latter have been selected because of the similarity of their digestive tracts and of their diseases to those of human beings. Furthermore, they require substantially less food than normal-sized pigs do.

After preliminary investigations of the highest amount of juice which can be added to the basic diet without harmful effect to the test animals, and after working out the necessary techniques for all kinds of biological, physiological and biochemical investigations, project workers have started the main experiments. A two-year test on

irradiated juice will involve 640 mice and 320 rats. Forty miniature pigs will receive irradiated juice for one year.

The following criteria will reveal if irradiated juice has any harmful effects: biological parameters, such as weight, growth, life span, incidence of diseases and general behaviour; blood values, such as the different kinds of blood corpuscles, the blood serum and the chromosomes in the leucocytes; the histological structure of different organs, such as liver, kidneys and heart, with special concern for tumour incidence; cytological effects on different organs and body fluids, such as blood serum and ovarian follicle juice.

In addition to running tests with whole irradiated fruit uice, researchers will conduct short-term feeding tests on fruit-juice components, such as irradiated sugar. One or more additional special research studies on other biological systems will be necessary in order to clarify special effects of irradiated food and food components.

The future

On the basis of the data and the results gained from the model substance, fruit juice, plans are being made to introduce food product of general interest into the oriented basic research and the studies on technological feasibility. The choice of the food with which to continue this international co-operation rests with the participating countries. As the wholesomeness tests on fruit juice are phased out, the new product will be phased in.

Wholesomeness studies connected with the necessary oriented research will become more and more the focus of project activities. Those involved in the project hope that the joint effort will contribute to overcoming the urgent problems of the inadequate food supply through the development of this new preservation technique and through confirming the wholesomeness of irradiated food.

World Federation of Engineering Organizations

Meeting in Paris from 4 to 7 March, 120 representatives of the engineering profession in 60 countries and of four regional federations of engineering societies agreed unanimously to form a World Federation of Engineering Organizations. Having reached this decision, the group held the First General Assembly of the Federation.

The objects of the new organization are to advance engineering as a profession in the interest of the world community, to foster co-operation between engineering organizations throughout the world and to undertake special projects through co-operation of the member organizations and in co-operation with other international bodies.

The Federation consists of National Members, who represent the engineering profession in the participating countries, and International Members, who represent existing regional federations of engineering societies.

The General Assembly of the new World Federation decided to carry out work programmes on the qualification and continuing development of professional engineers and their technical supporting staff and on the promotion of a worldwide system of information dissemination and retrieval in the engineering field. Members also arranged to have a worldwide code of professional conduct for engineers drawn up and discussed the role of professional engineering societies in public affairs and the role of the engineer in assisting developing countries.

Representatives of the Director-General of UNESCO and the Executive Director of UNIDO welcomed the new organization and forecast fruitful co-operation between the Federation and their respective organizations. The UNIDO representative, Azmi A. Afifi, noted that many countries are in the process of establishing national committees for UNIDO and suggested that professional engineering organizations participate in these committees.

The next General Assembly of the Federation will meet in Beirut in October 1969.

Secondary Recovery of Oil

In an effort to tap more of the world's oil reserves, major oil companies are testing a chemical that they believe will recover oil from apparently depleted wells.

Alfred Globus, President of Guardian Chemical Corporation, Long Island City, New York, has stated that his company's Polycomplex A-11 chemical has an affinity for oil that may be of great value in extracting the substantial reserves which frequently remain in the ground after a well has been largely pumped out.

The first step in the extraction process is to flood the oil well with a mixture of water and Polycomplex A-11. When this mixture returns to the surface, it carries the oil. The oil is separated by spinning or by some other method, the mixture returned to the well and the process repeated.

Polycomplex A-11 has also been used to remove paraffin deposits plugging established wells, to help dispose of waste brines pumped from wells, and to control oil spills from tankers, barges and tugboats.

A viscous liquid compatible with all grades of oil, Polycomplex A-11 is soluble in water and is both non-corrosive and non-toxic.

Research Projects

Effects of Specific Micro-Organisms on Rubber's Technological Properties

Latex within the untapped and undamaged *Hevea* tree is sterile, but the latex arriving at the factory five to six hours after tapping contains approximately 10^7 bacteria and 10^4 yeasts per ml, the microbes proliferating mainly at the expense of non-rubber substances and also de-stabilizing the latex. As little is known about the effects of micro-organisms on the technological properties of the rubber from field latex, a study has been made on the effects of a number of pure cultures of bacteria and yeasts, inoculated into sterile latex, upon the technological properties of the dry rubber.

The researchers used ten bacterial cultures *Streptococcus faecalis*, *Micrococcus* sp, *Enterobacter cloacae*, *Staphylococcus aureus*, *Serratia marcescens* (non-pigmented), *Bacillus subtilis*, *Brevibacterium* sp, *Pseudomonas* sp, *Bacillus mycoides* and *Acetobacter oxydans* (NCIB 9013). The first five are strong acid producers, the next two are late acid producers, the following two are biochemically inactive and the last one oxidizes alcohol.

After preparing the bacterial cultures and collecting sterile latex, which contains dry rubber, the researchers inoculated separate samples of sterile latex with washed cells of each of the first nine bacterial cultures; they also prepared an uninoculated control sample. The experiments were triplicated to provide 27 treated samples and an equal number of control samples. In a further series, sterile latex was inoculated with washed cells of each of the three yeast cultures in the absence and presence of *acetobacter oxydans* the only culture brought in rather than isolated in Malaya from *Hevea latex* with the usual control patterns for comparison.

As far as possible, an inoculated test sample and an uninoculated control sample were obtained from the sterile latex collection of the same day. Because of the difficulty in collecting a sufficient quantity of sterile latex on the same day, it was occasionally necessary to mix raw rubber crepe prepared on different days to make a set of test and control samples.

In the technological tests, researchers mixed samples of dried rubber in an open mill. Because of the small size of the samples, tests were limited to tensile strength, elongation at break, modulus and plasticity retention index (PRI). For economy of material, moulded rings were used instead of rings from vulcanized sheet.

The results show that the bacteria had hardly any effect on the properties of the dry rubber; sometimes slightly higher tensile strength and modulus were observed, suggesting a faster curing rubber. Most samples inoculated with bacteria showed a marginal reduction in PRI.

From the results of tests using pure and mixed yeast cultures it would appear that none of the three yeasts, with or without *acetobacter oxydans*, have had any marked effect on the properties of the rubber.

As the cultures used were a fair cross-section of the microbial population of natural rubber latex obtaining in Malaya, the results may well reflect the behaviour of field latex generally when bacteria and yeast are present.

Adapted from "Effects of Specific Micro-organisms on the Technological Properties of Rubber", by C. K. John and J. O'Connell, Journal of the Rubber Research Institute of Malaya, *Volume 20, Second Part 1967, pp. 112–116.*

Making Building Blocks From Soil

A new building block developed by Esso Research and Engineering Company can be made from a variety of surface and subsurface soils (one third of the world's soil may be suitable if additives are used) and a petroleum-based binder.

The soil for the product "BMX blocks" is mined, screened and mixed with an inexpensive asphaltic binder and, when necessary, a chemical additive. The manufacturing process is similar to that for conventional blocks but is somewhat less expensive.

