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CONTENTS

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EDITORIAL

Science and The National Crisis

August 1965 will be remembered as the month of Pakistan's gravest aggression against India by the injection of thousands of armed infiltrators into Kashmir for disruption and sabotage. Perhaps Pakistan was counting on an insurrection with the participation of the Kashmiri Muslims in the name of religion. It was a grave miscalculation, if Pakistan hoped that it could subvert the loyalty and patriotism of the Kashmiri and other Muslim populations in India. Indian secularism and democracy have proved their strength against appeals in the name of religion. Having failed in its designs, it tried to cut the lines of communication of the Indian forces in Kashmir by a large scale crossing of the Indian boundary with tanks, infantry and air force in the sensitive area of Akhnoor. There was no way left for the Government of India to counter this aggression except by crossing into West Pakistan and diverting the armed might of Pakistan. Indian forces have given a fitting reply to the aggressor and have covered themselves with glory. We have no doubt that the long range effects of India's brave and principled reply to Pakistani aggression will be more far reaching than appear at the moment. India will march ahead as a democratic State standing on the secular principles of Gandhi and Nehru, giving spiritual support and sustenance to freedom and democracy in Asia and the world. While the danger from Pakistan is perhaps no longer as grave, the danger from our northern neighbour, China, with its proclaimed belief in violence and warfare with weapons of mass destruction, looms large. What future may hold—war and distress or an uneasy peace— is anybody's guess ! We should remember Shri Chagla's remarks after his recent experience in the U.N. Security Council that the country must be strong if it is to sustain its ideals of secularism and democracy. In building the strength of the country, the scientists have a vital role to play. In modern times there is no rigid dividing line between economic and military strength. It was India's ability to sustain its own defence effort and a better infra-structure of science and technology and industrial base which gave it a superiority over Pakistan. In the years to come, the Indian scientist will have the dual role of working as proud citizen of a secular democracy and key person in strengthening the scientific and industrial potential of the country.

FRANKLY SPEAKING:

FORWARDING OF APPLICATIONS

The rules governing the forwarding of applications of scientific personnel seeking employment elsewhere, could be considered amusing—if they were not, at the same time, harmful to the interests of scientific workers and the progress of science itself. In most organisations, a temporary employee can apply twice and the permanent one only once a year. The process of forwarding an application is itself admittedly so tedious that an 'advance copy' of the application is permitted to catch the last date. However, unless the application is forwarded through official channels or a 'no objection' certificate produced at the time of interview, the candidate is not allowed to appear. The employer can refuse to forward the applications and some have not hesitated to exercise the right. By insisting on his right to apply, the applicant may risk displeasure, earn an adverse remark in his confidential report and lose the chance of promotion even in his own department.

Why all this hullaballoo and restrictions against a scientist seeking a change for better prospects or more congenial working conditions? At the early stages the younger scientist needs to look round and make a number of changes before settling down to a career of his choice. Such changes are recognised as healthy and in keeping with the larger interests of science. Even at a later stage, age, experience and maturity may find use to greater advantage by switching to duties of a different type. A certain degree of personnel mobility and job rotation at all stages are accepted as a healthy practice. Unnecessary fetters can only lead to discontent, dis-satisfaction and an unhealthy research atmosphere—obvious disincentives to creativity. It is inconceivable that an unwilling scientific worker can be compelled to give his best ! Unless a scientist is going over to administrative or non-creative jobs and leaving scientific career altogether, he may be more useful elsewhere and make a better contribution to the overall scientific effort. Why not let him go !

We do not suggest that a scientist may walk out of his institution one fine morning regardless of his duties and responsibilities —that he leaves half-completed project to the detriment of the interests of scientific effort, or if he is a member of a project team, he leaves his co-workers in the lurch. We also do not suggest that if some special facilities by way of equipment, instrumentation and staff have been built up specifically for his use, he disregards his responsibility in favour of somewhat better emoluments elsewhere. We do not hold a brief for such irresponsibility nor condone anti-science behaviour of a scientist. But these responsibilities could be defined in the terms of employment and adhered to by the scientists as a matter of faith.

Commenting on the rules regarding forwardal of applications, the Third Reviewing Committee of the CSIR recommended as follows:

> "There appears to be no reason to restrict the right of scientist to apply for any post anywhere in India, but we suggest that rules in this regard should provide for adequate notice for release to the authority he is serving and should safeguard the interest of the project in which the scientist may be engaged."

If accepted, this recommendation would introduce a degree of welcome mobility of scientists between various scientific organisations. Congenial atmosphere and working conditions are the only guarantee against scientific workers seeking frequent migration out of the organisation.

Role of Industries in India's Economic Development*

Giving a concrete indication of the structure and content of the Fourth Five Year Plan particularly in the field of Industry, is not possible at present since the meeting of the National Development Council will be held only in September. It is only then that decisions will be taken about the outlines of the Fourth Plan.

Priorities for industries supplying the requirements of Agriculture

Agriculture is undoubtedly the backbone of our economy. It supplies food for the nation and raw materials to the industry. An adquate growth rate in agriculture is a prerequisite for expansion of national income and industrlal output. In the first three years of the Third Five Year Plan, the progress in agriculture appears less satisfactory in part because there had been a spurt in the last year of the Second Plan. During 1964-65, however, agricultural output grew by more than 7 per cent.

The two important contributions that Indian industry can make to the economic growth of the country are—(i) providing inputs for agriculture such as fertilisers and pesticides, pumps and tractors and (ii) manufacturing machinery and raw materials needed to facilitate further growth without strain on the balance of payments.

There cannot be agricultural growth without massive inputs from industry. The most important of these is fertilisers. There have been set-backs in the fertiliser programme during the Third Plan period. In spite of a substantially higher level of inputs of fertilisers, agriculture gets less than its minimum requirements. Redoubled efforts will be necessary to achieve a higher rate of production to make up for lost time. Similarly, we have to enlarge rapidly the supplies of tractors, pesticides, pumps and other similar requirements of the agriculturist. These industries will get the first priority in the allocation of the foreign exchange that is available to finance the import of capital equipment for new projects and substantial expansion during the coming year.

Supplies of components and raw materials

While the expansion of the industries feeding agriculture cannot be slowed down and must indeed be speeded up, as far as other industries are concerned, the accent must be on expanding supplies of components and raw materials rather than on expanding capacity. Full use is not being made of the productive capacity already installed as a result of shortage of components and spare parts. The allocations for these purposes, already inadequate, have had to be further reduced during the current year as a result of the difficult foreign exchange situation. To an extent, the reduced availability of free foreign exchange should be made good by an increased inflow of external assistance. We have over a period of time been urging the institutions and countries providing us assistance to earmark a larger proportion for financing components and raw materials.

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*Abstract from the speech of Shri T. N. Singh, Minister of Industry delivered at the Seventeenth Meeting of Central Advisory Council of Industries held on 13th August, 1965 at New Delhi.

We have pointed out that, in view of the development of machine building, the transport equipment and other capital and producer goods industries, we are able to utilise a much larger supply of components and raw materials to produce capital equipment within the country. The consortium was able to raise the proportion of the assistance made available in non-project form to 50 per cent for this year. There may be a further improvement in this regard next year.

A number of industries have been able to maintain and expand output levels as a result of the availability of external assistance for non-project imports. Some notable examples are provided by the output trends in the industries financed by the I.D.A., such as trucks and machine tools. Such assistance has been available also from other sources, the Americans having played a major part. A new credit for $100 million has just been negotiated with the I.D.A. to finance requirements during 1965-66 not only of the industries covered under the earlier loan but also of the cables and wire industry. It is hoped that the allocations and licensing for these sectors will be completed within a very short time in order to secure the maximum level of production during the current year.

A fuller utilisation of existing industrial capacity, particularly in high priority sectors, is, no doubt, linked up with the availability of foreign exchange and it must be our endeavour to use available foreign exchange resources to ensure optimal utilisation of existing capacity. It is important that the dependence of industry generally on imported components and raw materials should not be exaggerated. Many of our basic industries such as sugar, cement, steel, aluminium and paper depend only to a negligible extent on imported supplies. The cotton textiles industry's requirements are being adequately met under the PL-480 programme. The import needs of major export industries such as jute, textiles and cashew nuts are being provided for adequately in spite of our foreign exchange difficulties. The impact of the import cuts will no doubt be serious in some sectors. The effect on the general level of industrial output and its growth must not, however, be over-estimated.

There is the need for industry to play a bigger part in the export drive. Greater exports are the only means whereby industry can secure ample supplies of the components and raw materials that it needs. In order that firms which are export-oriented may be enabled to raise production levels, it has been decided to leave by and large undisturbed the various import entitlement schemes. While some firms have already gone out in a big way for exports, many others have not devoted sufficient attention to this matter.

Tax credits

For a number of items, including major export commodities like jute textiles, tea and ores, further assistance has been provided through tax credits. These tax credits will not be considered to be income for purposes of taxation. It is hoped that this assistance will provide a further stimulus to exports.

Basic industries

In a number of industries, production will go up substantially this year and next year as a result of completion of schemes in hand. Steel output is expected to go up by $1\frac{1}{2}$ million tons between this and the next year, and cement output by one million tons this year. There are many other Third plan schemes which will add to industrial output this year and next year.

There will, however, be a very considerable carry forward into the Fourth Plan of investment in the Third Plan industrial projects. These projects, whether they are in public sector or private sector should be completed at the earliest. Nation cannot afford to leave scarce foreign exchange unutilised in this manner. Many of these projects will when completed, provide the basic materials needed by other industries, such as steel, special steels, aluminium and basic chemicals. Our priorities for the coming months thus have to be to expand supplies of the materials needed by agriculture, to secure a larger inflow of components and raw materials into industry generally, and to complete the various projects that are in hand. In addition new projects will be taken up which will yield their fruits towards the middle of the next Plan. The choice of such projects have to be carefully made, having regard to the availability of assistance and the contribution that they will make to the improvement of the balance of payments through export promotion or import substitution.

A greater use of the engineering capacity that we have, particularly in the machine building industries, can help us improve production in spite of the shortages of imported materials. The industry must also be on the look out for possibilities of import substitution and exploit these fully.

Foreign investment

Private foreign investment brings with it not only know-how but also foreign exchange needed to pay for equipment. Such foreign investment is welcome but on a selective basis. It must come in for projects which have priority in our Plan, and the terms must fit in with our general policy. Foreign investment of this kind is helpful to us and supplements external assistance.

Controls on industrial production

The Government have tried to stimulate production by simplifying controls whenever appropriate and some controls have been lifted. Only a part of the output of cotton textiles is controlled, and many categories of steel have been decontrolled. The policy of the Government is that as and when the need for a particular control disappears, it is removed. A degree of control is, however, essential in the context of the shortage of foreign exchange and the need to ensure that priorities are observed.

Apart from foreign exchange resources, the problem of rupee resources for private industrial development is also a matter of much concern. In this connection, the nation will have to make sacrifices for its economic development. We cannot expect our friends abroad to provide increased resources for our Plan, unless we are prepared to make a large effort ourselves. In the Indian context, taxation is an essential means of channelling resources into investment instead of consumption. There must of course be selective tax measures designed specifically to promote higher exports, production, investment and savings. Under the tax credit scheme related to excise duty liability provided for in the last Finance Act, a proposal to give further stimulus to additional output in certain important industries is at present under consideration. It is hoped that this will result in not only higher output in these industries, but also give stimulus to the manufacture of machinery, etc. needed by these industries. Personal income tax rates were reduced in the last Budget with a view to stimulating personal savings. Basically, the outlook for Indian industry is very promising in the context of the visualised growth rates in the national economy as a whole and in industry in particular.

The financial institutions will continue to provide the necessary assistance to private industrial development. The Industrial Development Bank is now well established and has been steadily expanding its assistance to industry. Other institutions such as the I.F.C., I.C.I.C.I., and the N.S.I.C. have continued to provide both foreign exchange and rupee loans. The Unit Trust has succeeded in mobilising a sizeable volume of savings for investment, particularly in industry.

Institutional financing can, of course, provide only part of the requirements of industry, and reliance must be placed in the main on the capital market. Unfortunately the capital market has been depressed in the recent past. The sluggishness of the capital market may reflect the adjustment to higher interest rates generally; this is a necessary and desirable process. Also, there is now possibly greater discrimination in the reactions of investors to investment proposals; this again is a healthy trend. The reduction in taxation of personal incomes as also the scheme for grant of tax credit certificates to investors in equity shares of new industrial undertakings are designed to promote investment by individuals in industrial equities.

Industry will need to rely also on a larger ploughing back of profits to finance the larger expansion programmes visualised for the Fourth Plan. While reasonable dividends must continue to be paid, the investing public will surely accept it as fair if more funds are used to finance the expansion that will provide capital appreciation in the years to come.

Much has been said recently regarding the impact on industry of the restrictions of bank credit. The contraction during the current slack season has been significantly less than last year, and there can be no doubt that restrictive measures are necessary if an undue expansion of the money supply over the year is to be avoided. The credit controls are being applied in such a manner as to cause the least hardship and least disturbance to priority sectors.

Problems of small industries

The small scale sector is perhaps treated less generously than the large scale sector with regard to foreign exchange, in part because of the non-availability of detailed information regarding capacities. Nevertheless, production has been expanded using substitutes, however imperfect. There is very considerable output in this sector based on indigenous raw materials particularly from agriculture; and this area of agro-industries, possibly using new techniques which do not cost too much in terms of capital but which are still efficient, holds out much hope for the future. In recent years large scale industry has done a great deal to collaborate with the small scale sector in order to secure supplies of various components and ancillary items.

Licensing Policy

As regards Government's licensing policy, it will necessarily have to take into account the present foreign exchange shortage. It is important to recognise that scarcity of foreign exchange is going to be with us for quite some time to come. Licensing policy must therefore, firstly take into account the fact that greater economy in foreign exchange is likely to be realised by expansion of existing units and fuller utilisation of existing capacity. Fresh capacity to be licensed should normally be on schemes which are substantially export oriented. Secondly, in the present context of shortage of capital, our licensing policies should keep in mind the need to avoid excessively capital intensive processes, particularly, if such processes tend to displace labour on a substantial scale. There is a tendency to use capital instead of labour, even when, in terms of costs, such substitution is not economically attractive. Of course, it is not intended that Indian industry should be content with antiquated processes; but even in adoption of modern processes of production, there is always a possible choice of techniques. In a country like ours, where there is a considerable reserve of labour and where the need to provide gainful employment to the growing millions is urgent, there is everything to be said in favour of giving the closest attention to the right combination of labour and capital.

The rise in the general level of prices in recent years and particularly in the last year or two, has certainly placed an additional strain on the earnings of industrial workers. The worst affected are the un-skilled or the semi-skilled workers, because their total earnings are just enough to provide them with the bare necessities of life. But, despite these hardships, the workers have generally taken a responsible attitude. The man-days lost through industrial disputes did show some rise last year, but on the whole, the record is still good.

Indigenous know-how

There is the tendency on the part of our entrepreneurs to place an excessive and continuing reliance on foreign technical know-how in preference to indigenous know-how. In the present stage of our technological development, it is, of course, necessary that we should take advantage of the more advanced technology developed elsewhere in the world. At the same time, it is important that there should be adequate emphasis on the development of indigenous know-how, and where this becomes available, on its full utilization. It has been noticed that in a large number of cases where foreign collaborations have been approved, Indian collaborators frequently come up for extension of their collaboration agreements after the expiry of the original period without themselves having made any effort to develop any know-how. It is clear that every case of foreign collaboration involves some outlay of foreign exchange. It is therefore necessary that Indian industry should develop greater self-reliance and ensure that foreign technical know-how is sought only in cases where this is really necessary, and that too, for the minimum period necessary to develop indigenous know-how.

In the lives of nations, as of individuals, periods of crisis do occur and more so in a nation on the march. It is in manfully overcoming the difficulties and proceeding ahead to our objectives without gloom or despair that the greatness of a nation lies. In the recent past, we have faced some difficult situations and faced them with a measure of success. There is therefore no reason why the present foreign exchange crisis should create a sense of pessimism. If the foreign exchange shortage could result in instilling in us greater self-reliance in developing more indigenous resources and raw materials and in hastening the process of import substitution, certainly something good would have emerged from our present trials.

During the Chinese aggression, many bold decisions were taken and industry pledged their full support and co-operation in the implementation of all the measures that were then proposed. After the Chinese aggression receded, perhaps it will not be incorrect to say that we have not applied ourselves to the task which we had earlier set before us with the same determination and zeal. If we continue to keep alive the same determination and confidence in ourselves, there is no doubt that not only shall we successfully tide over the present crisis, but still turn this to our eventual advantage.

Industrial Research & Development in Japan*

Introduction

In Japan, due to technical research being done in the limited field during the Second World War, there was at the end of hostilities a wide gap between the research activities of Japan and those of the advanced countries. To bridge this gap in the early post-war years, industrial development was accelerated by utilizing the scientific and technological resources of the highly industrialized countries through the "induction of foreign technology into Japan" which involved contracts for technological assistance. This was done by purchase of plans, designs and drawings; employment of foreign engineers and procurement of technical know-how. It contributed substantially towards the technological development of the country. Such technological tie-ups opened up new spheres in production techniques leading to economy in raw materials, increase in yield rates, simplified processes and lower costs as also improvement in quality of products and development of new ones. Gradually, as the enterprises grew in size, increasing importance was attached to the promotion of research. Existing research facilities have been rapidly improved and adjusted in order to raise the nation's overall standards with the result that a new and creative research system has been established—thereby permitting the previous practice of inducting foreign technology to be abandoned, stage by stage.

Policy on industrial research

For the economic, social and cultural advancement of a country, the phenomenal progress of science and technology is inevitable and its contribution to the welfare of the population and the industry is more than evident. In Japan there has been a rising demand for a 'consistent and integrated policy' for science and technology.

Owing to the lack of space, it is impossible to describe in detail the organizational pattern of all research organization in Japan. But, to give a general picture, the research organizations are grouped into three categories : (1) private companies, (2) government research institutes, including local government and special corporation, (3) universities and colleges.

According to the survey of the Statistics Bureau of the Prime Minister's Office, the research expenditure of Japan was US $ 781 million in 1962, registering a remarkable seven-fold increase over the 1953 figure. In the data, 64% of the research expenditure was incurred by private companies. The number of researchers was 117 thousand, 50% of them belonging to private companies.

Notwithstanding the development of industrial research activities by the private companies, the role of the government in research has become still more important. The government has annually augmented its budgetary efforts towards promotion of

*From a sectional study on Industrial Research in ECAFE countries.

science and technology for stimulating research activities, training of scientific and technical personnel, and for improving documentation services, etc.

The Government will play an important role covering not only in the promotion of basic science, but also the promotion of such research as private enterprises may not be able to undertake such as large scale research and that closely related to human life, as for example prevention of air and water pollution, and research for levelling-up the production structure of business, geographical research etc.

Administration

A set of advisory organizations have been constituted to insure views and opinions of broader areas for incorporation in the making of national policies on the part of Administration.

Science Council of Japan was established in 1949, under the Prime Minister, for the purpose of promoting the development of science and its permeation into administration, industry and scientific organization representing scientists of Japan.

The Council for Science and Technology was established in Prime Minister's Office as an advisory organ to the Prime Minister in 1959. The purpose of the council is to promote 'consistent and integrated policy' for science and technology by the Administration.

Atomic Energy Commission, established in the Prime Minister's Office in 1956, administers policies on research and development of nuclear energy and insures democratic administration of nuclear energy.

Space Activities Council, attached to the Prime Minister's Office, was established in 1960 for the purpose of establishing the national policies for meeting the challenge of the phenomenal accomplishment and advancement in the area of the space exploration.

Science and Technology Agency, established in the Prime Minister's Office in 1956, is administering consistent and integrated policy for science and technology, and encouraging the research activities in the field of use of nuclear energy and space exploration.

Agency of Industrial Science and Technology, whose main duties are the co-ordination, propogation and practical application of results of research conducted by attached laboratories and institutes; encouragement of research activities; and other services in scientific and technological promotion and improvement of manufacturing and mining industries, was established in 1948 as an independent agency directly under the Ministry of International Trade and Industry.

Government Research Institutes

In addition to the large number of research laboratories maintained by private enterprises, Japan possesses many government research organizations which are as follows :

(1) Science and Technology Agency has three research institutes attached to it. Two of them are closely related to the industry. One is National Aerospace Laboratory, the other is National Research Institute for Metals.

(*i*) National Aerospace Laboratory is engaged in research on aerodynamics, airframe, jet engine and rocket; research on automatic control and instrumentation for aircraft and space vehicles; study on flight testing.

(*ii*) National Research Institute for Metals conducts research on heat resistance materials, pure metals, materials for electronics industry, ferrous and non-ferrous metals, atomic reactor materials, etc., research on judging defects of steel and its preventive measures; and research on industrial development of metal and casting.

(2) The Agency of Industrial Science and Technology has thirteen research institutes and laboratories relating to manufacturing and mining industries.

(*i*) Governmental Mechanical Laboratory has, as its chief function research on technology of machining and forming; research on improvement in durability of machinery, on automation techniques and on optical instruments.

(*ii*) Government Chemical Industrial Research Institute, Tokyo, is mainly engaged in research on analytical methods, catalysis, pure substances and chemical physics; research on air and water pollution, and research on the utilization of sea water, and on chemical engineering.

(*iii*) Osaka Industrial Research Institute conducts researches in organic chemistry, including polymer science and inorganic chemistry, including carbon products and pigments; and researches on applied physics concerning optic instruments, industrial instrumentation etc.; on ceramics such as glass, porcelain enamel and new ceramics products; and on paper industry and on utilization of sea water.

(*iv*) Government Industrial Research Institute, Nagoya deals with research work on the promotion of productivities in mechanical engineering; on the utilization of radiation for the chemical and physical field; on ceramics materials, pottery and porcelain; on foundry technology; on control technology for industrial wastes; and on the utilization of solar energy.

(*v*) Fermentation Research Institute is engaged in research on micro-biological treatment of industrial wastes; on enzymes; on new useful micro-organisms and breeding of micro-organisms; and on the prevention of mold growth; on continuous fermentation and process automatic control.

(*vi*) Textile Research Institute conducts researches on the manufacture of synthetic fibres; on spinning, weaving, dyeing and finishing; and on the physical properties of textile.

(*vii*) Electro-technical Laboratory is the largest institute in the Agency of Industrial Science and Technology; it is engaged in research on electronics; research in relation to power engineering; research on atomic power; and on establishment and maintenance of electric standards.

