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The views expressed in the journal are not necessarily those of the Association of Scientific Workers of India.

Editorial

Once the right type of selection is made for scientific/technical training of individuals, after due consideration to their aptitude, it is not very difficult to impart the training on right lines. A little change here and there in the educational curriculam in-force in India—mostly on the pattern of foreign countries -will serve the purpose.

The emergent countries seem to be caught in a vicious circle. Accelerated economic development can be based only on an expanded educational programme. To support such a programme a higher national output is needed and this in turn cannot be obtained without raising the level of the skills and technical training of the hitherto fore unexploited man-force. A recent survey made by UNESCO stressed the need for emergency measures in the new countries to train cadres of skilled workmen. But how are these to be achieved ?

The only way out of the whirlpool is that the system of technical training should be so orientated that a good number of students get the maximum training in the minimum of time. The pattern of scientific/technical education in India at present needs only a little reorientation. The only major point to be considered in this context is change of emphasis from theoretical to practical aspect in most of the common courses. It is only through practical work that the instructors can help in creating a positive attitude towards scientific/technical way of life in Indian young men.

The training in some of the foreign countries e.g. in Israel is based upon a weekly schedule of 12 hours theoretical study and 32 hours workshop practical; an essential and favourite part of the study programme is 'on the job' visits to industrial enterprises.

Another important factor concerns the financial condition of the trainees, the dependence of the trainees on their parents for their maintenance creates a lot of difference in living pattern of the students. Sometimes parents are forced to pay heavy amounts through their nose in order to get the wards execute their education. No wonder the idea of an 'investment' creeps in the mind of both the ward and the guardian which in later life of the trained personnel puts the priority on the financial aspect of life even to the extent of ignoring science or technology as way of life.

Stipends or Govt. loans are a good way out of this predicament but in a developing country there is a limit to these. Some of the educational experts consider it to be extravagant on the part of the state authorities if the latter decides to give free scientific/technical training. This type of free education many a times creates an indifference in the mind of the student towards the essential parts of the study particularly if they are imparted at the cost of trainees comfort. The solution to such a problem has been found in some of the advanced training institutes in foreign countries. Cooperative methods whe-

reby the student spends part of his time in practical productive work are essential part of the education. Contacts with industry not only helps in 'earnig while learning' but also stimulate interest in theory. The trainee also comes face to face with expedients of the industry and is equipped with knowledge whice will make him a success in his line when he takes up his own field in later life. Such a scheme should be a compulsory part of the training and trainees should be persuaded and encouraged to live on the earnings they can make from the productive work. This will create not only a sense for the dignity of labour in the future trained personnel but create a confidence and fellow feeling in them which will be of great help in creating a highly industrialised socialist society—a necessity for building a strong India.

Editorial News

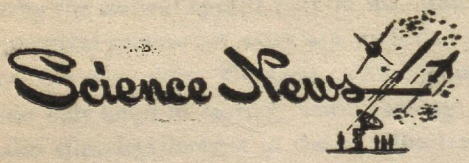
ARTS IN SCIENCE TEACHING

Science teaching is a subject which cannot be treated at par with general education. Not only the methods are different, for example, the laboratory spirit has to be brought in the class room, but the precepts and conceptions have to be conveyed in material and tangible form. In fact, science teaching in schools at formative stage and preparatory stage is the very foundation on which the future supply of scientists and technologists depends. Not only young minds are shaped and channelled, but the talented can be screened and given special care and grooming. However, the subject has received less serious attention in this country than in some of the other technologically advanced countries. In fact, the UNESCO took up the survey of science education in schools several years back. A special information service replies queries pertaining to problems in every day science and thus inspire interest in growing minds.

An especial area of science education is that powerful pedogogico-sociological innovation which we know as 'audio-visual' education, a technique which falls more properly in the domain of arts than sciences, with one difference that the motiffs are motivated. Some recent experiments in Delhi, using television sets science education in schools has met with heartening initial success. However, the technique is in vogue in a much wider scale in western countries. For the limited facilities available for 'demonstration classes' in Indian School, this sort of teaching would be very welcome in fact even for those schools which have comparatively better facilities for 'laboratory' demonstrations, a centralised, well organised 'practical' projected audio-visually and giving the effect of a class room, would be a boon.

A point which has to be considered, till such facilities as television become generally wide spread as a part of science education in Indian schools, is effective utilisation of conventional arts in science teaching. The new audio visual phase is perhaps just the version of the sporadic though very useful application of arts in the study of sciences. It is needless to record the epic illustrations in the Natural History Tests of Eighteenth and Nineteenth century which enlivened the interest of people towards these individually practised pass-times which are now full-fledged branches of descriptive sciences.

More concentrated efforts can be made to fully utilise the effects of plastic as well as well as fine arts to convey principles, phenomena and concepts in science for a more rational and more effective science teaching both as a part of curricula in schools as well as popularisation of science.



MODERN CONTRIBUTION TO ANTARCT RESEARCH

New evidence linking an underwater mountain range in the Antarctic with the Andes of South America has been gathered by two young British scientists aboard the Royal Research Ship *Shackleton*. Seismic readings were taken by the two scientists, in co-operation with a naval vessel, to extend the highly successful magnetic survey that they carried out during the *Shackleton's* previous voyage.

Since she left Southampton in October last year, the *Shackleton* has steamed over 30,000 miles visiting the British Antarctic bases with relief staff and supplies, and making the first of a series of regular observations to check the secular change in the earth's magnetic field.

Secular change is thought to be connected with currents on the surface of the earth's core. Observations taken during the International Geophysical Year showed that it takes place more rapidly in the Antarctic.

The British Antarctic Survey (formerly the Falkland Islands Dependencies Survey) is devoted to scientific research in British Antarctic territory under the direction of Sir Vivian Fuchs. For more than 17 years it has maintained permanent bases on the mainland of Graham Land and on nearby islands. Today the Survey's work forms part of an international co-operative study of the whole region in which the 10 nations taking part exchange information.

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BRITISH SURVEY SHIP'S RESEARCH IN INDIAN OCEAN

A Royal Navy survey vessel returns to Britain on May 31 with evidence that the east coast of the African continent may extend under water for nearly 1,000 miles from the existing coastline.

The vessel, HMS *Owen*, returns with her sister-ship, HMS *Dalrymple*, from survey work in the Indian Ocean where she has worked as part of the British contribution to the international Indian Ocean expedition.

The expedition, sponsored by the International Council of Scientific Unions and by UNESCO, is undertaking a scientific exploration of the ocean's marine biology and submarine geology. It is also directed towards the encouragement of marine sciences in the countries bordering the Indian Ocean. The expedition will occupy almost all the world's larger research vessels during the coming two years.

Admiralty Announcement

The Admiralty announced in London on May 28 that HMS *Owen*, which sailed from Britain last September for the first of five se asons in the Indian Ocean, had reported that her survey work had revealed an offshore zone 200 miles wide and extending from Madagascar to Socotra island. The characteristics of the zone suggested that it might be underlaid by a wedge of sedimentary rocks several miles in thickness and effectively extending the continent of Africa. Geologists working on land in East

Africa and Madagascar had suspected that the eastward-tilted continent might continue beneath the deep waters of the Indian Ocean, and the findings of HMS *Owen* appeared to confirm this.

HMS *Dalrymple*, which also returns to Britain on May 31, has been engaged on research work in the Persian Gulf.

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GROWING LEPROSY GERMS IN TUBES

British scientists may be the first to grow human leprosy germs in the test tube—thereby solving one of the main problems hampering research into the disease.

Doctors at National Institute of Medical Research in London have already discovered how to grow rat leprosy germs in the cells of rat connective tissue. Now they have made human leprosy cells expand in a culture medium rich in cane sugar, and hope soon to make the germs divide and multiply. Once this is done, the way is open for proper testing of drugs.

A factor that has hampered progress in the fight against leprosy is the slowness of action of the germs causing the disease. Whereas other germs divide and multiply in 20 minutes—multiplying their numbers by 4,000 times in four hours—the leprosy germ takes 10 to 14 days to make the first division into two. That is why it has been difficult to test drugs for their action against the disease. It has been necessary to rely on the similarity between the leprosy bacillus, known scientifically as Mycobacterium leprae, and that causing tuberculosis, and to assume that drugs effective in treating the latter will be equally effective against the first. This does happen, but it is difficult to determine on this basis the best drug for the job.

When leprosy germs can be grown in the test tube, selection and testing of drugs will be easier.

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"TELSTAR" PRJECT—Mr. CLARKE SEES REALIZATION OF 17-YEAR-OLD IDEA

The transmission of the first transatlantic television picture from the U.S.A. to Europe *via* the communications satellite "Telstar" marks the realization of an idea put forward 17 years ago by a British scientist, Mr. Arthur C. Clarke.

Mr. Clarke, winner of this year's Kalinga Prize for his writings on science, was invited to be guest of honour at the launching of "Telstar" on July 10 from Cape Canaveral (U.S.A.). Unfortunately he was unable to be present, but instead saw his theory become fact by following the satellite's progress by radio from his home in Ceylon, where he is making an underwater film.

It was in October 1945 that Mr. Clarke, then a Flight-Lieutenant in the Royal Air Force, first suggested the idea of worldwide communications *via* satellites orbiting in outer space. He wrote a feature called "Extra-terrestrial Relays—Can Rocket Stations Give Worldwide Radio Coverage?" for a radio magazine.

In the article he outlined in exact detail what has now been achieved by the "Telstar" project and added: "Many may consider the solution proposed in this discussion too far-fetched to be taken very seriously. Such an attitude is unreasonable, as everything envisaged here is a logical extension of developments in the past 10 years."

Mr. Clarke tried to patent his idea but failed.

On July 10, his partner in film-making, photographer Mike Wilson, who is in London

on a visit, said: "It would have been worth a fortune under patent, but he did not mind being turned down. He is just glad that everyone will benefit. The Americans acknowledge it was his idea, and they have constantly consulted him during the planning.