Esso estimates that savings in lower installation and finishing costs may be as much as 30 per cent. Because of the smooth, non-porous finish and even shape of the blocks, for example, workers may apply an adhesive mortar with a paint roller; this technique could cut labour costs for installation in half.

The blocks can be used in a variety of shapes but in early production probably will be made in the conventional form so that buildings in which they are used require no special design.

Device for Recording Eye Movements

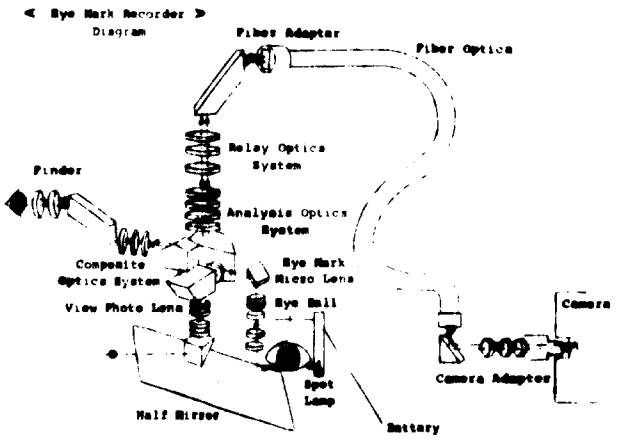
For several years researchers in Japan have been experimenting with precision optical devices which not only could provide a view and photographic record of a person's eye movement and the reaction of his eyes to changing visual stimuli but also would be light enough for a person to wear without pronounced inconvenience.

Such a device would have a number of possible uses, among them helping to determine the best possible location of instruments and signals used by workers in various industries and by consumers of such products as automobiles.

A Japanese firm, NAC Incorporated, recently announced that it has produced a lightwear precision optical device which fits onto the subject's head and makes it possible for observers to monitor eye movements on a television screen or to record them on 16-mm film or videotape. A fibre optic is employed to permit full adaptation to cameras, analyzers or videotape recorders.

When the eye movements are recorded, it is possible to develop quantitative analyses of such factors as the timing or period of eye fixation, the direction and distance of eye movement in response to various stimuli and the relationship of eye and head movement.

The accompanying pictures show the device, the NAC Eye Mark Recorder, being tested for two of its possible uses, in teaching driver's training and in studying human reactions to advertising and display.



The Industrial Research and Development News *invites readers to submit for possible publication brief stories about industrial research projects which they have recently completed or are carrying out and which may be of special interest to their counterparts in developing countries.*

Please address correspondence to:

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The Role of the African and Malagasy Industrial Property Office

By Denis Ekani

One of UNIDO's functions, as specified in resolution 2152 adopted at the twenty-first session of the United Nations General Assembly, is "the improvement of the international system of industrial property", which it must try to achieve "in co-operation with the international bodies or intergovernmental regional bodies concerned with industrial property".

The only such regional body to date is the African and Malagasy Industrial Property Office (OAMPI), which was set up under the Libreville Agreement of 13 September 1962. All of its members are developing nations, and it has been officially included in the list of intergovernmental bodies called upon to co-operate with UNIDO.

The Libreville Agreement created an instrument for regional co-operation by instituting a joint system for securing and protecting industrial property rights. This regional arrangement comes within the general framework of the Paris Union Convention of 20 March 1883, Article 15 of which permits members of the Union to conclude special arrangements among themselves concerning the protection of industrial property.

Regional co-operation

As developing countries, the newly independent French-speaking African states were anxious to recognize and protect industrial property in their countries, for they realized that industrial property is an important factor in economic development and technological progress. These countries also knew that setting up the proper machinery would place a heavy strain on their legal, administrative, financial and human resources.

Before these states attained independence, the administrative machinery necessary to apply the legislation covering most overseas possessions had been centralized by the colonial powers in the metropolitan countries. Though preparations had been made for the transfer of powers in such spheres as education and general administration, nothing had been done locally in regard to industrial property.

The new states faced the task of drafting legislation that not only would suit their needs but also would take into account the interests of those who held industrial property rights and would provide for setting up an administration to carry out the new laws, for finding the necessary funds and, above all, for appointing and training men capable of running the programme. As these countries assessed the situation, they realized that for each state to draft special national legislation and set up an administration to enforce it would entail a financial burden out of all proportion to the services provided and would considerably hamper access to the new technology sought through the protection of industrial property.

Since independence in 1958, African countries with only national systems for the protection of industrial property have received few patent applications – in some cases barely a dozen – as compared with the thousands of applications now filed with OAMPI.

The institution of a regional system for the protection of industrial property and of a single office has, from the standpoint of savings, achieved the anticipated benefits. Since 1964 the fees received for the protection of rights have financed the operation of a joint administration without need for recourse to national budgets and with a minimum of staff drawn from the administrations of member states.

International co-operation

Although the African and Malagasy Industrial Property Office was established for the purpose of obviating the type of difficulty that would inevitably have arisen at the national level, industrial property poses other problems within an international context, such as ensuring worldwide protection of inventions, verifying their novelty and bringing about a real transfer of technology.

Ensuring worldwide protection of inventions. Modern communication media have had the effect of facilitating the dissemination of ideas and of technological innovations. Consequently, the research results can be protected only on an international basis. This necessity has instilled new life into the Paris Convention of 1883 and into the International Bureaux for the Protection of Intellectual Property (BIRPI) which received the task of administering the Convention. Since the Second World War, many countries, regardless of political or economic status, have acceded to the Convention, to which seventy-nine states, including the members of OAMPI, are party.

By signing the Convention, the members of OAMPI have accepted a number of commitments. They have undertaken to pay their contributions to the budget of the Bureaux and have assumed various obligations, such as participation in assemblies for the administration of the Convention. Needless to say, the exercise of this prerogative calls for the presence of qualified industrial property experts.

Obligations must be assumed at the national level also, for Article 12 of the Paris Convention stipulates that each of the countries of the Union undertakes to establish a special industrial property service and a central office for the communication to the public of patents, utility models, industrial designs and trade marks. The special industrial property service is to publish an official periodical journal which will include the names of the proprietors of patents granted, with a brief description of the invention patented and with reproductions of trade marks registered.

These commitments obviously entail additional expenditures which, though small, could have contributed to meeting more pressing needs. The establishment of a central office has enabled member states to honour their obligations while saving on related expenses which OAMPI bears.

At the same time, the role of OAMPI is to cover a wider international field. OAMPI and BIRPI have arranged for close co-operation, and OAMPI has the power, within certain limits, to represent its members at international meetings organized within the framework of the Paris Union. This is a result of an amendment adopted at Stockholm – at the suggestion of the members of OAMPI – and incorporated into the provisions of Article 13 of the Paris Convention as revised at Stockholm.

Verifying the novelty of inventions. It is becoming increasingly apparent, for both theoretical and practical reasons, that the examination of inventions is the only valid working system for patent offices. From the theoretical point of view, such examinations are the logical counterpart of the privilege which society confers upon the inventor; from the practical point of view, they constitute an important test prior to the negotiation of rights and make it possible to avoid the artificial encumbrance caused by the piling up of worthless patents. Consequently, the general tendency among patent offices is to adopt the examination system. It should be added, however, that most offices favour the system of deferred examination. This is because patent offices which require prior examinations encounter innumerable difficulties owing largely to the increasing rate of technological progress and its specialization, the growing volume of documentation to consult, the need for a large staff of examiners and the slower issue of patents. The deferred examination system seems to represent a happy compromise between the system of registration, which entails a purely formal examination, and the system of thorough examination prior to issue of a patent.