(*viii*) Industrial Arts Institute is mainly engaged on research on industrial design; basic research on industrial art techniques; research on packaging techniques and on merchandise analysis.

(*ix*) National Research Laboratory of Meteorology, Tokyo, is carrying researches on establishment and maintenance of standards excluding electric standards, for example length, mass, temperature, pressure, viscosity, humidity , time, force, angle, density, speed, volume, etc.

(*x*) Resources Research Institute is located in Saitama, and its main functions are research on mining, safety in mines and mining equipments; research on new process of coal preparation and treatment of waste from coal preparation plants; research on motor vehicle exhaust and smoke abatement, research on structure of coal, production of cokes and new material from coal; research on synthetic high polymers and hydrocarbon; research on combustion of fuels etc.

(*xi*) Government Industry Development Laboratory, Hokkaido is engaged in research on utilization of coal and tar; research on utilization of metal and non-metal resources; research on chemical and instrumental analysis; research on material testing; research on chemical apparatus.

(*xii*) Geological Survey of Japan, Tokyo is mainly dealing with Geological survey and investigation and preparation of geological maps; survey and research on natural resources including water, hot spring and geothermy; geophysical prospecting; geophysical general survey and research and geochemical research; strength property and age determination of rocks.

(*xiii*) Government Industrial Research Institute, Kyushu is engaged in research on chemical and instrumental analysis; research on chemical industry; research on measuring techniques; research on industrial materials; research on machining and plastic working of metal.

(3) Ministry of Transportation, whose duties are administration concerning sea, land and air transportation, has two research institutes. One of them is Ship Technical Research Institute which has close relationship with ship building industry.

Ship Research Institute deals with research work on propulsion dynamics and structure of ships; on marine engine, equipments and related facilities of ships; on welding and fabrication of ships; on testing of model and actual ships; on testing of electronic navigation.

(4) Japan has research institutes of the type of special corporation. Typical institutes of this type are Japan Atomic Energy Research Institute and Institute of Physical and Chemical Research which are sponsored by the Government. Their research activities are so important that we must mention their role in the promotion of Japanese industry.

Research by Private Industry

In present-day Japan, industrial researches carried out by the private companies play a most important role for developing industries. With the growing economy and strengthened industrial foundation, Japanese industrial circles are becoming very anxious to further improve the nation's technology by stages, for it is on her newly developing technology that Japan's hope for a higher rate of economic growth depends. During the last few years, many of enterprises are attempting to establish central research laboratories, increase the number of research workers and seek materials for future use.

Among the private companies, about 7,500 of them are conducting research, and number of central research laboratories in the private companies is over sixty. The total expenditure for research activities in industry amounts to $500 million in 1962, and covers 64 per cent of total research expenditure of Japan. In the same year private companies employed about 55,000 researchers, covering 50 per cent of total researchers. Some of the central research laboratories are the largest in scale and possess the most modernized equipments and facilities in the world. But it is still 1-2 per cent of the total sales, though many enterprises hope to bring this rate up 2-5 per cent in the near future.

For the first time in the history of Japanese industry, the Hitachi Co. Ltd. established in 1941 a central research institute under private sponsorship. Today almost every large manufacturer has research organizations of its own. In these organizations, engineers, scientists and technicians are engaged not only in research work to improve the quality, performance and design of products as well as the technology and manufacturing processes but also in basic research in industry so as to establish a consistent research system in each enterprise. The expansion of the research and development activities of these research institutions is not only aimed at improving the quality as well as the quantity of manufactured products, so as to place Japanese products on a competitive footing in the world's export markets but also producing new technology and new products. The research laboratories of Japanese industrial undertakings are patterned very much on the same lines as those of the United States. It may be said that Japan has caught up with other advanced countries in the field of research for technical development and that the country is now ready to engage its scientific and technological talents in cultivating and developing even unknown fields.

Scientific Personnel

The university aims at teaching and studying professional learning and technical arts. In Japan, there are about 340 universities including technical colleges. They are turning out about 32,000 scientists and engineers for industries and research institutes in 1965. But by the rapid growth of industry and the accelerated expansion of research activities, the demand for scientists and engineers is increasing so fast that shortage of them has posed a serious problem.

Research in Universities

As for research activities of universities, including research institutes attached to national universities which have been established to overcome the limitations in carrying out research imposed by shortage of personnel or funds, they are engaged in academic research as well as basic research which cannot be dealt with by private enterprises and other research bodies. Thus the role of universities is very important as it forms the basis of research activities done by the industry.

LETTER TO THE EDITOR

(The Letter given below has been received from ASWI, CMRS Branch)

Dear Editor,

We refer to your editorial feuilleton "Frankly speaking" in the June issue of Vijnan Karmee. Opinions have been invited from scientists to assess the usefulness of tailored advertisement for the recruitment of an eminent specialist or promoting a scientist of the laboratory, who has been working meritoriously for a period.

Since it appears that the controversy raised has resulted from our representation regarding an advertisement, we owe the readers of Vijnan Karmee a statement of facts and an explanation elucidating certain misapprehension about the representations.

The letter therefoie may kindly be published in the next issue.

I. The advertisement against which objection was taken was tailored for a person, who is not a scientist of the laboratory to be merited in recognition of his work.

II. The person for whom the advertisement of a post of Scientist 'E' was made, has been found by us to possess a just average academic career, has passed his Ph.D. examination only in 1964 and who has neither specialised knowledge in any branch of science nor has outstanding work to his credit, that might merit recognition.

We apprehended certain motive which might not prove helpful in building a healthy atmosphere in research and therefore pointed out. Anomalies about this particular advertisement have already been sent to the ASWI General Secretary (Orgn.). The same in part or whole may be published in the Vijnan Karmee for the benefit of the readers.

As regards tailored advertisements it is not known to us if any advertisement suiting the qualifications and experience of any Scientist has been made from this laboratory with a view to promoting him for his meritorious work, during the last five years. On the other hand, the advertisements from the Laboratory are very often tailored to prevent internal candidates from applying for the post. A typical advertisement (Advt. No. 2/65) is given below where it was drafted in such a manner that the departmental candidates with five years' experience were debarred from applying. (There were suitable internal candidates with five years experience whereas advertisement demanded six years experience). There are many such examples.

We admit however, some tailored advertisements have been made to bring in some specific people from outside. A typical advertisement (Advt. No. 5/65) is given below. The interview and the selection took place on 17.8.65. A candidate with Second Class Degree has been appointed as a scientist in this case in preference to a number of experienced departmental candidates including a candidate with First Class Degree (First in order of merit). It will be interesting to note that the selected candidate passed only in 1965.

Yours faithfully,
(S. Dutta)
President,
Executive Council, ASWI, CMRS Branch

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CMRS ADVERTISEMENT No. 2/65
JUNIOR SCIENTIFIC ASSISTANT (3 POSTS): Rs. 210-10-290-15-320-EB-15-425/-

Post (i) Qualification: Degree in Science or Diploma in Mining Engineering with at least six years' experience in Mine Ventilation work.

* * *

CMRS ADVERTISEMENT No. 5/65
SCIENTIST (1 Post):
Rs. 400-40-800-50-950/-

Qualification: *High academic qualification* in Mining Engineering preferably *with research or industrial experience in Mines* or a good knowledge of mining research papers published in India and abroad. **Desirable:** Should be able to conduct research work in Mines in Hydraulic stowing and Pneumatic Stowing or Mine Working. *Candidates who have appeared in the Final Examination in 1965 may also apply.*

Energy Survey Committee Finds Nuclear Power Competitive*

THE Energy Survey Committee of India has come to the conclusion that "nuclear energy is already competitive" in certain regions of the country located at a distance from cheap coal supplies and where hydro power is not available.

This conclusion is based on a detailed analysis of the relative costs of generating electricity in thermal, hydro and nuclear stations that was undertaken by the Committee.

The Committee's report adds that "during the 1970s, when the problems of using thorium have been satisfactorily resolved, nuclear energy is likely to become increasingly competitive.

The Committee was appointed in January 1963 to undertake a survey of the energy resources of India and to take a long-term view of the probable demands. It was also asked to suggest how best the resources could be developed sufficiently in advance so as to eliminate any shortfalls and thus help planned development. The 19 member Committee included four foreign experts experienced in this field. It was headed by Prof. M. S. Thacker, Member of the Planning Commission, who succeeded the late Shri M.R. Sachdev as its Chairman. Dr. H. J. Bhabha, F. R. S. was one of the two advisers to the Committee.

The 450-page report is divided into 16 chapters and six annexures and was approved and signed in New Delhi on July 27.

Special Circumstances

In the chapter entitled "The Energy Problems of India", the report points out that "in the special circumstances of India, with great distances between centres of consumption and the coal fields, and thus high delivered costs of coal, there are more than normally favourable conditions for the competition of nuclear energy". The report makes a close examination of the extent to which it may be reasonable to hope that, in suitably chosen locations, nuclear energy will be economically competitive in the present and within the next fifteen or twenty years.

On the future organization and regulation of electricity supply the Committee has observed that the need for some rethinking of the institutional framework of the electricity supply has come from changes in the technological background. One of these is "inherent in the rapidly developing nuclear technology which promises that large nuclear generating stations will be competitive with conventional thermal stations in areas far from cheap fossil fuels."

Discussing the major problems of electricity policy, the report says that nuclear energy is already competitive with a thermal station using high cost coal or coal midway between high and medium costs at 75 per cent plant factor; it is also competitive in more limited areas at 60 per cent plant factor.

* Reprinted from 'Nuclear India' Vol. 3, No. 12, Aug. 1965.

Demand for Electricity

The demand for electricity has been growing much more rapidly than that for energy as a whole. The Committee has assessed the demand, on the basis of a 7 per cent growth in national income and a corresponding assumption of a 10 per cent industrial growth annually, to increase from 16,900 million KWH in 1960-61 to 74,000 million KWH in 1970-71 (about 4.3 times), 124,000 million KWH in 1975-76 (about 7.3 times) and 204,000 million KWH in 1980-81 (about 12 times).

It has examined in considerable detail the problems of the relative advantages in different conditions and locations for thermal, nuclear and hydro stations. For each there are conditions in which it is likely to be the best solution. The Committee has suggested an analytical framework that should be used to judge each particular case.

Nuclear energy has advantages where the demand for electricity is remote from coal supplies and coal has a high cost. Thermal stations are cheapest where there is surplus or cheap coal. Hydro is in general best used to meet peak demands. In certain areas it can meet the whole demand, but in many areas it requires to be backed by thermal or nuclear generation. The Committee has foreseen an increasing demand for nuclear, thermal and hydro power.

The report gives certain tentative projections for the growth of various forms of power; and takes note of the view expressed by the Department of Atomic Energy—a view shared by some members of the Committee—that since nuclear power was already competitive with conventional thermal power in certain regions of the country there was justification for higher targets for nuclear power in the Fifth and Sixth Plans as compared to the figures given in the table prepared earlier and incorporated in it. By the end of the Fourth Plan in 1971 the country would be generating about 1.2 million kilowatts of electricity from atomic energy.

The Committee has estimated that the energy demands in the country may be expected to rise from 242 million tonnes in coal replacement in 1960-61 to 439 million tonnes in 1970-71 (about 1.8 times), 616 million tonnes in 1975-76 (about 2.5 times) and 857 million tonnes in 1980-81 (about 3. 5 times).

Commercial Energy

The Committee's report has also indicated that the demands for commercial energy are expected to increase much more rapidly from 96.4 million tonnes of coal replacement in 1960-61 to 256 million tonnes of coal replacement in 1970-71 (about 2.6 times), 417 million tonnes of coal replacement in 1975-76 (about 4.3 times) and 648 million tonnes of coal replacement by 1980-81 (about 6.7 times).

The Committee has estimated the demands for oil at about 40 million tonnes a year by 1975-76 and about 65 million tonnes by 1980-81 on the basis of 7 per cent growth. Of this, possibly as much as three quarters might have to be imported. It is clearly of immense importance to do all that is practicable to increase indigenous supplies and to find means, by trade agreements or otherwise, to facilitate imports. But the Committee foresees some danger that if India follows the energy pattern of the United States and some of the countries of Europe, it will become excessively dependent on imported fuels.

Investment

The Committee has examined and estimated the very considerable amounts of investment that are likely to be needed to meet the needs of energy. It is estimated that some 13 per cent of all national investment is likely to be absorbed by the requirements of energy, principally those of electricity.

For the time being, a large part of this investment has to take the form of imports which make a very heavy claim on India's foreign resources and on her requirements for foreign aid. There is obvious need to bring down as quickly as possible the import content of investment in energy.

The report has pointed out that in 1960-61, on the basis of relative valuations of different fuels that the Committee adopted, about 22 per cent of all energy came from coal, about 19 per cent from oil and about 4 per cent from hydro electricity, making a total of 45 per cent from these commercial forms of energy; about 55 per cent of the total came from non-commercial forms of energy, e.g., firewood, cattle dung and waste products, with firewood providing about 40 per cent of the whole.

Finally, the Committee has recommended the continued supervision of the problems of energy, regarded as an integrated whole, by some appropriate body and has advocated the setting up within the Planning Commission of a unit responsible for maintaining the body of statistics necessary for the co-ordination of energy policies and for watching the progress in this field.

SCIENCE IN PARLIAMENT

Science Teaching in Schools

Shri M. C. Chagla, Minister for Education told Shri M. C. Shah in the Rajya Sabha on September 3, 1965 that a detailed scheme to promote general science education in the country was being formulated by the National Council for Educational Research and Training.

Four-year degree courses in science education have been organised at the Regional Colleges of Education, to which candidates, who have passed the Higher Secondary or equivalent examination are admitted. The Regional Colleges will be expanded for 400 admissions each year to these courses. Special one-year courses in science education for science graduates have also been instituted at the Regional Colleges. Twenty selected university centres are proposed to be developed for science education where both four-year, and one-year courses will be conducted. The programme of Summer Science Institutes will be expanded to provide facilities to increasing numbers of serving teachers each year.

There was no proposal to set up an Institute of Science Education in each State in the Fourth Plan but "we are giving every possible aid to States to carry out the programme" for improvement of science education. The Government was trying to give effect to the very valuable suggestion of UNESCO team on science education in India.

Shri Chagla told Shri B. N. Bhargava that arrangements for teaching science in schools were not satisfactory. The main difficulty was lack of science apparatus. A central science workshop had been set up at Delhi to design and develop prototypes of scientific equipment and apparatus required by schools. It was also proposed to have a small unit to produce the apparatus and supply it to schools so that no foreign exchange was involved.

Shri Chagla told Shrimati Phulrenu Guha that for training more science teachers, the intake of regional colleges of education had been increased. Correspondence courses were proposed to be provided and the number of summer schools had been raised.

The Minister agreed with Shri B. K. P. Sinha that at the school stage, greater importance should be attached to mathematics which was the basis of all sciences. Shri Chagla told Shri Biren Roy that there was a big programme for production of science literature for schools, but on account of lack of resources the scheme of "Vigyan Bhavans" had not been implemented as fully as it should have been.

Science Talent

Shri M. C. Chagla, Education Minister told Sarvshri S. N. Chaturvedi, Daneshwar Tantia, Kidar Lal and Vishwa Nath Pandey in the Lok Sabha on September 1, 1965 that under the science talent search scheme, scholarships are awarded to young students to assist them in their scientific studies in universities. Selections for scholarships are made on an all India basis through a special test held for candidates who have passed the Higher Secondary or equivalent examination. The value of the scholarships is Rs. 50 per mensem for the first year of the B.Sc. degree course and Rs. 75 per mensem in the next two years. In addition, a book allowance of Rs. 100 a year is given to all scholarship-holders. In the current year, 325 candidates have been selected for the scholarships.

Scientific Inventions

Shri Bhakat Darshan, Deputy Minister of Education told the Lok Sabha on September 1, 1965 that a very large number of minor and major inventions have been made by various Government Departments and Organisations, besides private individuals and institutions during the last five years. Replying to Shri Jyotishi, Shri Bhakat Darshan said that the Inventions Promotion Board during this period considered 841 inventions out of which 285 were found suitable for financial assistance and prize awards. A large number of inventions are being utilised by the inventors themselves or by collaboration with the industry. During the last five years 149 inventions were referred by various research institutes to the National Research Development Corporation for assessment of their commercial scope and technical feasibility. Of these 52 inventions have been licensed by the Corporation to the Industry, 15 of these have already gone into production. Incentives have geen given to the inventors in the shape of educational assistance and prize awards directly or through the research institutes to which the inventors are attached.

The Inventions Promotion Board also brings out a Journal containing information about the latest inventions and the products obtained from them. The Council of Scientific & Industrial Research gives 40 per cent of the royalties and premia accruing on the processes to the inventors.

Counting Machines

Shri M. C. Chagla, Education Minister stated in the Lok Sabha on September 1, 1965 in reply to a question by Shri Ram Harkh Yadav that the Central Electronics Engineering Research Institute at Pilani has developed an industrial counting machine costing about Rs. 100. The machine consists of cold cathode trigger tubes operating on the principle of gas discharge. The maximum speed is about 300 counts per second which is faster than that of Electromechanical type counters. Count pulse may be generated with a photocell and lamps arrangement. Predetermined number can also be counted by incorporating rotary switches. At the end of each count a signal is generated.

ASWI ACTIVITIES

Bureau of the Central Executive Committee

Three meetings of the Bureau of C.E.C. were held during July-August, 1965. The discussions and decisions taken are summarised below:

(1) It was decided that ASWI should establish closer contacts with the members of Parliament. In this context, it was decided to undertake the following steps:

(*a*) A descriptive pamphlet giving the aims, objects and activities of the ASWI may be brought out for distribution to MPs.

(*b*) The Association should offer its active cooperation to the Indian Parliamentary and Scientific Committee in all their activities.

(*c*) Personal contacts with MPs may be maintained.

(2) The terms and conditions for affiliation of other organisations with ASWI were discussed and approved.

(3) It was reported that as many as 12 papers have been contributed by ASWI to the Budapest Symposium organised by World Federation of Scientific Workers.

(4) A letter was received from Ceylon Association for the Advancement of Science, inviting the ASWI to attend their annual meeting on 16-18 December, 1965. As the Ceylon Association will not be providing the passage, the Gen. Secretary and the Treasurer were asked to examine if it would be possible to find funds for sending at least one delegate of ASWI.

(5) Dr. N. P. Gupta, President, ASWI, suggested that a programme for All-India drive for membership of the Association should be undertaken.

(6) It was agreed that the next meeting of the CEC may be held in the 2nd half of Oct., 1965.

(7) The question of enrolling students as members of ASWI was discussed and it was agreed that post-graduate students may be enrolled as members of ASWI.

(8) It was decided that a series of lectures on subjects of general interest may be organised. The work of drawing up a list of subjects and speakers was entrusted to the President, General Secretary and Secretary (CSIR Branch.)

* * *

Karaikudi Eranch

The following members have been elected to the Executive Committee of the Branch for the year 1965-66:

Dr. K. S. G. Doss	President.
Dr. M. A. V. Devanathan	Vice-President.
Dr. P. B. Mathur	Vice-President.
Dr. R. L. Seth	Secretary.
Shri P. V. Vasudeva Rao	Joint Secretary.
Shri R. Subramanian	Treasurer.
Shri J. Kuppuswami	Member
Shri K. C. Narasimhan	,,
Shri S. Gopal	,,
Shri S. Sampath	,,
Shri V. Kapali	,,
Shri M. Sundaram	,,
Shri N. Ramaswami	,,

Shri M. I. A. Siddiqi Member
Shri B. V. K. S. R. A. Tilak ,,
Shri P. Subbiah ,,
Miss R. Kanakam ,,
Miss Alice Kurian ,,
Shri T. R. Venkatasubramanian ,,

* * *

Lucknow Branch

The Lucknow Branch has been meeting and discussing the non-implementation of CSIR Governing Body decisions. The Five Year promotion decision is of utmost importance and has not so far been implemented.

The Branch, while welcoming the Government decisions to upgrade the pay scales in the Central Government Post-graduate institutions, felt that the difference in the pay scales between various institutions will tend to influence the migration of scientists. It was suggested that a proper evaluation should, therefore be made of the pay scales, working conditions etc. in the various Government departments, universities etc., by a Commission appointed by the Government.

* * *

Roorkee Branch

At a recent General Body meeting of the Branch, four resolutions were adopted.

They were regarding (*i*) the starting of two centrally administered higher Secondary residential schools by CSIR for the wards of CSIR employees in Hyderabad and Lucknow on the lines of the schools run by the Railways and Defence Ministries,

(*ii*) meeting the whole or part of the railway and bus fare by the CSIR, of the scientific staff and their families for the purpose of a visit to any hill station in India once in three years,

(*iii*) expediting the process of reviewing the work for promotion to the next higher rank of all the scientific staff who have completed 3 years of service in one post, and

(*iv*) issuance of fresh instructions by D.G.S.I.R. to all the CSIR laboratories that there should be no restrictions on the number of applications of CSIR scientific staff for jobs within the CSIR organisation.

Institutional Subscribers for Vijnan Karmee

The Association of Scientific Workers of India has decided to enrol institutional subscribers for Vijnan Karmee, Journal of Association. Research laboratories, educational institutions and industrial concerns can now become institutional subscribers and receive copies of the Journal as also other literature published by the ASWI. The institutional subscription will be Rs. 25/- per annum.

Vijnan Karmee is one of the few scientific journals in the country devoted to the cause of science and scientific workers. The Journal has achieved more than 16 years of steady growth and rising circulation which now stands at about 2000 amongst the scientific community of the country. A number of well known scientists are associated with the Journal in advisory and collaborative capacity.

Research laboratories, educational institutions and industrial concerns are invited to subscribe to this Journal. Subscription forms can be had from:

ASWI, Post Box No. 137, New Delhi-1

Printed and published by K. Ray at the United India Press, B. S. Marg, New Delhi

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Your views please:

INDIA AND THE ATOM BOMB

The Prime Minister, Shri Lal Bahadur Shastri, and the Defence Minister, Shri Y.B. Chavan, have made a firm declaration that India would not use its resources for the manufacture of an atom bomb. Whatever may have happened in the recent years, it does not necessitate a basic change in the policies of the country on the peaceful uses of nuclear power.