"One way he will benefit himself eventually—he will be able to receive BBC television programmes in Ceylon."

Auditor-Turned-Scientist

Arthur Clarke was born at Minehead (Somerset) in 1917 and after schooling at Huish's Grammar School in Taunton entered the civil service as an auditor.

It was during World War II that his scientific talents were fully exploited. He first worked on a ground-controlled approach system for landing aircraft and later became an authority on radar. After the war he studied at King's College in London, obtaining a first-class honours degree in physics and pure and applied mathematics.

After serving as assistant editor of *Science Abstracts*, he turned his attention to full-time writing and has since written a number of books on science, engineering and his favourite hobby—underwater exploration,

Now President of the Ceylon Astronomical Society, he lives in Colombo, although he is well known in both the U.S.A. and Britain for his numerous lecture tours and television appearances. A former chairman of the British Interplanetary Society, he is a member of a number of scientific organizations throughout the world.

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GERMANY'S FASTEST TRAIN

A train drawn by a newly-developed 6,000 h.p. electric locomotive and capable of a speed of 120 miles per hour is now the fastest train in the Federal Republic of Germany.

The Federal Railways have just brought this train, the new "Rheingold", into service. Like its predecessor, which began to speed over the tracks in 1928, the new "Rheingold" bids fair to play a significant role in the competition between long-distance rail traffic and air transport, especially in serving tourists.

Many Improvements

Its speed is the most obvious of the many improvements which the new train incorporates. Others include an observation car, more comfortable and spacious seats and air conditioning. The authorities declared that there was no reason why all German long-distance trains should not be brought up to this standard within the next eight years.

Meanwhile, the President of the Federal Railways has announced that the replacement of steam traction by electric traction has been progressing rapidly. Within the next few years, a track lenght of 9,000 kilometres, out of about 32,000 kilometres of the Federal railway network, will have been electrified, he says.

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THE ATOM AND ..... INSECTS

On the Island of Curacao, one of he Netherlands Antilles, an interesting experiment was carried with the aim of destroying the blow-fly, which does great damage to livestock. This fly lays its eggs in cuts, scratches, and slight wounds in the animal's body. In about 24 hours maggots hatch from the eggs, which feed on muscular tissue. These can devour an animal alive. On the Island of Curacao, where the climate is mild and the winter is warm, the

renew their progeny the year round.

To destroy the flies, sterilization of the males was resorted to, the sterilizing being done with the help of Hray installations and gamma radiators containing the radioactive isotope of cobalt. Every week, 400 sterile males were scattered by aircraft over every square mile of territory. These mated with females which had grown up in natural conditions and the eggs laid by the latter proved to be without vitality.

That is how the blow-fly was completely wiped out on the Island of Curacao three months after the experiments were begun. The possibility presented itself of entirely liquidating the pests as a biological species.

The amazing experiments on Island of Curacao was reported to the United Nations Organization, to the International Committee on Utilization of Atomic Energy for Peaceful Purposes. The Committee organised a special symposium of entomologists in Bombay, which S.V. Andreyev, a Leningrad scientist who heads the Biophysics Laboratory at the USSR Institute for the Protection of Plant life, was invited to attend.

The Leningraders decided to devise a method of radioactive sterilization of garner and fruit pests. It is for this purpose that an automatic pest-producing factory has been designed. At this enterprise all processes will be regulated from a central control board. Equipment will include high-precision automatic machines, semi conductor and electronic devices, radioactive emanation installations, refrigerating plant, and clin atic chambers.

The climatic chamber in the institute is already operating; its control device automatically maintains the required temperature, humidity and intensity of illumination.

At the same time research has begun to establish the proper dose of radioactive emanation to be given to the insects. S.I. Samoilova, who has a candidate's degree in agriculture and B.K. Martens, who has a candidate's degree in the technical sciences, have in laboratory conditions determined the doses for sterilising the boll warm, a cotton-field pest. V.A. Molchanova, who has a candidate's degree in agriculture, carried out identical investigations for the cabbage maggot and the apple worm.

This is how still another possibility of utilizing radioactive radiation for the needs of the economy has been revealed. And perhaps the time is not far off when pests, and also mosquitoes, flies and other insect parasites will vanish forever from the face of the earth with the help of the peaceful atom.

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LIFE ON VENUS

Molecular oxygen, which is indispensable to organic life, has been found in the upper layers of Venus' atmosphere. The discovery was made by Vladimir Prokofyev, of the Crimean Astrophysical Observatory.

The astronomer based his conclusions on a thorough study of unique spectra of Venus. These spectra were obtained by using a big tower solar telescope and a specially designed spectrograph when Venus was at its closest to the Earth, and subsequently when the planet was varying distances away.

It is known that the atmosphere of Venus contains carbon dioxide. So far only one spectrum of the night sky glow has been obtained by any scientist in the world. It is the work of Nikolai Kozyrev, of the Pulkovo Observatory. This spectrum indicates the presence of nitrogen in the atmosphere of Venus.

All this leads scientists to believe that organic life is possible on that planet.

Articles

THE GALAPAGOS ISLANDS, A NATURAL LABORATORY FOR STUDYING EVOLUTION[1]

By Jean Dorst

Deputy Director of the Natural History Museum, Paris; Scientific Secretary of the Charles Darwin Foundation for the Galapagos Islands

The Galapagos Islands are one of the undoubted show-places of biology. They lie just below the Equator, some 600 miles off the coast of Ecuador, the country to which they belong. Their origin is strictly volcanic and they are, in fact, the upper parts of volcanoes that have risen from the ocean bed: they have never been linked with the American continent. This 'oceanic' island characteristic, in the biogeographical sense, accounts for the sparseness of their flora and fauna as compared with those of the neighbouring continent. It is probable that at some remote geological period the Islands were more easily accesssible perhaps because of the existence of a westward projection of Central America. This would explain how certain reptiles managed to get to the Islands and survive until our own times, sheltered from the evolutionary trends in evidence in other parts of the world, whereas mammals were unable to make the crossing at a time when communications were no longer possible.

Thus the special interest of the Galapagos Islands resides in their being a refuge of this kind; they are in many ways a kind of preserve for a fauna which has disappeared elsewhere. This is particularly true of the gaint tortoise which is now everywhere extinct except in the Galapagos and the Seychelles, although fossil forms of it have been found throughout the world. Other denizens of the Island include the marine iguana, the only existing saurian which is really amphibious, the land iguana, a snake and a number of small reptiles.

But the Islands—a miraculous storehouse for the biologist—have also been the theatre of true differentiations which have taken place there under conditions of complete isolation. The number of primary stocks being so few, it is much easier to trace the descendance of the secondary forms. The biologist is afforded a far better ringside view of the process of the differentiation of species, as it were, than anywhere else in the world, where the phenomena are rendered owercomplicated by the multiplicity of the initial stocks. The process of evolution is thus made perceptible, and this, undoubtedly, is the interesting characteristic of the Islands, making them a veritable natural laboratory for studying evolution. It is hardly surprising that they made such a powerful impression on the young Charles Darwin when he visited them in 1835 during the voyage of

1. We publish here the text of a paper presented by Mr. Dorst at the third session of the Advisory Committee on Humid Tropics Research, held in August in Honolulu (Hawaii) as published in UNESCO chronicle, Nov. 1961.

the *Beagle*: and he himself later described them as the starting point for the development of his masterly theories.

But there is more besides. As a result of the very special oceanographic factors, and particularly the existence of cold currents—an extension of the famous Humboldt current proceeding from the Antarctic along the South American coast—the seas that wash the shores of the Galapagos Islands are abnormally cold for what are in fact equatorial latitudes. This has had a profound effect on the climate of the Islands, which are largely desert, as well as a very marked one from the oceanographic standpoint. In consequence, the seas of the archipelago, at the junction of the cold and hot waters, are populated by animals of extremely varied origins, some from the warm seas and others from the cold Antarctic seas with low-temperature currents. This produces the astonishing spectacle of the frigate bird of the tropical seas side by side with the penguin characteristic of the Antarctic, from which it comes.

The Islands, therefore, are of outstanding interest to the biologist in many ways. However, world-famous though they are, they are at present in grave 'jeopardy'. At the time of their discovery in 1535, they were virgin islands, despite the earlier visits by Indians of the pro-Colombian era. But before long, they came to be used as a landfall for pirates and privateers, and eventually they were subjected to colonization by people to whom the problem of the conservation of nature meant, of course, absolutely nothing. On top of that, the giant tortoises were found to be a valuable source of fat, and a small scale industry developed, especially during the nineteenth century, based on the exploitation of these unfortunate creatures, from each of which it was possible by boiling down, to extract from one to three gallons of oil noted for its choice flavour. Certain biologists reckon that some 10 million of them were destroyed during the course of three centuries of exploitation. The result is that these tortoises are now extinct in some of the islands and extremely rare in others. The fauna as a whole, for that matter, has suffered greatly from the ravages of man and also from the introduction of domestic animals which later reverted to the feral state. There are no indigenous mammals on the Islands: the rat and the mouse were unwittingly, and the goat, the ox, the pig and the dog wittingly, introduced by man. All of these did irreparable harm to the local fauna by destroying their habitats. Entering into competition with the reptiles, they emerged victorious in the unequal struggle because they were better adapted. Also, certain of the newcomers went in for destroying the eggs and the young both of the reptiles and of the birds.

The effects of all this were intensified by the tranformation of biotopes resulting from direct human action. The colonization was almost invariably carried out with complete lack of judgement, and culminated in attempts to cultivate land totally unsuitable for farming and soon left abandoned, in most cases, with its biological balance thoroughly shattered. Never has there been so radical a despoiling of nature, or so intensive a destruction of a biological aggregate unique in the world.