One might suppose that developing countries, such as the members of OAMPI, which are anxious to ensure the transfer of genuine technological know-how, would have an examination system. Because of the heavy commitments mentioned above, however, the attainment of that objective is beyond the means of any one of them alone.

The adoption of such a system may be beyond the means of a central office of the size of OAMPI, primarily because of the lack of the necessary administrative staff and of technicians capable of undertaking research. For this reason, the Office initially opted for the system of registration. Later it may adopt the system of deferred examination in co-operation with such specialized international agencies as the International Patent Institute of The Hague, which could do research for OAMPI.

At the same time, these international agencies can help the Office to build up the documentation and to train the necessary personnel to do novelty-testing research, a task which could be undertaken directly by the OAMPI at a later stage. Naturally such a second stage will be more desirable and feasible if the Office, possibly with United Nations assistance, can broaden its foundations and become a vast regional patent centre. OAMPI will bear the obligations and expenses which, in its absence, would represent a burden to each member country without any compensating advantages.

Ensuring the transfer of technology. A vast, worldwide network to ensure the transfer of technology is now being

established. It is made up of patent offices, standardization bureaux, industrial technology institutes, development associations and the technical departments of such ministries as planning, industry, agriculture and mining. By means of this network, institutions will be able to pool and co-ordinate their resources to the best advantage of the developing countries. As far as OAMPI's member countries are concerned, only a central patent office can usefully integrate itself within this network and profit from it.

Organization

The above considerations afford an idea of the importance and of the current role and prospects of the African and Malagasy Industrial Property Office as a central office which, without placing too heavy a burden on its member states, enables them to train qualified personnel for the administration of industrial property and to co-operate fully in the efforts that are being made to ensure the transfer of technology.

The Office was organized according to three principles which guarantee the interests of member states and ensure its effectiveness: centralization, the equality of members and respect for national sovereignty.

Centralization. This is the fundamental principle of the OAMPI, laid down in Article 1 of the Libreville Agreement, which, in turn, is based on Article 12 of the Paris Convention for the protection of industrial property. As mentioned above, the Convention imposes on each signatory state the obligation to organize a special national service for the protection of industrial property. The problem confronting the members of OAMPI was to comply with this provision while avoiding the burdens that its literal application might have entailed for each of them. Solving this problem through the establishment of a single joint service has brought about a marked centralization of structure and procedure.

As specified in Article 1 of the Libreville Agreement, the joint service takes the place of the "national service" in the case of each state. In other words, member states of OAMPI have no national industrial property services. The Libreville Agreement does sanction the procedure for filing "national applications" in each state rather than with the international organization, but that, as will be explained later, is only an extension of the procedure for the filing of applications with the African and Malagasy Industrial Property Office. Moreover, only the organs of the Office are competent to apply the administrative procedures established under the Agreement and, at a higher level, only the heads of member states are empowered to amend and adopt the Libreville Agreement and its annexes and, if appropriate, to extend the competence of the Office.

The supreme organ of OAMPI is the Administrative Council, which is composed of representatives of member states. On the technical and administrative level, the Director-General of the Office is responsible not only for administrative procedures, such as the issue and publication of patents, but also for studying questions of principle to be submitted to the Administrative Council. The Council's decisions are binding on member states.

To our knowledge no other inter-African body is so thoroughly centralized and integrated; the Office is probably the only inter-African supranational body.

State sovereignty. Although the Office is a supranational body, the certificates it issues are national. A patent issued by the Office automatically and *pleno jure* becomes a national patent in each of the member states. Moreover, any legal disputes concerning such rights lie with national courts in accordance with the traditional criteria governing the delimitation of jurisdiction.

Furthermore, each member state is responsible not only for organizing its policy on research and industrial property within its own territory but also for laying down the general principles of that policy within the limits set by the Libreville Agreement.

Each state thus retains full competence to deal with infringements and abuses of the industrial property rights granted by OAMPI.

This compromise permits the co-existence within the Office of states having different political, economic and ideological systems, and makes it possible for countries with quite different basic political and economic outlooks to be members of OAMPI.

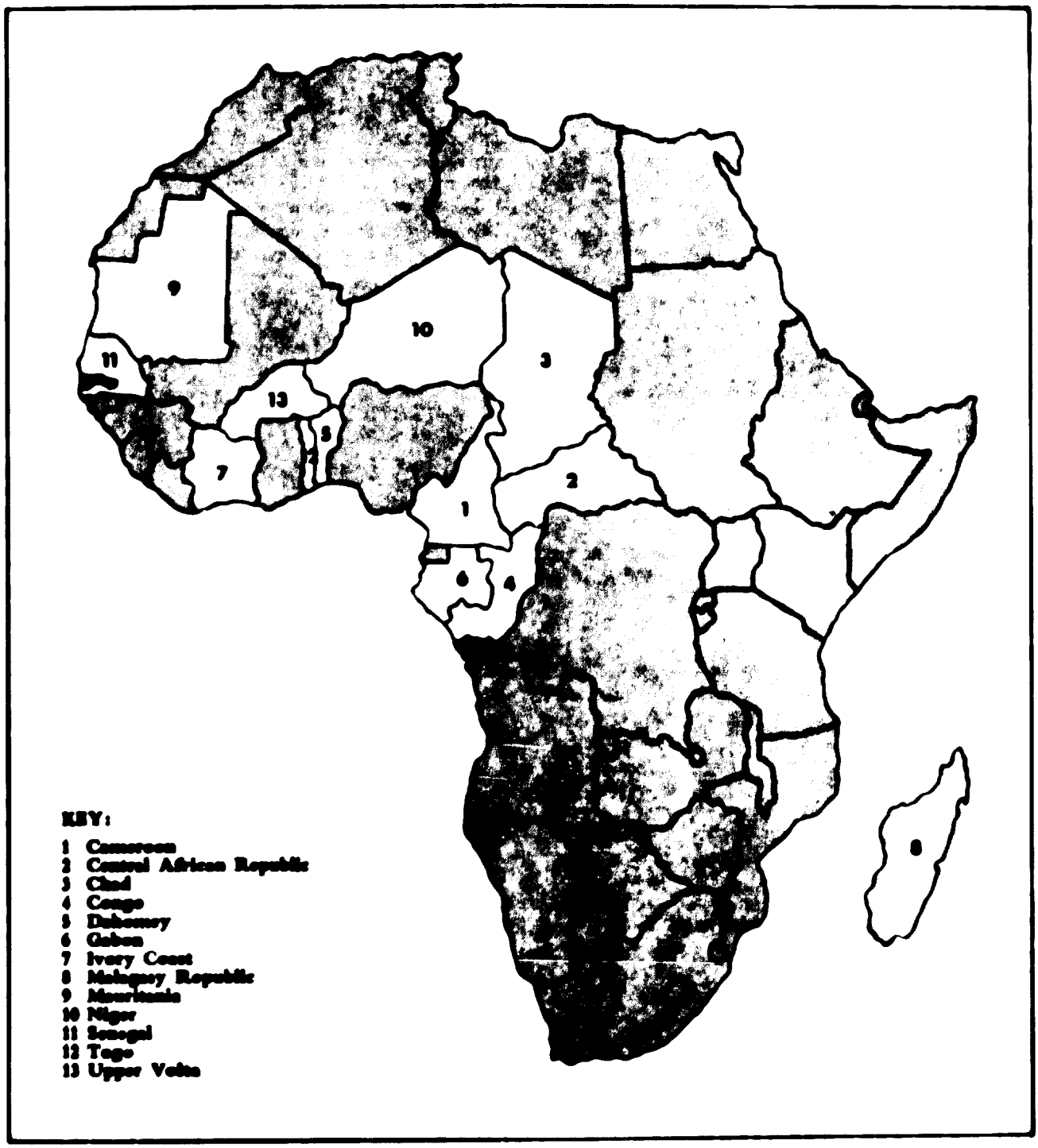
Equality between states. The Office might have adopted a system for voting and contributions on the basis of such criteria as population or economic capacity of each member state. As establishing OAMPI was an act of solidarity, however, the members felt that the only applicable principle was that of equality between member states. This equality relates primarily to expenses. When the countries established OAMPI, it needed operating funds which could only come from contributions by signatory states. Each state contributed the same amount. The concern for equality also led member states to establish this initial system on a permanent basis in order to ensure identical treatment for founder states and newcomers. Under Article 17 of the Libreville Agreement, new members pay an initial contribution. This contribution is the only subsidy that members of the Office have paid since its establishment; OAMPI is expected to balance its own budget. Moreover, provision is made for the equal distribution of any budgetary surplus among member states.