The recent aggression by Pakistan in which it employed sabre-jet aeroplanes and patton tanks and other sophisticated military hardware have given a jolt to the entire thinking regarding defence preparedness and its implications. The economy of the country is being geared to defence and self-reliance. The leaders of the country have realised that in their hour of crisis they have to depend on the inherent strength of the people of the country, their unity and their economic and defence potential. For arming its army, navy and air force, India would have to generate its own defence industry. Faced with hostile neighbours like China and Pakistan, our brave Jawans have a right to ask for the best and the latest that the country can give them to defeat the enemy and defend the country. What is the place of atomic weapons in the armoury that the country should provide to its armed forces! Since China has an atom bomb and may provide it to Pakistan, what should be India's stand to face the situation ? Would making an atom bomb in India be the correct answer to act as a deterrent ? What would be the economic effects of investment of such large resources for the production of weapons of mass destruction ? Should the land of Gandhi and Nehru take upon itself the arming with weapons of mass destruction, which are essentially weapons for total warfare ? Can India depend upon the wisdom and sanity of major nuclear powers to provide protection in the event of a threat of a nuclear attack by its hostile neighbours?

These and various other questions are agitating the minds of the scientists and the people. It is the duty of the scientists in the country to provide a clear answer giving due consideration to social, economic, scientific and technological aspects. Vijnan Karmee which has the largest circulation amongst the scientific workers in the country and reaches more than 2,000 scientists directly would be glad to publish your views in its special issue being brought out in December 1965. We invite you to favour us with your views on "*Should India manufacture its own Atom Bomb?*"

Editor

September 4, 1965

Dear Prime Minister,

The members of the Association of Scientific Workers of India have been deeply stirred by the perfidious Pakistani attack on our country.

The Association has always championed the cause of peace among nations so that the fruits of scientific effort could be fully utilised for welfare of humanity. But there can not be peace at any price. Liberty and freedom have to be preserved. Only then nations can live in peace.

We of the Association and the younger scientists of the country wish to assure you of our full wholehearted support in the measures that you take for the defence of our motherland. We are asking our members to be on their posts, work still harder and make greater scientific and personal efforts to make the army and the Nation strong. We also assure you of our active and full participation in civil defence measures that may be required to protect the civilian population.

We shall make all efforts to educate the public about the situation particularly on the need of maintaining communal harmony at this hour.

Yours sincerely,

Sd/- N.P. Gupta

प्रधान मंत्री भवन
Prime Minister's House
NEW DELHI

No. 3780-PMO/65

September 5, 1965

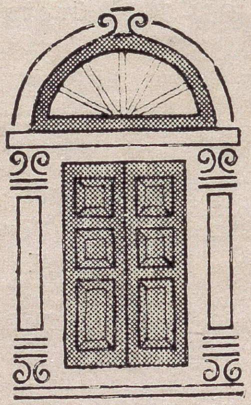
Dear Shri Gupta,

I have received your letter and deeply appreciate the offer of the members of the Association of Scientific Workers in this hour of national crisis. Our scientists will have an important role to play in the measures that are taken for national defence.

Yours sincerely,

Sd/- Lal Bahadur

(Copies of the letter to the Prime Minister of India by Dr. N.P. Gupta, President, ASWI and the reply of the Prime Minister)



Editorial

National Policy for Industrial Self-sufficiency

The National Emergency which has continued since the Chinese aggression against India in 1962 and further aggravated by Pakistani aggression in 1965, has brought in its wake new factors and added responsibilities for the nation. After the outbreak of Indo-Pak hostilities several countries have put a ban on supplies of defence materials and arms to India. In an effort to pressurise the Government of India into accepting compromises and placating Pakistan, threats of withholding economic aid have also been held out. The PL-480 Project under which the U.S. Government has been making large scale deliveries of foodgrains to India may be run into difficulties, be curtailed or stopped altogether.

The grave crisis through which the country is passing, since it has to divert a substantial part of its resources for defence, has further aggravated the already critical economic and foreign exchange difficulties. In the absence of essential raw materials and components, the industrial production in several strategic sectors has shown a downward trend. Even public sector projects for alloy steels, aluminium, oil refineries, petro-chemical complex and fertilizers are likely to be affected or delayed due to non-availability of foreign exchange complement. The situation calls for a serious thinking in responsible circles to evolve an immediate and long-term policy to strengthen self-dependence to sustain our political independence, national sovereignty and territorial integrity of the country. Committees for import substitution of raw materials have been set up by the PlanningCommission. These may be useful but the magnitude of the crisis demands a more thorough and sustained effort based on a National Policy. At the present stage, the industrial sector, whether public or private is largely dependent on foreign know-how and technology, imports essential raw materials and components, and tied with trade-marks, patents owned by foreign interests. The extent of control exercised by foreign technology and economic interests is not conducive to the health of the national economy or its future well-being. Indian industrialists with few honourable exceptions, and Government officials who head public sector projects are too keen to let foreign interests come in and do the job for them, while they sit back and earn profits at the cost of the consumer—without taking risk or responsibility. The failure of industrial firms, public or private, to develop know-how on their own or in association with State sponsored research organisations, has led to their long range dependence on research carried out by the companies abroad. As Prof. Dedijer said 'this amounts to supporting research carried out in other countries and pay heavily for it'. It has also resulted in the level of indigenous technology remaining many steps behind that of the foreign collaborating firm, acceptance of their discarded plant and machinery in certain cases, purchase of outmoded designs and processes and payment of substantial amount of foreign exchange for the use of foreign trade names.

The use of foreign sounding trade names or trade marks of European or American industrial firms is actually in the nature of a hoax played on the unwary consumer.

It is well known that a number of foreign firms and their subsidies in India actually purchase their products from the same source and get it packed under their label. These products then sell at prices several times higher than that of the indigenous product without a foreign name. There are cases of drinks, consumer articles, food products, cosmetics and perfumery materials, being permitted use of foreign trade names and royalty paid in foreign exchange for the use of these names. This country boasts of a well developed Standards Organisation which has done a commendable job of laying down Indian standards for most of the products. With proper enforcement of quality standards and award of deterrent punishment to adultrators of food, medicines and cosmetics, the consumer could be safeguarded against unscrupulous anti-social elements. Rigorous observance of standards would eliminate the only argument ~~held~~ in favour of foreign trade names. It should be a part of national policy that public will not be made to pay and foreign exchange not sent out of the country through the use of foreign trade names.

Another aspect is the encouragement and facilities afforded to a large number of companies with foreign equity capital or subsidies to undertake activities which are neither of basic manufacture nor need sophisticated know-how and technology. Perhaps, the worst affected is the field of drugs and pharmaceuticals where foreign interests are strongly entrenched. They are given extensive capacity and expansion licences for activities such as tableting, ampuling and bottling of products imported in bulk from their parent companies abroad. A number of foreign concerns are permitted to import finished products or penultimate stage intermediates and raw materials even when with some effort these could be manufactured or made available indigenously. These concerns send back crores of rupees in foreign exchange in the form of repatriated profits. The prices of drugs in India are amongst the highest in the world. The pressure of the foreign entrenched interests is such that in spite of repeated demands from organisations of scientists and the public, the Government of India has not been able to set up a committee to inquire into the causes of the high prices of essential drugs and pharmaceuticals. In Great Britain the Ministry of Health has won the law suit filed by some pharmaceutical concerns against its purchase of antibiotics at lower prices from Italy which does not observe patent rights but in India protection to foreign patents is such that essential drugs are beyond reach of the common man. Considering the fact that standard of living and per capita income in India is amongst the lowest and the prices of drugs amongst the highest in the world, the disparity between the two extremes makes the misery of the common man more acute. Whatever may be the reasons for permitting equity capital participation or subsidies by foreign concerns at one time, the encouragement given to them by way of expansion of non-essential activities and repatriation of profits as foreign exchange is against the interests of the country and should be put a stop to as a matter of national policy.

Permission for multiple foreign collaborations for import of technology for the same product is another serious factor. For the same item industrial licences have been granted to large number of parties to enter into foreign collaborations without an adequate evaluation or appreciation of either the need or quality of technology required. Most of the agreements exclude disclosure to third parties and offer the indigenous firms the benefits of research and development from their parent concerns. In actual practice thus they bar association of the scientific and technological institutes in the country with these industries for further improvements and future development. In most cases, after years of collaboration and repeated renewals of agreement, the Indian firms still import essential components or vital parts of plant and machinery. No effort is made by the Indian entrepreneur to be self-sufficient for total manufacture of a product in the country. Even after 15 years, some 15-20% of the *essential components* of Indian cars are still imported. Although we have a terylene plant set up in India, the price of terylene in India is perhaps the highest in the world. We have U-Foam plants but the TDI continues to be imported. We have acrylic resin plants but the monomers are imported. We have formaldehyde plants but methanol is still imported. In the fields of dyes although some firms have been in the line of manufacture for the last 15-20 years, no effort has been made to develop their own research and development organisations and for every new intermediate and product a new collaboration is sought. Even after years of collaboration, repeated renewals of collaboration are requested, thus perpetuating dependence, causing setback to indigenous technology and exclusion of any research effort either by industry itself or through sponsorship in the government research organisations.

Since the country is short of foreign exchange and has no means to purchase the capital equipment, capital participation by the foreign interests is inescapable in certain cases. Usually the amounts involved in capital equipment are far greater than the payments for know-how and technology and there would be some justification for purchasing foreign know-how if the plant itself is to be got through foreign participation. In such cases once the plant has been imported, efforts should be made to duplicate the design and ensure that future expansion and new units are based on exclusively or as far as possible indigenous effort. Some industries have made modifications in design or evolved indigenous designs basing on their own effort but such cases are rare and more an exception than the rule.

We do not under-estimate the need for foreign know-how for the rapid industrial development of the country. In fact notwithstanding the present anarchic situation, the present advance in industrial field owes a great deal to the import of foreign know-how. For many years to come, in certain sectors large scale import of technical know-how and even after India has grown into fully a modern industrial State, inter-flow of technology and import of technology at the highest level would have to be ensured. We may quote the Third Reviewing Committee of the CSIR as follows:

> "There is one channel of flow which is of special importance and that is through collaboration with more advanced technologies of foreign countries. This channel is an efficient one and is by far the quickest for the specialist knowledge of manufacture as the flow is directed to the point where it is made use of. Even in advanced countries the flow of know-how between nations plays a very major part. The maintenance and improvement of such channels of flow with due consideration of other consequential problems are essential to India's move forward. But this is not enough. While facilitating a judicious inflow of foreign specialist know-how, India must build up its own specialist knowledge and learn to overcome its large dependence on foreign know-how. . . ."

In the August issue we have published a report on the "Industrial Research Policy in Japan". The Ministry for International Trade and Industry (MITI) in Japan firmly rejects any collaboration involving foreign

(*Contd. on page 24*)

Frankly Speaking

Woes of a foreign-qualified scientist

It is frequently argued that the National Laboratories have denuded the universities of good scientists by offering better emoluments. Perhaps, an equally important factor in the universities and other teaching institutions losing their scientific personnel is the deplorable condition of the facilities by way of equipment, library and research facilities available with them. We are giving below an abstract from the letter from a foreign qualified scientist who has also mentioned the name of three eminent botanists in the universities as referees. He has given the titles of 10 *research papers published by him of which three are in foreign journals. We hope that the state of affairs of the college under reference and that of other similar ones will receive the urgent attention of the authorities in the University Grants Commission and the Ministry of Education.* Editor.

"Having recently returned from West Germany where I worked for three years with a Post-Doctoral Fellowship in Botany which I won in 1962, I joined my previous post of a lecturer imparting instructions upto B.Sc. Hons. (since this session also M.Sc.) classes. I have been serving this college since 1953. This University is only slightly better than an average Secondary School with absolutely no library beyond the usual text books. The equipment is outdated and there is certainly no place available to keep any new equipment even if we were able to purchase some. We are, at present, 10 teachers (all lecturers) and none of us, except the senior most (the functional Head of the Dept.) has a room/laboratory to himself. The rest of us sit in the only under-graduate laboratory. Neither is any research done here nor do the university/ college authorities expect such a "time wasting thing" from us. Looking at the way things are moving here there appears no hope of its development in the near future.

Having returned from abroad recently, after the several assurances given in public by our Education Minister that India needs its scientific personnel, I still have the urge and great desire to work on certain lines for which I even brought with me the small equipment at my own cost. Naturally, it pains me to find that I shall not be able to continue my work and this thought has been haunting me ever since I joined back this department in May last. I consider it my misfortune to have to work here and waste myself and the little experience that I gained in Germany. During my stay there as well as earlier in India at Banaras, I have specialised in Plant Physiology investigating the influence of soil nutrients on the secondary substances in plants such as the alkaloids, amino acids and hormones. A list of my research publications some of which have appeared in foreign journals, is enclosed for your perusal. In Germany I had the opportunity to be associated with Prof. Egon Stahl of the University of Saarland, where I got the first-hand training in the modern methods of biochemical investigations, including Thin Layer Chromatography of which he is one of the founders.

I would be very grateful if you could very kindly get me fixed up in one of the National Laboratories under your charge where library and other facilities for work may be available."

The Economic Times Fourth Survey on Foreign Collaboration

The participation by foreign collaborators in joint ventures averaged 22.7 per cent of the issued capital, according to this survey of "The Economic Tim:s" on foreign collaborations in Indian industries.

The number of collaboration agreements approved by the Government of India during the first two quarters of 1965 showed a considerable decline compared with the corresponding period of the previous year.

During the period January 1957 to June 1965, country wise, the U. K. leads in the number of collaboration agreements. The U.S.A. stood next with a wide margin followed by West Germany, Japan, Switzerland, France, Italy and East Germany in that order.

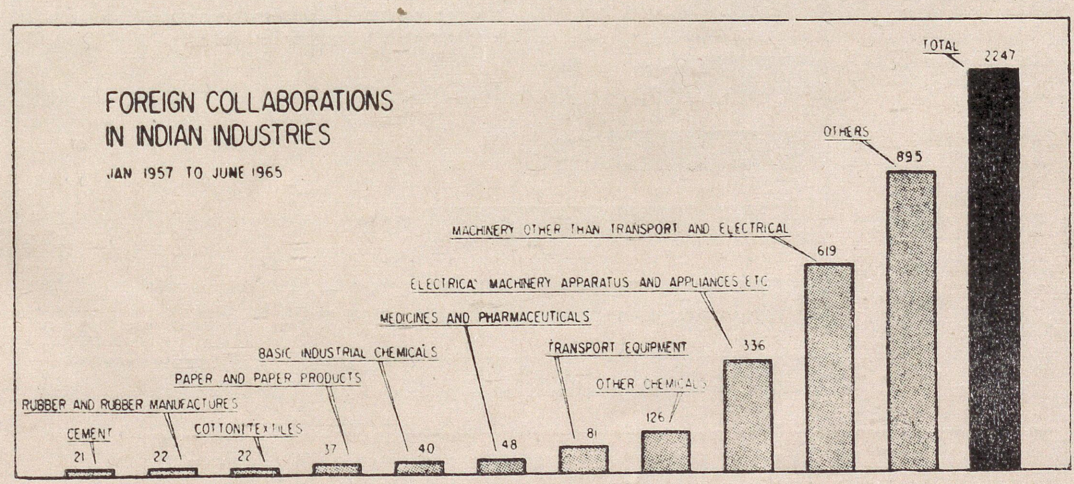
Industrywise, the largest number of agreements have been concluded by companies engaged in the manufacture of machinery other than transport and electrical equipment. Electrical machinery companies came next, followed by chemicals and transport equipment.

This is the fourth survey of "The Economic Times" on foreign collaborations in Indian industries and it covers the period January 1957 to June 1965. The previous surveys appeared in "The Economic Times" dated November 30, 1964, February 10, 1964 and August, 5, 1963. In addition to the first two quarters of 1965, the present study includes the period covered by the earlier surveys also.

While the number of collaborations is dealt with in this study on a census basis for the entire period January, 1957-June, 1965, detailed analysis is presented only in respect of 68 major foreign collaboration agreements concluded during the very recent years by 53 companies.

These 53 companies include the 30 companies covered by the study published on November, 30, 1964, but excludes the 101 companies covered by the study published earlier on February 10, 1964. Totals are however, indicated for all the 154 companies.

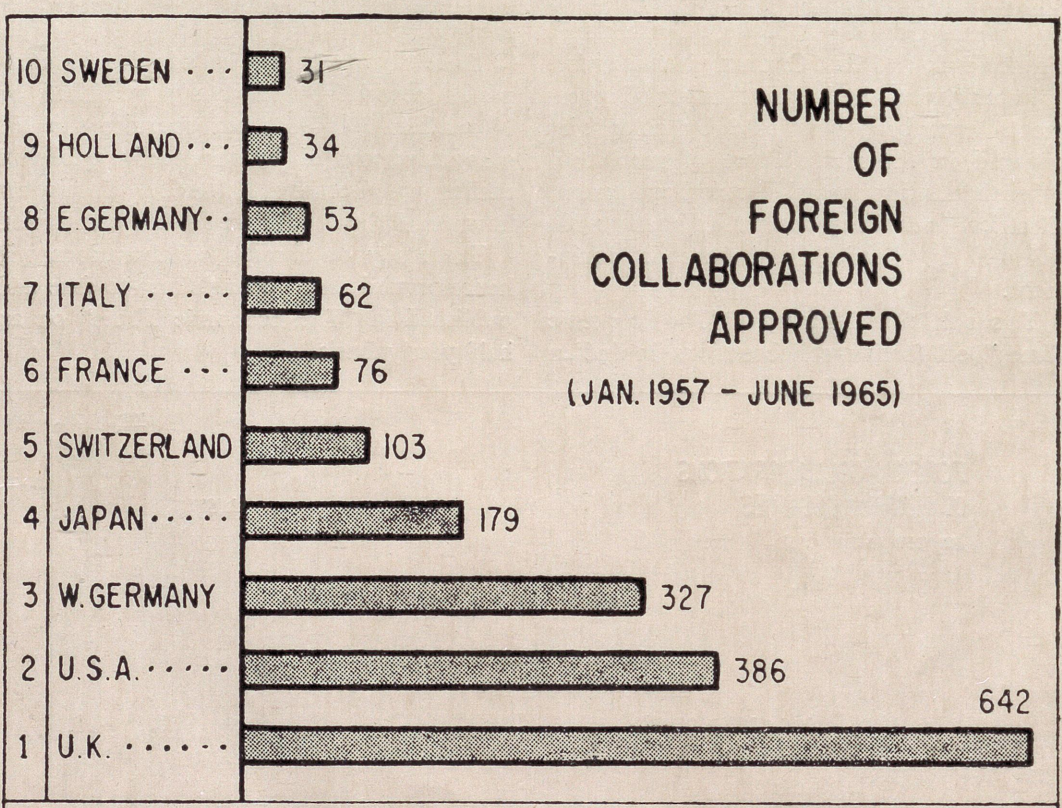
The study on foreign collaborations will henceforward be brought up-to-date and published in "The Economic Times" on an half yearly basis.



Collaborations in 1965: During the first two quarters of 1965, altogether 131 collaboration pacts were approved, as against 403 in the whole of 1964, 298 in 1963 and an equal number, in 1962. It would thus appear (vide Table I page 11) that the rising tempo witnessed in 1964 has been more than arrested in 1965. The substantial concessions allowed in the 1965 Finance Act, are not yet reflected in these data. The decline in the collaboration pacts is also due to the severe foreign exchange stringency which restricts the payment of know how fees, royalty payments, etc. On the one hand, the Government has given tax reliefs to the investing foreign companies, but on the other hand, the Government had necessarily to restrict the payments for know-how etc., keeping in view the adverse balance of payments positions.

The industrywise distribution of the agreements is presented in Table I on page 11 It is evident from the table that engineering and chemical industries account for a major portion of the pacts concluded. There is ample evidence to prove that the Government is nowdays making better scrutiny of the applications for foreign collaborations and exercising better control than during the Second Plan period when a number of collaboration agreements were approved in respect of some old and well-established industries also. During very recent years, the collaborations approved are mostly for new industries which need foreign technological know-how.

The graph on page 7 shows the distribution of the agreements according to industries.



THE RANKING OF FIRST 10 COUNTRIES

Countrywise data : Countrywise analysis of the number of foreign collaborations for the period January 1957 to June, 1965 is presented in Table II on page 12.

Since 1957, the largest number of agreements have been concluded with the U.K. (642); U.S.A. stood second with a wide margin (386) followed by West Germany (327) Japan (179) and Switzerland (103) in that order. Among the centrally planned economies the largest number of agreements have been concluded with East Germany (52); Czechoslovakia stood second (22).

The graph appearing on page 8 shows the ranking of first ten countries according to the number of collaborations for the entire period from January 1957 to June 1965.

Detailed analysis : In the present study, details have been collected and analysed in respect of the 68 agreements concluded by 53 companies. The data presented here are fully dependable, but they are not considered to be representative enough to portray a complete picture of all the agreements concluded. The available information has been processed and presented in Table III on page 12 and Table IV (*on fly sheet*). Similar data for 131 other agreements (101 companies) were published in "The Economic Times" dated February 10, 1964.

Royalty agreements : Among the 68 agreements, details regarding royalty payments are available in respect of 28 agreements, pertaining to 24 companies (vide Table III); no royalty is payable in the case of 33 other agreements. In the case of 7 other agreements, the information is not available.

The details presented in Table III with regard to the terms of payments of royalty reveal that there is very little uniformity between the agreements.

In the majority of companies, however, the royalty is fixed as a percentage of the net sales value of the products manufactured. But, this varied from one per cent, in the case of Mahindra Ugine Steel to 5 per cent in the case of Gujarat Machinery, Hoist-O-Mech, Sussen Textile Bearing and Tractors and Bulldozers. In the case of Sussen Textile Engineering the royalty payable was also connected with the export of goods manufactured by the company.

Capital participation : The participation in equity and preference capital of the foreign collaborators in respect of the 68 agreements concluded by the 53 companies is shown below together with the proportionate share of each country in the total capital issued by all the selected units.

SHARE OF FOREIGN PARTICIPATION IN ISSUED CAPITAL

(68 Agreements: 53 Companies)

(Rs. in lakhs)

Country	**No. of Collaboration agreements (a)**	**Total Issued capital of the companies**	**Foreign Participation**	**(4) as% of(3)**
(1)	(2)	(3)	(4)	(5)
U.S.A.	14 (13)	3536	562	15.9
U.K.	15 (13)	2920	827	28.3
W. Germany	6 (6)	538	199	36.9
Switzerland	3 (3)	301	47	15.7
Others	3 (3)	540	129	23.8
TOTAL	41 (38)	6504(b)	1763	27.1

Note (*a*) Figures in brackets in Column 2 indicate the number of Indian companies concerned.

