comment

of Science and Technology

by R. O. B. Wijesekera

Scientists throughout the ages have had to contend with the laymen's query: what is the practical use of this discovery and that? Today more than ever this question is being raised by laymen and not-so-lay-men. The following story is often quoted in this context. It concerns Michael Faraday, celebrated physicist and chemist. In one of his lectures in the 1840's, the great scientist illustrated the peculiar behaviour of a magnet in connection with a spiral coil of wire. He was demonstrating the fact that by the introduction of the magnet into the hollow centre of the coil a flow of electric current was caused in one direction and that its withdrawal reversed the direction of the current. A. listener asked Faraday: "What is the possible use of this observation?" To this the scientist replied, "Of what use is a new-born baby?" It is common knowledge today that this very principle is the one Faraday used to develop the electric generator which for the first time made it possible to produce electricity commercially. The new-born baby which represented a bit of science grew up subsequently into the technological giant we know today.

The question that is now pertinent is this. Is the laymen the best judge? Or is he any judge at all? Can he comprehend the vast potential of science and how it relates to, and gives rise to technology? The potential of Technology, and its application most laymen can visualise. But what of science itself, that generates such Technology? Now, science is the activity that gives rise to new knowledge about nature, and phenomena and the things around us. Technology on the other hand plays the role of utilising this new knowledge to build new prototypes, gadgetry process etc.—in other words the application of the knowledge acquired through science to practical ends.

This then is the modern situation—that science is the base on which technology is built. Historically speaking however, science is a development of Philosophy. This development occurred as a consequence of the "scientific method" —the progression from observation and hypothesis to verification by experiment; and finally to the theories that themselves undergo modifications as a result of the discovery of new phenomena through further experimentation. In the old days another "Technology" existed which in fact was as old as mankind itself. It was not based on science and was the result of empirical efforts and chance discoveries. Even the technology that preceded the Industrial Revolution was largely empirical and not based on science. The invention of the steam-engine which, for the first time gave man a source of colossal mechanical power, was hardly based on science. In the modern era, however, no empirical approach can give the swift results we need for our own progress. The need for technology and technological innovation is evident to most informed laymen. But not so the need for science, on which all modern technology is necessarily based. This is most so in less developed nations, and this in many ways is their tragedy. In the developed world the maxim is well established:

> *"Out of the multiple doorways of scientific research,*
> *Come the technological triumphs of tomorrow."*

feature articles

Leather in our National lives

by V. Nayudamma

Leather is ageless and matchless. Leather is unique and ubiquitous, serving a multitude of human needs, both in times of war and peace, from times immemorial

Who discovered fire? Who discovered leather? It is hard to say. The cavemen used the skin to cover his body; the jungleman for his bow and arrow and as leather telegraph; the desertman for his cases of wine and water and for his tent and the modern man uses it to a wide variety of purposes.

Why is leather so unique? Look at a live animal. The skin acts as a tent to cover the body, bones, blood etc. and gives the body a shape; as an umbrella against rain not allowing water to get in; but at the same time permitting perspiration and sweat to get out; as a shield against atmospheric conditions—wind, water, fire and microorganisms; as a transmitter to feel, touch and as a sensitive thermostat to control body temperature. Skin breathes-porous, permeable to air and water vapour with a large surface area and reservoir capacity. It is resistant to wear, tear, abrasion, grease, soiling, stress, strain and flexural fatigue; skin repairs itself against wounds, cuts and diseases. When the animal is dead, the skin is removed and the job of the tanner is to convert it into leather and retain the original properties of skin with added desirable characteristics.

What makes skin or leather so unique?

Skin or leather is nature's own fabric with a three dimensional matrix of interwoven collagen fibre bundles. The fibre itself is made up of fibrios which in turn are made up of simple aminoacids. The chemical composition, the heliacal structure of collagen fibre and the three dimensional network contribute largely to the unique properties of leather.

Leather is ancient and yet modern. The caveman used it to cover his naked body. Even today, leather jacket and pants are the 'in' thing and very popular amongst the young and the old. Leather clothing has become a luxury item and prestige symbol. India exports fur coats, leather garments, garment and gloving leathers.

For defence, leather was used to make leather Narges for navigating rivers; for spearshafts, bow's, arrows, shields, armour for the body and head; today, leather is used for army boots, harness, clothing, gloving, belts, ammunition pouches, washers for armoured vehicles etc.

Leather meets industry's needs, for example, industrial belting; textile and jute leathers, picking bands, pickers hydraulic and pneumatic leather, packings, diaphragms, washers, railway dust shields, razor honing leathers, industrial gloves, gauntlets, leather aprons, etc.

Sport lovers recognise leather in football, volley ball, cricket, hockey ball covers, wicket-keeping gloves, grip leather and guts for tennis and badminton racquets.

To medical men, leather is a life saver—wooly sheep skins as bed-pads to prevent bed sores for invalid patients; orthopaedic leather for the handicapped; special protective wear for nurses, miners and others for occupational health and collagen sutures, pads and powders for surgical operations.

To the artist and interior decorator, leather is a much liked medium. Leather is used for upholstery, wall hangings, dividers; furnishing, fabrics, book-binding covers, book marks; toys, ash trays, glass holders, leather puppets, paintings and leather jewellery.

Speciality items like chamois leather is used for cleaning and polishing jewellery, lenses; automobiles and filteration of aviation petrol.

In daily life, leather finds a place in sandals, shoes, ties, watch strap, purse, hand bag, belts and gloves and the like.

Whatever the foibles of fashion, leather will change its appearance to match the mood and the moment. The versatality and adaptability is leather's greatest strength.

The role of leather in every walk of life is thus clear.

Now let us examine how important is leather in the nation's life.

Indian leather-industry is age old. References to it are found in Rigveda: Even today practically every village has a tanner-cobbler. By age long experience, observation, common sense and skills, the Indian tanner has developed techniques and products which have won world's acclaim. In the past, concentration of specific skills in different regions was seen. Agra was associated with foot wear; Kanpur with heavy leathers, harness, saddlery, etc.; Jullundur for sports goods, Bombay for leather goods, Chamba and Kolhapur for chappals, leather puppets from

Mysore and Andhra; leather toys from Indore; East India vegetable tanned leather for export from Madras and fancy leathers from Calcutta, etc. However this position has been fast changing.