Structure

OAMPI is managed by an Administrative Council and a Director-General, whose respective responsibilities are defined by the Libreville Agreement.

The Administrative Council consists of the ministers responsible for industrial property questions in each member state, e.g. the Minister of Trade and Industry, the Minister of Economic Affairs and Planning or the Minister of Mining. Article 13 of the Libreville Agreement specifies the responsibilities of the Administrative Council. These include the application of the Libreville Agreement and its annexes, the general operation of the Office, voting

Distribution of Member States of OAMPI



on the budget, and financial, technical and administrative supervision of the management of OAMPI. The Council appoints the Director-General and the Deputy Director.

The Administrative Council, which holds a regular session once a year, elects a chairman who represents it between sessions and who has extensive powers enabling him to keep the operation of OAMPI under continuous surveillance and to take decisions on behalf of the Council.

The Administrative Council makes decisions according to majority vote, with each member country having one vote.

OAMPI, whose central office was established by the Libreville Agreement at Yaoundé in the Federal Republic of Cameroon, is under the authority of a Director-General, who is responsible to the Council for all matters concerning financial, administrative and technical management, on which he must make an annual report.

With regard to financial management, the Director-General is the authorizing officer for expenditures. It is his duty to prepare the budget and to submit the annual accounts and inventory to the Administrative Council. His handling of financial business is permanently supervised by a financial controller and by an auditor.

The administrative duties of the Director-General include the management of personnel, whom apart from the Deputy Director and the Controller he recruits and appoints. He is also responsible for the procedure governing registration of industrial property rights and for all subsequent action that may affect such rights.

The Director-General of the Office thus acts on behalf of OAMPI and, consequently, of its member states in all the following procedures.

Receiving and centralizing applications. The Office is responsible for receiving all applications that the Agreement specifies have to be filed with it — and these form the vast majority — and for centralizing those filed with national administrations.

Processing and approving applications and declarations. Articles 5, 6 and 7 of the Agreement empower OAMPI to process applications. The approval of applications and declarations is subject to the conditions laid down in the annexes and regulations.

Registering and issuing official patents and certificates. OAMPI is responsible for the official certification of industrial property, i.e. for the issue of patents and registration certificates for trade marks, designs or models. It may reject irregular applications.

Publishing. In accordance with Article 12 of the Paris Convention, OAMPI publishes an official journal enumerating the patents issued, the trade marks registered and the designs or models for which publicity has been requested and giving information on the activities of the Office or on matters that might be of interest to applicants. Fascicles of all patents and improvement patents are issued as well as special registers of patents, trade marks and industrial designs or models.

Article 9 of the Agreement stipulates that OAMPI shall keep, for all member states, special registers of patents, trade marks and designs or models in which transfers of the ownership or use of exclusive rights are recorded and shall issue copies of these entries to third parties.

Issuing certificates and official copies. OAMPI is to issue certification on action it has taken or noted and is to prepare official copies of documents that it has received, registered or issued (official copies of patents, certificates for trade marks, designs or models, copies of or certificates regarding entries in the special registers).

Collecting fees. OAMPI is responsible for collecting all fees payable under the annexes of the Libreville Agreement and other regulations, such as annual patent fees, known as annuities, failing payment of which a patent lapses.

To perform these duties OAMPI has various technical, financial and administrative departments. Each of the two technical departments, one for patents and one for trade marks, designs and models, has a Chief and an administrative staff. The offices of the controller, the auditor (a Cameroonian official) and the accounts officer, who is assisted by an administrative staff, make up the financial department. The administrative departments provide secretariat services and deal with personnel, property, publications and documentation on behalf of the Director-General and the General Services Section.

At present, OAMPI has a staff of 21. The professionals have been recruited internationally from the member states; members of the executive staff are Cameroonian nationals.

As mentioned earlier, the African and Malagasy Industrial Property Office finances, as a rule, its own operations. One exception is the initial contribution; another is the contribution required of member states under Article 18 of the Libreville Agreement "if necessary for the purpose of balancing the budget".

OAMPI normally obtains its funds by collecting fees for the various transactions it carries out. To date, it has been able to balance its budget without calling for contributions from member states and has registered a surplus which has made its physical organization possible.

Higher Appeals Committee

Among the organs of OAMPI is the Higher Appeals Committee, an administrative tribunal competent to deal in the last instance with appeals against the decisions of the Director-General. Its rules specify its powers and composition.

Every two years the Administrative Council elects the Committee's members, by secret ballot, from a list of candidates proposed by the member states. Three members and three alternates are elected. The rules specify that these persons must be qualified lawyers or members of the judiciary. The Committee has a secretariat headed by an OAMPI staff member, appointed by the Administrative Council. He centralizes procedure, is responsible for the notifications prescribed by the rules and keeps the minutes of the Committee's meetings and its archives.

The Committee's competence extends only to appeals against the rejection of applications.

Appeals are administrative in nature and must be presented in writing. The lodging of an appeal involves the payment of a fee. No appeals have so far been lodged, but it may be noted that the establishment of the Higher Appeals Committee is the first step towards setting up an international industrial property court.

National administrations

The national administrations in certain member states play a part in the application procedure. The Libreville Agreement offers a choice between direct application to

OAMPI or to a national administration. Thus, application is made either to the competent national administration, if the state (Congo-Brazzaville, Ivory Coast, Niger, Senegal, Togo, Upper Volta) in which the applicant is domiciled has chosen this procedure, or to OAMPI, if the state (Cameroon, Central African Republic, Chad, Dahomey, Gabon, Malagasy Republic, Mauritania) in which the applicant is domiciled has opted for this method of application or if the applicant is domiciled outside the member states. In the latter case, the applicant must designate an agent in one of the member states.