This state of affairs has latterly moved the Government of Ecuador to counteraction. Incidentally, it had attempted, even before the second world war, to take steps to save this outstandingly precious heritage.

Following a visit to the Island by Dr. Eibl-Eibesfeldt, the problem was taken up by the International Union for the Conservation of Nature and Natural Resources, and at the Ecuadorian Government's request, Unesco sent a number of experts to the Islands to examine the state of the flora and fauna and to devise essential measures for their protection.

Under Unesco's auspices and with the support of the Ecuadorian Government, the Charles Darwin Foundation for the Galapagos Islands has now been established with its headquarters in Brussels. The Honorary President is Sir Julian Huxley, and the executive committee, under the chairmanship of Professor V. Van Straelen, is composed of representatives of all the countries, interested in the problem. With the aid of funds from a number of countries, a start has been made in constructing a biological station at Santa Cruz (on Indefatigable Island)—a suitable site on account of its central position in the archipelago and its comparatively unchanged natural state. The station, which is being built under the direction of Mr. R. Leveque, a Unesco expert commissioned by the foundation, will be ready to receive research workers in all fields and of all nationalities by the end of 1961.

The station's work programme is extremely ambitious and many-sided. The most pressing task, of course, is to device methods of ensuring the survival of the flora and fauna of the Islands. But that end, obviously, cannot be achieved by merely imposing restrictions: survival will depend far more on a series of measures affecting the general economy of the Islands. It is no business of the foundation, of course, to interfere in the internal affairs of Ecuador. However, the point is that the conservation of nature, here as in many other parts of the world, is very largely dependent on the economic conditions of the human population. The 2,000-odd settlers now living on the Islands—people of sterling quality though most of them are—are driven by their precarious position to exploit the fauna with inconsiderate haste. This type of exploitation must be stopped and replaced instead by the rational development of the few areas of the Islands which are definitely suitable for farming. At the same time, however, it is essential at all costs to ensure the preservation in large measure of the humid biotopes of the Islands, in view of their great biological and especially botanical importance.

The station will be able to do useful work to that end by studying the soil and its vegetation in order to find out which of the biological areas could be givjen over to rational farming, which ones will never be capable of yielding crops, and which ones should be preserved in their natural state. The Galapagos Islands offer a particularly interesting field of study for the ecologist, for they provide an opportunity of tracing the progressive transformations of the soil from raw lava to earth in the true sense—rich earth where vegetation can flourish.

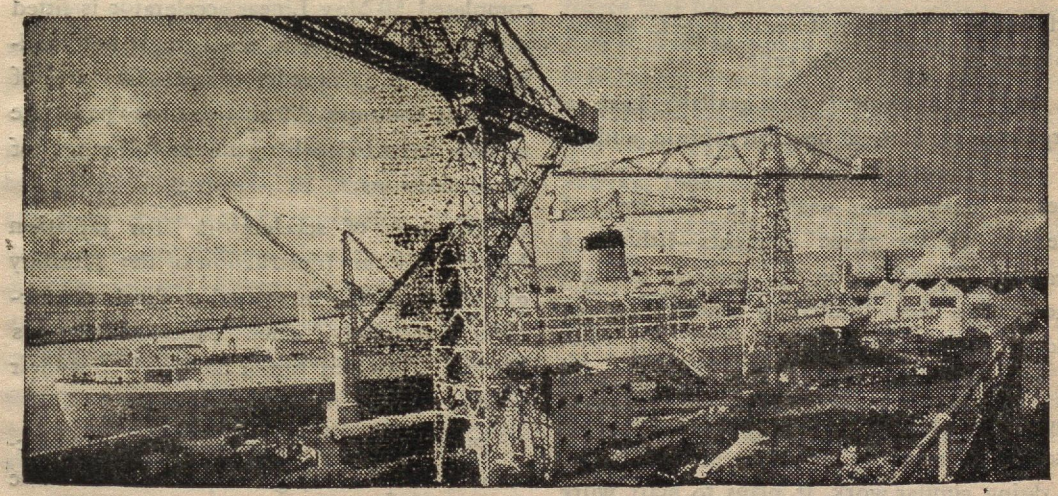
In contrast with the extreme poverty of the soil, the Islands are extremely rich in marine resources on account of the presence of low-temperature waters. Oceanographers speak of waves 'black with animals', on which innumerable varieties of fish, and even cetacea live. Rationally exploited, therefore, these resources could be a valuable source of income to the Islands and at the same time provide Ecuador with the nitrogenous foodstuffs that it lacks. In this connexion, also,

the biological station could devote part of its work to the basic scientific research essential for economic development.

Then there is tourism, as another possible and not inconsiderable source of income. The Galapagos Islands, whose name is familiar to people throughout the world, are outstanding for their natural scenic beauty and a fauna which includes some truly spectacular examples. They would be a great attraction for tourists who could provide a good source of revenue with comparatively little investment having to be made by Ecuador. The first condition for any such project, however, must be the strict protection of nature in most of the archipelago. The foundation could make itself responsible for studying the problem of protecting nature in this connexion and make proposals to the Government.

Work on all these lines will do more than anything else to ensure the survival of wild life on the Island, hard—hit by the undubitable underdevelopment which lies at the root of the ravages caused over the centuries.

These, of course, are only a few of the aspects of prospective research. A systematic investigation of the flora and fauna can be expected to yield truly sensational results, for they have scarcely been studied so far in spite of a long series of missions to the Islands. The archipelago has still much to teach us about evolution, as well as in the field of ecology and the study of behaviour, and the ecological system of the Islands and its study may bring to light facts and phenomena unknown and undetectable anywhere else in the world. A unanimous effort should therefore be concentrated on preserving this capital of inestimable scientific value.



"TRANSVAAL CASTLE" NEARS COMPLETION IN GLASGOW

Alongside the giant cranes in a Glasgow, Scotland, shipyard lies the new hotel-class liner "Transvaal Castle", now nearing completion for her maiden voyage next January. The 35,000-ton liner marks a new conception in ocean travel, the convention of different classes of accommodation has been dispensed with. Instead, the cabins are all of similar designs and fitted with the same facilities.

USE OF NUCLEAR TECHNIQUES INCREASING FOR TREATMENT OF CANCERS

The use of nuclear reactors and atomic particle accelerators to treat various types of cancer is steadily becoming more important in the United States.

The first reactor designed specifically for medical use was built at the Atomic Energy Commission's Brookhaven National Laboratory near New York City. It became operative March 15, 1959. The relatively new atomic device provides a neutron beam to treat patients with brain tumors. This so—called neutron capture method of therapy uses energy released by the prompt decay of radioisotopes created in the tumor or lesion.

Nonradioactive elements are introduced into the patient's body and become localized in the tumor. A beam of neutrons then causes the nonradioactive elements to become radioactive. The prompt decay of these radioisotopes destroys tumor cells.

Only three elements now available have a large enough thermal neutron capture ability of rapid disintegration into energetic particles to make them usable in this form of therapy. Of the three elements—lithium 6 uranium 235 and boron 10—the last neutron therapy has been limited to lesions associated with a brain cancer.

In addition to the work being done at the Brookhaven laboratory, the Massachusetts General Hospital in Boston, Massachusetts, is doing similar work. It plans to start work soon with cancer sufferers, using the medical part of a new reactor installed recently at thc nearby Massachusetts Institute of Technology.

Medical use of atomic particle accelerators began 25 years ago when radioactive isotopes became available. Today, the use of electron or positive ion accelerators in biomedical research is widespread, and the use of such acceleraters for the treatment of cancer is steadily increasing.

High-energy X-rays and ions created by accelerators are currently empoyed in therapeutic investigations of known, deep—seated localized tumors. This technique is being used by physicians and others who are using the Atomic Energy Commission's 70 Mev (70 million electron volt) synchrotron-type accelerator at the University of California School of Medicine in San Francisco.

At the Cancer Research Hospital of the Atomic Energy Commission's Argonne National Laboratory, near Chicago, a recently completed 50 Mev Linear accelerator is fitted with an electron beam scanner. It automatically covers a predetermind skin area of irregular contours. Atomic particles penetrate to any desired depth up to the full range of their electrons.

The use of accelerators for radiation hypophysectomy (destruction of the pituitary gland) has deeply interested medical researchers, particularly since experimental rats showed a lowered tumor incidence after their pituitary glands were destroyed.

Physicians have long known that destruction of the pituitary gland provides dramatic temporary relief for many cancer patients. Surgical removal of this gland, however, is difficult and dangerous. The gland is now

(*Continued on page* 19)

FIFTY YEARS OF THE ATOMIC NUCLEUS

By Dr. J. A. Newth

Fifty years have passed since Rutherford, working in Manchester, established by his elegant experiments the main feature of atomic structure—the existence of the nucleus. Those fifty years have been years of tremendous technological advance culminating in man's first exploration of outer space. They have also been years of vast social upheaval embracing two world wars, revolutions involving a third of the world's population and the emergence as free nations of most of the former colonial territories.

From the point of view of a scientist, the study of the nucleus has been one of the most exciting and stimulating fields of money, equipment and manpower that have been invested in this research, every problem solved has shown the existence of another awaiting solution.

But, more than this, the nucleus has presented mankind as a whole with very different problems. These are economic, social, political and moral in character. Since 1945 we have had the possibility of using nuclear energy for peaceful purposes, to raise the living standards of the world's population. Equally, we have been able to develop nuclear explosives whose power is such that the destruction of our entire civilization is a real danger rather than a fantasy of imaginative science fiction. The uses of nuclear energy are not the responsibility of the scientist alone—the whole of humanity is involved.

As we pass to the second half century of living with the nucleus an assessment of our position is in order. No scientist could write of the history up to the present without saying something of the scientfic advances that have been made. No one with a social conscience could write without discussing the uses and misuses of nuclear energy.

The comments that follow are the views of an English scientist viewing the social problems as they appear to an Englishman with some concern for human welfare. For a Russian, Chinese or an American the emphasis would be different since their economic surroundings and their political outlooks are so dissimilar.