India is the single largest livestock holder in the world holding around 180 million cattle, 57 million buffaloes, 67 million goats and 44 million sheep and with an annual production of 100 million pieces of hides and skins. Cow hides are obtained mainly from fallen dead animals and the quality is poor. However, the Indian goat and red hairy sheep skins are unequalled for their quality and go into the making of high cost glace kid and garment leathers.

The industry exists in cottage, small, medium and large scale sectors. There are 20 mechanised organised tanneries with a total investment of around one billion rupees accounting for only 15-20 per cent of the total leather production.

The investment in medium and small scale/cottage sectors is estimated to be around 1.5 billion rupees accounting for over 80% of leather production. Similarly, footwear and leather goods are produced mostly in small scale sector. In 1947, the country produced only 60 million pairs of leather footwear and in 1971, over 200 million pairs and on top of this, 100 million of plastic and rubber footwear were produced. Yet, the annual per capita consumption of footwear is only 0.55 pairs as contrasted to 2-5 pairs in advanced countries.

The leather industry provides gainful employment to over one million people. The value of leather and allied industries today is estimated to be around 3500 million rupees a year. Of this amount, the export earnings in 1972-73 and 1973-74 accounts for 1880 million rupees. In 1973, India exported leather to the tune of Rs. 1500 million; finished leather 200 million, footwear 100 million and leather goods 50 million rupees. It has become the second or third largest foreign exchange earner of the country.

The stage is now set for reducing the export of leather and exporting only the finished leather products. In such a case the unit value will increase and exports may hit a 4000 million rupees peak by the end of the Five Year Plan.

Along with leather industry concurrent growth is also seen in the fields of machine and materials manufacture. A wide variety of auxiliary materials have gone into making of leathers like unhairing and tanning agents, oil products, pigments, resins, finishes are being produced in India. In the recent past machine manufacturers have been active for indigenous production of machinery for leather, footwear and leather goods manufacture.

However, we still import to a small extent speciality chemicals and sophisticated equipment and machinery to the tune of around 100 million rupees a year.

In addition, a variety of by-products from the leather industry find use. For example, fertiliser and fodder from waste hair and blood; leather board from leather scrap, sausage casings, sutures, catguts; wool and hair for felt, carpets, drug industry; fleshings and trimmings for glue and gelatine etc.

Leather thus contributes greatly to the nation's industrial and economic development. There is yet another important dimension to this industry—namely, social development.

Leather industry for long has been craft-based, dispersed, traditional and embedded with inertia, prejudice and stigma. Living and working conditions are poor, production levels and ability to withstand competition are low, and workers in the past have been denied the light of education and the lead of intelligentia.

One way of looking at it is to close down these uneconomic units and start modern mechanised tanneries. But that would mean displacing the traditional skilled workers. The best way would be to utilise these inbuilt traditional skills, coupling the modern management and marketing methods, to get better returns to the products and to the workers. Fortunately leather, footwear and leather ware industries are amenable for development as a labour intensive, 'farming' out or as an 'assembly' industry. A central modern organisation and management can set up common facility centres for the cottage tanner to get his lot tanned and finished. Further with an integrated approach, cottage, small and large scale sectors could well co-operate one acting as a feeder unit to the other. Similarly the centre may have a designer, master cutter to cut components, supply these components to the cottage worker to stitch or stick; collect the footwear or leatherware for quality control marking and marketing. This way the unemployed and under-employed and traditional skills could be fully utilized and yet be competitive in international markets.

Yet another aspect is the stigma attached to this industry because of the effluents and bad odour associated with leather making. If science and technology were any good suitable methods should be found for treatment, disposal or utilization of effluents. Also appropriate and simpler tools and techniques could be introduced to improve the working conditions and economic returns of the cottage tanner. (The young going to schools may not return to the industry and the older generation with skills on their finger tips could be given gainful employment)

Some very successful results have been obtained in this direction bringing science to the very doors of cottage workers by the untiring efforts of Central Leather Research Institute. Small Industries, service Institutes, village industries Corporation and others.

A radical change is quite visible in the Indian leather Industry. Setting up co-operative finishing units, common facility service centres, functional leather industrial estates; leather and footwear corporations; setting up of modern leather and footwear factories in the public, private and joint sectors: the traditional tanner switching over to finishing leathers—are all in the right direction.

In the leather world, two trends clearly emerge: First, the demand for leather is ever increasing and second, the leather industry is moving from advanced to developing countries—close to natural resources. On both counts, India is at an advantage. Apart from world markets, a large internal market exists. If only one pair of sandals is given to every person in India, we need to double the industry's capacity today.

Synthetic materials have made several in-roads to substitute leather, but basically synthetics have become supplements and not substitutes. Also it is good to realise the raw-material for leather is a by-product of the meat industry and unless a better alternative use is found for raw skins, leather industry will continue to flourish.

India has internal and external markets. A large raw material resources; skills, science, technology and trained manpower. Indian leather industry has thus a clear and bright future.

From times immemorial leather has been serving and continues to serve a multitude of human needs. Leather has unique properties derived from its natural three dimensional network. Leather finds a pride of place in every walk of life and every day life. It is a valuable industry fetching much needed foreign exchange and giving gainful employment to a large number of people. It has large internal and external markets. The leather industry is labour intensive and the age old experience and traditional skills could be well utilized. Here is an industry that gives an opportunity for total development and growth—namely, industrial economic and social development.

Leather is nature's own fabric. Leather is ageless and matchless.

There is nothing like leather—is there?