Article 3 of the Agreement provides for postal applications to OAMPI. In such cases, the agent is designated in the application or at a later stage.

The national application procedure is advantageous only to OAMPI's most economically advanced member states, which have facilities for the filing of patents, trade marks or industrial designs for models. This procedure enables them to pursue their own activities and make independent progress while co-operating with the other members of the Office. For other countries, the national application procedure is of scant advantage. In fact, the number of national applications is negligible compared with that of direct applications, which come almost exclusively from non-African countries.

From the legal point of view, only the date indicated by the national administration receiving the application is of importance, since the application is effective from that time. On the other hand, such matters as registration, the issue of patents and their publication are the exclusive responsibility of OAMPI, which also centralizes all files. This means that the national administration merely serves as an offshoot extension of OAMPI. National applications are made either to the clerk of the civil court, in the case of trade marks, or to the ministry in charge of industrial property questions, in the case of patents and industrial designs or models. The reason for this difference in procedure is that industrial property matters are organized on the lines of the French system, which also provides the pattern for the regulations of the Office.

Under the terms of Article 25 of the Libreville Agreement of 13 September 1962, OAMPI is open to "every African State being concerned and not having signed the convention for the protection of industrial property, signed in Paris on 20 March 1883 and revised in Lisbon on 31 October 1958". The Republic of Togo, in joining OAMPI on 24 October 1967 and bringing the number of members to thirteen, has underlined the importance of the Office. OAMPI's member states are confident that other African nations will soon follow the precedent set by Togo in adding its name to the roll of OAMPI members.

Countries Set Up National Committees for UNIDO

Fourteen countries have implemented the recommendation unanimously adopted by the International Symposium on Industrial Development in Athens last December that member governments "consider the establishment of national committees for UNIDO". These countries are: Chile, China, Honduras, India, Kuwait, Laos, Lesotho, Morocco, the Netherlands, Nicaragua, Rwanda, Sudan, Tunisia and the Republic of Viet-Nam.

The Symposium suggested that the committees be composed of representatives of government departments, academic and research institutions, and public and private business organizations, and they should act in an advisory capacity both to the governments and other institutions in all questions related to the activities of UNIDO.

Sudan's National Committee, the first to be set up, is a 38-member advisory body presided over by the Under-Secretary of the Ministry of Industry and Mining. Its members include representatives of the government bodies concerned with industrial development, central and industrial banks, the Chamber of Commerce, federations of industries and trade unions, the state railways and the Institute for Industrial Research. Also on the Committee are the deans of the faculties of economics and engineering of the University of Khartoum and the Technical Institute and 16 members chosen to represent industry, business, banks and the press.

The secretariat of the Committee will be composed of a senior inspector and a number of inspectors from the Ministry of Industry. The Committee will hold quarterly meetings to advise on the use of UNIDO facilities and services to further the industrial development of the Sudan and will examine all other questions relating to the promotion of UNIDO objectives as a whole.

Expert Group on Food Problems to Meet

UNIDO is inviting twelve experts from developed and developing countries to attend an Expert Group Meeting on Scientific Approaches to the Problems of Preservation and Refrigeration of Foods in Developing Countries. The group will meet at UNIDO headquarters, Vienna, from 14 to 17 October.

Much of the discussion will revolve around background papers setting forth particular problems in developing countries and suggesting how they may be solved through the use of applied science and special techniques.

For Your Information . . .

The following publications may be purchased throughout the world from United Nations sales distributors, through local book dealers, or directly from: Sales Section, United Nations, New York or Geneva.

Manual on the Use of Consultants in Developing Countries, 158 pages (Sales No.: E.68.II.B.10; $ 2).

At a United Nations Interregional Seminar on Industrial Research and Development Institutes in Developing Countries held in Beirut, Lebanon, in December 1964, participants noted the importance of the role of consultants in the development process, and agreed that it would be worthwhile to prepare a manual on the use of consultants that might serve as a guide to developing countries.

The primary aims of the *Manual* prepared as a result of that recommendation are to provide government officials, private businessmen and others using consulting services with background information on the selection and effective use of such services, and to show the organization of the consulting profession, the types and scales of fees usually paid, and the contract forms commonly used in order to provide guidelines for the establishment of local consulting organizations in developing countries.

Prepared with the co-operation of a number of experts in the consulting field, the *Manual* generally reflects the views of those who habitually supply and receive consulting services in both developed and developing countries. The Centre for Industrial Development, UNIDO's predecessor, prepared with the assistance of Lawrence W. Bass a background report which served as a basis for the present *Manual*. The background report was sent to more than 250 honorary correspondents specializing in industrial consultancy in a number of countries, with a request for their comments and suggestions.

At a series of meetings held at the United Nations Headquarters in New York, experts studied the initial report and the comments received.

The *Manual* is designed to give simple and practical answers to questions relating to the use of the consultants. Many case studies of consulting projects, and actual examples of contracts, fee scales, etc. ha been included to illustrate consulting activities.

The first seven chapters of the *Manual* cover the major questions pertaining to the use of consultants.

Chapter 1 deals with the role of consultants in the development process of both developing and industrialized countries and outlines the main reasons for using outside consulting services.

Chapter 2 contains a review of the most important sources of consulting services, including the activities of individual consultants, consulting firms, industrial research institutes, universities, government agencies, foreign governments and international organizations, as well as a review of secondary sources, such as suppliers of equipment, materials or proprietary information and integrated engineering construction organizations.

The various steps to be taken in the selection of consultants with suitable qualifications and experience to carry out a project successfully and economically are described in Chapter 3. The procedures outlined are illustrated by case examples, and the rules governing the selection of foreign consultants in some countries, as well as a selected list of consulting associations, may be found in Annex 2.

Chapter 4, dealing with contracting procedures, covers the essential points to be included in written agreements between clients and consultants and contains a summary checklist of contract provisions. Various types of contract forms selected for the purpose of illustration appear in Annex 3.

Chapter 5 begins with a discussion of the various cost factors involved in undertaking a consultancy assignment and goes on to review the different systems which have been developed for the remuneration of consultants. Illustrative case material on fee scales adopted by consulting associations in several countries is included in Annex 3.

The role of consultant and client in undertaking an assignment and their responsibilities for ensuring the successful completion of a project are discussed in Chapter 6. Since both client and consultant must evaluate an assignment on its completion, a section of this chapter deals with evaluation procedures.

Chapter 7 deals essentially with the development of the local consulting profession in developing countries. Special attention has been paid to questions relating to training and remuneration, and to the importance of creating a proper professional environment; the types of assistance which should be considered in the establishment of local consulting activities are also carefully reviewed.

For the purposes of the *Manual*, the types of assistance provided by industrial consultants have been divided into five functional classifications which are reviewed in Chapters 8 through 12. Case studies illustrate the role of consultants in undertaking some of these activities.

Techniques of Sectoral Economic Planning – The Chemical Industries, Industrial Planning and Programming Series, No. 1, 58 pages (Sales No.: 66.II.B.17; $ 1).