The Science of the Nucleus

Very early studies of radioactivity have shown that certain atoms were capable of liberating vast amounts of energy by comparison with that available from chemical changes. After Rutherford's discovery of the nucleus it was clear that this energy was stored in the nucleus—a consequence of the forces that held the nuclear particles together. These nuclear forces are quite unlike the well-known gravitational and electrical forces of classical physics, and their study over the past fifty years has been one of the most exciting branches of modern physics.

The international centre of nuclear physics in the 1920's was certrinly Rutherford's laboratory in Cambridge—it gathered to it scientists from all parts of the world. In the 1930's more and more laboratories were established to pursue the subject and the output of scientific results increased by leaps and bounds.

One of the most fruitful techniques used for studying nuclear forces has been the bombardment of nuclei by particles of very high energy. A small supply of high-energy particles exists in the cosmic radiation, but

man-made accelerators are capable of providing far greater numbers when and where they are wanted. The recent history of research in nuclear physics is closely tied to the construction of these accelerators from the earliest Cockcroft-Walton machine constructed in Cambridge in 1932 through the cyclotron built by Lawrence in the U. S. A. to the gigantic synchrotrons now working at Dubna, Geneva and Brookhaven.

This type of research has led to a tremendous body of knowledge about nuclei—how they can be transformed in different ways and what are their individual properties. It has also given birth to a whole field of physics—the study of fundamental particles. The majority of these particles were undreamt of twenty years ago but now they number more than a score. Most of them are unstable, disintegrating spontaneously after less than a millionth of second. They are produced in the interactions of high energy particles with nuclei.

In such a rapidly changing situation it is hardly surprising that no all-embracing satisfactory picture of nuclear forces should exist. At present, one can only say that the subject is thriving and that theories and experiments vie with one another in their multiplicity and their complexity.

Nuclear Energy

One result of the intensive research in the 1930's into nuclear properties was the realization that the nuclear energy which is released spontaneously in radioactive materials might, under certain circumstances be released in a "controlled" fashion. With the outbreak of the second World War the fear that the Nazis might develop a nuclear explosive helped to stimulate a tremendous effort to forestall them. The success of this effort is well-known. Following a trial nuclear explosion in New Mexico in July 1945 nuclear bombs were dropped on Hiroshima and Nagasaki in 1945 as the war with Japan drew to its close.

It was in the search for a nuclear explosive that the first nuclear pile was constructed in which nuclear energy could be released slowly as useful heat rather than with explosive violence. Thus in 1945 the technology for producing useful, peaceful nuclear power existed together with the possibility of producing nuclear weapons. Unfortunately, explosive material was a necessary by-product of power generation so that no clear separation could be made between investment in the peaceful uses of nuclear energy and investment in nuclear weapons.

Nuclear Power for Peace

The immediate post-war enthusiasm for the development of nuclear power for industrial purposes was a result of many factors. The rapid develepment of technology during the war led to the hope for correspondingly rapid advance in peaceful developments. There was a widespread understanding of the connexion between the standard of living in a country and the power available per head of population. The demands of the underdeveloped countries, the emergent nations of Asia, Africa and S. America, for power were clearly insatiable. In the industrial countries where stocks of fossil fuels were known to be limited there was a great hope that nuclear power stations would provide a cheap alternative to conventional thermal stations.

All these factors combined together to give a feeling of great optimism about the future peaceful applications of nuclear power. Governments were not slow to initiate pro-

grammes of development, although a cynic might well say that it was the requirement for nuclear explosives that gave the greatest impetus to reactor developments.

Looking back at the achievements of the sixteen years since the end of the war it is clear that many of the early hopes have not been fulfilled. In most industrialized countries reactors have been built as prototypes or for research. In a few, notably in Britain, a significant proportion of the country's electricity is planned to come from nuclear reactors. But, by and large, the efforts have largely been devoted to research, and the investment *that could have been made* in producing nuclear power stations has not, in fact, been made.

The reasons for this situation have little to do with technical problems. Sufficient experience exists for nuclear power stations, large or small, to be planned with complete confidence that their operation will be satisfactory. The hazards associated with the radioactive by-products are well understood and can be dealt with.

The reasons are "economic". Cynics, again, will say that, once the military supplies of nuclear explosives were ensured, the urgency for building reactors disappeared and Governments lost interest. Official reasons given for the slow progress concentrate on the higher short-term cost of nuclear power compared with that from other sources. In France hydroelectric power is cheaper, in Britain and the U.S.A. power from coal is cheaper, and so on.

In many cases this reasoning may be correct, but one should beware of taking short-term economic arguments too seriously. For example, in a country like Britain, as Fremlin has recently pointed out, the cost of conventional power should include some items that are ignored by economists. The mining of coal and the atmospheric pollution produced by burning it lead to human ailments that are charged to the health budgest rather than to the cost of electric power. If man's environment and well-being counted for rather more and penines or cents per kilowatt-hour counted for less, the balance would certainly be tipped in favour of nuclear power. The value of coal and oil as raw materials for chemical industry is an additional argument for replacing them as sources of power as rapidly as possible.

A peculiar virtue of nuclear power—the minute quantity of fuel required—has been exploited (with different aims) in the Soviet ice-breaker *Lenin* and in the American submarine *Nautilus*. In Britain, a traditional centre of ship-building, no comparable project has yet been undertaken.

Where the underdeveloped countries are concerned, the failure to provide nuclear power stations is only one aspect of the general failure to invest capital on acceptable terms. The trickle of help that has been given to Asian and African countries falls so far short of what is both necessary and possible that attention must be focused on the major political obstacles. Given a rational political policy, nuclear power would be of a tremendous value to many of the emergent states with their need to industrialize and at the same time raise the standard of living of rapidly increasing populations.

Finally, and wholly on the credit side, mention must be made of the uses of radioactive by products of nuclear reactors. These substances have found increasing uses in medicine, chemistry, agriculture and general

industry. In immediate economic terms their value may be small but they could make possible scientific advances of the greatest importance.

Nuclear Weapons for War

The post-war nuclear armaments race must be one of the most depressing episodes in the whole history of human civilization. It culminates in the present perilous situation where a large fraction of the world's population could be destroyed by the irresponsible action of a tiny group of people. It appears also that the destruction could also result from some faulty pieces of apparatus or human error *without anyone desiring it*. It is small wonder that the movement for "Nuclear Disarmament" attracts growing support from people of all political views.

To be sure, the armaments race is not confined to nuclear weapons. It is part of a political struggle that is waged with all the weapons available—including military therats and sabre-rattling. Nuclear weapons have increased the risks to such a level that the game is too dangerous to play and it is for this reasons that hopes for disarmament have been directed first to the nuclear arms.

In a short article no adequate survey can be given of the arguments used by successive nuclear 'strategists' to justify the uses of nuclear weapons. Nor can any satisfactory account be given of the international negotiations that have taken place with the avowed aim of banning nuclear explosions and outlawing nuclear weapons. All that can be done is to outline the main problems and suggest the lines of a possible solution.

With the development of the fusion bomb (H-bomb) triggered by a conventional fission explosion, there is no limit to the size of explosion that can now be produced. At the same time, so-called 'tactical' weapons have been developed with much less explosive power than that of the bombs used in Japan in 1945. Thus, military scientists have provided their armies with a complete spectrum of nuclear weapons ranging from the kiloton artillery for tactical use to the 50-megaton weapon whose only use can be the extermination of large populations. Needless to say, the borderline between tactical and strategic weapons is arbitrary and nebulous.

A feature of all nuclear weapons is that their testing involves widespread hazards. Quite apart from the disaster that overtook the crew of the Japanese fishing boat *Lucky Dragon* in March 1954, every test explosion releases radioactive contamination which, in the case of the H-bombs, is measurable over a large part of the world's surface. The accumulation of this radioactivity presents a biological hazard to present and future generations. No one is sure of the extent of the danger, but this uncertainty is itself a reason for caution.

It would certainly be misleading to suggest that the fall-out from tests is the greatest danger from nuclear weapo ut it is a reminder that every country, ...clear or non-nuclear, has a legitimate interest in the behaviour of the nuclear powers. It is also sure proof that neutrality is no protection in a nuclear war.

Nuclear Disarmament

Freedom from the threat of destruction that menaces the world can, utlimately, only come with an agreed policy of general disarmament. With good reason it is generally accepted that the first part of such an agreed policy must involve a ban on nuclear weapons. In this connexion one must consider in rather different terms the major nuclear

powers, the U.S.S.R. and the U.S.A., the minor nuclear powers, Britain and France, and the non-nuclear powers (including China).

For the non-nuclear powers there can, of course, be no interest in entering the race with nuclear weapons. Rather must they insist that they are already unwillingly involved in the issues of nuclear warfare and have a right to be heard in disarmament negotiation.

Their position could and should be strengthened by the withdrawal of Britain and France from an expensive junior partnership in nuclear alliance. The nuclear weapons of these two countries contribute nothing to their security and only ensure that they will be among the first targets is any nuclear war.

Where the two major powers are concerned, the difficulties in the way of agreement have been sufficiently ventilated. It is now clear that any technical problems connected with the control, supervision or inspection of disarmament are secondary to the political issues involved. A strong group of non-nuclear powers committed to a policy of disarmament could solve the technical problems: the political difficulties will only be settled by continued negotiation under the strong pressure of world opinion.

Conclusion

The only conclusions one can draw from such a picture of the present are conditional. Given political sanity and agreement to disarm, the prospects for nuclear power are as bright as ever they were. Without such agreement nuclear warfare cannot be escaped.

Let us hope that for the historian in fifty years' time the story of nuclear weapons will be a brief episode starting and finishing in the space of twenty years.

(*Continued from page* 14)

destroyed by the radioactive isotope, yttrium 90.