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උපාලි ඇම්. සේනානායක
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විද්‍යාව, ක්‍රම කීපයකින්ම විස්තර කළ හැක. මෙය ඒ ඒ කෝණය අනුව පෙනෙන විධියට ද පැහැදිළි කළ හැක. යම් පර්යේෂණ කාණ්ඩයක් කර ඉන් ලැබෙන ප්‍රතිඵල අනුව යම් යම් නිගමන කෙරේ. ඒ නිගමන අනුව නීති හෝ සිද්ධාන්ත සෑදේ. ඇතැම් විට නව පර්යේෂණ නිසා පළමු සිද්ධාන්ත වෙනස් කර අලුත් සිද්ධාන්ත සෑදේ. පර්යේෂණ කිරීමෙන් අරමුණු දෙකක් අනුව කළ හැක. එකක්, යම් කිසි රහසක් අනාවරණය කිරීමට කරන එකකි. දේදුන්නේ පාට ඇති වන සැටි සොයා ගැනීම එබඳු සරල පර්යේෂණයකි. දෙවැන්න යම් කිසි අපහසු දෙයක් පහසුවෙන් කිරීමේ අරමුණ ඇතිව කරන පර්යේෂණයයි. බිම දිගේ ඇදගෙන යාම වෙනුවට ලිස්සා යන රෝදය නිපදවීම මෙයට දිය හැකි කදිම උදහරණයකි. මේ දෙවර්ගයටම වඩා වෙනස් පර්යේෂණ වර්ගයක් ද වේ. එනම් අහම්බෙන් හෝ අත්වැරද්දකින් සිදු වන දෙයක් විග්‍රහ කිරීමයි. නිව්ටන් ගුරුත්වාකර්ෂණය සොයා ගත්තේ පළමු ආකාරයටයි. ප්ලාස්ටික් බඳුනකට තමා බොමින් සිටියදී කිරි වීදුරුව වැටුනු පසු කැල්සියම් කැසිනේට් ප්ලාස්ටික් සොයා ගැනීම එබඳු දෙයකි.

සෑම පර්යේෂකයකු තුළම තිබිය යුතු අවශ්‍ය ගතිගුණ කීපයක් වේ. පළමුවැන්න පර්යේෂණයේ දී සිදුවන දේ තීක්ෂණ ලෙස බලා සිටීමයි. දෙවැන්න යම් යම් සිදු වන දේ ඒ ආකාරයෙන්ම වාර්තා කිරීමයි. ඇතැම් විට යම් පර්යේෂණයක දී ලද ප්‍රතිඵල කුමක් සඳහා යෙදවිය හැකි දැයි එක වරම පැහැදිළිව නොපෙනේ. එඩිසන් විදුලිය සොයා ගත් විට යමෙක් ඇසුවේ එහි ප්‍රයෝජන කුමක් ද යන්නයි. එවිට ඔහු පිළිතුරු දුන්නේ අලුත උපන් දරුවෙකුගේ ප්‍රයෝජන මොනවාද යන්නයි. විදුලිය නොවීනි නම් අද ලොව කුමන විධියේ එකක් දැයි සිතා ගැනීමට පවා අසීරුය. පර්යේෂණ දෙකක් එකවර ප්‍රතිඵල දෙකක් දීම ද තව උදහරණයක් වශයෙන් දිය හැක. රේඩියෝ තරංගමාලා විකාශන යන්ත්‍රය නිපදවීම එකකි. එම තරංග නිසා ක්‍රියා කරන ගුවන් විදුලි යන්ත්‍රය අනිකයි. මින් එකක් නැතිව අනෙකේ ප්‍රයෝජනයක් නැත.

පර්යේෂණයක අරමුණ, එහි ඇති අමාරුකම් දන්නේ පර්යේෂකයා පමණි. එහි අගය බැරෑරුම් කම නොදක්නෙක් ඔහුට අණ දෙයි නම් එය පසුපස ආසනයේ සිට මොටෝරියක් පදවන්නට අණ දීමට සමාන දෙයකි. මෙබඳු අයම පර්යේෂණ ආයතනයක් පාලනය කරන්නේ නම් ඉන් වන විපාකද පැහැදිලිය. පර්යේෂණ කර ඒ ගැන යම් අවබෝධයක් ඇත්තෙක්ම මෙබඳු ආයතන පාලනය කිරීම අවශ්‍ය දෙයකි. අද යම් පර්යේෂණයක් කර හෙට කර්මාන්තයක් ඇරඹීමද තවත් අය ගේ ඇති වැරදි මතයකි. කරන සෑම පර්යේෂණයක්ම හරියන්නට නුපුළුවන. ඇතැම් විට යමක් සෙවීමට පර්යේෂණ රාශියක් කළ යුතුව ඇත. පිට අයෙකුට පෙනෙන්නේ මෙය නාස්තියක් ලෙසය. එලෙසම නාස්තියක් නැතිව පර්යේෂණ ද කළ නොහැක.

විද්‍යාව යනු මැජික් වචනයක් නොවේ. මැජික් වල රහස සෙවීම විද්‍යාවයි. විද්‍යාවත් කර්මාන්තත් එකිනෙකට සම්බන්ධ දෙයකි. විද්‍යාව නැතිව කර්මාන්ත නැත. කර්මාන්ත නැතිව විද්‍යාව

නැත. ලොව් දියුණු සෑම ජාතියක්ම විද්‍යාව කර්මාන්තයට යෙදවීමෙන් දියුණුව ලබා ඇත. ඇමෙරිකා, යුරෝපීය, සහ ජපානය ඕස්ට්‍රේලියාව වැනි රටවල් විද්‍යා පර්යේෂණ සඳහා වියදම් කරන්නේ කෝටි ගණනිනි. කැනඩාවේ ජාතික විද්‍යා සභාවත්, ඕස්ට්‍රේලියාවේ පොදුරාජ්‍ය විද්‍යා සහ පර්යේෂණ ආයතනයත් මෙහිදී කදිම උදහරණයක් ලෙස පෙන්විය හැක. රටක විද්‍යා සහ කාර්මික පර්යේෂණ එකම සභාවක් මගින් පාලනය කිරීම සුදුසුය. එවිට රටක සෑම තැනකම කෙරෙන පර්යේෂණ, ඊට අවශ්‍ය උපකරණ, ඇති මිනිස් ශ්‍රමය සභාව හා සම්බන්ධ වේ. අනවශ්‍ය අනු පර්යේෂණ, නැත්නම් එකම විදියේ පර්යේෂණ දෙතැනක කිරීම මින් වලකී. එලෙසම ඇති ශක්තිය සමව බෙද ගැනීම ද සභාවට කළ හැක.