With this publication, UNIDO initiated a new series, the Industrial Planning and Programming Series. This series will present studies prepared by UNIDO staff members and by expert consultants as well as contributions made in this field by *ad hoc* groups of experts or during seminars. It is envisaged that the studies to be published will cover the spectrum of industrial planning and programming, including programming data, planning methodology and programming techniques, and organizational aspects. It is hoped that the series will reach planning and programming officials and technical assistance experts working in developing countries and will be helpful to them in their daily endeavours.

In all this work the primary emphases have been on technical co-efficients and other programming data and on methods of formulating and evaluating individual industrial projects. The present study, No. 1 of the new series, is intended to bridge the gap between the central plan and the development of individual projects by providing programming data and planning methodology at a sectoral level.

This first study was prepared for UNIDO by a consultant, Thomas Vietorisz of the New School for Social Research, New York. A survey of the techniques of sectoral economic planning as applied to one particular sector, the study covers two principal topics: (*a*) planning problems concerning the relationship between the chemical industries and over-all industrial and national economic developments and (*b*) particular features of the chemical industries and planning problems arising within this sector.

Projection methods, multi-level planning and problems of consistency and efficiency in plans are among the general issues discussed under the first heading. The objectives of industrial development in relation to the balance of payments, employment and structural diversification are subsequently taken up from the point of view of the role of the chemical industry. The first section closes with a survey of problems relating to the generation and evaluation of particular development projects.

Among the specific features of the chemical industry that play a key role in planning, the following are singled out for detailed consideration: markets in relation to economies of scale; raw materials; equipment requirements and linkage to the metal-working sector; labour inputs; and research and development.

The principal conclusion of the present study in relation to the planning of the industry is the overwhelming importance of economies of scale and the disadvantage of serving small markets. The chemical industry, and especially its basic branches, requires large markets for efficient operation. The penalty of small-scale production is paid in terms of loss of productivity of the capital embodied in machinery and equipment. The result is a deterioration of the economy-wide capital-output ratio and, in so far as machinery and other capital equipment are imported, an increased burden on the balance of payments. Joint planning of the chemical industries in common markets of sub-continental dimensions is clearly indicated; at the same time, the distribution of the benefits of growth can take place properly only when other industries are considered simultaneously with chemical development.

Other numbers of the series are as follows: No. 2: *International Comparisons of Inter-industry Data*, Proceedings of the Meeting of the First Ad Hoc Group of Experts on Industrial Programming Data, held in New York, November 1965 (Sales No.: E.68.II.B.14; $ 3,50); No. 3: *Planning for Advanced Skills and Technologies*, Proceedings of the Ad Hoc Meeting of Experts on the Role of Advanced Skills and Technologies, held in New York, 22–29 May 1967 (Sales No.: E. 68. II. B. 12); and No. 4. *Profiles of Manufacturing Establishments*, Vol. I (Sales No.: E. 67. II. B. 17; $ 5); and Vol. II (Sales No.: E.68.II.B.13; $ 6,50).

Profiles of Manufacturing Establishments, Vol. I, Industrial Planning and Programming Series, No. 4; 363 pages (Sales No.: E.67.II.B.17; $ 5).

The first issue of the *Profiles* series, this volume contains data on some 190 industrial establishments selected from five countries: France, India, Israel, Japan and Yugoslavia. It summarizes certain important quantitative and qualitative features of selected establishments, each operating under varying economic and historical conditions. The presentation purports to provide a "zoo" of live specimens of industrial establishments which may be studied by various users for various purposes. The size of the establishments ranges from small to huge, and a number of manufacturing industries, both consumer-goods and producer-goods industries, are covered. The publication is intended "not to force upon the users a hasty image of representative specimens, but rather to invite them to acquaint themselves with a number of possibilities existing in the real world".

Volume II of the *Profiles*, containing about 250 additional establishments from the same group of countries, is expected to appear by November 1968. Volume III, scheduled for publication in 1969, will contain similarly organized data from a different group of countries.

This *Profiles* series has been developed as an integral part of the UNIDO data bank series in the field of industrial programming and project programming; it is hoped that these data and their unique layout will be of immediate practical help to planning officials, industrialists and technical assistance experts working in developing countries.

A limited number of the following may be obtained free on request from: Documents Distribution, UNIDO, Vienna.

Trade Union Contributions to Industrial Development: Varieties of Economic and Social Experience, 194 pages (ID/WG/1/DP.16).

This report, the latest in UNIDO's series of studies on the nature and role of non-governmental organizations in industrial development, surveys various aspects of the

contribution to industrial development of branch and national organizations of trade unions which are active in the developing as well as in the developed countries. The survey examines mainly the participation of trade union organizations whose activities are aimed directly at the acceleration of industrial development. These activities include economic planning, management of enterprises, training, establishment of co-operatives and welfare programmes.

The report, which was prepared primarily as background material for seminars and workshops, is directed at the developing countries. An attempt has been made throughout to examine such aspects of trade union participation in industrial development whether in the developing or in the industrialized countries as are likely to be of particular interest to the developing countries.

Prepared by the Industrial Institutions Section of the Industrial Services and Institutions Division of UNIDO with the assistance of Professor Everett M. Kassalow, the report brings out some interesting points concerning the role of trade unions in the industrialization process of developing countries. It notes, for instance, that the very newness and, in some ways, the uniqueness of development efforts in the new societies make it difficult to foresee the role of particular subinstitutions, such as trade unions, in the development process.

The report also points out, however, that experiences in the less-developed countries have shown that trade unions there may take on many tasks and have the opportunity to penetrate many fields concerned with over-all development which have barely been touched by trade unions in the industrially advanced nations. It is quite possible, therefore, that the role of trade unions in the industrialization process of the developing countries will be more important than the role played by the trade unions in the developed countries.

150 To Attend Iron and Steel Symposium

UNIDO, in collaboration with the Government of the Union of Soviet Socialist Republics, has organized the Second United Nations Interregional Symposium on the Iron and Steel Industry. Some 150 participants will attend the symposium in Moscow from 19 September to 9 October 1968.

Working under the title "The Techno-economic Principles of the Iron and Steel Industry in Developing Countries", participants in the Symposium will review the present state of the world's iron and steel production, examine recent technological developments, discuss the prerequisites for developing an iron and steel industry on a national and regional basis, determine the optimum capacity of iron and steel plants, and assess reconstruction and modernization potentials in the iron and steel industry.

During the course of the meetings, the delegates will visit iron and steel works and metallurgical and projecting institutions in the USSR. Following the Symposium, they will visit steel plants in Poland and Czechoslovakia and possibly in France and India.

Although the Symposium will emphasize the needs of the developing countries which recently have directed their efforts towards industrialization, the meeting will also include material of interest to countries that already have steel manufacturing installations. To provide an opportunity for the exchange of many types of information, UNIDO is inviting experts and specialists not only from iron and steel works but also from research organizations, process and facility designing institutions and organizations supplying equipment.

Approximately fifty delegates from developing countries will receive United Nations fellowships to enable them to attend the Symposium. Some of the world's top steel-making experts and specialists in iron and steel technology from both developed and developing countries will attend. Other participants will be from UNIDO, the United Nations Regional Economic Commissions and the Government of the USSR.