Five years ago radiation hypophysectomy was performed with an accelerator on patients with advanced cancer of the breast. Since the early experiment, many patients have been treated with the atomic accelerator. Signs indicating complete destruction of the pituitary gland appear generally within three months. To date, the results have been beneficial in nearly 50 percent of the cases treated.

MEDICAL RESEARCH TODAY

By Pierre Auger

The progress, of benefit to mankind, that has come from great discoveries such as the microbial origin of communicable diseases, chemotherapy, antibiotics, residual insecticides, etc., has actually taken medicine almost from the Middle Ages to its present level in no more than the past half century.

Alhough the diagnostic skills of doctors thirty to forty years ago can still be admired, the therapeutic facilities at their disposal can now be seen to be, in many instances, little better than pious hopes, and those few that were effective were not well understood and were often not properly used.

Clinical experience and acumen are greatly amplified by precise investigations; skilfully prescribed and compounded medicines, to be taken with water before or after meals, are largely replaced by single substances administered in a difinite dose per kilogramme of body weight at intervals chosen to maintain a desired blood level.

A further important and fundamental development greatly influencing research is the change in attitude from that wholly concerned with the sick individual to that more widely concerned with keeping the healthy person fit. The concern for sickness of the patient has thus widened into that for the health of the community. The older communicable diseases, for example tuberculosis and syphilis, are being rapidly conquered and the problems of the newer ones, such as poliomyelitis and other virus diseases, are being solved.

These benefits are of value both to developed and underdeveloped countries. For the former where people live longer and where their lives are more sophisticated the importance of cancer and the degenerative diseases is great; in the underdeveloped countries so great is the rate of change that these diseases may well be problems there in the next generation. Another result is the increased size of populations and the attendant problems of food supplies and nutrition; both of these call for much thought and study.

The results of past recearch have been great and beneficial for man; those of the increasing research of the future can be expected to be no less, and will arise more and more from fundamental studies though these may often commence during the search for answers to practical problems.

Medicine and medical research are no longer mainly concerned with bedside observations on diseased persons and the study of the effects on them of empirical remedies.

Advances in medicine today are based on the study of the healthy as well as the sick and the dead, particularly in relation to their total bodily and mental environment. Disease is a condition that can be defined in terms of deviation from the normal, and this means that the medical research worker must observe the behaviour of the so-called normal man as well as that of the sick one.

For the effective prosecution of medical research not only is the clinician needed but also workers in a number of other disciplines such as physics, nuclear sciences, chemistry, biochemistry and statistics. These are concerned with the examination of normal, as opposed to abnormal phenomena, which are

studied in the sick person by the clinician and the pathologist.

For future progress clinical medicine must be integrated with the basic sciences. Many medical problems are in fact really problems in applied biology, physics, chemistry and mathematics. Thus surgery is no longer a matter of operative technique, important is this may be. The surgeon must understand his patient in his biological and social setting, his metabolic and electrolyte balance, his nutrition and his respiratory, circulatory, hepatic and renal functions.

Medical research is no longer a bedside study separated from the laboratory. The first half of the century witnessed the disintegration of medicine into specialties. Now in the second half it is being reintegrated with other disciplines derived directly from the basic sciences. Medical research is becoming more and more a combined operation conducted on a wide front. Progress in cardiac surgery, for example, demands the participation of a team of experts versed in different disciplines. The study of drug addiction needs the co-operation of the pharmacologist, biochemist, psychiatrist, criminologist and sociologist.

There have been political changes in the pattern of medical research. At one time this was done mainly in the universities, but now it has spread from their confines and is carried out in hospitals and research institutions and by organizations sponsored by central government and international organizations, such as the World Health Organization.

In the past, national governments were interested in medicine mainly from the preventive aspect. By introducing the necessary legislation and a public health service many countries have reduced the incidence and morbidity of the major bacterial infections, although these have to a lesser extent been replaced by virus infections.

With the changes in the economic structure of many parts of the world, the community has had to play an increasing part in the economics of medicine, particularly in the provision of medical care, and the financing of medical education and research.

As a result of government sponsorship at the national and international level, attention is being focused on the study of diseases that were once considered of minor medical interest. Mental illness and the chronic degenerative diseases such as rheumatism, coronary disease, atherosclerosis and diabetes, are attaining greater prominence in the practice of medicine and in research programmes. They are of economic importance because of of the chronic disability that they cause.

Government intervention is also changing the pattern of medical economics. A whole body of research is growing up into the economics of the provision of medical care, and although strictly speaking not a scientific activity, it is a necessary one.

Another economic trend in medicine that has repercussions of medical research is the growth of health insurance which in some countries has grown to such an extent that there are very few free beds left in public hospitals. This means that there are fewer hospital patients available as subjects for research and teaching. Furthermore, the increasing dependence of universities on government funds will result in some of the research done there being subordinated to the needs of the nation and national security. This is particularly true in the field of nuclear medi cine.

Government aid can be of value to medical research in providing funds and amenities for those projects that are socially urgent and those than can only be solved on a national scale. In some cases the government has acted through a nationally formed research institute, of which thirty or more have been created in different countries in the last fifty years.

A corollary to national government aid is international co-operation in all fields of medicine. An increasing number of research workers, and research workers in training, are improving their knowledge and outlook by spending a period in the hospitals and research organizations of another country.

With the growth of industrial development in many countries industrial health and welfare are becoming of increasing importance, and both government and industry are concerned with raducing wastage of manpower due to disease and injury. Many large plants now have rehabilitation schemes for their workers after injury of illness.

The pharmaceutical industry has contributed towards progress in therapeutics by the discovery of a number of new and useful drugs. Whereas at one time new drugs were discovered in university or hospital labroatories, almost all those marketed in the last fifty yeats have come from the laboratories of the pharmaceutical industry. This industry is also sponsoring research in the hospitals and universities on fundamental work.

In recent years there has been a trend towards the study of man in relation to his environment. Illness, particularly mental illness, is being studied against its social background. If the concept of positive health is to be pursued many sociological factors must be considered.

Medical education programmes are undergoing modification. Medical teachers are going into the underdeveloped countries on an exchange basis to train doctors, and new medical schools are being built there. The need for a close relationship between medical education and medical research in emphasized in some quarters.

It is now accepted that medical teachers benefit by undertaking research and similarly the education of the medical student benefits by carrying out a piece of simple research. The increasing number of full-time appointments in medical schools should give teachers more time for reflection and reseach by relieving them of the necessity of part-time medical practice outside the hospital.

The general public is becoming more sickness-conscius as a result of the medical information that is now disseminated by press, radio and television, although it is often the more sensational aspects that are stressed. The patient can no longer be treated in ignorance of his disease. It should be explained to him in simple terms and if incurable he should be told how to live with it. Much disease would be prevented if the layman were taught the principles of healthy living without producing hypochondriasis.

With the great reduction in communicable diseases and with more adequate nutrition there is a resulting increase in population and increase is length of life. The ultimate aim of geriatrics which is concerned with problems of aging has been summarized as the adding of life to years and not years to life.

The implications of the longor life are seen when the expectation of life of 30 years for rural populations in underdeveloped countries is compared with that of some other

countires of perhaps 70 years. In the latter populations there will obviously be many more older people than in the underdeveloped countries.

In the last decade the problems resulting from this have come to the fore. They are social, economic and medical. There is increasing need for older people to be able to earn at least part of their day-to-day expenses and even more to be able to care for themselves as long as possible. Much success has been achieved in preventing the elderly from becoming immobilized aud bed-ridden.

Further work is needed into the understanding of all aspects of aging and this probably involves studies of all ages and of the degenerative diseases and cancer. Experimental research on aging is now being done in some centres. The varying rates of failure of different organs with age opens up a wide study of the part played by environment in its broadest sense and by genetics. Thus it will be seen that the problems of the aging will benefit from many aspect of medical research while their study will in turn contribute to the solution of other medical problems.

(Reprinted from UNESCO "Courier" April, 1962)

RESEARCH IN CHANCER AWARDED

Nobel Prize Winner bags yet another Coveted International Prize

Prof, Otto Heinrich Warburg, who is also the holder of the Nobel Prize, has been awarded the "Ludwig Darmstaedter and Paul Ehrilich Prize 1962".

Instituted in 1952 with the help of the Federal Government the Prize, which is worth 100,000 Marks is considered to be one of the most important international distinctions in the field of medical research. It is awarded every two years. Half of the money goes to the prize-winner and the other half to members of the rising generation of researchers.

Now living in West Berlin, Prof. Warburg was born on October 8,1883, in Freiburg, the south-west German university town. He wos a pupil of another German Nobel Prize recipient, Emil Fischer. In 1931, Prof. Warburg became director of the Institute of Cellular Physiology of the Kaiser Wilhelm Association (today the Max Planck Society) in Berlin set up with funds from the Rockefeller Foundation. He received the Nobel Prize for Medicine in 1931. He is a member of the Royal Society in London and a Knight of peace Class of pour-le-merite He stayed in the United States for some time as a guest professor.

The esteem in which Prof. Warburg is held in Germany and abroad stems not only from his scientific achievements but also from his firm opposition to National Socialism. He helped many to flee from the dictatorship who were being persecuted for political or racial reasons.

During the award ceremony in the Frankfurt Paul's Church, the Professor reported on the present progress of his research in combating cancer. In addition, he expressed his conviction that it would one day be possible to fight this dangerous disease by chemotherapeutic methods.

Prof. Warburg started from the discovery that cancer cells, in contrast to healthy cells in the body, can live without oxygen. He said: "This characteristic explains their behaviour and opens up the possibility of causal therapy".

Fight with cancer on

Prof. Warburg also pointed out "We cannot assert that we are already in a position to cope with cancer. But we many say that we are on the way to it. And I am convinced that we shall succeed".