පර්යේෂණ මගින් ලද ප්‍රතිඵල කර්මාන්ත සඳහා යෙදවීමට, විද්‍යා සභාව සම්බන්ධීය ශාඛාවක් ලෙස ගණන් ගත හැක. එලෙසම කාර්මිකයන්ට අවශ්‍ය උපදෙස් ගැනීම ද එමගින්ම පාලනය කළ හැක. ඕස්ටේලියාවේ පොදුරාජ්‍ය විද්‍යා සහ පර්යේෂණ ආයතනය (CSIRO) මෙලෙස කියා කරන ආයතනයක උදහරණයක් ලෙස ගත හැක. ශ්‍රී ලංකාවේ මෙබඳු ආයතන ලෙස ලංකා විද්‍යා හා කාර්මික පර්යේෂණ ආයතනයත්, ජාතික විද්‍යා සභාවත් ගණන් ගත හැක. අන්‍ය පර්යේෂණ ආයතනත් මීට සම්බන්ධ කර ගැනීම වැදගත් ය. එක එක ආයතන වෙන් වෙන්ව කැපී පෙනීමේ අදහසින් එසේ සම්බන්ධ වීමට කැමැත්තක් නොදක්වන්නේ නම් එය විද්‍යාඥ කමට තරම් නොවේ. සෑම විද්වතෙක්ම, කාර්මිකයෙක්ම, රටට සේවය කරන්නේ නම්, එම සේවය වඩාත් හොඳින් කළ හැක්කේ එකම සංගමයක් ලෙස ක්‍රියා කිරීමෙන්ය. මෙසේ ඕස්ට්‍රේලියාවේ, වීට් පර්යේෂණ, මස් පර්යේෂණ, වයින්, මීපැනි, කිරි සහ කිරි ආහාර වර්ග, ඛනිජ, පළතුරු ආදි පර්යේෂණ ආයතන විශාල ගණනක් ඒ ඒ තැන වෙන වෙනම පර්යේෂණ කළ ද පාලනය වන්නේ මධ්‍යම පොදුරාජ්‍ය විද්‍යා සහ පර්යේෂණ ආයතනය මගිනි.

කුඩා රටක් වන ශ්‍රී ලංකාවට මෙය එතරම් ලොකු, සංකීර්ණ කාරණයක් නොවන්නේ ය.

13 not out at the SLAAS Headquarters

by S. S. Vedanayagam

It was exactly 13 years ago that the SLAAS (then known as the CAAS or Ceylon Association for the Advancement of Science) decided to open an office with a paid Office Assistant for its activities. Hitherto, the official work of the Association was carried out by 2 General Secretaries, who functioned in a purely honorary capacity with the assistance of a part time typist.

Having just then retired from Government service, prematurely, I was selected from a batch of applicants to be the first Office Assistant of the Association. The Headquarters of the Association was then an insignificant building located behind the imposing structure of the CISIR. In this modest building, however, worked 2 scientists (Drs. V. Basnayake and R.O.B. Wijesekera) who during their spare time attended to the official work of the Association. They were the then General Secretaries who sacrificed their precious moments of leisure for the cause of science. I was indeed fortunate to have been associated with them to work for the Association. The three of us got the office going and from then onwards there was no looking back.

The first Newsletter of the Association was printed in May 1963 in which a reference to me has been made as follows: "The Association is fortunate in having a person of Mr. Vedanayagam's calibre as Office Assistant and in welcoming him to the Association it is hoped that he will play a valuable role in the future development of the Association." I do not know whether I have fulfilled the hope expressed, but I can say that I have tried my best always to maintain a high standard of efficiency in the work of the office.

The Association was fortunate in having an anonymous donor who donated Rs. 10,000 a year for 5 years in succession for the popularization of science by the Association. To carry out this work, a Committee for the Populariztion of Science was formed and a Co-ordinator who was to translate the ideas of the Committee into action was appointed.

The General Research Committee of the Association is composed of members from the various branches of science who could provide advice on scienctific problems as and when they arise.

The Council of the Association which meets regularly once a month is the governing body of the Association and is composed of the General President, the President-Elect, the Immediate Past General President, the General Secretaries, the Secretary for Foreign Relations, the Treasurer, the Assistant Treasurer, the Editor, the Assistant Editor, the Chairman of the G.R.C., the Chairman of the Popularization of Science Committee, the Chairman of the Board of Trustees, the six Sectional Presidents and six elected members (elected at the Annual General Meeting)

From time to time various ad hoc committees are appointed and their reports are submitted to the Council for consideration and action.

The activities of the six Sectional Committees embracing the various branches of science have also increased steadily over the years and the small staff of the office has enough work to keep it fully occupied.

A major event in the activities of the Association is the holding of its Annual Sessions at the end of the year. This has been regularly held since the inception of the Association 32 years ago. To this session representatives from the sister Associations are invited and generally a number of foreign delegates representing their respective Associations do attend. The work involved in making arrangements for the Annual Session is enormous and I am glad to say that we have always received praise and appreciation from the foreign delegates for the arrangements made by us for the successful completion of the sessions.

The office was shifted to its present location in the centre of the old race-course in May 1970 and arrangements are afoot to move the office from here to a spacious 3-storeyed building at Wijerama Mawatha costing over Rs. 6 lakhs. The committee in charge of the building operations hopes to have this building completed by the end of the year. The Association sadly lacks a library with the necessary facilities. Due to lack of space in the present building the valuable books we receive from various foreign organisations have had to be dumped on the open shelves and no proper use could be made of them by the members. A good room for the library will however be provided in the new Head quarters and it is hoped that an up-to-date library will be made available for the use of the members.

Looking back on the 13 years of my service in the Association I can say that it has been a period of pleasant memories for me.

On-going Projects and affairs of the Atomic Energy Authority

by W. A. Amarasiri, Officer-in-Charge, Atomic Energy Authority

Nuclear techniques have become and continue to be a promising tool for scientific research and development. Its applications cover areas such as Agriculture, Medicine, Industry, Hydrology, Power Generation etc. The Atomic Enegery Authority of Sri Lanka is obliged with the introduction., promotion and encouragement of the use of nuclear techniques in research and development of this country.