Study of Coal Industry in Santa Catarina, Brazil, Under Way

A technical and economic study of the Brazilian coal industry in the State of Santa Catarina is under way. The National Bank for Economic Development (BNDE) is sponsoring the research which is being performed by Battelle Memorial Institute of Columbus, Ohio, U.S.A., and MONTOR, a Brazilian consulting firm associated with MONTREAL Montagem e Representação Industrial S.A., Rio de Janeiro.

The main objective of the study is to improve the production and utilization of Brazilian coal.

Santa Catarina, a state in the south of Brazil, has 1,200 million tons of coal reserves. Approximately 1.6 million tons of raw coal are mined each year for use in Brazil's steel industry. The raw coal is processed to yield 0.77 million tons of metallurgical coal, plus steam coal and pyrite residues.

Santa Catarina coal is a good coking coal, but it contains finely-dispersed ash which cannot be removed by ordinary washing. The researchers are studying improved methods of selective mining and processing and the transportation system for sending coal to the steel plants.

Another part of the study is evaluating the feasibility of developing new coal-based industries in Santa Catarina, including the production of sulphur and sulphuric acid from the pyrites, additional power stations fuelled with coal, and chemical processing plants utilizing coal as a source of carbochemicals.

U.K. Universities to Run "Industrial Units"

The Ministry of Technology of the United Kingdom will make grants of £ 1 million over the next five years to help in setting up "industrial units" at four universities and the College of Aeronautics. Offering consultancy and short-term research and development services in tribology, instrumentation and other branches of engineering, the units will operate on a commercial basis and are expected to become self-supporting in a few years.

The institutions chosen for this experimental programme have special knowledge and experience to offer, and there is evidence of an industrial demand for their services and of their ability to satisfy it.

The Centre of Tribology at Leeds University will provide an advisory and consultancy service on such problems as lubrication and bearing design and will undertake (on a confidential basis if required) development and research work for industry. A bearing design service will be offered, and the Centre will initiate a programme of computing work leading to computerized design of lubricated machine elements. To help in the development and testing of new lubricants there will be an independent rheological laboratory.

Short courses on tribological subjects will be provided at all levels, and the Centre will provide facilities and supervision for higher degree students.

The Industrial Centre for Tribology at the University College of Swansea will have aims similar to the Leeds Centre. It has a special interest in problems relating to iron and steel manufacture. During an initial period it will provide technical assistance to industry, supported by the use of diagnostic aids, and will provide educational facilities for designers and other engineers and to assist local authorities in the formation of curricula for foremen and draughtsmen.

The Centre will carry out a survey in depth over a limited part of the field to assess the most profitable improvements and to determine the future aims of research. The technical area with which the Centre will be particularly concerned is the problem of lubrication in "difficult" environments where corrosive conditions are encountered. The results of this survey will decide the Centre's future function.

Under the special supervision of the professor of production engineering, the Centre for Industrial Innovation at the University of Strathclyde will cover virtually all the applied science and engineering departments of the university, including the department of industrial economics and industrial administration and the Strathclyde Business School.

Apart from consultancy work, sponsored work for industry and *ad hoc* practical courses, the unit will make a special feature of development work. It will be equipped to develop production prototypes of inventions devised in the university laboratories to meet specific industrial needs.

At the University College of North Wales, Bangor, the School of Engineering Science is handling some successful projects in two related areas of engineering. One is instrumentation, electronic devices and materials sciences, where a typical project is an automatic inspection and quality control system for the manufacture of floor tiles. The other area is control engineering and low-cost automation, where one development is an optimal control system for a linear motor. The initial function of the new Industrial Developments Unit there will be to extend the successful projects at present being handled by the school. The Unit will undertake the development of projects to the stage necessary for assessment of the potential for each particular application. It will have sufficient manufacturing capacity to develop basic ideas into practical prototypes capable of commercial exploitation.

The unit will also act in a consultative capacity and undertake small-scale production when necessary.

In the Industrial Unit in Precision Engineering at the College of Aeronautics, Cranfield, short-term courses in precision engineering will be arranged for post-experience graduates and mature technical staff from industry. The Unit will undertake further research and development work including special investigations, on a confidential basis, under contract for industrial sponsors. A consultancy service will be offered in precision engineering techniques for industry.

The Ministry's grant will be for a limited period only and the Units will be reviewed at the end of two years.

Adapted from New Technology, *December 1967, a publication of the Ministry of Technology and the Central Office of Information, London.*

Working Group on Industrial Investment Promotion Services

A Working Group on Industrial Investment Promotion Services will meet at UNIDO headquarters, Vienna, from 23 to 28 September. Experts from some twenty developing countries and representatives of financial institutions of developed countries interested in investing in the industries of such countries will participate in the meeting.

The main purpose of the meeting will be to promote specific industrial investment if feasible. Other topics on the agenda include machinery for industrial investment promotion in developing countries, the establishment of a portfolio of project reports on investment opportunities in developing nations and UNIDO's role in the promotion of industrial investment.

Calendar of Meetings

September to December 1969

Refrigeration Machinery Congress

Eger, Hungary, 2-9 September. László Prockl, Department General-Secretary, Gepipari Tudomanyos Egyesulet, Szabadság Tér 17, Budapest 5, Hungary. Hungarian Society of Mechanical Engineers.

International Packaging Exhibition

Tokyo, Japan, 4-10 September. Japan Packaging Institute, Tokyo. International Trade Centre, Harumi, Tokyo.

European Symposium on Chemical Reaction Engineering

Brussels, 9-11 September. Professor R. Jottrand, 50 Avenue F. D. Roosevelt, Brussels 5, Belgium. European Federation of Chemical Engineering.

International Surface Mining Congress

Minneapolis, Minnesota, 18-20 September. Howard L. Hartman, General Co-Chairman, 101 Hammond Building, University Park, Philadelphia, Pennsylvania 16802, U.S.A.

Second Interregional Symposium on the Iron and Steel Industry

Moscow, 19 September—9 October. Mr. M. Maurakh, Chief, Metallurgical Industries Section, UNIDO, Felderhaus, Rathausplatz 2, A-1010 Vienna, Austria.

Working Group on Industrial Investment Promotion Services

Vienna, Austria, 23-28 September. Mr. Chafic Akhras, Chief, Industrial Policies Section, UNIDO, Felderhaus, Rathausplatz 2, A-1010 Vienna, Austria.

International Construction Materials and Silicate Conference

Weimar, German Democratic Republic, September—October. Organisationsbüro, Fakultät Bausoffingenieurwesen, Hochschule für Architektur u. Bauwesen, Coudraystrasse 13, 53 Weimar.

International Electronics Automation and Instruments Exhibition

Copenhagen, Denmark, 27 September—4 October.

Business Efficiency Exhibition

London, England, 30 September—9 October. Business Equipment Trade Association, 109 Kingsway, London W.C. 2, England.

Annual Meeting for Process Engineers

Stuttgart, Federal Republic of Germany, 1-3 October. Verfahrenstechnische Gesellschaft im VDI, Postfach 10250, 4 Düsseldorf 10, Federal Republic of Germany.

International Plastics Fair

Milan, Italy, 5-13 October (with an International Congress on Plastic Materials). Unionplast, Viale Teodorico 19/2, Milan, Italy.