Among those who took part in the ceremony were ex-president Theodor Heuss, who is the honorary chairman of the paul Ehrlich Foundation, and two of "his" scientists, Richard Kuhn and Adolf Butenandt, also holders of the Nobel Prize.

ASSOCIATION NEWS

Minutes of the 2nd (1962) CEC meeting of the Association of Scientific workers of India held on 30th July 1962 at 5-30 P. M. in the CSIR Conference Hall, New Delhi.

Present :

Prof. M. S. Thacker (President), Dr. S. Husain Zaheer (Hyd.) Sri C. Thyagarajan (Hyd.), Saravshri M. R. Raman, S. Ramabhadran, Y. H. Rao, J. N. Misra (Delhi), Sri U. B. Kanchan (Jt. Secy.) Sri G. M. Verma (General Secy. Pubn), Sri A. K. Singh (General Secy. Org.).

The meeting took-place with the President Prof. M. S. Thacker in the chair.

The President and members of the CEC observed two minutes silence and passed the following resolution condoling the sad and sudden demise of Professor B.C. Guha on 20th March, 1962 :

"It is with deep regret that the 2nd (1962) CEC Meeting of the Association of Scientific Workers of India have to record the sad and sudden demise of Prof. B.C. Guha on 20th March, 1962. Professor GUHA was one of the Founders of the ASWI and was very closely associated in active capacity as the General Secretary, Vice-President and President in the initial stages. This year, he was elected as the Vice-President of the Association at the Annual Meeting held at Cuttack. It is unfortunate that the Association will not be in a position to have the benefit of advise and help of one of the very active members in its fold. His contribution to Science, Scientific work and the Scientific Workers of this country will, however, remain as a permanent record of his dedication to the cause".

Confirmation of the minutes of the 1st CEC (1962) meeting

The minutes were read out and confirmed.

Report of the General Secretary (Orgn.)

The report of the General Secy (Org.) as per Appendix 'A' was read out and approved.

Report of the General Secretary (Pubn.)

The report of the General Secy (Pubn.) as per Appendix 'B' was read out and approved.

Report of the Treasurer

The report of the Treasurer as per Appendix 'C' was read out and approved.

Conversion of ASWI From Trade Union To Societie's Act

After discussions, it was decided that the admendments arising out of the discus-

sion with the Registrar of Firm's and Societies should be passed on to the Branches/ Units/Affiliated Organisations for their comments and approval. Based on the above, further action will be processed. It was again emphasized by the President and Dr. S. Husain Zaheer that every care should be taken to ensure that whatever rights and privileges the Assocn. has at present should not be lost consequent to any such transformaction that may be brought-about.

Increage in Membersihp/Recognition of ASWI

It was decided to issue the draft letter pertaining to increase in membership signed by the President. The letter regarding recognition of ASWI will also be sponsored by the President. The drafts submitted to the President earlier should be suitably cut down to one page of printed matter.

Audit Report

The audit report of the year 1961-62 submitted by the Auditors was considered by the CEC. As per the advice of the Auditor, it was decided to write-off the unrealiseable outstanding revenues of Rs 731.24 nP. in respect of advertisement pending for many years, from the various firms.

Membership vis-a-vis Centre's Share

On the basis of the report submitted by the General Secy (Org.), the CEC took a very serious note of the present financial position vis-a-vis the poor contribution from the Branches/Units/Affiliated Organisations. The General Secy. (Org.) was directed to bring-forward this question as a specific resolution for the next General Body Meeting. In the meantime, he should also expedite the branches and explain the situation to them.

Indian Regional Centre

The CEC noted that all accounts relevant to the Indian Regional Centre and the ASWI have been settled satisfactorily.

ASWI Symposium

Dr. S. Husain Zahher who had been authorised earlier as a one man Committee in regard to matters connected with the National Symposium submitted a report. Based on this report, the CEC decided that the title of Symposium should be "ROLE OF THE INDIAN SCIENTIST". The dscussion should include - "Scientist in Indiustry", "Scientist in Educational Institutions", "Scientist in Research Institutions and "Scientist in Indian Society". Every attempt should be made at the Symposium to evaluate the existing situation, the problems encountered; and steps taken or suggestions made to overcome the difficulties. The venue of the Symposium should be Regional Research Laboratory, Hyderabad. It should be held sometimes in February or March, 1963. The Committee approved all the details pertaining to the organisational aspects like duration, invitations, individuals to be sponsored and final programme, publications and financial matters. It was decided that the ASWI should approach the Ministry of Scientific Research & Cultural Affairs for a grant to conduct the Symposium. The General Secy. (Org.) will persue the question of the finance while all other aspects relevant to the organisation of the Symposium will be undertaken by Dr. S. Husain Zaheer.

CSIR SWA

The Committee directed the General

Secy. to expedite the branches and units and bring to their notice that the formation of individual association is very essential in respect of respective branches.

World Federation Symposium

The Committee noted the decision of the National Preparatory Committee. The following delegates were sponsored on behalf of India to attend the Symposium on 'Higher Scientific & Technological Education' to be held in Moscow in September, 1962 :

1. Dr. S. Husain Zaheer (Hydrabad)
2. Prof. PC Mahalanobis (Calcutta)
3. Prof. AC JOSHI (Chandigarh)
4. Prof. BR Seshacher (Delhi)
5. Dr. Gurbakhsh Singh (Varanasi)
6. Prof. SN Bose (Calcutta)
7. Bring. SK Bose (Bombay)
8. Dr. Rais Ahmed (Srinagar)
9. Mr. A. Rahman (Mysore)

Advertisements—Vijnan Karmee

The Committee noted and approved of the report submitted by the Jt. Secy. (Pubn.) Sri UB Kanchan. The Committee congratulated Mr. Kanchan on his efforts made for procuring advertisements to the tune of about Rs.2,000/-, on the basis of his tour to Bombay. The Committee also advised Sri Kanchan to make similar efforts in Calcutla. Every effort should be made by the Association to ensure that the publication ultimately is made self-sufficient without depending much on Govt. funds. In this context, the efforts made by the publication office, this year, is commendable.

Any Other Business

(i) In the course of the meeting, Prof. Thacker had to leave earlier because of certain eye trouble. Dr. Zaheer in his absence took the chair. Prof. Thacker also pointed out that there was a possibility of his undertaking some other assignment from the Govt. consequent to which it may not be possible for him to be the President of this Association and many other such Institutions. In that eventuality, he desired that the Assocn. should make an alternative arrangement. He advised that Dr. Zaheer who has been one of the oldest and active member of the Assocn. should undertake this responsiblity of Presidentship of the Assocn. for the remaining period of the year. It was also decided by the CEC that the meeting should be held sometimes in September 1962 prior to his relinquishing his chair as President of this Association.

(ii) The General Secy. (Org.) informed the the CEC that a nominal sum of Rs. 10/- p.m. is required for the maintenance of the office of the Association. The Committee approved it w.e.f. 1st June, 1962.

The Meeting came to a close with a vote of thanks to the chair.

A. K. SINGH,
GENERAL SECRETARY.

APPENDIX 'A'

Report of the General Secretary (Organisation)

Conversion of ASWI From Trade Union to Society Pattern

(Minute No. 1 of the previous report refers)

Subsequent to the filing of the application with the Registrar of Firms & Societies at Lucknow, the Association has been informed that the clause in the Constitution relevant to 'Protection of Economic and Service Conditions' does not come within the purview of the Societies Act. The question was taken up with the Ministry of Law with the help of Law Adviser of the CSIR. On the basis of his advice, certain amendments pertaining to objection referred above and other minor objections as raised by the Registrar have been made so as to fulfil our purpose within the Societies Act. The amended draft constitution which is before you will be submitted to the Registrar of Societies after the approval of the CEC.

Increase In Membership/Recognition of ASWI by The Govt.

Pending decision on Item N0.1 above, the action required will be initiated later.

Audit Report

(Minute N0.3 of the previous report refers)

The accounts of the Association for the period ending 31st March, 1962 have been audited and the report of the Auditor's for the year 1961-62 has been submitted to the Govt. A copy of the audit report will be published in V.K. for information of all members.

Members vis-a-vis Centre's Share

(Minute N0.4 of the previous report refers)

Further reminders were issued to the Branches/Units/Affiliated Organisations regarding contribution towards Centre's share. The response is very poor. The contribution towards Centre's share is again very little during the year 1961-62. The CEC should take serious note of the situation.

The affairs of one of our constituent Units Rajahmundry has come to a stand-still during the current year and Unit has taken a decision to wind up the Unit. The Secy. of Rajahmundry Unit has been informed to take further action as per Constitution.

The present position of Mysore Branch is also far from satisfactory. Activities of this Branch have also come to almost stand-still. The Secretary, Mysore Branch has been requested to furnish the details as to why such an awkward situation has arisen.

Grant-In-Aid

(Item N0.5 of the previous report refers)

The Govt. of India, Ministry of Scientific Research & Cultural Affairs, New Delhi has been approached for a consolidated grant in the current year to the tune of Rs. 12,500/- towards the recurring expenditure connected with the publication of V.K. To a request for the payment of first instalment, the sanction of Govt. has been recently received for Rs. 3,000/-.

A. K. Singh,
General Secretary.

APPENDIX 'B'

Report of the General Secretary (Publication)

Since last quarter, we have been able to bring out five issues of the Journal VIJNAN KARMEE i.e. March, April, May, June & July; part of the material for Augurt issue is in the Press and we hope, we will be able to regularly publish our Journal by 15th of each month so that it may reach the members before the end of the month. There was some complaint by some of the members in the previous months that the journal was not reaching them regularly. Due to orientation in the system of mailing, we hope the trouble is over. with the help of our Jt. Secretaries, Sri U.B. Kanchan and Sri R.M. Chitnis, it will be further improved and there will be no complaint from our members in this respect.