(*b*) Does not represent the total of Column 3 since the figures of some companies appear against more than one country.

Of the 68 collaboration agreements entered into by 53 companies, 41 agreements involved capital participation from abroad.

The capital participation by West German companies was highest at 36.9 per cent of the issued capital of the concerned Indian companies followed by the U. K. (28.3), U.S.A. (15.9) and Switzerland (15.7).

The share of each country in the capital obtained by the 53 companies is shown in Table below:

COUNTRYWISE DISTRIBUTION OF CAPITAL PARTICIPATION

(53 companies, 68 agreements)

Country	No. of companies	Participation (Rs. lakhs)	% to total
U.S.A.	13	562.1	31.9
U.K.	13	826.5	46.9
W. Germany	6	198.8	11.3
Switzerland	3	47.2	2.6
Others	3	128.5	7.3
TOTAL	38	1763.1	100.0

Of the total amount of Rs. 17.6 crores obtained as capital by the 38 Indian companies, more than 46 per cent was provided by the U.K. collaborators and 32 per cent by U.S.A. companies; West Germany was the only other country which provided a big amount of capital, accounting for 11.3 per cent of the total.

Directorships : In order to study the pattern of directorships the complete details of the 53 companies as well as those of the 101 companies studied in "The Economic Times" dated February 10, 1964, have been clubbed together to obtain a more comprehensive picture, the pattern of distribution thus emerged is shown in the following frequency table :

Total No. of directors			No. of Companies
4	...	...	1
5	...	...	9
6	...	...	24
7	...	...	33
8	...	...	31
9	...	...	28
10	...	...	10
11	...	...	11
12	...	...	3
13	...	...	0
14	...	...	3
15	...	...	1
Total	...	...	154

Among the 154 companies, there were 136 companies which had 4 to 10 directors on the board. There were three companies with 14 directors and only one company with 15 directors. The distribution of foreign directors in these 154 companies is indicated below:

No. of foreign directors*			No. of Companies
None	...	...	62
One	...	...	26
Two	...	...	30
Three	...	...	16
Four	...	...	14
Five	...	...	6
Total	...	...	154

*Residing in India or abroad.

Almost two-fifth of the companies had no foreign directors; among the others the most common practice is to have two foreign directors.

There are six companies which have five foreign directors each and this is the largest number of foreign directors observed in this study.

A few salient features of the agreements are listed in Table IV on *fly sheet.* The issued capital of the companies, the foreign collaborator's participation in the capital and their share in the total are shown in columns 4, 5, and 6, of the table.

Of the total issued capital of Rs. 151.2 crores, shares worth Rs. 34.4 crores have been allotted to foreign collaborators. This forms 22.7 per cent of the capital issued. Among the 53 companies in Table IV, 8 had majority participation by foreign collaborators (i.e. exceeding 50 per cent). This proportion is highest (70 per cent) in the case of Indian Explosives. There were three cases where it was 60 per cent.

The total envisaged project cost of the 154 companies amounted to Rs. 307.0 crores, of which Rs. 34.4 crores was financed by

TABLE I : NUMBER OF FOREIGN COLLABORATIONS — INDUSTRYWISE
(Cases Approved By Government)

		1957	1958	1959	1960	1961	1962	1963	1964	Jan.-March 1965	April-June 1965	Total Jan-June 1965	Total Jan. 1957-June 1965
1.	Plantations	3	6	4	—	—	—	—	—	—	—	—	13
2.	Sugar	4	2	2	—	—	—	1	—	—	—	—	9
3.	Cotton textiles	9	4	3	2	—	1	3	—	—	—	—	22
4.	Jute textiles	1	1	—	1	—	—	—	—	—	—	—	3
5.	Silk & Woollen	—	1	5	2	3	1	—	1	—	—	—	13
6.	Iron & Steel	2	—	1	1	—	—	5	38	4	2	6	53
7.	Transport Equipment	4	4	11	20	6	9	14	9	1	3	4	81
8.	Electrical Machinery, apparatus, appliances, etc.	11	11	12	72	73	44	54	43	9	7	16	336
9.	Machinery other than transport & electrical	8	11	26	107	143	81	88	107	23	25	48	619
10.	Aluminium	1	1	2	1	1	1	—	—	—	—	—	7
11.	Basic industrial chemicals	5	—	4	2	3	3	4	15	2	2	4	40
12.	Medicines and pharmaceuticals	4	10	9	6	3	9	2	4	1	—	1	48
13.	Other chemical products	6	9	14	21	29	18	11	15	1	2	3	126
14.	Cement	3	3	4	3	1	—	4	3	—	—	—	21
15.	Rubber & rubber manufactures	2	3	3	5	3	—	—	6	—	—	—	22
16.	Paper & paper products	2	2	1	9	8	8	1	6	—	—	—	37
17.	Electricity Generation & supply	—	—	3	—	—	—	1	—	—	—	—	4
18.	Trading	4	1	4	2	1	—	2	—	—	—	—	14
19.	Shipping	—	2	1	—	—	—	—	—	—	—	—	3
20.	Banks & Insurance	3	4	3	—	—	—	—	—	—	—	—	10
21.	Others	9	28	38	126	129	123	108	156	23	26	49	766
	Total	81	103	150	380	403	298	298	403	64	67	131	2247

foreign participation (i.e. 11.2 per cent) Column 8 of the table IV gives the details regarding the payment fees for technical know-how.

There are 12 companies which had more than one collaborator.

Type of agreement: In Table V on page 14 a broad classification of the 68 agreements entered into by 53 companies is presented. Out of the 68, there were 41 agreements, which had financial collaborations in addition to technical collaboration. In the case of 56 agreements, provision for training Indian personnel abroad has been made.

TABLE II : FOREIGN COLLABORATION IN INDIAN INDUSTRIES—COUNTRYWISE
(Cases Approved By Government)

		1957	1958	1959	1960	1961	1962	1963	1964	Jan.-March 1965	April.-June 1965	Jan.-June 1965	Total 1957 to June 1965
1.	U.S.A.	6	4	10	61	77	57	67	78	18	8	26	386
2.	U.K.	17	34	52	120	126	79	70	105	14	25	39	642
3.	West Germany	2	6	13	58	67	42	48	68	9	14	23	327
4.	East Germany	—	—	1	5	4	5	10	24	4	—	4	53
5.	France	2	1	2	9	16	14	16	11	4	1	5	76
6.	Italy	4	4	4	9	13	11	6	8	1	2	3	62
7.	Japan	1	3	8	39	30	24	32	35	3	4	7	179
8.	Sweden	1	—	1	13	—	6	1	6	1	2	3	31
9.	Canada	—	1	—	1	3	6	—	3	—	1	1	15
10.	Pakistan	—	2	—	—	—	—	—	—	—	—	—	2
11.	Austria	—	—	1	3	5	4	2	5	—	—	—	20
12.	Czechoslovakia	—	—	—	6	5	1	5	4	—	1	1	22
13.	Holland	1	—	—	6	10	7	4	5	1	—	1	34
14.	Switzerland	—	2	1	13	19	19	19	19	4	7	11	103
15.	Belgium	—	—	2	4	2	4	3	5	—	—	—	20
16.	Yugoslavia	—	—	—	—	1	1	3	2	1	—	1	8
17.	Denmark	—	—	2	6	4	2	3	9	1	—	1	27
18.	Finland	—	—	—	2	1	1	—	—	—	—	—	4
19.	Panama	—	2	1	—	—	—	—	—	—	—	—	3
20.	Poland	—	—	—	1	6	—	3	4	2	—	2	16
21.	Hungary	—	—	—	1	2	2	—	3	—	—	—	8
22.	Others.	47	44	52	23	12	13	6	9	1	2	3	209
	TOTAL	**81**	**103**	**150**	**380**	**403**	**298**	**298**	**403**	**64**	**67**	**131**	**2,247**

TABLE III : ROYALTY PAYMENTS : PARTICULARS OF AGREEMENT

No. (1)	Name of the Company (2)		(3)
1.	Allied International Prod.	..	Royalty equivalent to 3 per cent of the net sale price of the company for all the products manufactured and sold by the company—payable half-yearly.
2.	A. P. V. Engineering Co.	..	(1) 15% on the profits before tax with a minimum of £2000 per annum. (2) Royalty at the rate of 5% (subject to Indian Income-tax) on the company's selling prices less the cost of imported components.

No. (1)	Name of the Company (2)	(3)
		(3) Licencee fee of 5% (subject to Indian taxes) on ex-factory selling prices.
3.	Bharat Forge Co.	Royalty equivalent to 2 per cent (subject to Indian Tax) of company's net sales. If the Income-tax of 50% is increased subsequent to the agreement, royalty shall be increased proportionately.
4.	Batala Engineering.	3% of S. P. for the first 100 machines manufactured and 2% from 101 to 300 and 1% on 301 and above. On export, 6% of S.P.
5.	Bajaj Tempo	(1) Royalty at 3% on the specified price after deducting the value of imported components. (2) (a) Royalty of 2% on the net invoice prices of all aggregates manufactured and distributed and 4% on the value of spare parts manufactured and sold by the company. (*b*) Service charge of 2% on the net invoice price of all aggregate manufactured and distributed by the company.
6.	Chemicals & Fibres of India.	Royalty at 3½% on sales (net invoice value) up to 2,000,000 lb. in any calendar year and charges at 2½% on the next 2,500,000 lb. in any calendar year.
7.	Chemicals and Plastics (India)	A royalty at the rate of 3 per cent of the net realised sales of all PVC and related materials manufactured by the company.
8.	Deepak Industries Ltd.	3 per cent (subject to Indian taxes) on the net ex-works value of the products manufactured under licence.
9.	Deepak Insulated Cable Corporation	An annual royalty of 0.5% on the net sales value.
10.	English Indian Clays Ltd.	No royalty is payable. But under a selling agency agreement, a commission of 5 per cent on the annual net export value of the products of the company.
11.	Graphite India Ltd.	A royalty (subject to Indian taxes) of 2 per cent. on the net sales price for all graphite sold for consumption in India for ten years.
12.	Gujarat Machinery Mfrs.	(*i*) Royalty payments of 5 per cent subject to tax on ex-works selling price of the equipments to be manufactured less all trade discount rebates, packing expenses and freight and transport charges. (*ii*) Royalty of 4 per cent subject to taxes.
13.	Hoist-O-Mech Ltd.	5 per cent. based on the company's gross f.o.b. Bombay invoiced selling price of all Hoists sold and delivered by the company.
14.	Industrial Plants Ltd.	3 per cent on the net sales of the machines less the cost of imported components.
15.	Indian Graphic Arts Equipment	A royalty of 3% subject to tax on the net sales of graphic art machines for a period of ten years. 5% commission on all foreign sales at ex-factory price.
16.	Lakshmi Machine Works	Royalty at the rate of 2.5 per cent on the ex-works price of all machinery to be manufactured under the exclusive manufacturing rights granted to the company.
17.	Mahindra Ugine Steel Co.	1% on the net sales value of the products sold by the company during the first two years commencing from the date when the plant is completed and 0.8% on the net sales value of products for the subsequent eight years subject to tax and further subject to a ceiling of Rs. 20 lakhs.
18.	Shama Pistons & Rings Ltd.	(*i*) 4 per cent subject to Indian tax on the net ceiling value of all pistons and piston pins produced and sold. (*ii*) —No—
19.	Sikands Ltd.	2½ per cent of the net invoiced sales value of the licensed products.

No. (1)	Name of the Company (2)	(3)
20.	Sylvania & Laxman ..	$4\frac{1}{2}$ per cent. per annum on the net sale value of the products.
21.	Sussen Textiles Bearings ..	5 per cent subject to Indian taxes on net ex-works sales on all items except top arms of type ST; 8 per cent subject to Indian taxes on exports to countries permitted by the agreement except on top arms of type ST.
22.	Tractors and Bulldozers. ..	5 per cent subject to Indian tax based on the net ex-works BRNO selling price of the components manufactured in India.
23.	Tiwaç Industries Ltd. ..	(*i*) —No— (*ii*) 0.10 Swiss Francs (ten centimes) on the first one lakh SWITO alarm time pieces manufactured by the company,—payable every six months.
24.	York India Ltd. ..	3% per annum on its net sales.

N.B : Where there is more than one collaboration, the royalty payable to each collaborator has been indicated separately.

Table IV : *see fly sheet.*

TABLE V : CLASSIFICATION OF 68 AGREEMENTS ACCORDING TO TYPE

Type of agreement	U.K.	U.S.A.	W. Germany	Japan	Switzerland	France	Italy	Others	Total
1. Financial Collaboration in addition to technical collaboration	15	14	6	—	3	1	—	2	41
2. Supply of plant and machinery	9	12	7	—	4	1	2	6	41
3. Use of patents and trade marks	11	9	7	—	3	1	2	8	41
4. Deputing technical personnel to India	9	7	6	—	3	1	2	7	35
5. Training Indian personnel abroad	17	16	7	2	3	1	—	10	56
Total number of collaborations @	**20**	**19**	**9**	**2**	**4**	**1**	**2**	**11**	**68**

@The constituents do not add up to this total as a number of agreements fall under more than one type distinguished here.

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TABLE IV : SELECTED DETAILS OF 68 COLLABORATION AGREEMENTS

(53 Companies)

S. No.	Name of the Company	Foreign Collaboration and Country	Period of Collaboration (f) (Years)	Issued Capital (Rs. lakhs)	Participation by foreign Collaborators (Rs. lakhs)	(5) as % of (4)	Envisaged Project Cost (Rs. lakhs)	Payments Towards Know-How & Services (Rs. lakhs)	Whether any Royalty Agreement Concluded
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	*Allied International Products (b, c)	Textron Industries, Inc. Providence, U.S.A.	10	75.0	25.0	33.3	110.0	—	Yes
2.	*Anup Engineering, (b, c, d)	Machinefabrick Reineveld, N.V., Holland	10	30.0	3.0	10.0	69.0	1.0	No
3.	Asian Electronics (b, c)	Avtomacija of Ljublijana, Yugoslavia	6	30.0	—	—	50.0	16.0(a)	No
4.	Arbor Acres Farm India (b, c, d, e)	1) Arbor Acres Farm Inc., U.S.A	5	12.5	6.3	50.4	34.0	15.6	No
		2) International Basic Economy Corporation, U.S.A.	—		—	—		—	No
5.	Andhra Foundry & Machine Co. (b, c)	RHEINSTAHL, W. Germany	—	65.0	—	—	102.0	41.7(a)	No
6.	A. P.V. Engineering Co. (b, c, e)	1) A.P.V. Co., Sussex, U.K.	15	17.0	3.5	20.6	17.0	—	Yes
		2) William Gardner & Sons, Gloucestor, U.K.	5		—	—		0.2	Yes
		3) Thomas Ths. Sabroe Ltd., Denmark	5		—	—		—	Yes
7.	*Bayer India Ltd. (b, c, d)	Farbenfabriken Bayer A.G., West Germany	N.A.	265.0	148.4	56.0	627.1	14.5	No
8.	Batala Engineering (b, d, e)	1) S.P.A. Gatti & C. and Officiana Messanica Farretto, Italy	5	7.4	—	—	162.0	0.6	Yes
		2) Soc. Graziano C. Italy	5	—	—	—		0.3	Yes
9.	Bharat Forge Co. (c)	1) Allison, L. Bayle & Associates, U.S.A.	—	230.0	—	—	470.6	2.1	Yes
		2) The Steel Improvement & Forge Co., U.S.A.	10		5.0	2.2		9.0	Yes
10.	Bombay Steel Rolling Mills (e)	A.J. Gerrad & Co., Illinois, U.S.A.	—	12.1	—	—	24.5	—	—
11.	Bharat Steel Tubes (b, c, d)	Abbey Etna Machine Co., Ohio, U.S.A.	—	120.0	47.1	39.2	305.0	9.5	No
12.	Borax Morarji (b, c, d)	Borax (Holdings) Ltd., London, U. K.	—	30.0	13.5	45.0	65.0	—	No
13.	Bajaj Tempo (b, d, e)	1) Vidal & Sohn Tempo Werk GmbH, West Germany	5	65.3	17.8	27.3	150.0	0.6	Yes
		2) Ziahnrad, Fabrik Fredrishsafew, W. Germany	—		—	—		0.6	Yes
14.	Chemicals & Fibres India (b, c, d)	Imperial Chemical Industry London, U.K.	10	250.0	150.0	60.0	585.0	26.7	Yes
15.	*Chemicals and Plastics India, (c, d)	B. F. Goodrich Company, Ohio, U.SA.	10	150.0	34.4	22.9	338.9	—	Yes
16.	Cochin Refineries (b, d)	Philips Petroleum Co., U.S.A.	—	700.0	175.0	25.0	2275.0	1292.8	No
17.	Coromandel Fertilizers Ltd., (c, e)	1) California Chemical Co., U.S.A.	10	849.0	58.2	6.8	3247.0	—	—
		2) International Minerals & Chemicals Corporation, U.S.A.	10		51.6	6.1		—	No
		3) E. I. D. Parry Ltd., London U.K.	—		6.4	0.8		—	No
18.	Cominco Binani Zinc Co. (b, c)	Consolidated Mining & Smelting Co., Canada	10	210.0	84.0	40.0	495.0	52.5	No
19.	*Deepak Industries Ltd. (b, c)	John Holroyd & Co., Lancashire, U.K.	10	35.0	—	—	87.0	—	Yes
20.	Devidayal Cable (b, c)	Barron & Grouther (Export) S.A. U.K.	—	37.5	—	—	97.0	—	No
21.	Deepak Insulated Cable Corporation (c)	Farukawa Electric Co., Japan	5	30.0	—	—	60.0	0.4	Yes
22.	Devidayal Tube (c, d, e)	Delta Metal Co., U.K.	10	125.0	32.0	25.6	183.4	—	—
23.	*English Indian Clays (b, c)	English China Clays, Cornwall, U.K.	10	30.0	15.0	50.0	50.0	—	No
24.	Everest Refrigerants (b, c)	Technical Enterprises, U.S.A.	—	60.0	10.0	16.7	120.0	57.6	No
25.	*Graphite India Ltd. (b, c, d)	Great Lakes Carbon Corporation, Delaware, U.S.A.	10	125.0	25.0	20.0	346.0	—	Yes
26.	*Gujarat Machinery Mfrs.	1) Nikex, Hungarian Trading Company, Budapest, Hungary	10	40.0	—	—	90.7	3.2	Yes
		2) CEKOP, Poland	6	—	—	—		2.5	Yes
27.	Hindustan Polymers (c, d, e)	1) Universal Oil Products Co., U.S.A.	—	300.0	—	—	635.0	17.5	No
		2) B. X. Plastics Ltd., U.K. (This is a wholly owned subsidiary of Bakelite XYlonite Ltd., U.K.)	—		20.0	6.7		20.0	No
28.	*Hoist-O-Mech (c, d)	Munck International, Norway	7.5	35.0	—	—	51.8	0.9	Yes
29.	Hindustan Ferrodo Ltd., (c, d)	Turner & Newall Ltd., Manchester, U.K.	5	386.5	198.3	51.3	291.5	—	—
		Subsidiaries :							
		1) Ferrodo Ltd.	5					1.1	—
		2) Turner Brothers Asbestos	5					0.7	—
		3) J. W. Roberts	5					0.1	—
		4) Turner Asbestos Cement	5					0.1	—
30.	*Industrial Plants (c)	Hitachi-Seiki, Japan	10	75.0	—	—	135.0	1.4	Yes
31.	*Indian Explosives (b, c)	Imperial Chemical Industries U.K.	10	343.0	240.0	70.0	121.5	1.5	No
32.	*International Tractors (d)	International Harvestor Co., U.K. (A subsidiary of International Harvestor)	N.A.	150.0	25.5	17.0	437.5		—
33.	Indian Graphite Arts Equipment Co. (c)	Michel-Goss, Dextar, U.S.A.	—	30.0	15.0	50.0	70.0	1.5	Yes
34.	International Computors Tabulators India Mfg.	International Computors & Tabulators, London U.K.	5	50.0	30.0	60.0	71.7	—	No
35.	Lakshmi Machine Works (b, d)	Rieter Machine Works, Switzerland	—	250.0	30.0	12.0	595.0	—	Yes
36.	Mysore Electro -Chemicals (b, c)	Accumulatoren-fabrik, Sonnenschein, GmbH, W. Germany	10	35.0	5.0	14.3	40.0	—	No
37.	Mahindra Ugine Steel (b, c, d)	Ugine, France	10	300.0	41.5	13.8	650.0	30.9	Yes
38.	Mohatta & Heckel Ltd. (b, c, d)	George Heckel Gmb H. W. Germany	—	65.0	10.0	15.4	125.0	—	No
39.	*Mysore Acetate & Chemicals (b)	1) Vonkohorn Universal Corporation U.S.A.	N.A.	225.0	58.5	26.0	415.0	198.2(a)	No
		2) Aktiebolaget Che. matur, U.K.	N.A.		9.5	4.2		41.0	No
		3) Transoceanic Engineers, Texas, U.S.A.	N.A.					11.4	No
40.	Premier Cable Co. Ltd. (c, d)	VEB Kabel Work, Oberspree, Berlin, G.D.R.	10	70.0	—	—	120.0	10.5	No
41.	Rockwell India Ltd. (b, c, d)	Rockwell International S.A., Switzerland	—	30.0	15.0	50.0	51.9	—	No
42.	*Shama Pistons & Rings Ltd., (b, c, d)	1) Karl Schmidt, West Germany	10	48.0	2.0	4.1	91.7	—	Yes
		2) SIM. SA of Morges, Switzerland	7					—	No
43.	*Sikands Ltd. (c, d)	Rubery Owen & Co. Ltd., Darlaston, U.K.	5	30.0	—	—	54.0	0.7	Yes
44.	*Scottish Indian Machine Tools (c, d)	Scottish Machine Tool Corporation, Glasgow, U.K.	10	64.0	25.6	40.0	105.0	1.8	No
45.	*Sylvania & Laxman (b, c, d)	Sylvania Electric Prod., New York, U.S.A.	N.A.	80.0	36.0	45.0	200.0	4.6	Yes
46.	*Sussen Textile Bearings (c, d)	Spindelfabriks, Sussen, Schurr, West Germany	10	60.0	15.6	26.0	200.0	9.0	Yes
47.	Sri Ramkrishna Steel Industries (b, e)	Lepage Consulting Engineers (Bureau Technique Lepage & Co. (SA), (Belgium)	—	50.0	—	—	135.8	2.3	No
48.	Simon Carves India (b, c, d)	Simon Carves Ltd., U.K.	—	60.0	36.0	60.0	60.0	—	No
49.	*Teclamit (Hind) (b, c, d)	Teclamit Ltd., U.K.	5	40.0	21.2	53.0	40.0	—	No
50.	*Tiwac Industries Ltd. (b, c)	1) Haesler Sales, (Adam Eng. Co.), London, U.K.	N.A.						
		2) Louis Schwab S.A., Montier, Switzerland	N.A.	21.0	2.2	10.5	39.5	—	Yes
51.	*Tractors & Bulldozers (c, d)	1) Motokov, Czechoslovakia	N.A.	50.0	—	—	90.0	—	Yes
		2) Z. J. Svermy National Enterprise, Czechoslovakia	N.A.	—	—	—	—	—	No
52.	*Usha Forgings & Stampings (b, c, d)	Technoexpert, Praha, Czechoslovakia	N.A.	25.5	—	—	56.9	2.0	No
53.	York India Ltd., (b, d)	Borg-Warner Corporation & Borg-Warner International Corporation, U.S.A.	—	30.0	15.0	50.0	51.0	—	Yes
	TOTAL (53)			**65,03.8**	**17,63.1**	**27.1**	**150,96.0**	**19,04.4**	
	TOTAL (1017) (p)			**86,13.6**	**16,80.8**	**19.5**	**156,08.1**	**7,34.8**	
	GRAND TOTAL (154)			**151,17.4**	**34,43.9**	**22.7**	**307,04.1**	**26,39.2**	

Note :—(*a*) Includes payments for supply of machinery;
(*b*) Agreement with foreign collaborators for supply of machinery;
(*c*) Agreement for training Indian personnel abroad;
(*d*) Agreement to use the patents and trade marks of the collaborators;
(*e*) Available information incomplete;
*Added subsequent to the previous study.
(*f*) In this column "—" and "N.A." indicate "not available".
(*p*) Pertains to the 101 companies published in the E.T. dated February 10, 1964.