International Foundry Congress

Kyoto, Japan, 6-12 October. International Commission of Foundry Technology Associations, Postfach HB 2815, Zurich 23, Switzerland; c/o Japan Foundrymen's Society, Toyokawa Building, 8-4 Ginza Higashi, Choku, Tokyo, Japan

International Council for Building Research Studies and Documentation Congress

Ottawa, Canada, 7-11 October. Secretary of the Organizing Committee, c/o Division of Building Research, National Research Council, Ottawa 7, Ontario, Canada.

Exhibition at the Convention of the Prestressed Concrete Institute

Montreal, Canada, 8-12 October. R. J. Lynman, Executive Director, 205 W. Wacker Drive, Chicago, Illinois, U.S.A.

International Exhibition and Congress of Instrumentation and Automation

Düsseldorf, Federal Republic of Germany, 9-15 October. Düsseldorfer Messegesellschaft m.b.H., Nowea, Postfach 10203, 4 Düsseldorf 10, Federal Republic of Germany.

Expert Group on Refrigeration Techniques and Equipment

Vienna, Austria, 14-17 October. Mihajlo Mautner, Food and Light Industries Section, UNIDO, Felderhaus, Rathausplatz 2, A-1010 Vienna, Austria.

Machine Tool Congress

Budapest, Hungary, 24-26 October. Gepipari Tudomanyos Egyesulet, Szabadsag Tér 17, Budapest 5, Hungary.

National Die Casting Exposition and Congress

Detroit, Michigan, U.S.A., 4-7 November. Irwin I. Chaitin, Exposition Director, 1601 W. Lafayette, Detroit, Michigan.

Symposium on the Use of Nuclear Techniques in the Prospecting and Development of Mineral Resources

Lima, Peru, 4-8 November. Mr. H. S. Storhaug, Acting Chief, Scientific Conferences, International Atomic Energy Agency, Kärntner Ring 11, A-1010 Vienna, Austria.

International Exhibition of Electronic Components and Related Measurement (Electronica)

Munich, Federal Republic of Germany, 6-13 November. Münchner Messe u. Ausstellungs Ges. m.b.H., Theresienhöhe 13, Munich 12.

Symposium on Nuclear Desalination

Madrid, Spain, 18-22 November. Mr. H. S. Storhaug, Acting Chief, Scientific Conferences, International Atomic Energy Agency, Kärntner Ring 11, A-1010 Vienna, Austria.

Second Tripartite Technical Meeting for Mines Other Than Coal Mines

Geneva, Switzerland, 18-29 November. International Labour Office, 1211 Geneva, Switzerland.

International Surface Treatment Exhibition

Basel, Switzerland, 19-25 November. John Buck (Trade Fair Agencies) Ltd., 44 Newman Street, London W. 1, England.

Instrumentation and Automation Fair

Milan, Italy, 19-25 November. Federazione delle Associazioni Scientifiche Tecniche di Milano, Piazzale Morandi 2, Milan, Italy.

Conference of Plastics in Machinery and Vehicle Industry

Budapest, Hungary, 20-22 November. László Prockl Department General-Secretary, Gepipari Tudomanyos Egyesulet, Szabadság Tér 17, Budapest 5, Hungary.

International Packaging Exhibition

Paris, France, 24-30 November. Salon de l'Emballage, 20, rue Carpeaux, Puteaux (Seine), France.

International Conference on the Trends in the Training and Teaching of Engineers

Paris, France, 9-13 December. UNESCO, Place de Fontenoy, Paris 7ème, France.

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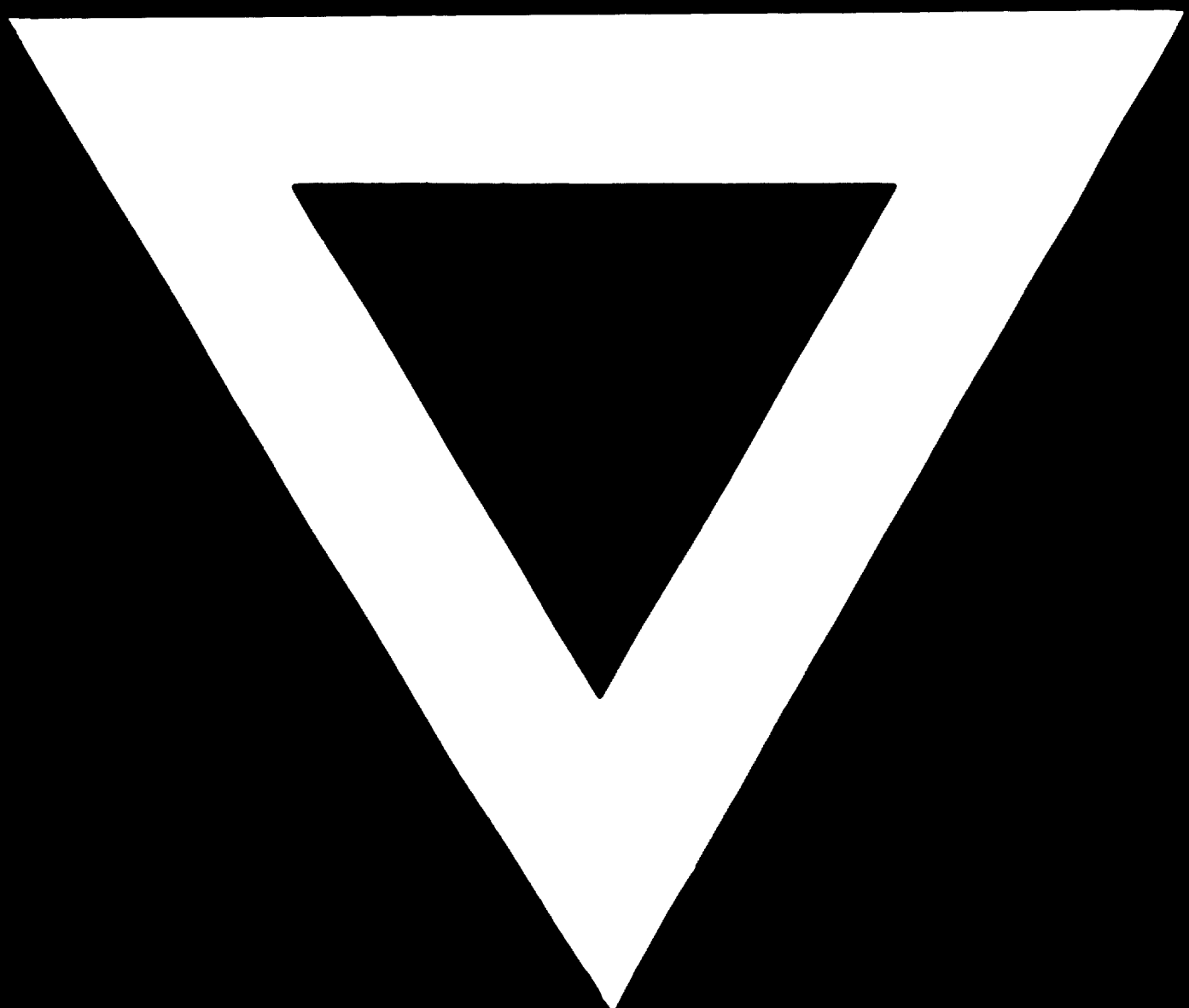

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