In the previous report, we observed that the revenue from the advertisements has not been satisfactory since a long time. We were running a deficit of about Rs.1700/- due to publication activities in the year 1961-62. Our Jt. Secy, Shri U.B. Kanchan went on tour for acquiring advertisements to Bombay/ Poona. Despite certain difficulties, he has been able to get promises of advertisements for about Rs.2,000/-. This has been possible with the kind help from our Vice-President, Dr. S. Husain Zaheer and Dr. B. Mukerji. A small help from other members, in this context, will be a source of encouragement to the publication wing of the Association.

Though we have squared up our financial dealing with the Indian Regional Centre of WFSW by re-paying them an outstanding loan of Rs.2,000/ (standing against us for the last two years), we still owe Rs.3,500/- to the Printing Press. The re-payment was possible because of realisation of money from advertising parties. A sum of Rs.731·24nP has been outstanding for a long time against some of the advertisers whose advertisements were published in the past. Every effort has been made to realise the amount from the parties concerned but due to certain technical difficulties and other reasons, we are unable to realise the amount and consider the amount as unrecoverable. It is, therefore, proposed that the CEC may authorise to write off the above amount. With some revenue from the advertisements and an expected first instalment of Govt. grant, we hope to tide-over the financial difficulty for the present. If our revenue can be increased we propose to give some illustrated articles on popular scientific topics which will make the Journal much more attractive for reading than it is at present.

We repeat our request (made in the previous report dt. 19-3-62) to our Branches to help by way of specific contributions taking up different columns or sending original review or articles on scientific topics or topics concerning the general welfare of scientific workers.

We started a German Language Course for our readers in our Journal. We do not know the reactions of our members to this column. Hope no member has an adverse comment to make on inclusion of such a column. In case such a column is felt of any use, we can try to include French and Russian language courses too.

G.M. Verma,
General Secretary (Pubn.)

APPENDIX 'C'

Report of the Treasurer

The Audit for the year 1961-62 has been completed. The loan of Indian Regional Centre viz: Rs. 2,000/- has been paid back. The response of General Secretary's appeal for Centre's share from the Branches/Units has been poor. UP, PWD, Research Institute Scientific Workers Association, Lucknow and Southern Railway Chemists & Metallurgists Staff Association, Madras have remitted Rs. 11.75 nP and Rs. 22.00 respectively towards affiliation fees. The financial condition of the Association is far from satisfactory. Still we have to depend on the Government grant for running the show. I again request the Branches/Units to give a careful thought to this and to help the Association to stand on a sound financial footing.

Below is the statement of actuals of Income and Expenditure for the period 1st April, 1962 to 25th July, 1962 :-

Income

	Rs. nP
Membership fee	
(i) direct	5.00
(ii) Branches	33.75
Advertisement revenue	775.00
Excess of expenditure over income	3570.75
Total	4384.50

Expenditure

	Rs. nP
Organisation	
Stationery/Printing	24.25
Postage & Telegram	85.28
Miscl. expenses	20.00
Vijnan Karmee	
Establishment	348.00
Stationery	50.53
Postage & Telegram	230.07
Miscl. expenses	86.56
T. A. & Conveyance	235.81
Bank charges	4.00
Printing (Citizen Press)	300.00
Liabilities	
Citizen Press	3000.00
Total	4384.53

J. S. Yadava
Treasurer

W·F·S·W News

PROPOSED TIMETABLE FOR THE SYMPOSIUM AND W. F. S. W. MEETINGS

Moscow, 9—15 September, 1962

9 September	10.00. — 13.30.	Plenary Session of the Symposium
	15.30. — 19.30.	Plenary Session of the Symposium
	evening	Meeting at the Scientists' Club
10 September	Meetings of Sections of the Symposium at the University, the Bauman Institute and the Friendship University	
	18.00.	Bureau of the W.F.S.W.
	22.00.	Executive Council of the W.F.S.W.
11 September	Meetings of Sections of the Symposium Evening free	
12 September	10.00. — 13.00.	Closing Session of the Symposium
	Afternoon	Visits to factories and laboratories
13 September	10.00. — 13.30.	General Assembly of the W. F. S. W. Plenary Session
	15.30. — 19.30.	Commissions of the General Assembly
14 September	10.00. — 13.31.	Commissions of the General Assembly
	15.30. — 19.30.	General Assembly
15 September	10.00. — 13.30.	General Assembly
	15.30. — 17.30.	General Assembly—Closing Session
	18.30. — 21.00.	Meeting of the new Executive Council of the W.F.S.W.

12. Lektion

Dear friends !

If you have read the story "Ein Freund kommt" carefully, you would have realised that you could not understand everything correctly. You will remember that in lesson No. 7 it was said that the subject of a sentence is always in the nominative case. Furthermore, many verbs not only require a subject but also an object, which is in the accusative case. However, there are verbs governing the dative too. They are few in number ; nonetheless it is important to know and remember them. As in the accusative case, the article indicates the dative too. As you already know, only the masculine singular has an accusative form. Here is the dative :

Herr Braun hilft dem Freund. Wie geht es der Frau und den Kindern ? Das Auto gehört dem Lehrer. Der Lehrer antwortet dem Kind.

	masculine	neuter	feminine
Singular	dem	dem	der
Plural		den-n	

Please always remember that the dative plural adds an "n" to the end of the noun.

× × ×

We have now seen that many verbs require a complement which is the accusative or the dative. Verbs requiring the accusative object are known as transitive verbs, and they will usually take an additional complement which is in the dative. This is known as the indirect or dative object and indicates who is affected by the action of the subject (nominative) upon the person or thing (accusative object) : Thus the indirect object usually

denotes a person or an institution comprising a group of persons, e. g. a school, a management, a ministry etc.

Nom.		Acc.		
The	teacher	gives	the	book.
Der	Lehrer	gibt	das	Buch.
The	teacher	takes	the	book.
Der	Lehrer	nimmt	das	Buch.

Nom.	Dat.	Acc.
The teacher gives	the child	the book.
Der Lehrer gibt	dem Kind	das Buch.

Nom.	Acc.	Dat.
The teacher gives	the book	to the child.

Nom.	Acc.	Dat.
The teacher takes	the book	from the child.

Nom.	Dat.	Acc.
Der Lehrer nimmt	dem Kind	das Buch.

The action performed by the subject (the teacher gives, the teacher takes) upon the person or (in this case) thing (the book) affects the person (the child).

× × ×

The German dative is thus not equivalent, either in form or in function, to the English prepositional expression *to the*, and should, therefore, not always be translated by it.

If both objects (direct and indirect) are nouns, the order of words in the sentence is: nominative/verb/dative object/accusative object.

The interrogative pronoun for dative is "wem" for persons and things.

Wem gibt er das Buch? Er gibt *dem* Freund (*dem* Kind *der* Frau) das Buch. Er gibt *den* Freunden (den Kindern den Frauen) das Buch.

Nom.	wer	was
Acc.	wen	was
Dat.	wem	

13. Lektion

Dear friends !

To-day Walter Schmidt introduces his Indian friends, Prem and Krishna, to his family. Though the family lives in Germany, he speaks of them to his friends :

Walter : Mein Vater und meine Mutter sind meine Eltern. Ich bin ihr Sohn.

Krishna : Haben Ihre Eltern auch eine Tochter ?

Walter : Ja. Sie ist meine Schwester und ich bin ihr Bruder. Wir sind Geschwister.

Prem : Wo leba Ihre Familie ?

Walter : Unsere Familie lebt in Stuttgart, der Hauptstadt des Landes Baden-Württemberg im Südwesten Deutschlands.

Krishna : Hat Ihre Mutter auch einen Vater und eine Mutter ?

Walter : Ja. Ihr Vater ist unser Grossvater und ihre Mutter ist unsere Grossmutter.
Wir lieben unsere Grosseltern sehr.

Prem : Hat Ihr Vater auch noch Eltern ?

Walter : Nein. Mein Vater hat keine Eltern mehr, sie sind tot.

Krishna : Hat Ihr Vater auch einen Bruder ?

Walter : Ja. Mein Vater auch einen Bruder. Er ist unser Onkel. Ich bin sein Neffe und meine Schwester ist seine Nichte. Seine Kinder sind unsere Vettern und Cousinen.

Prem : Hat Ihre Mutter auch einen Bruder.

Walter : Ja. Meine Mutter hat auch einen Bruder und eine Schwester. Ihr Bruder ist mein Onkel und ihre Schwester ist meine Tante. Die Tante hat auch einen Sohn und eine Tochter. Ihr Sohn ist mein Vetter und ihre Tochter ist meine Cousine.

Grammar

Notice that the pronoun *ihr* may be a personal pronoun or a possessive pronoun. When it is a personal pronoun it is always attached to the verb and represents the 2nd person plural : ihr kommt, ihr geht. When it is a possessive pronoun it is always attached to a noun and stands for either the 3rd person singular feminine (ihr Vater : her father) or the 3rd person plural (ihr Vater : their father). When capitalized it also refers to the formal mode of address *Sie* (Ihr Vater : your father).

Ich habe einen Freund	das ist mein Freund.
Ich habe ein Buch	das ist mein Buch.
Ich habe eine Uhr	das ist meine Uhr.
Ich habe viele Freunde	das sind meine Freunde.

	masculine		neuter		feminine	
ich	mein	Freund	mein	Buch	meine	Uhr
	meine	Freunde	meine	Bücher	meine	Uhren
du	dein	Freund	dein	Buch	deine	Uhr
	deine	Freunde	deine	Bücher	deine	Uhren
er, es	sein	Freund	sein	Buch	seine	Uhr
	seine	Freunde	seine	Bücher	seine	Uhren
sie	ihr	Freund	ihr	Buch	ihre	Uhr
	ihre	Freunde	ihre	Bücher	ihre	Uhren
wir	unser	Freund	unser	Buch	unsere	Uhr
	unsere	Freunde	unsere	Bücher	unsere	Uhren
ihr	euer	Freund	eure	Buch	eure	Uhr
	eure	Freunde	eure	Bücher	eure	Uhren
sie	ihr	Freund	ihr	Buch	ihre	Uhr
	ihre	Freunde	ihre	Bücher	ihre	Uhren
Sie	Ihr	Freund	Ihr	Buch	Ihre	Uhren
	Ihre	Freunde	Ihre	Bücher	Ihre	Uhren

der Vater/father, die Mutter/mother, die Eltern/parents, der Sohn/son, die Schwester/sister, der Bruder/brother, die Geschwister/brothers and sisters, leben/to live, to reside, die Familie/family, der Grossvater/grandfather, die Grossmutter/grandmother, die Grosseltern/grandparents, lieben/to love, to like, tot/dead, der Onkel/Uncle, der Neffe/nephew, die Nichte/niece, der Vetter/cousin (male), die Cousine/cousin (female), die Tante/aunt. Hauptstadt/capital, Land/country or state.