Budapest Symposium and the 8th General Assembly of the World Federation of Scientific Workers

(From a Correspondent)

It may be recalled that the World Federation of Scientific Workers (WFSW) was founded in 1946 to bring together scientists and scientific organisations from different countries. It was formed to promote the interests of scientists and the use of science for human welfare. The WFSW has consultant status B with UNESCO. The Association of Scientific Workers of India (ASWI) formed in 1947 with Shri Jawaharlal Nehru as its Founder President has been affiliated to WFSW since its very beginning. The World Federation holds its General Assembly meetings every 2-3 years and the meetings of its Executive and Bureau in-between . On the occasion of the Assembly, the WFSW organises an International Symposium. Six such Symposia have been held in the past.

The 8th General Assembly of the World Federation met at Budapest from September 24-26, 1965. Preceding the General Assembly, as has been the practice, a Symposium on "Problems of advancement of Science and Technology in developing countries and the role of international cooperation" was also held from September 20-23, 1965. Over 200 delegates from over 50 countries including those from Latin America, Asia and Africa participated in the Symposium. Observers from UNESCO and WHO were also present, the former also made a grant of $ 3,000 for the Symposium. The Indian delegation originally scheduled to comprise fifteen had to be limited to only four in view of the national emergency. (Appendix I). A total number of 60 papers from different countries on various aspects of the subject were presented, of these 14 were from India.

After the Plenary Session, where invited speakers delivered their papers, the Symposium divided into three sections. In the latter, the papers were read and discussed. The broad lines for further action which emerged from the symposium were finally discussed and reports from Chairman of each section, in the Closing Session. The papers could be generally divided in three categories:

1. General papers, discussing features of developing countries and problems of international collaborations.
2. Specific papers on specialised topics discussing issues in a scientific manner and suggesting possible solutions.
3. Political papers.

The Indian contribution was in the second category, the Chinese had not sent any papers in advance and theirs belonged to the last category.

The Chinese Delegation of 17 persons submitted only three reports at the Symposium. These were in the nature of political theses. The Chinese were opposed to the holding of the Symposium throughout its period of preparation of three years.

First they wanted a change in the topic of the Symposium. Then they vigorously opposed any financial help from the U. N. agencies and their participation in the Symposium as observers. The ASWI had proposed to the World Federation that the Symposium be held in India but the Chinese successfully blocked this proposal with support from the West European scientists mainly from U. K.

The Chinese had not participated in the Preparatory work. They did not inform the hosts about their participation until the very last moment. In the Bureau and the Presidium meetings the Chinese obstructed proceedings at all levels and attempted to centralise all discussions around Viet Nam.

At the inaugural plenary session, Chang-Wen-Chi from China read out a political thesis on advancement of science through "fight against U.S. imperialism and Soviet revisionism." He attacked India for its "aggression" against Pakistan and the U.S.-Soviet collusion in helping India in this matter.

The Indian delegate, Shri A. Rahman, before he read Dr. S. Husain Zaheer's paper in the Plenary Session, took the opportunity of making a statement in replying to the Chinese, pointing out the contradictions in their professions and actions. It was emphasised that while they were exploding atom bombs, the Indian Prime Minister had categorically stated that India would use atomic energy only for peaceful purpose. He also drew attention of the assembly to the recent Chinese ultimatum and the facts of Pakistan's aggression. The Indian delegation's emphasis was, however, on sticking to the scientific aspects of the Symposium and appealing to people not to make the Symposium a political forum.

The dignified and positive approach of the Indian delegation had the desired effect on the audience. The Indian delegation further developed this approach in the sectional meetings where the quantity and quality of their papers and contribution at the floor, evoked considerable appreciation of their positive role and understanding of the problems of development of the countries in Asia and Africa. The UAR delegate spoke highly of Indian scientific development and of the need for further Indo-UAR cooperation to help other countries.

Dr. V. B. Singh replied to the Chinese allegation of famine deaths in India. While presenting his paper in a technical section he produced figures of India's agricultural production which had nearly doubled itself during the last 20 years. He went on to say that the Chinese were trying to equate facts with deceitful propaganda in their wishful thinking.

The Soviet Delegate also replied to the Chinese allegations but appealed to the participants to stick to the subject of the Symposium.

A significant feature of the Symposium was the rebuke earned by the Chinese delegation from Prof. Powell, Chairman of the Conference, who remarked :

> "The Chinese tendentious attacks which go widely outside the generally accepted limits imposed by good manners......(they) are thus brought into greater danger of being held in general contempt."

General Assembly :

The 8th General Assembly of the Federation met after the Symposium from Sept. 24-26, 1965. Its deliberations were divided into six Commissions :

1. Finance, Budget, Procedures.
2. Economics.
3. Disarmament.
4. Publication.
5. Vietnam.
6. International Cooperation.

Of about 20 items on the agenda, discussion centred round the report of the Secretary General, scientists and disarmament, and aid to Viet Nam. Speaking during the general discussion, Chou-Pei-Yuan from China read out his political thesis. In this document he repeated his catch phrases like U.S. imperialism, Soviet revisionism, Indian aggression and expansionism. Many delegates raised points of order but the Chinese started shouting. The Chairman declared that he had lost control of the meeting and Chou went on for 55 minutes against the allotted time of 15 minutes.

The Chinese behaviour was resented by all delegations. Chairman Powell at first tried to pass over the incident but later issued a statement against it. He expunged Chou's entire speech from the proceedings and reiterated that the Chinese by their uncivilised behaviour had brought themselves in contempt at the Assembly. He praised the restraint shown by the Indian and Soviet delegations in the face of severe provocations. He further ordered that any further violations of the rulings of the Chair will be followed by immediate suspension of the meeting and switching off the electric current in the Hall. In one day this had to be done three times amidst shouts of "shame" "Chinese go home" and "Boos" when the Chinese speakers tried to act against the Chair's decisions.

The deliberations of the General Assembly showed once again the slogan mongering of the Chinese. The positive role of the Indian delegation was evident from the second statement of the Chairman, Prof. Powell, who condemned the Chinese behaviour as uncivilised and said that they by their action have earned the contempt of the scientific community. He said that the Chinese had made a concerted attempt to wreck the Conference and the Federation and praised the Indian delegation for its restraint and positive contribution.

The election of Dr. S. Husain Zaheer as one of the Vice-Presidents and Dr. N. P. Gupta as member of the Executive Council, is an indicator of the success of the work of the delegation.

The six commissions set up by the General Assembly held prolonged discussions on resolutions. There was little controversy in the commissions on

(*i*) Economic conditions of scientists
(*ii*) Finance, Constitution and Regional Centres
(*iii*) Publications

and the reports and resolutions were mostly adopted unanimously. A new Regional Centre of the World Federation was announced at Cairo. This Centre would look after the World Federation's activities in Africa. It may be recalled that Regional Centres of the WFSW exist in India, China and Prague (Czechoslovakia).

The Chinese opposed the very concept of international cooperation and proposed the thesis, which was later tabled as an alternate resolution by the Albanian delegate, that aid from imperialist countries instead of promoting science and technology had just the opposite effect and hence must be resisted. They cited India as a classic example of the ruinous effect of such aid. They further emphasised that aid through U.N. agencies had the same effect.

Shri A. Rahman emphasised the role of international cooperation and suggested that every country must build up its potential to fully utilise such aid and the need of a study by the WFSW to examine the effect of technical aids on various countries.

The Commission on "War danger, disarmament and allied problems" evoked intense discussions both in the Commission meetings and in the Assembly. Five drafts were presented. Finally a sub-committee drafted a resolution deleting all reference to U.S. Imperialism. Several Indian amendments were also incorporated (appreciating the role of countries which have refused to make atomic weapons and welcoming the cease-fire between India and Pakistan). This resolution was bittterly opposed by the Chinese both in the Commission and in the Assembly, but the Assembly passed it by an overwhelming majority.

A long discussion also took place on the recommendations of the Commission on practical steps to aid Viet Nam. Apart from ideological support, there was little of practical value in the resolution. Some participants even frankly commented that many delegates were only keen to get their ideological position reflected in the resolution on Viet Nam. Dr. Gupta of the Indian delegation commenting stated that he agreed with demand for stoppage of bombings of North Viet Nam, withdrawal of all foreign troops and peace and freedom for Viet Namese people. On the resolution itself, the Indian, British and the French delegations abstained.

At the international front, the Association of Scientific Workers of India has been engaged in explaining the science policies of our country aimed at peaceful co-existence, prohibition of nuclear weapons and international cooperation for peace and prosperity. Now a heavy responsibility rests on the Association. In its task of countering Chinese and Pakistani propaganda among the scientists, the ASWI needs better resources and support from all sides. The Indian Scientific Workers will do their bit in the Service of the Nation in India and abroad.

APPENDIX I

1. Dr. N. P. Gupta
2. Shri A. Rahman
3. Shri Y. R. Chadha
4. Dr. V. B. Singh

SCIENCE IN PARLIAMENT

Indian Scientists

About 50,000 Indians with postgraduate qualifications in science are employed in the country. The number of similar qualified Indians employed abroad is estimated to be about 1000. Fiftytwo scientists have gone back to foreign countries after joining the Scientists' Pool, some for advanced study or research, some for employment and others for personal or family reasons. This information was given by the Deputy Minister for Education Dr. (Mrs.) T. S. Soundaram Ramchandran in the Lok Sabha in reply to a question by Shri P.C. Barooah on September 15, 1965.

The Deputy Minister stated that considering the level of expansion in postgraduate and doctoral degrees in scientific and technical subjects during the Fourth Plan, the Working Group for Scientific Research in the Council of Scientific & Industrial Research has recommended for the consideration of Planning Commission a provision for Rs. 45 million for the Scientists' Pool, Rs. 60 million for fellowships in National Laboratories, universities, etc. and Rs. 18 million for grants-in-aid to research.

Pilot Plant for Cement

In reply to a question by Shri Raghunath Singh, the Deputy Minister for Education Dr. (Mrs.) T. S. Soundaram Ramchandaran told the Lok Sabha on September 15, 1965 that the Regional Research Laboratory, Jorhat has designed the layout of pilot plant costing about Rs. 20 lakhs for cement manufacture. The proposal to set up the plant is under consideration. The process consists in nodulizing a suitable mix of finely ground lime-stone, clay and coal and sintering it in a vertical kiln. The air necessary for combustion is provided from the bottom of the kiln. The top three feet is the sintering zone. The fuel in each of the nodule burns and provides the necessary heat for reaction between lime-stone and clay. The cement clinkers are discharged through a rotary grate by an air locking system.

Pilot Plant for Protein Manufacture

A bench-scale unit for the manufacture of protein from petroleum products is expected to go into operation in October, 1965. Disclosing this in the Lok Sabha in reply to a question by Shree Narayan Das on September 15, 1965, the Deputy Minister for Education, Dr. (Mrs.) T. S. Soundaram Ramchandran stated that trials abroad have shown that protein concentrates produced from petroleum products have been beneficial to cattle and when mixed with cattle feed have no toxic or deleterious side-effects, either on the cattle or on persons who consume the milk. Consumer acceptability tests are proposed to be undertaken.

Outlay for CSIR

In reply to a question by Shrimati Maimoona Sultan, the Deputy Minister for Education Dr. (Mrs.) T. S. Soundaram Ramchandran told the Lok Sabha on September 15, 1965 that the Working Group for Scientific Research in CSIR at its meeting held on July 23-25, 1965 considered the detailed research programmes and the financial requirements of the Fourth Five Year Plan proposals of CSIR which were estimated at Rs. 220 crores. On the basis of the recommendations made at the Working Group meeting, the requirements of CSIR for the Fourth Five Year Plan would be assessed and submitted to the Planning Commission for consideration.

Structural Engineering Research Centre

The Deputy Minister for Education, Dr. (Mrs.) T. S. Soundaram Ramchanadran affirmed in the Lok Sabha on September 15, 1965 in reply to a question jointly tabled by Shri P. R. Chakravarti and Shrimati Savitri Nigam that a Structural Engineering Research Centre has been established by CSIR at Roorkee by bifurcating the Central Building Research Institute. The Centre would develop as a research school for specialised design and development work in structural problems connected with buildings, bridges and other structures. The centre would also offer consulting service to organizations in the public and private sector.

Activated Carbons

A prototype semi-commercial plant for the manufacture of activated carbons was commissioned in Hyderabad on June 19, 1965. Disclosing this in the Lok Sabha in reply to a question by Shri Ram Harakh Yadav on September 8, 1965 the Deputy Minister for Education, Dr. (Mrs.) Soundaram Ramachandran said that this 2-tonne per day capacity plant, designed by the Regional Research Laboratory, Hyderabad and fabricated locally will have a production rate of 500 tonnes this year. Activated carbons with a wide range of applications can be produced in this plant. Experiments conducted on this plant would provide useful data for designing commercial plants. The production from the plant may replace the activated carbons at present imported.

Teaching of Mathematics

The Deputy Minister for Education, Shri Bhakt Darshan made a statement in Lok Sabha on September 22, 1965 regarding teaching of mathematics at the college and university level in reply to a question by Shri Bagri. He stated that the Chairman of the University Grants Commission advocated from time to time the need to strengthen the teaching of mathematics at the college and universiy level. The University Grants Commission accordingly set up a Review Committee for mathematics in 1959 and an Expert Committee of mathematicians in 1964.

The Syllabii recommended by the Review Committee have been recommended to all universities. The Expert Committee has circulated the following suggestions to universities—"The contents of the courses in mathematics should reflect the vast and revolutionary changes in progress at the present day. While they should provide for the introduction of newer disciplines and concepts, they should also aim at teaching the old subjects with necessary shift in the emphasis on modern aspects to enable students to gain a deeper understanding of the subject. The changes introduced should be gradual and continuous.

In the Higher Secondary (XIth Class) and the Pre-University class, mathematics should be compulsory for all students irrespective of whether they are to go in for science, engineering, medicine or agricultural courses. The syllabus in mathematics should be modernized by introducing sets and number systems including basic laws of algebra, relations, functions and graphs; elements of statistics; elementary trigonometry; the course in geometry should only include a few theorems on similar triangles and a few theorems of solid geometry. It is highly desirable to introduce the student to elements of analytical geometry.

In this first degree stage, (B.A. or B.Sc.)

the compulsory papers should consist of modern algebra, and analytical geometry. Topology may be introduced in the honours classes. The optional papers may be in different special disciplines of pure and applied mathematics. The courses in modern algebra should include groups, rings, vector spaces and matrices. The courses in geometry should include analytical geometry of two and three diamensions and homogeneous co-ordinates. The student should take a major subject in mathematics and two ancillary subjects (related to mathematics).

At the post-graduate stage, functional analysis and measure theory and higher topics in modern algebra should be compulsory. Non-Euclidean and other geometries should be studied. The distribution of load between compulsory papers and optional papers should be equal. The optional papers may be in either pure or applied mathematics.

Finally, the system of examinations should be changed, so that somester (or a term) be taken as a unit. The somester system allows a wide latitude in the choice of courses and it makes the students more hard-working and serious in their studies.

The Deputy Minister stated that it is for the universities which are autonomous bodies to give effect to the suggestions.

ASWI Activities

Bureau of the Central Executive Committee

At a meeting of the Bureau of Association of Scientific Workers of India held on 7th September 1965, the following resolution was adopted :

"The members of the Association of Scientific Workers of India have been deeply stirred by the perfidious Pakistani attack on our country. The Association has always championed the cause of peace among nations so that fruits of scientific effort could be fully utilised for welfare of humanity. But there can not be peace at any price. Liberty and freedom have to be preserved. Only then nations can live in peace.

The Association of Scientific Workers of India assures its wholehearted support to the Government in all the efforts required for the defence of the country. The Association asks its members to be at their posts, work still harder and make greater scientific and personal efforts to make the Army and the Nation strong. The Association offers its active and full participation in all civil defence measures that may be required to protect the civilian population and to maintain communal harmony.

The Bureau of the Association directs all branches, units and members to actively participate in and initiate if necessary, all civil defence measures being organised in their localities. Contacts should be established with civil defence authorities and services of scientist members placed at their disposal for any specialised duties. Active steps should also be taken by ASWI units and members for collection of funds and donation of blood."

* * *

Jamshedpur Branch

The Jamshedpur Branch of the Association of Scientific Workers of India has now successfully completed twenty months of existence. The fact that the current membership of the Branch stands at 165 out of a total strength of about 250 qualified scientific workers of the National Metallurgical Laboratory, is a solid proof of the sustained interest and confidence it has been able to create amongst its members. The strength of the Association and its future depend largely on a sense of belonging that the Association can create in its members. In order to achieve this sense of belonging, it is naturally necessary that the members are kept in constant touch with the activities of the Association both at the centre and at the local branch. "Vijnan Karmee", the Association's official journal has, in the recent past, been greatly stream-lined and is now reaching the members directly from the office of the General Secretary (Publications), New Delhi. Apart from containing articles of scientific and professional interest, "Vijnan Karmee' also focuses attention on the current problems of scientific workers of our country in general and is serving a useful role in keeping the members informed of the activities at the centre. While one would not underestimate its valuable contribution in the larger context, the natural eagerness of the members to know more about matter that directly concerns themselves and their branches in every day life, cannot also be overlooked. It is with this sense of bringing about a closer contact amongst members on one hand and amongst members and the organisation on the other, that the Executive Committee of the A.S.W.I.J. decided to issue periodic News Bulletins to its members and constituted a Sub-Committee consisting of Mr. T. V. Prasad as Convenor, Miss Shipra Samanta and Mr. S. K. Banerjee as members to manage the News Bulletin.

The inaugural issue of the News Bulletin was out in August 1965.

The other activities of the Jamshedpur Branch of ASWI include the consideration of the following problems and the action taken by the Branch :

Pay scales of Senior Scientific/Technical Assistants in C.S.I.R. Laboratories :

The retrograde revision of the pay scale of S.S.A./S.T.As. consequent to the implementation of the last Pay Commissions report and the dissatisfaction it caused the scientific workers, were brought to the attention of the authorities concerned through resolutions passed by the Executive Committee and subsequently by the General Body of the Jamshedpur Branch. The resolutions suggested that the present pay scale of Senior Scientific/Technical Assistants should be replaced by a new scale of Rs. 350-25-800. Our representatives to the Central Council Meeting of A.S.W.I. held in March '65 in New Delhi further pursued this matter, as a result of which the Council had passed a resolution to this effect and it is understood that this issue is being taken up by the Central Executive Committee of the A.S.W.I. with the C.S.I.R.

Review of cases of scientific workers for promotion after five years of service in a particular grade :

The undue time lag between the acceptance by C.S.I.R., in principle, the policy of giving promotions to scientific workers after five years of service and its implementation was pointed out by the Executive Committee to Mr. M. C. Chagla, Union Education Minister and Vice-President of C.S.I.R., when he last visited Jamshedpur, and he was requested that this principle should be implemented immediately for promotion of scientific workers from Senior Laboratory Assistant to the Director. The Vice-President had kindly agreed to look into the matter and take necessary action. The Central Council of the A.S.W.I., too, in a resolution passed in March, 1965, requested the C.S.I.R. to expedite this matter. It is now understood that the C.S.I.R. in turn, moved the Finance Ministry, Govt. of India, which has since approved that the principle can be applied for promotion of scientific workers in C.S.I.R. Laboratories up to the level of Scientist (Rs. 400-950) i.e. for promotions upto Scientist (Gr. Rs.700-50-1250).

Central School for children of Central Govt. employees :

In view of the hardships faced by the Central Govt. employees stationed at Jamshedpur, regarding the education of their children, a request was made by the Executive Committee in a Memorandum submitted to the Union Education Minister and Vice-President of C.S.I.R., Mr. M. C. Chagla, that the Government should start a Central School at Jamshedpur on similar lines to those provided for Central Government Employees in some other cities. It is learnt that the Education Minister has conceded to this request and requested the Director , N.M.L. for taking necessary steps in this direction. The A.S.W.I.J. extends its full support and co-operation to the Director and hopes that with his dynamism and influence he has with the steel town authorities, the idea of a

Central School will become a reality in the near future.

Educational programme of A.S.W.I.J.

The programme of conducting classes for helping scientific staff of N.M.L. who are desirous of appearing for the Associateship examination of the Indian Institute of Metals was initiated by A.S.W.I.J. last year. It is encouraging to note that from the first batch of participants in this programme, seven persons have appeared for Part I of the A.I.I.M. Examination held in June 1965.