Sri Lanka is one of the early members of the International Atomic Energy Agency, IAEA, the specialised organisation of the United Nations on the peaceful applications of the atomic energy. Various establishments in this country receive technical assistance from the IAEA through its Research Contract Programme and Regular Programme annually. The assistance given is in the form of expert services and equipment. In addition the IAEA also grants fellowships, scientific visits and training courses to local personnel for training in specific areas in nuclear science. The Atomic Energy Authority functions to be the co-ordinator of all services rendered to Sri Lanka by the IAEA. Sri Lanka recently became a party to the regional co-operative agreement for research, development and training related to nuclear science and technology. This has provided the opportunity for local institutions for the entering into co-ordinated research programmes, exchange of informations and scientists, the use of facilities available in the more advanced countries in the region, etc.

The Atomic Energy Authority has set up committees in Agriculture, Medicine, Hydrology and Energy with representatives from relevant research establishments, university campuses, government departments and corporations and from planning authorities. The committees function in an advisory capacity to the Authority also assisting in formulating and implementing projects in the relevant areas.

The Agriculture Committee of the Authority has formulated for early implementation an internal co-ordinated research programme in (i) Fertilizer Efficiency studies in all crop types and (ii) Soil Moisture Studies. Almost all the agricultural research institutes have proposed projects for implementation under this programme. The necessary equipment has been made available by the IAEA and these have been centralized under the Authority for use by all institutions. Expert services for 6 months are also being made available by the Agency in May this year. All work connected with this programme will be co-ordinated by the Authority. The Hydrology Committee of the Authority identified four areas in which nuclear techniques would be profitabliy applied viz. (*a*) Sedimentology (*b*) Direct Recharge Measurements (*c*) Seepage and (*d*) Underground Water Studies. A project request on sedimentology has already been made to the Planning Ministry for inclusion in the UNDP Country Programme. The request made to the IAEA for technical assistance to implement the projects on Direct Recharge Measurements and Seepage Studies were approved by the Agency and a part of the equipment has already been delivered. On arrival of the expert assigned for these two projects and the delivery of the remaining equipment, the projects will be initiated in June. Studies on underground water has been carried out using artificial tritium and stable isotopes and Carbon-14 in the Vanathavillu area. These investigations are been extended to Mannar and Jaffna areas.

The Energy Committee of the Authority submitted its interim report to the Authority with following recommendations:

1. Even if hydro-power is marginally more expensive, its development should be given preference over the exploitation of other resources.

(*Continued on page* 13)

(*Continued from page 6*)

2. No further oil fired electricity generating plants need be installed. Hydro-power plants should be commissioned in rapid succession in order to avoid power and energy shortages.
3. It is envisaged that the first nuclear power plant would have a power of around 100 MW(e) and would be necessary to be in operation in about 1990. The target would have to be revised if adequate quantities of gas resources are found available for power generation purposes.
4. Steps to be taken to obtain a research reactor in two to three years time. The IAEA to provide whatever possible assistance.
5. A comprehensive survery of the Uranium and Thorium resources available be undertaken with IAEA assistance in order to estimate the quantities available.
6. To keep close track of the developments in new techniques in power generation.

This report was submitted to the Ministry of Industries and Scientific Affairs with the recommendation for the formulation of a National Energy Policy for Sri Lanka by the Government. On request by the Minister, the Energy Committee continues its settings to draw up guidelines for such an Energy Policy. After a survey of the present status of Nuclear Medicine in Sri Lanka the Medicine Committee submitted a report for consideration by the Authority and to make necessary recommendations go the Ministry of Health. The main recommendations include:

(i) The setting up of a nuclear medicine unit in Colombo for diagnostic investigations and research.
(ii) The setting up of a centralized radiation protection service under the Atomic Energy Authority.
(iii) Provision of adequate foreign exchange for institutions to purchase their isotopes and spares requirements.

Preliminary action has already been taken in regard to all above by the Authority.

By statute the Authority is obliged to formulate, implement Atomic Energy Regulations suitable for Sri Lanka. Regulations for import export, production, treatment, manufacture, use, handling etc. of radioactive material and irradiation apparatus, have been formulated by the Atomic Energy Authority. While the import and export aspect of the Regulations was gazetted by the Ministry of Foreign and Internal Trade the rest of the Regulations was gazetted by the Ministry of Industries and Scientific Affairs. The function of the Atomic Energy Authority includes the issue of appropriate licenses to all users of radioisotopes and radiation in both private and public sector and to make inspection and surveys at premises where these are used.

research in progress

Coconut Research Institute

Coconut research in Sri Lanka was institutionalised with the initiation in 1929 of the "Coconut Research Scheme". With the expansion of its activities, its status was raised to that of a "Coconut Research Institute" in 1951. The Coconut Development Act of 1971 created the Coconut Development Authority to co-ordinate the functioning of the four constituent Boards of which the Coconut Research Board is one. The Ministry of Plantation Industry exercises general control over all major plantation crops and their associated Institutions.

Research activities are funded by a Government grant generally administered by the Coconut Development Authority through the Coconut Research Board.

The Board consists of seven members all of whom are nominated by the Minister of Plantation Industry.

The Coconut Research Institute has its head quarters, at Bandirippuwa Estate, Lunuwila and maintains three sub-stations, four commercial estates and fifteen nurseries.

Research activities are currently concentrated upon the agronomic aspects of production and protection of the crop with only limited laboratory scale investigations on the technology and chemistry of coconut products. It is proposed to considerably expand these latter activities in the future. The Institute is also responsible for the provision of quality coconut seedlings to the industry. Assistance is provided to the Coconut Cultivation Board, in fulfilling its responsibility of providing advisory and extension services. Administration, Estate Management and Publication and Publicity Units function as support services.

The activities of the Coconut Research Institute are conducted by eight Divisions or Units, the main areas of responsibility are as indicated below:-

(1) **Agrostology:- Development of pastures as inter-crop with coconut.**
  - (*a*) Soil nutrient status—principally by use of "indicator plants"
  - (*b*) Nitrogen fixation by legumes.
  - (*c*) Agronomy and arrangement of pastures and fodder grasses
  - (*d*) Weeds of coconut land
  - (*e*) The microclimate within the "coconut square."