14. Lektion

Dear friends !

Many of you, who are following this course, intend to go to Germany for further studies. It will be quite interesring for you to read about the life of a student while in Germany. The following is a short story about two students in Munich :

Zwei Studenten in Muenchen

Kumar studiert in München. Er ist seit einem Monat dort. Er wohnt zusammen mit seinem Freund Hans beim Kaufmann Krueger, Elisabeth-Platz 30, Ecke Agnesstrasse. Frau Krueger ist die Hausfrau von Kumar. Seine Wohnung ist nicht weit von der Universität. Die Wohnung liegt der Post gegenüber.

Kumar geht morgens aus dem Haus und fährt mit seinem Freund zur Universität. Hans hat kein Fahrrad und geht immer zu Fuss. Aber sein Weg ist nicht weit; vom Elisabeth-Platz zur Universität braucht er nur zehn Minuten.

Mittags nach den Vorlesungen geht Kumar mit seinem Freund zum Essen. Sie gehen die Ludwigstrasse entlang und bei einem Zeitungsstand links um die Ecke zu einem Gasthaus. Dort isst man sehr gut. Gewöhnlich bestellen sie ein Menü; das ist nicht so teuer. Nach dem Essen lesen sie die Zeitungen und Illustrierten und trinken manchmal ein Glas Bier oder eine Tasse Kaffee.

Nachmittags geht Kumar wieder zu einer Vorlesung. Jetzt geht er allein ohne seinen Freund, denn Hans arbeitet zu Haus für seine Prüfung. Nach der Vorlesung ist Kumar frei und fährt nach Haus. Manchmal machen die Freunde einen Spaziergang durch den Park. Nach dem Abendessen arbeiten sie oder gehen wieder spazieren. Manchmal besuchen sie mit ihren Freunden ein Kino oder ein Theater. Meistens gehen sie aber früh zu Bett, denn sie sind abends immer sehr müde.

Prepositions

The primary function of prepos tions is usually to denote relationships of time oi of space which have reference to the action performed by the subject. They are attached o a noun or to a personal pronoun. Prepositions cannot always be equated to their apparent English counterparts as there is much divergence between the two languages as to the relationships which they express.

Praepositionen mit dem Dativ

Kumar geht um 9 Uhr *aus dem* Haus. Er wohnt *mit seinem* Freund *bei seiner* Tante. *Nach dem* Essen trinkt er eine Tasse Kaffee. Er ist *seit*

einem Monat in Deutschland. Er hat das Geld *von seinem* Vater. Er geht *zu seinem* Freund. Die Wohnung liegt *der* Post *gegenuber.*

Remember : aus, bei, mit, nach, seit, von, zu, gegenüber, *immer mit dativ*
Also : gegenüber steht oft nach dem Substantiv.

das Abendessen	dinner	der Spaziergang/ Spaziergänge	walk
allein	alone		
bestellen	to order	spazieren gehn	to go for a walk
besuchen	to visit, to go to see	der Student/en	student
das Bett/en	bed	die Tasse/n	cup
das Bier/e	beer	das Theater	theater
denn	for (conjunction)	trinken	to drink
		die Universität/ en	university
die Ecke/n	corner		
essen	to eat	die Vorlesung/en	lecture
das Fahrrad/ Fahrräder	bicycle	der Weg/e	way
früh	early	weit (weit von)	far (far from)
das Gasthaus/ Gasthäuser	restaurant/inn		
gewöhnlich	usually	die Wohnung/en	lodgings
das Glas/Gläser	glass	der Zeitungs-	newsstall
die Hausfrau/en	landlady	stand/Zeitungs stände	(stand)
der Kaufmann	tradesman		
das Kino	cinema	die Präposition/ en	preposition
man	one		
manchmal	sometimes	stehen	to stand
meistens	mostly	das Zeitabverb/ ien	temporal adverb
Das Menü/s	menu		
		müde	tired
der Park/s	park	der Platz/Platze	square
die Prüfung/en	examination	seit	since

SEVENTH INDIAN STANDARDS CONVENTION

All ISI Members and Others Concerned

In continuation of circular letter about the Seventh Indian Standards Convention to be held at **Calcutta** from **28 January to 2 February 1963,** I have great pleasurein informing you that we have decided to include a Technical Session on metric system in the programme of the Convention. The Session will be entitled 'Training and Education of Engineers in Metric System (S-9)'.

In view of the abiding interest in the subject, consequent on the introduction of the metric system in the country, we hope you and your nominee(s) would avail of the opportunity to share your valuable experience and knowledge, and would not only take part in the discussions in the new Technical Session but also contribute papers to it.

The titles of the papers, which you and your nominee(s) may decide to contribute to the foregoing as well as to other Technical Sessions, may please be entered on the reverse of the nomination from and returned to us or we may otherwise be intimated, at your early convenience.

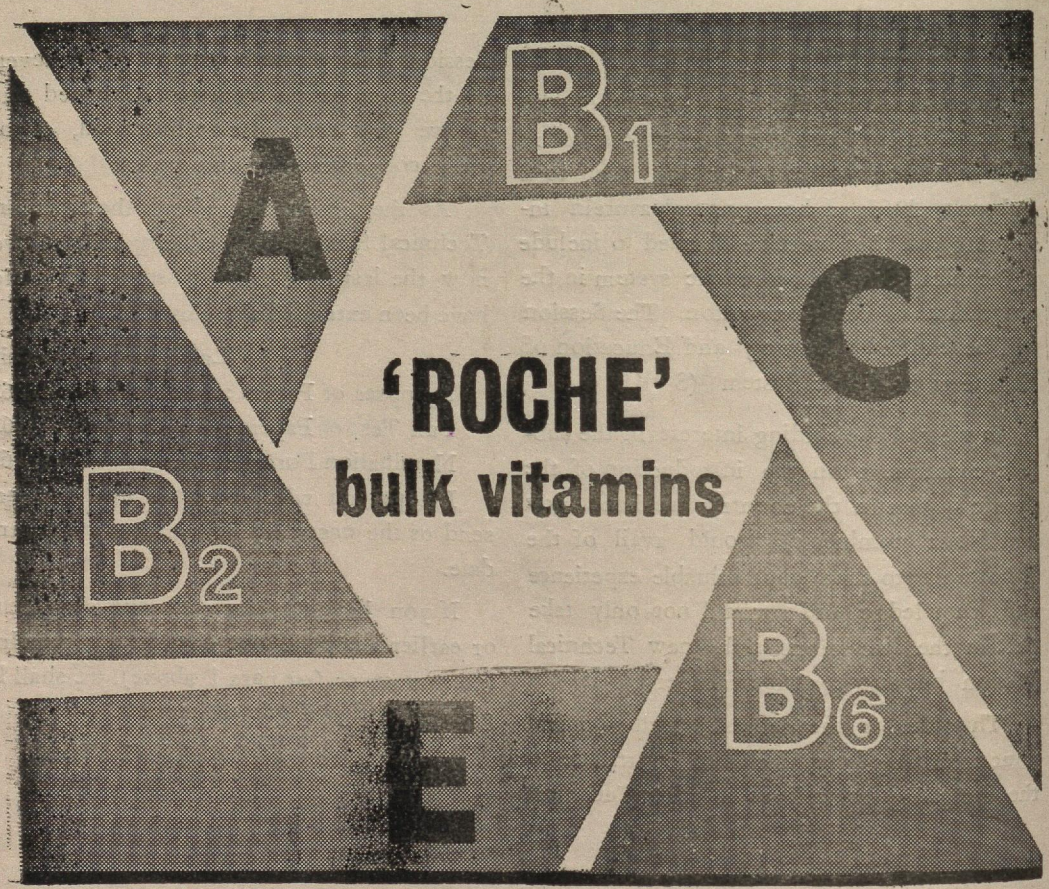
As the intimation about the additional Technical Session (S-9) is being sent to you now, the last dates for recessary information have been extended as follows :

	Last Date of Receipt
Synopses of Papers :	15 September 1962
Full Text of Papers :	15 October 1962
Nomination Forms :	7 September 1962

I hope you will accept our invitation and send us the necessary information at an early date.

If you have not received with this letter or earlier a copy of our circular announcing the conference (*see* para 1 above). we shall be glad to send you one on request.

Lal C. Verma,
Director.



for the pharmaceutical industry

A
Acetate in oil
Palmitate in oil
Acetate dry powder
Palmitate water-miscible

B_1
Thiamine Hydrochloride
Thiamine Mononitrate

B_2
Riboflavin
Riboflavin-5'-Phosphate Sodium

B_6
Pyridoxine Hydrochloride

PANTOTHENATES
Calcium Pantothenate
Sodium Pantothenate
d-Panthenol
dl-Panthenol

NICOTINATES
Niacin
Niacinamide

BIOTIN

C
Ascorbic Acid
Coated Ascorbic Acid
Sodium Ascorbate
Calcium Ascorbate
Ascorbyl Palmitate

E
dl-Alpha Tocopherol
dl-Alpha Tocopherol Acetate
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