On the basis of experience gained in last year, certain modifications in the programme have been made this year to suit the candidates convenience and needs. An important aspect of this year's programme is the special attention envisaged for the Engineering Drawing. The number of classes for this subject has been increased. The help and guidance received by the A.S.W.I.J. from Shri M. J. Shahani Scientist, N.M.L. and his colleagues in drawing out a well arranged programme of classes for Drawing have been very valuable and A.S.W.I.J. takes this opportunity to express its sincere gratitude to them. The Basic Metallurgy programme also has been considerably rearranged to make the classes interesting and useful to the candidates. In all twenty-five classes in Drawing and thirty classes in Basic Metallurgy have been planned for this year. The Director, N. M. L. in his usual way has extended his support to the educational programme of A.S.W.I.J. by kindly according his permission for holding the classes within the working hours. This is, it is felt by one and all, a very healthy sign of encouragement and recognition of the useful purpose, which the A.S.W.I.J. is pursuing for the enhancement of professional status of its members.

Election of Acting President

Consequent on the resignation of our President Shri H. V. Bhaskar Rao from his responsibility as Scientist, N. M. L. and his leaving Jamshedpur, the Executive Committee of A.S.W.I.J. which met recently, unanimously elected Mr. T. V. Prasad, one of the Vice-Presidents of A.S.W.I.J. to act as President for the rest of the term.

Shri Bhaskar Rao has since sent his resignation from the Presidentship of A.S.W.I.J.

(*Contd. from page 5*)

control of the Japanese technology and screens out cases where technology is already available in the country. It is this firm handling of the policy to develop self-sufficiency which has brought Japan to the high level where it is today. India will have to take a lesson from Japan for an energetic policy of self-dependence by mobilisation of its total resources in science and technology to aid industrial development and give industry a national infra-structure for future growth and development.

NEWS ROUND UP

Shanti Swarup Bhatnagar Memorial Awards

The Shanti Swarup Bhatnagar memorial awards for outstanding work in the fields of physical, chemical, biological, engineering and medical sciences for 1963 and 1964 have been announced.

The recipients are:

1964—Dr. A. R. Verma (physical sciences), Dr. Sukhdev (chemical sciences), Dr. D. S. Athwal (biological sciences) and Dr. B. R. Nijhawan (engineering sciences).

1963—Dr. R. Ramanna (physical sciences), Dr. B. D. Tilak (chemical sciences), Dr. J. J. Ganguly (biological sciences) and Dr. Brahm Prakash (engineering sciences).

The 1963 award for medical sciences, made every two years, is shared by Dr. S. H. Zaidi and Dr. B. K. Anand.

* * *

Scientists' Promotion

The CSIR has adopted a new principle of promotion to provide incentive and encouragement to scientists of ability and remove frustration among those who get clogged for want of vacancies in the next higher grade.

The work of the scientists in all grades below that of Assistant Director will now be assessed once in five years and any scientist who has done good work will automatically be promoted to the next higher grade without depending on any vacancies in posts.

However in the case of a scientist in the grade of Rs. 700-1250, the five-year assessment rule will apply only when the scientist after the completion of five years is at the maximum of the scale of pay of his grade for at least one year.

In respect of those up to the level of Rs. 700-1250 grade, the assessment may be done even before five years on the completion of one year's service at the maximum of the grade.

The advantages of the new schemes are that the promotion does not depend on vacancies in the next higher grade and that scientists with good record need not look for jobs outside CSIR.

* * *

Gemini Five broke all previous records in space flight

United States of America launched a spacecraft Gemini Five in the orbit on August 21, 1965. The spacecraft took off from Cape Kennedy with Astronauts Gardon Cooper and Charles Conord on board. The bell shaped Gemini craft wighed 3.5 tons and two stage Titan II rocket propelled it into the orbit.

The fuel cells used in the spacecraft comprised of a device in which hydrogen and oxygen are brought together and the reaction produces electricity and water. The electric power produced by these cells was of the order of 2 kilowatts.

After completing the man's longest space journey that took them 5.3 million kilometres in 7 days 22 hours and 56 minutes, the two Astronauts returned safely to the earth. They flew 120 times around the world and also covered about 960 kilometres in the 121st revolution. The Astronauts did not feel any ill effects from the prolonged weightlessness. The flight has demonstrated that man can stay well in space for 8 days, the time needed to go to the moon and return.

An other experiment conducted during the flight was the rendezvous with an other flight in the orbit. The Astronauts carried an 80 pound cluster of electronic boxes called Rendezvous Evaluation pod which was thrown from the spacecraft as an independent satellite.

Then with the aid of radar and a computer, the Astronauts steered the spacecraft towards the pod, which was equipped with high intensity flashing lights and a radar transmitter. The transmitter activated by radar signal from the spacecraft sent radar impulses of its own back to the spacecraft. The Gemini Computer provided immediate information on the direction and speed of the pod, its distance from the spacecraft and the rate at which the distance was changing.

* * *

Ten Point economic programme outlined by Federation of Indian Chamber of Commerce and Industry

The FICCI gave to the Finance Minister and the Parliament a ten-point programme for strengthing the country's defence and economy.

The Federation appealed to the Government to take industry and business into confidence for augmenting the country's defence potential. The Federation recommended a constructive programme to overcome the country's difficult position.

The ten suggestions are :

(*i*) The capital market should be revived immediately by doing away with the psychological inhibitions associated with some of the tax on bonus shares, the super profits tax and so on;

(*ii*) The wide range of controls on prices, production and intercompany investment should be removed.

(*iii*) Production should not be allowed to suffer for lack of finance.

(*iv*) Rural savings should be attracted to industry.

(*v*) The increase in the import duties as proposed in supplementary Budget will place additional burdens on industry. The impact of increased duty on the price level will continue over a period of years.

(*vi*) The additional excise duty on furnace oil and other petroleum products will increase the cost of production of a number of industrial products.

(*vii*) The new import duties may discourage imports but the situation cannot be fully met without a positive programme of assistance for promoting exports.

(*viii*) Higher taxes proposed will result in higher prices. This will reduce income and capacity to save.

(*ix*) Frequent changes in tax policy creates uncertainty and disturbs the conditions for investment.

(*x*) The Government should cut down avoidable expenditure and practice strict economy.

* * *

National Awards for Teachers

The Government of India selected 90 teachers for this year's (1965-66) national awards in recognition of the meritorious services rendered by them to the Community. Each recipient is given a Certificate of Merit and Rs. 500/- in cash.

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Editorial

Science and Politics on the Food Front

The title could have been science on the food front if politics in this field did not have the terrible impact which it has on the scientific aspects. It has been known to every one in position of responsibility that the food production in the country was not keeping pace with the requirements of the growing population—that the gap between the need and the availability was widening. As far back as 1950, Prof. P. C. Mahalanobis, Statistical Adviser to the Cabinet, had made amply clear in his presidential address to the Poona Science Congress that the wishful thinking by the government of self-sufficiency in food in 2 years propounded by no less a person than the late Prime Minister Shri Jawaharlal Nehru was an impracticable proposition. In his presidential address, he had categorically stated that unless a scientific attitude is brought to bear on agricultural operations, the country would be moving towards greater scarcity on the food front. Once again at the Science Congress in Madras, the then president of the Association of Scientific Workers of India, Dr. S. Husain Zaheer, and other responsible authorities made it plain from the highest rostrum available to the scientists that the policies on the food front were leading to disaster. It was proved with statistical data, facts and figures, that the costliest proposition for the country was to import food in the form of wheat or rice—it was cheaper to import fertilizers than to import cereals—it was cheaper still to build fertilizer factories in the country and produce fertilizers to increase food production. To what other factor if not politics, is one to ascribe the fact that the targets laid for fertilizers production as far back as 1943 have not been fulfilled uptodate in 1965. We have continued importing food under PL-480 until the total credit against us has amounted to above Rs. 2,000 crores. This amount which practically amounts to the annual national budget of the entire country, is known to have an upsetting effect on the economy. Was it the belief in the responsible circles that the American farmer would go on feeding Indian masses for all times to come and no national effort was needed to put the food situation in order!

It needed all the rude frankness of Dean Rusk to remind the country that it had overdrawn on the generosity and sympathy of the American government and the American people. With more valour than discretion, the Govt. of India announced that they would spurn PL-480 and food aid if political strings were attached. Within two months, the treacherous monsoon which is known to play tricks with the national budget proved the unreality of such notions. The food authorities had to trim their sails to the wind to declare that PL-480 was the only hope to avert a famine and strings or no strings, aid would have to be begged of the American authorities. Simultaneously, the government has also climbed down from the stand taken in negotiations with the Bechtel Corporation that sale, distribution and import of raw materials will not be permitted to a foreign controlled organisation. They have also had to change the stand that the Indian Government would not allow a majority participation by the foreign collaborators. With the change in its stand by the Government of India, the American Government has been persuaded to rush immediate aid of 1.5 million tons of wheat and release $ 50 million for purchase of fertilizers. It has been said with a certain degree of truth that the fertilizer field has been made over to foreign interests for at least a decade, if not longer, and the controlling interest has passed over to foreign hands. It is equally clear that self-sufficiency on the food front would not be achievable in a year or two.

Having moved one step forward, the government has taken two steps back. Could the strategy on the food front have been otherwise? It is a question which must engage the serious thinking of every Indian citizen. Could a responsible government have permitted a repetition of the Bengal famine and could it have taken any different stand in its negotiations with the foreign interests in the setting up of fertilizer factories? The answer would be positive provided the government was prepared to take some drastic steps. It is generally estimated that the overall food deficit in the country does not exceed 5-7%. If the cut in the ration is equally distributed over the entire population, austerity measures are enforced strictly, feasting in affluent quarters and wastage in ceremonies, marriage parties etc. is put down with a firm hand, it should not be beyond the realm of possibility to cover this deficit. The government has chosen not to do so. It is well known that even when the country was facing dire emergency, the food trader did not respond to the call of patriotism. The stocks were hoarded, sent underground, sold in the black market and profits made out of it. After some half-hearted measures and in spite of threat of strong measures by the Prime Minister himself, the government climbed down and permitted the food trade to hold the consumer to ransom. An obvious solution would have been to nationalise the food trade and clear the line of communication between the producer and the consumer by completely eliminating the intermediate channels. This was not done. Again, it is well known that the landlord policies which encourage the big producers in holding back his grain from the market would need far-reaching land reforms. Some of the State Ministries are either manned or controlled by landed gentry and no legislation which cuts at the root of landlord ownership can go through excepting through a strong attitude which can be taken by the Centre alone. This again has not been done. Thus on the political front no measure has been adopted which could ensure effective distribution of the foodgrains that the country is capable of cultivating at its present level.

Coming to the scientific side, for reasons which again must be sought for in the sphere of politics, sufficient emphasis on fertilizer production has not been laid. The production of Sindri factory is known to be for below the installed capacity. Rigorous measures to effect improvements, have not been undertaken. Building up of the fertilizer potential by insisting upon setting up of State-owned factories has not been given sufficient priority. As a result even the licences given to the private sector in regard to setting up fertilizer factories have mostly come to nothing. It is known that the land under plough from which nutrition has been drawn out over centuries and never given back, cannot be expected to produce at a level high enough to sustain the population. It badly needs fertilizers, inorganic and organic manures. The yield of rice in Taiwan (Formosa) is the highest in the world and is accounted for only by the massive and systematic application of fertilizers. The scientists can produce varieties of rice which give yields sometimes 20 times over than what is currently obtained by our farmers. These again require massive treatment by fertilizers. Thus the first priority goes to fertilizer production in the country. The country is short of nitrogen, phosphorous and potassic fertilizers. All the resources, both marine and land, must be mobilised to meet this shortage. In advanced countries, agriculture is given the outlook of an industry. Mechanisation of agriculture is possible only on the basis of minimum economic holdings, capable of tractorisation and mechanical harvesting would only be possible by the setting up of a large number of cooperatives of farmers who should be given tractors, better quality seeds and fertilizers on easy loan terms or where possible against assured deliveries of foodgrains over a period of years. This requires herculean efforts to be made by the Ministries of Food and Agriculture and Community Development which will have to develop a better understanding between themselves.

The Ministry of Food & Agriculture is fortunate in having the stewardship of an energetic and capable Minister like Shri C. Subramanian who has introduced far-reaching reforms in the structure of the administrative machinery of the I. C. A.R. and his own ministry. His approach to food and fertilizers is one of realism but we feel his hands would be further strengthened if the scientific and political factors that inhibit the maximum production on the food front are rectified by strong legislative measures and enlightened scientific policies. The duty of the scientists on the food front would be to improve the technologies and production of the fertilizers, mobilisation of all resources to produce more and more of fertilizers and improve the quality of high yielding crops. Even these measures would only be successful if these are combined with the right decisions at government level. Increased attention and encouragement to indigenous talent and the maximum utilization of indigenous know-how on the fertilizer front, elimination of uneconomic holdings, forming of the cooperatives and education of the farmers through extension media and by sending teams of scientists into actual field for direct contact with the farmers would result in utilisation of the results of research of the laboratories at the farm level. In the meantime, the government can certainly take up courage to enforce measures which lessen the burden on the poorer classes and enforce a distribution pattern which does not permit wastage and exhibition of affluence which can only be considered vulgar in conditions of such acute distress and scarcity.

Frankly Speaking:

Technical Assistants

We are unable to understand the logic of the authorities who are employers of scientists in their treatment of the scientific personnel classified as Technical Assistants. Before the recommendations of the Pay Commission in 1959, the uniform scale of a Sr. Scientific/Technical Assistant was Rs. 250-25-500. While the scales of pay and rates of increment of all classes of scientists were stepped up and in fact most of them got sizable amounts as arrears, the scale of pay of the posts of SSA/STA was lowered with a reduced rate of increment (Rs. 325-15-475-20-575). In fact a number of scientists working as scientific assistants were called upon to refund a part of over-payment made to them consequent upon the revision of grade on the recommendation of the Pay Commission. After protests, some of them were permitted to retain their old grade but the new entrants in any case were to be recruited in the new grade. Thus the gap between the scientific assistants, most of whom were M.Sc. or even Ph.D. and their more lucky brethren in the officer cadre was further widened. The lot of the JTA was also not improved in any manner. His rate of increment stayed at Rs. 10 and his grade materially underwent no change. What was the logic of widening the gaps between categories of scientists is hard to understand unless one takes that it was to create parity with the administrative cadre, viz. the prestige and position of administrative assistants being very much lower than that of the Section Officers.

To make matters worse, the technical assistants are treated almost as administrative cadre in matters of age of retirement and other benefits. While at the time of recruitment the classification as SSA or STA is incidental, the STA comes under increasing difficulties as he moves on in the grade. He is not entitled to merit promotion and his retirement age is at par with the administrative cadre. While this distinction has been abolished in the officers' grade, it is piously maintained for the assistants cadre. This can only be ascribed to the rigidity and whimsical manner in which the administration functions even of the scientific institutions. One would expect that these words may remind those in authority that the Technical and Scientific Assistants are basically recruited with identical qualifications and have similar duties to perform and this artificial distinction is only causing heart burning and frustration amongst the cadre which should be given every encouragement.

The Role of Science and the Problems of its Development in countries which have only just started on the path towards full Development

Dr. S. H. Zaheer*

Introduction

The application of science and technology for national development of any country requires a scientific approach to the problems. The advanced countries are too eager to help, and the countries which have just started are too anxious to utilize whatever help they can get from whichever quarter it is available. Such a state of affairs may give a feeling of development without anything worthwhile being achieved. It is essential for the countries which are just starting on the path of development to go deeper into their problems and have a balanced scientific and a properly planned approach to the problems of national economy, and the steps to be taken to solve them.

The countries which have just started towards full development, have the experience of advanced countries and of those who started earlier than them to take advantage of, and benefit from the knowledge available to mankind, not only technical but also organizational. The latter would be as crucial as the former.

It may be worthwhile here to emphasize that the help and assistance available from the advanced countries are essential and crucial to the efforts of the developing countries, but unless backed by a proper perspective of science and technology and the indigenous effort, the former are unlikely to bear any fruits. We know the generous and vast help given by the advanced countries to the developing countries, but we also know that creation of vast artificial lakes for irrigation purposes, though has generated immense irrigation facilities, it has also created a series of problems which have been ruinous for the purpose for which the irrigation facilities were created, because of the piecemeal approach. Secondly the emphasis on fashionable areas of science and technology, where the recipient countries neither had the economic resources nor enough technical personnel to benefit, has not led to the development of a proper base for science and technology.

Special Features

In order to fully utilize science and technology for national development more and detailed thinking would be desirable than has been given so far, particularly to the special features which prevail in the countries which have just started on the path of full development.

Before any discussion of the major factors which have an impact on the role of science and technology can be discussed it may be worthwhile to have a cursory glance

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over the different features of the countries who have just started on the path of full development. It would be necessary to do so in order to make a proper approach to their problems. In my opinion, these different features are geographic, historical, and economic.

Geographical

The geographical location and the size of the country has direct relation with the problems of a country. If a country is small, its problems could be entirely of different level as compared to those of a large country. These problems are connected with those of survey of natural resources, problems of communication and the population. Each of these have to be examined in considerable detail and quantitative data require to be worked out before any scientific approach is possible.

Historical

The level of education, in which the country is at the present moment, is also very important. Some of the countries which have just attained their independence have been so ruthlessly exploited and the population of the country so mercilessly deprived of any of the fruits of modern education, that they have to make a major effort to build up educational cadre for creating greater base for education, for carrying out surveys with regard to national economy, to have a cadre for dealing with organisation of management problems, and to create a base for science and technology. Even in those countries which attained their independence some time ago, the colonial powers had created an administrative machinery which is trained, in habit and mind, to obstruct rather than promote national economy. The administrative bureaucracy left by the colonial powers is so trained as to hinder effective planning and creating forward looking futuristic outlook to enable the country to take rapid strides towards development. In the name of scrutiny and efficiency plans are delayed and programmes are put out of gear. The administrative machinery, with its considerable prestige and reputation, is in many cases ignorant of the scientific developments and is inimical to their impact and the changes the impact engenders. These historical features have to be taken into account in order to make a radical change from the past and to open up possibilities for the future.

Economy

The level of economy of the country is also of direct consequence to the problems of planning of science. If a country has a major product which it exports and is thereby able to earn its foreign exchange, it has entirely a different set of problems than those countries which do not have such a facility. In this respect the countries with petroleum resources, or other such export commodities, have a greater advantage over the countries which largely depend on agriculture and have an economy through which they are not able to earn enough foreign exchange to meet their developmental requirements.

Some of these problems have been mentioned here, in order to emphasize the differences in the initial stage from which the take-off is to be made, of the countries who have only just started on the path of development. These differences are of such a degree and significance as to completely change the approach and the steps to be taken towards the solution of the problems of these countries. More so, as these have been neglected in the consideration of the problems of developing countries, which have all been considered more or less from a similar standpoint and approach.

Science Policy and Government

Having broadly mentioned the dimensions of some of the problems in the application of science and technology to the countries, which have just started on the path of full development, some of the basic areas, which have a long range impact on the role that science and technology could play in national development, may now be considered.

The first and the most important issue is the attitude of the govenment towards science and technology. Government means both the levels, i.e. the decision makers and policy makers, and the entire administrative machinery which is to interpret the broad decisions and to work out the details and make an effort for its implementation. The role of administration is particularly important as we have many examples of far-reaching policy decisions having not only failed to create any impact, but having affected the situation adversely as the implementation was left to those who lacked an appreciation of the special problems of science and technology and were not in sympathy with it.

What is to be realized by the policy makers is that science and technology offer the only tools that mankind have for the solution of social and economic problems of the country. These solutions are not merely technical but they require entirely a different attitude of mind to appreciate problems, work them out in detail and find their solutions. That these solutions are not cut and dried formulae of science but are in relevance to a particular situation, and cannot be imported lock stock and barrel but require to be modified in the context of situation of a country and implemented. Further, for implementation, a strong base of scientists and technicians is required.

Implementation of any programme, it may be pointed out, is a double process, in the sense that as a programme is being implemented and applied, the existing conditions and the problems which have been considered may not be the same and a programme may have to be modified, necessitating the feed back to the decision makers in order to make it more suited to the actual conditions. In addition, as the programme is being implemented the situation itself undergoes a change, again necessitating the modification of the original objectives in order to meet the changed circumstances and situation. It is, therefore, of utmost significance that this feed back system is not only utilised but fully developed in order to enable major developments to proceed at an accelerated speed.

Finally, the science and technology in a country cannot develop and cannot play their full role unless the mass of people are brought in contact with science and technology and vice versa, and a concerted and a definite effort is made to create scientific outlook in the people. There are three methods through which this can be achieved: First, by bringing people in touch with modern inventions and gadgets like television, transistors, cars, and tractors, etc. Not only these media are utilized in education but with the very contact with these gadgets the people have a new outlook in attitude towards their problems. The second area, where the contact may be most effective, is with regard to the attitude of people towards food and health giving them basic facts about nutrition, health and hygiene. This may not only give a better standard of health and efficiency but would also open them up to a new outlook and attitude towards life. The people mostly in the developing countries are either content with the existing state of affairs, blaming fate or God in adversity or they look to the government to solve all their problems. This attitude has to be modified and changed into giving them a certain amount of confidence wherein they should look at their own problems and try in their own way to solve these problems. The creation of this attitude would be accelerated by the previous two processes, mentioned eariler.

Planning for Research

From the organisational point of view it would be necessary for the Government to have a clear-cut well defined policy for science and technology. In brief, it should be with regard to *what is to be done* and *how it is to be done*. The Government has to take a definite decision with regard to the investment it is prepared to give for scientific research including training of personnel at various levels. Then the relative priorities of the various facets of the application of science and technology to the problems of country have to be worked out. In this particular respect it may be emphasised that while making provisions for science and technology and for the education of scientists and technologists there is a tendency to neglect the role of technicians. Technicians play a major role in the development of scientific facilities, in the promotion of scientific research, and necessary importance has to be given to this. The educational programme should really be directed towards three objectves : (1) training of technicians, (2) training of administrators not as it is understood in colonial countries but to have specialists in organization management problems, and (3) provision of the scientists and technologists to carry out research and also to run industry.

A glance at the educational programmes of many of the countries shows a lack of balance between the three types of requirements and the number of students who go in for various training programmes. With the available experience and knowledge, it is possible to know the relative proportions of each of the three types of requirements in the context of a particular country. Besides a well defined educational programme, it would also be necessary for a country to direct research facilities at various levels; at the level of the university and also create multipurpose laboratories or commodity laboratories to carry out research on problems of national importance. It may be emphasised that even when foreign know-how is available from friendly countries, it should still be necessary to have a research base in the country to adapt it and apply the solution to meet the particular problems in the country. It is not possible to import solutions and personnel and put the solution into use without this base.