(2) **Biometry:- Statistical service and crop statistics**
  - (*a*) Analysis of experimental data from other Divisions
  - (*b*) Copra conversion studies
  - (*c*) Effects of irrigation and the study of "immature nutfall"
  - (*d*) Bunch-thinning of coconuts.

(3) **Botany:- Breeding and Genetics—Physiology.**
  - (*a*) Selection of mother palms and provision of selected seednuts to the nurseries.
  - (*b*) The evaluation of selections and crosses in field trials.
  - (*c*) The study of dwarf x tall and other hybrids and the establishment of Hybrid Seed Gardens.
  - (*d*) Physiological studies of the coconut palm.
  - (*e*) Preliminary attempts at "tissue culture" of coconut.

(4) **Chemistry:- Plant tissue analysis. Sap products**
  - (*a*) Internal and external factors influencing variation of leaf nutrient contents.
  - (*b*) Nutrient recovery from applied fertilizers
  - (*c*) Sap yield from tapped inflorescences.
  - (*d*) Production of sugar, treacle and jaggery from sweet toddy.
  - (*e*) Regulation of fermentation and utilization of yeast.
  - (*f*) Products of alcoholic and acetic fermentation.
  - (*g*) Beverages based on sweet toddy.

(5) **Crop Protection:- Control of pests, diseases and weeds of coconut**
  - (*a*) Surveillance and successful biological control of the leaf-miner (*Premecotheca cumingi*).
  - (*b*) Breeding and release of biological control agents of the coconut leaf scale (*Aspidiotus destructor*) and the leaf-eating caterpillar (*Nephantis serinopa*).
  - (*c*) Chemical control of the red-weevil (*Rhyncophorus ferrugeneous*), black beetle (*Oryctes rhinoceros*) and stem-borer (*Xyleborus similis*).
  - (*d*) Control of fungal diseases—bud rot (*Phytophthora palmivora*),
  - (*e*) Biological control of the weed *Eupatorium odorutum* by the agents Ammalo insulata and *Apion brunneorignous*.
  - (*f*) Study of Leaf Scorch Decline.
  - (*g*) Maintenance of insectaries at Lunuwila, Colombo and Mylambavelly.

(6) **Intercropping:- Associate crops other than pasture and including livestock.**
  - (*a*) Trials on economic evaluation of intercropping in the different ecological regions.

(b) Study of crops of special interest as intercrops— manioc, passion fruit, cocoa, castor, banana, aroid yams etc.
(c) Breeding and management of dairy animals.

(7) **Planting:- Maintenance of nurseries.**
(a) Provision of quality seedlings to the industry.

(8) **Soils—Fertilizer practices: Soil Surveys.**
(a) Fertilizer trials on maior and minor nutrients.
(b) Comparison of different forms and types of fertilizer.
(c) Analysis of leaf and soil samples for inorganic nutrients
(d) Soil moisture studies.
(e) Nutient uptake using isotopic tracers.
(f) Soil Surveys, production and interpretation of soil maps.

The Toddy Tappers Training Scheme at Bandirippuwa Estate will come within the Administrative Control of the Coconut Research Board. The Staff of the Institute continue to function in Advisory and other assisting roles to several Institutions and organizations.

Tea Research Institute

PRESENT ACTIVITIES OF THE TRI

Instant Tea Project: Research on the production of instant tea was initiated in 1967 and there are, at present, three processes patented by the T.R.I. for instant tea production. In all these processes the starting material may be fermented leaf or black tea, and in one of them the product is soluble in hot water, whilst in the other two the product is soluble in either hot or cold water.

Miscellaneous Research Activities: Root exudates of tea plant were found to contain an organic acid (identified as malic acid) which mobilises phosphate in the soil and makes this nutrient available to the plant. The mechanism of action of this organic acid was elucidated.

Roundup (Glyphosate) was found to provide a means of controlling the growth of obnoxious weeds (including cootch grass) which occur in tea fields.

The sand culture technique for investigation of nutrient uptake by tea plants was perfected. Studies were made of the uptake of nitrogen by the tea plant and mixture of ammonium nitrogen and nitrate nitrogen was found to be more beneficial for growth than either of these two forms of nitrogen applied individually. Conversion of ammonium nitrogen to nitrate nitrogen occurs in the soil through the activity of soil micro-organisms.

Soil rehabilitation was found to increase tea yields, and sugar cane was identified as a suitable and protfitable rehabilitation crop.

Dimbula disease of tea was found to be the result of restriction to the flow of nutrients through the tea bush. This restriction occurred in the collar region of the bush, and could be eliminated only by the drastic measure of pruning the bush at soil level.

The effect of plant growth regulators on the development of nursery and field plants was investigated.

A number of new clones, some obtained by selection and others by clonal crossing, were developed and tested. Among these, a few show promise of becoming very useful for future replanting.

The basis was determined for the differing susceptibility of tea clones to infestation by the shot-hole Borer beetle, and the reason found for the rapid proliferation of the beetle at specific times after pruning.

The mechanism was unravelled of the effect of climatic conditions on the development of tea flavour.

The Fluid Bed Dryer was made available commercially, and its fabrication covered by international patents.

Investigation of root enzymes, responsible for the biosynthesis of theanine, is in progress.

Use of antitranspirants in tea, soil-plant water relations and phosphate nutrition in tea is in progress.

Multidisciplinary projects on the following subjects have been initiated:-

(a) Identification of parameters for the selection of clones.
(b) Shade trees for tea,
(c) Soil fertility,
(d)) Pruning,
(e) Causes for decline of yield,
(f) Dissemination of information.

news

International news

1975 Nobel Prizes

The 1975 Nobel prizes in science were awarded to two chemists, three physicists, three biologists and two economists. The prize in chemistry was given for researches on the architecture of organic molecules; the prize in physics for experiments and theories that clarify the architecture of the atomic nucleus; the physiology or medicine prize was awarded to the biologists for discovering how viruses interact with the genetic material of the cell; and the prize in economics for developing mathematical tools for optimizing the allocation of resources.