Research Areas

In order to fully develop the national economy and to efficiently develop industries it would be necessary to make a national research effort. This would necessitate working out critical areas, where research resources in terms of personnel and equipment have to be concentrated. There are, in my opinion, three areas which require emphasis depending upon the level of economy of a country. Firstly the area for industrial development including the area where foreign exchange can be saved. Secondly, meeting requirements of people in terms of food and health and other consumer goods, and lastly creating of central facilities for research. It would be desirable for the countries to concentrate their resources in the three areas after identifying problems which are critical to the national economy and are likely to yield major dividends.

There is a tendency for various social and historical reasons in the countries which have just attained their independence, either due to factors of national prestige or because of the presence of a large number of scientists who had their training in advanced countries, to deploy a large part of their limited resources to fashionable areas of research or those areas of research which have prestige value, at the cost of those areas of research which go a long way in building up a sound economy of the country and create a base for science and technology. Such dissipation of resources can only aggravate the situation and help to imbalance the development. This is not a place to go into details of the problems of priorities and the concentration of efforts but it can hardly be over-emphasised that the basic consideration by any country, which has just started on the path of full development, would be to concentrate on a survey of natural resources, their utilization and conservation, development of selected industries which give sound base to national economy, creating a favourable balance of payment for the country, and meeting the basic requirements of the people such as food, health, and housing.

In addition to having a clear-cut research programmes, there is a need to create central facilities which are most essential for making it possible for the science and technology to play their full role in the national development. These facilities often are neglected in most of the developing countries, even though they are vital for the development of science and technology, and I briefly mention them here:

(1) Building up of library and documentation services;

(2) Having good workshops for the maintenance and repair of equipment;

(3) Development of design and fabrication facilities in the country; and

(4) The problem of publication.

A well organised publication programme is important for scientific development within the country in order to collect and disseminate information which is made available on research in a country and also to disseminate scientific results. In the absence of such activities, the local problems and the experience would tend to get submerged in the spate of literature which comes from foreign countries and may create undue emphasis in development of scientific and technological problems of the advanced countries.

I have briefly touched upon some of the general problems. I have not gone into detailed discussion of each of the problem but my effort has been to focus the attention on what I consider to be the basic factors involved in trying to develop science and technology in the countries which have just started their development. The possibilities are immense and it is up to us who have gathered in this conference to pool our experience and utilise it in giving a helping hand in this great human effort. I quote the words of an Indian poet "it is human endeavour to search for the good, having attained the good to look for the better. Let us see where the human vision takes us next."

This paper was presented at the Symposium on 'Problems of Advancement of Science in Developing Countries' held in Budapest during Sept. 20-23, 1965.

Developing Countries—Their Problems and Scientific Tasks

Dr. M. S. Iyengar*

The main purpose of this paper is to review briefly the general nature of the problems confronting the developing countries, to indicate the limitations of their present achievements, to emphasize the need for an operational plan for scientific and economic development, and to make a few suggestions on the possible tasks of science at the national, regional and international level to promote it.

The term developing countries is used to describe poorer countries of the world and includes most of the countries of Africa, South America and Asia excluding the USSR and Japan. These countries possess many or all of these characteristics—low real income per head, an economy which depends on primary products, natural resources which are not being utilised fully to the benefit of its inhabitants, widespread unemployment, a small amount of capital equipment in relation to the number of workers and a high proportion of the population engaged in agriculture.

The earnings of an average Swiss equals the combined average income of two Mexicans, two Ghanians, two Philipinos, four Indians and three Ethiopians. Nearly half the people of the world are in the annual income group per head of £ 25 or less. They earn only 7 per cent of the world's income but the 22 per cent in Europe and North America earn nearly three fourth of the world's income. The gap between rich and poor is getting wider even when the income of each group is assumed to increase at the same rate. If Britain has an average income per head of £ 422 and it increases at 4 per cent per year, at the end of one year the average income is nearly £ 440 or an increase of nearly £ 17. If on the other hand the income per head is only £ 25 as in India and it increases by 4 per cent in a year, at the end of one year the increase is only £ 1, the gap is thus £ 16 wider—though one income is still 16 times the other. This does not take into account the population growth.

The rate of increase in population is the lowest in Europe and North America (25 per cent by 2000) whereas in South America the population trebles in 40 years. In Asia which includes China and India, there will be an extra 2,000 million people by 2,000 A.D. These changes mean that the relative sizes of regional population will also change. Nearly a third of world's population now lives in Europe (including the USSR) and North America. By 2,000 A.D., it will only be a fifth. The rates of increase in population have already resulted in changes in the number of people in each age group. Most of the people in developing countries are young usually below 15. In many countries like Mexico, Ghana, Thailand and Sudan, it is nearly half—compared to a third in the USA and under a quarter in Britain. This has repercussion on the educational facilities available and on the whole economy because the younger children do not contribute work or skill.

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In most of these developing countries, more than 70-90 per cent of the population are dependant on agriculture. Whereas the USA and the U.K. produce 20 per cent surplus food, countries like India produce only 84 per cent of their total requirements. There is also an imbalance in the in-take of food in the developing countries. In a well-balanced diet, under half of the calorie intake is derived from carbohydrates like rice, potato and sugar; the rest is derived from proteins obtained from meat, fish, fruits and vegetables. In India the starchy food accounts for more than 74 per cent and in Philipines 70 per cent. An average Indian gets only 7 lb. of meat and fish compared with 180 lb. an English man gets.

Due to malnutrition and bad hygiene the people of the developing countries suffer from bad health for most of their lives. Public expenditure on health does not account for more than 3 per cent and there is great shortage of doctors and hospitals.

Very few people in developing countries can read and write. Reliable and comparable figures are difficult to obtain but it is likely that in most of the developing countries between 70-80 per cent of the adult population are illiterate.

Comparison of the National income of the developed and developing countries emphasize the difference between the rich and the poor. India with 9 times the population has an income less than half of Britain. The UAR with the population as half of Britain, has one-twentieth the income.

The developing countries consume relatively little energy. The industrialised countries consume nearly 90 per cent of the world's energy. Developing countries still rely very largely on manual labour and other non-commercial sources of energy. In India about 55 per cent of the total energy comes from non-commercial forms like fire-wood, cattle dung and waste products with cattle dung, providing about 60 per cent of the whole.

Great majority of people in developing countries are relatively cut off from the rest of the country. Roads are often few, transport is inadequate and there are few newspapers and radios.

Untapped Resources

The full resources of the developing countries are not yet known. Large areas are barely mapped, let alone surveyed for minerals or oil; many rivers are not yet assessed for hydro-electric power and irrigation. But even what is known, shows that the mineral, agricultural and energy resources are very large indeed. For instance, the known reserves of oil were 40 times the annual output of 1958; much more has been discovered since then. Only 9 per cent of the world's surface is cultivated at present. FAO estimates that a further 21 per cent is potentially cultivable. Food yields in developing countries are generally a fourth or a fifth of the advanced countries where scientific methods of fertilisers, insecticides and machineries are used. Further due to primitive methods of storage over a third of the whole food grown is spoiled by pests and rats.

Problems of Development

Why are some countries under-developed? Some theories regard under-development as the "natural state" of the world and seek to explain why a few areas like Europe, America and Australia have escaped from it; some seek to explain under-development in terms of climate, historical cycles, innate physical or intellectual ability, disease and malnutrition and colonial exploitation. None of these views are convincing and fit all the facts. Whatever the reasons, the fact remains that a world divided into rich and poor—the rich getting richer the poor staying poor

—is unstable and explosive. It is also a very expensive and inefficient way of organizing the world, for it means that millions of human beings never use their abilities to the full; it means too that they contribute far less to the world's wealth.

A number of estimates have been made of the material resources required for the social and industrial transformation in the developing countries. They vary considerably but most of them fall in the range from 10 to 50 billion dollars per annum for a period of 20 years.[1] These estimates are well within the resources of the advanced countries and could be provided by a 30 per cent reduction in their expenditure on defence.[2] Prof. Bernal has shown[3] how the industrially advanced countries can wipe out poverty from the rest of the world by financing over a period of 20 years, the establishment of 25 more industrial centres spread in the developing world.

It is however widely recognized that in the long term, a country can be built up by its own people and that assistance from outside has to be seen as only temporary measure.

The problem of raising the standard of living is usually a problem of learning to use the material and human resources of the land through application of science and technology. It is also a problem of gaining confidence in their own power, in the potentialities of their country and in the great resources for their own betterment which are to be found in the science.

The developing countries are faced with a situation very much different from that prevailing in Europe and America at the start of the industrial revolution. Being latecomers they can avoid the mistakes made in Europe and North America; they can take short cuts and they can plan for the future. Since investments for economic development can rarely yield dividends more than 3 per cent on a loan (compared to 16-20 per cent in the developed countries) development has to be largely promoted, organised and controlled from above by the government. Unlike Europe, economic development is coming to the developing countries after political freedom and, therefore, there can be active popular participation which in turn implies a more rapid tempo of improvement than had been previously thought either possible or desirable.

Obstacles to Development

Nearly all developing countries now have Developmental Plans. They believe that rapid development will not just happen, but that it must be stimulated, directed and controlled so as to make best use of the resources and share the benefits equitably. The plans, however, vary widely. Only a few are comprehensive or operational—in most cases simply because there are not enough statistics and material to draw and not enough people to put it into practice. Sometimes the plan is little more than a list of projects to be undertaken by the States. Sometimes it is simply a programme of studies. India's Five Year Plans on the other hand are more comprehensive. It contains overall National targets and assessment of the resources available and of the investment required, a programme to finance this investment and allocation of the investment both in public and private sectors on major economic centres and policies to stimulate direct private investment as well as detailed list of projects in the public and private sectors. In most of the countries there is no control over private investment but in countries like India, more stress is given on public industries. But since the growth rate planned is very low this is not able to keep pace with the rising population and, therefore, the progress registered is not very encouraging.

The main sources of money for public investment are budget surplus, profit from public enterprises, borrowing from the public, foreign assistance, deficit finance and private investment. Of the resources available for investment in development, a certain amount must be in foreign exchange so that goods and skills which are not available locally can be imported. The shortage of foreign exchange is one of the main problems of the developing countries. The total exports of developing countries in 1960 was estimated at 9,882 million pounds, out of which only 14 per cent accounted for the manufactured goods, 28 per cent as fuel, 30 per cent as food and other primary products. The fact that so many developing countries are dependant on one or two primary products make them doubly vulnerable. Firstly, they are vitally affected if the price of the primary commodities (their export) falls and the price of the manufactured goods (their imports) rises; and secondly, fluctuations, even quite short-term fluctuations, in price make it impossible to plan effectively. Since 1951, the price of the primary commodities have been continuously falling. Taking hundred as the price index for 1948, the value of primary commodities in 1962 was only 87. During this period, the value for manufactured goods increased considerably. For instance, in 1961 Cocoa accounted for two third of Ghana's export and between 1953-60 the volume of Cocoa export increased by 71 per cent but because of the lower price, the value increased only by 53 per cent (30 million pounds). If the price had remained at 1953 level and if the same volume was sold the value would have increased to 40 million pounds.

The amount of aid given to the developing countries by the developed countries is estimated to be about 6 million dollars per annum. This falls considerably below the annual requirement of 20 to 50 million dollars required for development.

It has taken thousands of years for men to evolve from a nomadic to technical existence. Today in many places individuals accomplish this transformation in matter of years generally in response to industrialisation. For instance, sinking of an oil well in the Middle East and construction and maintenance of oil pipe lines require labour which can only be recruited from nomadic herdsmen of the region. The herdsmen forsake their old way of life and adopt the urban life, but this necessitates personal and social adjustments of such a character as to challenge the adaptability of man. We make adjustments to change in our physical environment much more rapidly than we alter our habits of thought and attitudes of minds. We expect and welcome change brought in the material world through science, but in our modes of thoughts and actions there remains much of the old savage. For instance, a true scientist welcomes criticism and lives in an atmosphere of constructive criticism. Virtually, the entire system of modern scientific publication and new information is based upon the critical review by professional colleagues. Yet we are particularly sensitive to criticism. The phenomena is all too familiar to demand elaboration. Then there is the hangover of feudalism, clanishness, racial and parochial feelings, neopotic and other tendencies which are the very antithesis of science and which are the hall-mark of a corrupt and decadent society, but to which even the scientists in the under-developed country readily succumb. Although great changes are taking place in the developing countries the traditional adherence to old beliefs and customs is staggering and hindering social change.

How can these be counter-acted and how can "quality" be made to prevail over "quantity" when by its sheer number it is all the time passing as 'quality'. In a country which has adopted democracy without having developed the true traditions of democracy and where jobs are few and aspirants many and the urge for material gain great, how can power be kept away from corruption and the individual saved from the worship of the holy cow of security? How can the loyalty to the Nation made to take precedence over loyalty to smaller groups?

Science and technology in developing countries

The backwardness in the industrial and economic field of the developing countries is markedly reflected in the scientific and technical fields[4] :

	Expenditure on research and development	
Country	*% of GNP*	*$ per capita* 1950
USA	2.8	78.4
USSR	2.3	36.4
UK (1961)	2.7	35.0
W. Germany	1.6	20.0
Japan	1.6	6.2
Ghana	0.2	0.4
Lebanon	0.1	0.3
India	0.1	0.1

Without the development of science and technology, the industrial and social advancement of a country is unthinkable if not impossible. Science has to play its role in the assessment of the natural resources of the country, in their industrial exploitation. Every aspect of national development policy depends on research conducted within the country, although it must, of course, be based on the achievements of, and conform with the standards of international scale. Yet very few of the political leaders have realised the liberating role of science. At the best they consider it a luxury. Even in a country like India when it comes to a financial cut the first victim is science. Science exists independent of the developmental plans of the country. Factories and industries are set up with foreign technical know-how and capital and no attempt is made to mobilise indigenous know-how and knowledge. And since foreign exchange is limited the industrial growth of the country is inevitably retarded.

What can be done ?

All the developing countries should have an operational overall Developmental Plan. The outline of the plan cannot be done without a preliminary survey of the actual industrial capacity, the distribution of mineral raw materials, the agricultural possibilities and perhaps more than anything else, of the availability of labour and particularly of technologists and scientists.

The making of the plan is in itself an enormous and urgent task which cannot wait for the complete results of the survey, but must be worked out while its first stages are already in action. Once an outline exists it is possible to develop rapidly the existing industry and agriculture and lay the basis for future development.

The second stage of building up basic industries and large-scale projects is the most important and at the same time most difficult stage. While here the full advantages of the planning can be realised by developing integrated projects like the multi-use projects which combine, for instance, flood prevention, irrigation, power production and navigation or coal mining, steel production and fertiliser production, etc., it is just these kinds of projects which at this stage cannot be undertaken by the technical resources of the under-developed countries without foreign capital and assistance. The under-developed countries have to export cash crops like cotton, oilseeds, tea, jute, etc. to earn the necessary foreign exchange and there is a limit to the agricultural expansion, for even here unless modern techniques of agriculture are adopted including fertilisers and tractors, the production level cannot quickly rise. For instance, in India, we have a food shortage of 4-5 per cent and so far we have not been able to make good this deficit and each year we have to import large amount of food-grains involving foreign exchange of over Rs. 70-80 crores. Further, there is always an extremely difficult decision that needs to be made about the rate of industrialization and consequently the rate of investment. If greater emphasis is placed on industry then the man-power resources devoted to agricultural and consumers goods production have to be severely curtailed and this involves a definite lowering of standard of living. Too slow an investment on the other hand, results in postponing the return from the investment to an indefinite future, a generation or more away. This lowers the enthusiasm and interest in these projects.

There is nothing intrinsically wrong with a high rate of basic industrial development, but this can be carried out without hardship or crisis only when the industrially advanced countries come to the rescue of the under-developed countries.

In the third stage of the expansion, the building of consumer goods industry on the most modern basis can be undertaken.

It may not be possible or even desirable for all countries to build a self-sufficient economy. Economic development can be visualised on a regional basis and the countries of the region could develop industries complimentary to each other as is happening at present in Europe. Switzerland has specialised in fine instrumentation, Sweden in the paper and fibre industry, Denmark in milk products.

Tasks for Science

The task of science and technology in developing countries could be visualised as a four-tiered pyramid, running over a priod of fifteen years.

The first tier is National. All the developing countries should have a National Policy for Science. They should make large scale efforts to promote scientific and technical research and in relation to the overall development of countries evolve a short and long-term plan for science. Allocation of funds, allocation of projects, and priorities of work should be worked out in relation to the country's developmental targets. It is also necessary to fix up time targets for the project and concentrate efforts on the priority items striking a balance between those which are essential but with small returns and those which yield large benefits.

The following points can be considered in working out priorities[5] :

1. The importance of the project in relation to the national economy, and the possible duration of this importance.
2. The approximate investment in research in terms of resources of the country's raw material and finance and the duration of the project.
3. Investment needed to put the solution into practice.
4. The life span of the solution.

A possible and more rational procedure for evolving an overall plan of science would be to constitute at a National level a panel of Scientists associated with the Planning Commission who should divide the entire field of science into suitable number of provinces which may be as general as petrochemicals, heavy engineering, steel, power, etc. On each of these topics a conference for working out the details should be convened. The invitees to the conference should include representatives of each of the following categories :

(*a*) Scientists chiefly engaged in research;

(*b*) People engaged in teaching at the University level;

(*c*) Representatives of the public undertakings and government departments;

(*d*) Engineers from the industries;

(*e*) Economists;

(*f*) Representatives of the Planning Commission;

(*g*) Representatives of the learned bodies or scientific societies;

The function of such a conference should be :

(*a*) To determine the state of knowledge in the particular field of application in the country;

(*b*) To prepare a list of problems to be solved in order to advance in the field of production or application;

(*c*) To prepare a draft of what should be taught in technical or professional colleges and universities; and

(*d*) To consider the implication of the programme in terms of men and materials.

The integrated scientific plan for fifteen years should then be worked out with appropriate ministries and Planning Commission in a suitable time.

Planning at the National level should also be followed up with planning of research at the Laboratory level. The success of planning research will depend upon the extent to which industrial objectives have been understood in technical terms. In the absence of such understanding, research programmes and industrial development may run parallel with few points of contact. This is particularly relevant with the developing countries where there is always a tendency on the part of the industrial entrepreneurs to enter into foreign collaboration for the installation of machinery and plant.

The present commitment of science should be increased at least to 0.5 per cent of Gross National Product of the country. The number of scientists should be considerably increased and there should be a detailed overall plan for the training of scientists. The status and salaries of scientists should be improved.

Since, in the ultimate analysis, responsibility rests on the citizen—as in a democracy it must—then the citizen must be scientific minded and aware of the technical as well as the social aspects of the problems. The various steps for achieving this objective should be :

(1) Establishment of evening educational classes,

(2) Increase in the number of scientific museums,

(3) Exhibition of scientific films and formation of scientific film clubs,

(4) Increase in the space and time given to science news coverage in the press and radio, and

(5) Establishment of an Institute of Scientific Information.

Other measures suggested are the reorientation of science policy in schools, introduction of scientific education in the administrative services and employment of scientists at different levels of government machinery.

The second tier is the Regional. The developing countries can group themselves into convenient regions :

(*i*) The Latin-American Region,

(*ii*) The Inter-African Region,

(*iii*) The Middle-East Region,

(*iv*) The Central Asian Region,

(*v*) The South-East Asian Region, and

(*vi*) The Far-East Asian Region.

In each of these regions, specialised institutes for scientific and developmental research can be set up. These can be based on the need for development of an asset common to several countries. For instance, most of the Arab countries have already formed a common organization to protect their interest for the exploitation of their oil resources. These countries could join together to establish a regional laboratory dealing with problems of petroleum including facilities for training of scientists and technologists. Such institutions could also assist in carrying out survey and drilling of oil wells, establishment of refineries and petroleum processing units. Similarly, the South-East Asian countries can group together to set up research organisations on tin and rubber. The setting up of the regional organizations would have to be carefully worked out in relation to the existing potentialities of natural resources of the region and also in relation to the need for markets of economic size. Many countries, particularly in Africa, have population of less than 5 million, many of whom live in isolated villages. Possibilities of developing joint industries in such areas could be considered. Plans for a joint motor industry are being prepared by Brazil, Chile and Argentina. Similar ventures could be extended to other sectors and other countries also.

Suitable scientific and technical committees on natural resources of each of the region should be set up. These committees could be specifically concerned with assessing the industrial potential resources of the region with a view to regional planning and indicate the priorities of the work to be undertaken in these regional laboratories.

The third tier is co-operation amongst the developing countries. The developing countries could form an organization for holding periodic conferences to exchange information and ideas on problems of common interest. Such conferences could also work out details of mutual help and co-operation in the field of training of scientists in different fields and making available to the countries technological data including design and process data of various processes developed by them. They can establish channels of information on the equipment and scientific apparatus available in the developing countries. For instance, India is in a position to help the developing countries in providing training facilities for scientists and technologists. It is also in a position to help in setting up of industries in the fields of cement, machinery, consumer industries like bicycles, fans, sewing machines and electrical goods. It is also in a position to supply some of the scientific instruments. Collaboration with India and other developing countries can be examined. Similarly, collaboration and joint research programmes can be undertaken in the field of reclamation of desert land for agricultural purposes, the use of saline water for agriculture and measures to counteract the salinity of the soil. A useful step has been taken by the Association of Scientific Workers of India in convening a meeting of Scientists from the developing countries to participate in the National Symposium on "Science and the Nation" held in Delhi in July, 1964 where an objective assessment of the achievements and limitation of science in the developmental activities of the country were discussed. It is also organising an International Conference of the developing countries in 1966 in Delhi. Such conferences should go a long way in establishing collaboration between the developing countries.

The fourth tier is International.

Technical assistance and international co-operation are two distinct and complementary activities for scientific co-operation between the advanced countries and the less developed ones. It aims at increasing through joint efforts knowledge of the national environment in order to apply it for the improvement of living standards.

The majority of technical assistance takes the form of the provision of experts or training facilities. In 1962, there were about 100,000 foreign experts working in developing countries on government financed technical assistance schemes. More than half of them served in the new countries of Africa; 40,000 were teachers and 40,000 (mainly French & British) were administrators in ex-colonial territories. The impact of these technical experts on the development of the countries has not been marked and in most cases the results obtained have been disappointing. There is an urgent need to review the entire position of sending experts and making their stay useful to the host country.