The prize in chemistry was given to John Warcup Cornforth, director of research of the Milstead laboratory of Chemical Enzymology in Sittingbourne England and Vladmir Prelog of the Swiss Federal Institute of Technology in Zurich. Cornforth has specialized in the synthesis of naturally occurring steroid molecules such as cholesterol and cortisone. In a series of papers he described the enzyme systems and the chemical steps the cell uses to synthesize the 27-carbon compound cholesterol from the two-carbon starting material acetic acid. Vladmir Prelog is known for elaborating a general theory of stereochemistry drawing on a lifetime of work on the geometry of organic molecules.

The physics prize was awarded to Aage Bohr of the Niels Bohr Institute in Copenhagen, Ben Molttelson of the Nordic Institute for theoretical Atomic Physics, also in Copenhagen and James Rainwater of Columbia University. In the late 1940s, Rainwater discovered experimentally that the electric quadrupole moment of certain atomic nuclei was as much as an order of magnitude larger than the value predicted by the spherical-shell model of the nucleus and he proposed anaspherical model of the nucleus. Bohn and Mottelson refined Rainwater's proposal into a comprehensive mathematical model showing how nucleus circulating in the outer shell of an atomic nucleus can give rise to systematic distortions in the shape of the nucleus as a whole.

The prize in physiology or medicine was shared by David Baltimore of the Massachusetts Institute of Technology, Renato Dulbecco and Howard M. Temin of the University of Wisconsin. While Temin was a doctoral student under Dulbecco at Cal Tech., he began searching for an enzyme capable of transcribing RNA into DNA. He found the enzyme in 1970. It was independently discovered by Baltimore at the same time and the two papers were published in the same issue of Nature. The enzyme is called RNA- directed DNA prolymerase or sometimes reverse transcriptase.

The Nobel prize in economics was awarded to Leonid V. Kantorovich of the Institute of Economic Management in Moscow and Tjalling C. Koopmans of Yale University. They worked independently on the application of the analytical technique later known as linear programming to the economic problem of allocating resources.

(*From Scientific American*).

UNESCO'S MAN AND THE BIOSPHERE (MAB) PROGRAMME

The vital problem today is to prevent the pressure of the ever-increasing population from causing irreversible damage to the environment and destroying irreplaceable resources on which mankind depends.

The general objections of Unesco's Man and the Biosphere Programme is:
".....to develop within the natural and social sciences a basis for the rational use and conservation of the resources of the biosphere and for the improvement of the relationships between man and the environment; to predict the consequences of todays actions on tomorrow's world and thereby to increase man's ability to manage efficiently the natural resources of the prosphere."

The MAB programme consists of a number of projects with global or regional impact. The objectives of these projects are:

To identify and assess the changes in the biosphere resulting from man's activities and the effects of these changes on man.

To study and compare the structure, functioning and dynamics of natural, modified and managed ecosystems.

To study and compare the dynamic interrelationships between 'Natural' ecosystems and socio-economic processes and especially the impact of changes in human populations, settlement patterns and technology on the future viability of these systems.

To establish scientific criteria to serve as a basis for rational management of natural resources.

To establish standard methods for acquiring and processing environmental data.

To promote the development of simulation and other techniques of prediction as tools for environmental management.

To promote environmental education in its broadest sense and encourage the idea of man's responsibility for and personal fulfilment in partnership with nature.

The present MAB programme consists of thirteen projects. The ultimate goal is a retention of the maximal variety of natural and man made environments, the protection of animal and plant species and the safeguarding of the world's genetic stock. To achieve such a goal a vast amount of research has to be done to provide the basic tools for future planning. The MAB programme is a hopeful beginning.

(*From Impact.*)

USSR.

Soviet probes on Venus

The planet Venus had held tenaciously onto its reputation as a world of mystery, wrapped in dense, murky clouds that block the view of earthbound astronomers and crush introducing space probes like childrens toys. In October 1975 a corner of the veil was lifted.

The two Soviet crafts that accomplished the feat Venera 9 and Venera 10 apparently lasted only 53 and 65 minutes respectively on Venusion soil, yet together they nearly tripled the time spent by functioning, man-made objects on that inhospitable wasteland. And for the first time, they gave earthings a look.

Five times before, Soviet probes had descended to the surface of Venus, but the first three were apparently dead-victims of heat and pressure-before they got there. Only Veneras 7 and 8 were able to transmit after landing and no pictures were included in their combined 73 minutes of data.

Launched on June 8, Venera 9 went into orbit around the cloudy planet on October 20. For two days the Soviet craft orbited the planet before detaching a parachute-equipped descent stage that would make the trip to the ground.

The second craft, Venera 10, reached the surface on October 25, following a June 14 departure from earth. Soviet researches described the view as that of an old mountain formation with smooth rounded rocks that seemed nearly flat, much more in keeping with theories of severe erosion. Between the rocks, reported Tass, were regions of debris resembling cooled lava or weathered rock.

The two probes report surface temperatures of 869 and 905 degrees F., similar to previous data, and such heat, together with its effects on surface chemistry makes Venus a one of a-kind laboratory for investigation.

(*From Science News*).

Scientists in the news

The Secretary-General, Dr. G. C. N. Jayasuriya left for Hawaii on an invitation extended to him by the East-West Centre to accept a Seminar Fellow Award at the Centre for a period of 5 months from January to June 1976. This award is for a study on the subject "Transnational Environmental Policy." He is one of a group of scholars and authorities from East and West who were invited to the Centre because of a common interest in the potentiality and mechanisms for transnational policy making as it relates to environmental issues.

Professor P. P. G. L. Siriwardena, Vice Chancellor of the University, of Sri Lanka attended the Commonwealth Vice Chancellor's Conference held at Wellington, New Zealand in February 1976.

Dr. Osmund Jayaratne, and Dr. R. O. B. Wijesekera Acting Secretary-General National Science Council were invited from the India Pugwash Society to attend the 25th Pugwash Conference held in Madras between the 13th and 19th of January.

From the 20th to the 27th January Dr. Osmund Jayaratne was invited to visit the Council of Scientific and Industrial Research in New Delhi in connection with the Indo-Sri Lanka Scientific and Technical Co-operation Agreement.