Another form, the technical aid takes, is the providing of training facilities. In 1962 about 40,000 students from developing countries received official technical assistance grants for study abroad and a further 20,000 for practical training. Perhaps 100,000 more used educational and training facilities abroad; they were financed privately or by their own government or by private commercial firms.

Barring a few in a majority of cases, the training is not tied up with any developmental project. The training is obtained in sophisticated fields which has no possibility of finding immediate application in the developing countries. What is urgently needed is to make these training project oriented and useful to the recepient countries industrial growth.

The most fundamental form of scientific co-operation is the sharing of information. This can be done through publications or through exchange of persons. A third way is through co-ordination of scientific activities and here international associations play a leading role.

The International Council of Scientific Union has rendered great service to the cause of science by mobilizing thousands of scientists the world over in the International Geophysical Year. It is also having plans for undertaking a number of long-term international collaboration programmes—the International Biological Programme, the Upper Mantle Programme, etc. which may have profound effects on developing countries. The ICSU could, however, consider undertaking programmes directed at immediate benefit to the developing countries like controlling the salinity of the soil or the spreading of the deserts.

The task of bringing the developing countries to the same level as the developed countries is not an easy one. The difficulties are immense and too obvious. But, there in the challenge, man's spirit is amazing. In the words of the late Jawaharlal Nehru, "Play thing of nature's mighty forces, less than the speck of dust in this vast Universe, he has hurled defiance at the elemental powers, and with his mind, cradle of revolution, sought to master them".

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Planning of Scientific Research

A. RAHMAN*

1. INTRODUCTION

1.1 Historical Development

Looking back over the history of scientific research, one notices, that by and large in the West European countries and America, the problems for research have been taken piecemeal, in the interest of an area of science, a particular industry or commodity or in view of its importance for defence. An overall and synoptic view of research has only just been appreciated and efforts are being made to coordinate research in many areas from the national point of view and the necessary machinery and organization being built up to meet these new requirements.

Soviet Union was perhaps the first country to develop an overall synoptic view of science and technology and make an effort at the national and State level to utilize it consciously for the national economic development. This approach, from the evidence available, is known to have permeated research planning also. Enough information, however, is not available to indicate the detailed machinery developed to work out various problems connected with planning of research, such as criteria for the choice of problem, method followed and evaluation machinery.

From the point of view of the developing countries a very useful description of the development of scientific policy in Yugoslavia† throws considerable light on the problem of planning.

It would be extremely useful if a comparative study of the various methods and techniques followed in different countries were to be made. This would help those countries which are about to start their own development.

In this paper, based on the experience in India and taking into consideration the studies in other countries, as are available, some suggestions are made in the hope that they would throw light on the problem and might be of some use to other developing countries.

1.2. Economic Considerations

The increase in the investment of scientific and technological research, due to the national policies as well as the increasing costs has not only brought to the fore the question of choice, i.e. selection of areas and problems of research where investment has to be made, but has also given it a crucial significance. An idea of the scale could be had from the fact that the giant European atom smasher alone requires £ 130 million, whereas U.K. at present is spending only £ 3.5 million within a year on social research. In other words, the question *which* and *to what extent* is inescapable.

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† Minerva 3, Number 2, 1965, 187-209. See also comments on it by A. Rahman sent for publication to Minerva.

The question is not limited merely to a choice between one project or other, or an area of work, but has also broader aspects, regarding the scale of relative investment in problems of national, social and industrial importance, on the one hand, and those which seek to satisfy intellectual curiosity on the other. A decision regarding the relative expenditure on each of these areas may not only affect research but also educational programme, social and industrial development, and the growth of science and its direction.

It need be emphasised at this stage that the heroic days of science are over. In other words, scientific research is an economic activity, subject to laws of economics and should be treated as such. This should not be taken to mean that individual has no role in science or the latter is not a creative field any more. It only means that factors other than individual's desire have assumed a considerable importance and significance in the choice of research problems.

This raises the question of the criteria for affecting a choice in evolving research programmes. So far an ad-hoc procedure has been followed, both in terms of giving aid to areas of research as well as centres of research, resulting in a pretty lopsided investment of diverse areas of research.[1]

There is need, therefore, to assess critically what has gone on so far and try to so revise the programmes of research and investment in areas of research, so that it is correlated with the national aims or other clearly defined objectives. This is indeed a difficult as well as time consuming task. Further, there is no experience to guide the lines of approach.

1.3 Process of Planning

The correlation of research with social objectives means planning of scientific research and working out relative priorities. It may be worthwhile here to clearly state as to what is meant by planning of scientific research lest it may be misconstrued to mean planning of scientific discoveries.

The main idea of planning of scientific research is two-fold :

Firstly, working out a criterion on the basis of which priorities to various areas of research could be worked out, and based on this criterion the areas and problems of research selected.

Secondly, based on the priorities of the research programme the allotment of relative resources, financial, personnel and others, could be made.

This approach implies an analytical study of the existing conditions at considerable depth; without it, it would neither be possible to work out a criterion to establish priorities nor a judicious allotment would be made. urther, planning is a two-fold process,[2]F

1. This would be evident from "A Study of Government Expenditure on Scientific Research", *JSIR* **22**, 1963, pp. 479-86.

2. It may be interesting to know the result of the application of such a technique, as it was applied in India at Council of Scientific and Industrial Research.
Firstly, an analytical study of the growth of C.S.I.R. laboratories was undertaken (A Study of Expenditure in National Laboratories, Survey Report No. 2., CSIR, 1964.)
This study revealed a pattern of growth, irrespective of the nature of the laboratory and its research programme. This pattern when projected yielded the financial requirements and relative allocation to the different types of laboratories and different types of activities within a laboratory for 4th Plan.
Secondly, the laboratories were invited to send their own plans.
It was interesting to note that the requirements for the 4th Plan, worked out by the projection methods for the laboratories, were surprisingly very nearly the same (for detailed working out of the plan, see Fourth Five Year Plan of the CSIR, Vol. 1).
A further study of the problems involved in planning revealed the necessity of a more rigorous approach and more standardized methods to be followed.

where scientists at the lowest level have to contribute, as well as those at the top. The plan itself should be a synthesis of what is received from various sectors and coordination at top.

2. General Considerations

In research planning, there are two major questions :

Firstly, should research be programmed according to the availability of resources or the latter be built in accordance with the importance and urgency of the problem which a research programme aims at solving?

Secondly, should a research programme have a time target ?

For the developing countries, the answer is obvious. They have no choice but to develop resources for attacking a few selected, well defined problems in a short period of time in order to make a break-through.

The current thinking is also in this direction. As for instance, the recent Conference, July 1964, at Accra organized by the African Economic Commission, or the Unesco Conference at Lagos set up targets of the resources, to be built up for meeting urgent national requirements.

The overall acceptance of the idea of building up resources to solve a problem in definite period of time necessitates a machinery for identification of the areas which are important nationally, socially, industrially and scientifically and selection of the key problems within these areas, for a break-through. Unless a fully developed machinery for such a selection exists, the chances of getting results from such a concentration would not only be meagre, but the chances for the efforts going astray are considerable.

There are also sound technological reasons for such a recourse : viz., having a sound machinery for choice of problems for definite objectives and fixing the *time schedule* for research, after which a review and re-assessment should be essential. *Time*, it may be stressed here, is of crucial importance in research. Some of the factors which have given their pre-eminence to time are[3] :

(*i*) "The short life time of consumer products, weapons system, and the mechanism of production. For example, since the beginning of modern science several hundred years ago, the lifetime of weapons systems has decreased continuously until today it is only five or six years."[4]

(*ii*) "Increased choice resulting from organized R & D......Many thousands of technical alternatives are now available from which products can be chosen for development, where once these were only two or three......Many product developments, which are or could be technical successes, represent only marginal operational improvements......Thus the decision regarding which one or which set of alternatives should receive R & D support is made specially difficult".[5]

(*iii*) "Relation between the short lifetime of the products of research, the large number of technial alternatives, and the long lead times required to bring these products into existence."[6]

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3. Operations Research in Research & Development—"A proposal for strengthening U.S. Technology". Ellis A. Johnson pp 1-41. Wiley 1963.
4. *ibid* pp 10-11
5. *ibid* pp 13-14.
6. *ibid* p. 15.

(*iv*) "Great areas of R & D that required the integration of basic and applied research[7] necessitating institutional collaboration to make a programme successful."

In view of these general—which should be considered as basic—considerations and their implications, some of which have been indicated, it would be desirable to not only clearly define the objective of each research study, but also to define the strategy of research, including levels of research, and the organisational requirements at different levels, to meet the objectives and to fit in the strategy in a given period of time.

3. Linguistic Problems

Another important consideration in the discussion of the problems of planning, is the removal of confusion arising out of usage of words, such as research problems, research projects, areas of research etc. It is necessary and desirable that such terms should be given a precise scientific meaning. An attempted definition of some of these terms is given in Appendix 1. The terms used in this paper have the meaning suggested in the Appendix.

4. Data required for planning

For planning of research, as indicated before, extensive data on scientific, technical and economic aspects would be required in order to arrive at suitable decision. In addition, data on organisational and related aspects would also be required.

For any successful effort at planning, it would be desirable to have data at least on the following :

1. Current research programmes at various institutions.
2. Technical facilities available at various institutions and country as a whole.
3. Detailed information from institutions with regard to relative deployment of resources between :

   bench scale research,

   pilot plant research,

   auxiliary research and supporting departments, like :

   library and documentation,

   design and fabrication—including workshop facilities and facilities for repair and maintenance,

   consultancy and advice,

   extension,

   operational research,

   anciliary requirements—buildings, amenities to staff, organization of scientific activities like symposia, seminars etc.

This information on the deployment of resources—financial, personnel and equipment—is essential to plan the future requirements of research and personnel in each field, for working out institutional cooperation, for critical assessment of what is being done and at what level and the modification required to meet a set of objectives.

This would require a machinery at three levels—at the level of *laboratory* or *institution* to collect the information, at *group organizational level*, like Council of Scientific and Industrial Research, Indian, Council of Agricultural Research, Indian Council of Medical Research, Atomic Energy, University Grants Commission in India, to compare and collate information at this *intermediate level* before it is discussed and utilized at *national level*.

In order to utilize information, it is necessary that information is collated in standardized forms to make it comparable.

7. *ibid* p. 16.

5. Procedure and Methods

For any serious effort at planning, a critical and objective review of research programmes and machinery for its selection and execution is essential. A study of how research problems are selected, is yet to be undertaken, but it can safely be said that the procedure is ad-hoc and personal. The result of such a procedure is evident from the character of research programmes. Dr. Kurt Mendelsson[8] gave his impressions on India in the following words :

"But even before the crisis, it had become clear to Western Observers that some kind of malaise was hampering the Indian science and technology. There was unmistakable tell-tale sign of this. One was the often depressing content of their scientific publications. It is not that the standard is low, but the *subjects on which the work is proceeding, are hopelessly out of date*."

This might as well apply to many other developing countries.

One of the reasons of such a state of affairs could be the absence of a well organised scientific and technical documentation service feeding the scientists. Even in advanced countries where such facilities are well organised, the situation has been well described by John Martyn of the Aslib Research Department :

"647 scientists were questioned. 245 (40%) reported some sort or other of duplication (though unintentional)of the research effort.88 out of 647 projects i.e. 14% were duplications. Losses due to late discovery of published information are associated with 9 % of the projects. In cash terms, it is felt that 9.9% (10% of the cost) of funds allocated might have been saved—i.e. in the U.K. where the total expenditure on scientific research was £ 8000 per scientist—this means 750 scientists do nothing."

A review could involve a critical study of programmes of the organisation which support the programmes and of industrial, social and national factors which have a direct bearing on the organisation and promotion of scientific research. A study of research programmes of the last 10 years is essential. The study could usefully cover the selection machinery of research problems, their relation with national, social, industrial and scientific growth, the resources spent and results achieved in terms of well defined objectives. In particular, it should concentrate on research on problems given up incomplete, and seek the causes of their being given up in terms of lack of resources of finance, equipment, personnel or other "supporting facilities" such as a library, documentation, workshop or due to other organizational or administrative causes. It could study the cooperation and collaboration in research between various institutions and organizations between complementary problems, utilization of available facilities of equipment and personnel in overlapping areas of work. It could also study the flow and exchange of information and the impact it had had on research programme itself.

For the problems which have been successfully completed, it could assess their impact, particularly in the field of industry. If the results of research have not been utilized, the causes have to be studied to know what is to be done.

While such a review is going on to give us a picture of how things are and to throw light on what is to be done, a greater clarity with regard to the phase and character of a research would be necessary.

6. Research Programme

A research programme has five distinct phases. These are :

8. Listener, September 24, 1964, pp 457-59.

(*i*) *Survey* of the field or areas of research with a view to sort out problems in relation to their relative importance for a particular sector of research, viz., national, social, industrial, and scientific.

(*ii*) *Exploratory work* to identify exact problem, to decide about the possible time of research for a speedy and successful solution, and to formulate the research project, the latter to include also the resources required and the time target.

(*iii*) *Bench Scale Research* to solve the problem.

(*iv*) *Pilot Plant work* to further develop the bench scale solution to an industrial solution, and also to affect a smooth transfer of the solution to large scale production.

(*v*) *Operational Research* to study the solution in factory condition in order to improve the solution and make it more efficient in production.

For a research programme, it is necessary to be specific with regard to its phase and to help allocating adequate resources for its successful completion. In a laboratory all these phases run concurrently. Consequently, it would be necessary to work out proportion of effort each laboratory has to spend on each of the phase over years. For planning the efficient use of the available resources of the laboratory, if a major problems has to be processed through all the phases, sufficient scheduling and programming would be necessary, so that facilities of equipment, personnel and funds are available for a quick transfer from one phase to another.

In addition to working out phases, as suggested above, and allocating resources, the work of the laboratory may also be divided in broad categories depending upon the time they are likely to take to be completed. In doing so it would be desirable that sufficient provision is made for tackling problems which are referred by the industry requiring quick answer, the short term problems arising out of the major programme of research referred by the industry or other institutions, and long term programmes of research.

The research programme of the laboratory should have provision and proper allocation for these types of research. Further a periodic review from this angle would also be desirable to judge the progress of work in relation to what has been happening in this or related fields and in other countries.

To put into practice ideas and suggestions which are discussed in this paper and to affect proper coordination, two steps would be essential:

Firstly, a greater discussion at various levels for identifying research problems and working out research programmes are essential. Some of the methods which should be useful are:

(*a*) *International discussion* amongst scientists and technologists of various institutions and of different fields of specialization.

(*b*) *Special seminar* to discuss research areas and to identify research problem.

(*c*) Surveys of naional requirements.

(*d*) Techno-economic surveys.

Secondly it would also be necessary to develop a machinery to exchange information and ideas between various institutions and organizational groups for research, in particular between the laboratory or the Institute where research could be carried out, the parent institution to which the laboratory belongs, university scientists, industrialists, administrators and planners in order to take the technical, scientific, economic and national perspective into considerations.

7. Allocation of Resources

Having worked out the machinery for selecting the research programme, the next important step is the allocation of resources for various plans of research, for different types of services required and for auxiliary services and activities. The resources to be spent within each group of activities and between different groups is to be worked out in some detail. These are :

(*i*) Relative proportion of allocated resources in terms of funds, personnel and other facilities between surveys, exploratory work, bench scale and pilot plant research and operational research. If there is no proper programming or there is lack of balance between these phases of research, the results, from the point of successful completion of research or its utilization, could be serious.

A Survey of Research programmes of the laboratories may reveal that not only sufficient thought has not been given to surveys and exploratory work in selecting research programmes but the proportion of bench scale research is far too much in relation to other facilities available, leading to considerable dissipation of the limited resources.

(*ii*) The relative proportion to be spent between research and those activities which support research—such as library, documentation, workshop including repair and maintenance services, extension, industrial liaison and extension, and publication. No studies have been carried out on this subject to suggest any guide lines for the proportionate allocation for these areas. May be, it differs from one field of research to another and between different at various technical levels.

(*iii*) Resources made available for activities connected with research. The latter though not part of research, are essential for the successful promotion of research.

These activities are—*training programme* of research personnel in highly specialised fields and newer branches of science for which facilities do not yet exist in the universities or in the country. For the developing countries the foreign training programme should be rigorously worked out to meet the requirements both immediate and future, of the country in highly specialised fields and for creating a base for advance work. A study of foreign training programme suggests serious imbalance from the point of view of institutions, the field of specialization and national needs.

Organization of and participation in scientific symposia, seminars, and conferences on the one hand, and committee work on the other, are essential features of scientific research and necessary funds on a planned basis should be made available to the institutions. On the national level, support of scientific societies, journals, specialised publications should also be planned.

(*iv*) In addition to planning of research programme and related activities, there is a need for working out of financial commitment on each of the above areas and in addition for *the building and construction programme*, which could properly be planned out, and also for *amenities for staff* by way of residential requirements, medical facilities, travel grants, social facilities in out of the way places and large cities, and for adjustment in *wage policy*. In the last mentioned point, it may be noticed that the salary scale at which certain specialised scientists and technicians are available, are subject to change and large scale increase. If a research organization is not able to meet these changes favourably it is likely to be depleted of its best personnel.

To work out the data and draw conclusions would not be enough unless this data is projected to work out the trends within the country, and in countries abroad. It is this projection and the idea of the future which has to be developed, which would help us in taking decisions now. If we go wrong in the projection and build a wrong picture of the future, the misdirection of effort and wastage would be tremendous.

8. Changes required

This paper very briefly suggests some of the facets for planning and organization of scientific research. It also discusses very briefly the interaction of these facets. More work is required to be done to further define the broad facets mentioned and discussed and quantitative data are to be collected before a better picture for planning and organization of research to meet both national requirements and the problem of individual creativity on the one hand, and return from the investment in research on the other could be obtained. This discussion would clearly reveal that there is necessity for clearly recognising that planning of scientific research and the study of the growth and organization of science in the context of the development of a country is special area of study and research. Consequently, at the national level and at the level of organizations, institutions and laboratories, necessary Units are required to be created for collecting data, analysing, sifting and contributing to this problem. In addition to these Units there is also an urgent need for changing the system for keeping records, accounts and budgeting. In order to make the data, which is recorded under each of these heads, cumulative and subject to analysis to draw conclusions, various details have been suggested in advanced countries in this regard and these are required to be tried to work out the best possible system in the context of the growth of a country.

In the end it may be worthwhile to mention that this paper does not suggest that research has to be judged by a particular set of standards, i.e. economic, technological, national, social or scientific. All it says is that clearly defined standards have to be evolved to judge each type of research programme which itself should have a clear set of objectives and a well laid out scheme.

9. Some special feature in developing countries

The researches carried out in the field of research on research, ignore many factors which are vital for research, for the simple reason that one takes them for granted in the developed countries, which have a tradition of a couple of centuries for sceince and technology. These are : tradition for science, and research atmosphere, existence of a scientific community which is able to exert its voice in decision making, well established channels of communication between scientists, scientists and administrators and decision makers. The channels are both internal as well as international.

In this connection the role of scientific journals and societies may also be mentioned. Both these are able to play often a vital role in matters affecting science. These features are absent in the developing countries, which have yet to establish the tradition, various mechanisms and levels of organization in order to make science and scientific community effective.

The same applies to the problems connected with the problem of utilization of results of research. . The advanced countries depending upon the level of their technology and the nature of their economy, have built up their mechanism of utilization. The mechanisms are such as to permit future growth. In the developing countries there is considerable reliance on the help from advanced countries. The latter may not be available in areas where the country requires, or when available it may choke the indigenous effort, or may give it a direction which may not be conducive to the progress of science and technology.

If a well established tradition or machinery existed the harmful effects of such impacts could be reduced, but since the former does not exist, the latter go unchecked.

The reason for emphasing these factors is that along with formal planning of research it is also necessary to give special care to build up those features of scientific research which though not part of formal science, have a crucial impact on the thinking and implementation of any research programme.

APPENDIX

1.1 Field of Research

A field of research comprises several areas of research based on specialised disciplines, a raw material or a commodity.

1.2 Area of Research

An area of research is an identified subdivision of the field of research.

1.3 Research Problem

A properly identifiable facet of an area of research requiring solution, which would lend itself to a plan of investigation, constitutes a research problem.

1.4 Project

A project is a plan of attack for solving a clearly identified problem within a given time.

This paper was presented at the Symposium on 'Problems of Advancement of Science in Developing countries' held in Budapest during Sept. 20-23, 1965.

A S W I ACTIVITIES

Bureau of the Central Executive Committee

Four meetings of the Bureau of the CEC of ASWI were held during September-October, 1965. The main points of discussions and decisions are reported as follows :

1. Intimation was received from Kirkee Branch informing of the accident in the Nitration Plant of the Kirkee Explosive Factory resulting in the death of 12-13 persons including some active members of A.S.W.I. A message on behalf of the Bureau, conveying condolences was sent.
2. It was decided to have a panel of 10 names to be sent as delegates to attend the International Symposium on "Problems of the Advancement of Science in Developing countries and the Role of International Scientific Cooperation" held in Budapest during Sept. 20-23, 1965. But due to the Emergency having continued, only 4 delegates, Dr. N. P. Gupta, Shri A. Rahman, Shri Y. R. Chadha and Dr. V. B. Singh could attend the Symposium.
3. The delegates of the ASWI met the Commandant of the Civil Defence at New Delhi and offered to place the services of ASWI members at his disposal.
4. In connection with Caaust Symposium, Dr. S. Husain Zaheer met the Prime Minister of India who suggested that Dr. Zakir Hussain, Vice-President of India may be requested to become the Chairman of the Organising Committee for the Caaust Symposium. The Vice-President was approached and he has very kindly agreed.
5. Letters have been sent to various institutions in India requesting them to nominate delegates to the Caaust Symposium.
6. It was suggested that the next C.E.C. meeting may be held in November, 1965.
7. Dr. N. P. Gupta reported that a Regional Centre for the World Federation for the Middle East Office has been set up at Cairo.

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Delhi Branch

As a sequel to the Resolution on National Emergency adopted by Bureau of CEC of ASWI and forwarded to all Branches of ASWI, the Delhi Branch had collected one day salary from the members for the National Defence Fund. Some members had also donated blood for the Jawans.

Nearly 500 books and priodicals were collected for the army personnel and delivered to the authorities of Military Hospital, Delhi Cantonment.

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