NSC activities

Professor Michael J. Moravscik led a group discussion on aspects of Science Policy and Planning at a Seminar held on January 21 and 22 at the American Centre. The seminar was organised by the National Science Council in collaboration with the United States Information Service. The Chairman of the seminar was Dr. R. O. B. Wijesekera, Acing Secretary General of the National Science Council. Professor P. P. G. L. Siriwardene, Vice-Chancellor, University of Sri Lanka, gave the inaugural address.

The emphasis of the seminar was placed on "Science" rather than "Technology." The functional and practical aspects of Science Policy were the foci of discussion. The objectives of the seminar were:

- to acquaint scientists and policy makers with the status of and methods in Science Policy activities. Special regard was to be paid to the problems of the less developed countries.
- to discuss controversial and open questions pertaining to the building of science in the less developed countries, and
- to survey the status of science development in Sri Lanka.

Practical proposals for the development of scientific activity in the local situation were made by the scientists present.

A seminar on 'Man and his Environment'' was held on the 9th March 1976 at the Sri Lanka Foundation Institute. The guest speaker was Dr.Hansjorg Oeltzschner, official of the Bavarian State Authority on Environmental Protection, Federal Republic of Germany. The seminar was sponsored by the National Science Council with the collaboration of the German Cultural Institute. The Chairman was Prof. B. A. Abeywickrema and the inaugural address was delivered by Dr. Osmund Jayaratne, Chairman of the National Science Council.

Dr. Oeltzschner spoke on several aspects of environmental pollution ranging from pollution problems to land development and use. A film on 'Water Pollution'' was shown.

Proposals to promote environmental protection for the local scene were discussed and recommendations were made by the scientists present, both for the government and the National Science Council.

CISIR activities

A Seminar was held from the 4th to 6th May to mark the 21st anniversary of the Ceylon Institute of Scientific and Industrial Research.

Present at the inauguration were the Prime Minister, Mrs. Sirimavo Bandaranaike, the Minister of Industries and Scientific Affairs, Mr. T. B. Subasinghe, members of the diplomatic corps, delegates from local and foreign scientific organisations and entire staff of the CISIR.

The Chairman of the CISIR, Professor P. P. G. L. Siriwardena delivered the welcoming address

The Prime Minister, Mrs. Sirimavo Bandaranaike in her inaugural address said that there is a great need today for scientists to move closer to the farmers in the field, the workers in the factory and the children in their schools. "If the common man is taught to understand the usefulness of scientific work, he will in turn encourage the funding of scientific work" said Mrs. Bandaranaike. She paid a tribute to scientists of the CISIR for developing a method of producing non-toxic manioc flour and for work on substitute flour for producing bread and bakery products which will help the country reduce its flour imports.

Industries and Scientific Affairs Minister, Mr. T. B. Subasinghe said that through the National Science Council efforts were being made to co-ordinate the various disciplines of science into one effort for both research and development.

Dr. Osmund Jayaratne, Chairman of the National Science Council and Mr. S.F. Laurentius, Director of the CISIR also spoke.

The inaugural sessions was followed by talks by the Heads of the different sections of the CISIR.

The Seminar was followed by an Exhibition which went on till the 22nd of May.

Distinguished visitors

VISIT OF PROF. MICHAEL J. MORAVSCIK

Michael J. Moravscik, Professor of Physics and Director of the Institute of Theoretical Science, University of Oregon, U.S.A. spent a few days in Sri Lanka, recently. His visit was arranged by the National Science Council in collaboration with the United States Information Service.

Born in Budapest, Prof. Moravscik had his early schooling there and attended the University of Budapest. He came to the United States in 1948 and earned an A.B. at Harvard and a Ph.D. at Cornell, becoming a U.S. citizen in the meantime. After some years in research he become Professor of Physics at the University of Oregon and research associate with the Institute of Theoretical Science of which he became Director in 1969. He has been Visiting Professor and Lecturer in a number of institutions in the U.S.A. and abroad. In the fall of 1971 Dr. Moravscik was appointed a member of the Advisory Committee on International Exchange of Persons.

Prof. Moravscik, who besides being one of U.S.A.'s recognised theoretical physicists is also an acknowledged authority in the area of Science Methodology, Policy and Management. Prof. Moravscik has published a number of papers in this area. His latest book "Science Development: The building of Science in less developed countries" formed the basis of discussion at the seminar held in Colombo.

VISIT OF DR. GEOFF OLDHAM

Dr. Geoff Oldham—Deputy Director, Science Policy Research Unit, Sussex, and Director, International Development Research Centre, Ottawa, Canada, spent a few hours in Sri Lanka on his way home after a conference in India recently. He called on the National Science Council and addressed a meeting of local scientists and technologists at the N.S.C. on Thursday 12 February.

Dr. Oldham described the role of the Science Policy Research Unit at the University of Sussex in promoting research into science policy in different parts of the world. He said that this institute, in association with the Institute of Development Studies in Sussex, had held several resident seminars to which participants from developing countries in all parts of the world were invited, together with others from the developed world. These included a seminar on "Policies for Science and Technology in Relation to Economic Development" held in September 1971 (attended by a representative from the Ministry of Planning & Economic Affairs) and one on "Science and Technology in Developing Countries" in 1974.

Dr. Oldham said that considerable interest in Science Policy research had been generated in the Latin American countries some of which have set up new institutions for such research. He specially mentioned Argentina, Mexico and Peru in this context. Many Latin American scientists and technologists had been able to impress on their respective Governments the need to build up an indigenous scientific capability in order to support the development of indigenous technology which was a prerequisite for the achievement of economic independance. The Latin American contribution to the work of SPRU was much appreciated.

Referring to the International Development Research Centre in Ottawa, Dr. Oldham said that this Institute had been set up in 1971 with a view to funding and fostering research in the developing countries on problems of development. The IDRC was unique in that it had an International Board of Directors with many representatives from developing countries.

Dr. Osmund Jayaratne, Chairman, N.S.C., who presided at this meeting led an interesting discussion which ensued in which many important issues were discussed. Dr. Oldham stressed that national institutions like the NSC should build up a research capability in order that local scientists could make the maximum impact on the development effort. He agreed that direct links could be established between such bodies as the NSC and the IDRC to avoid as far as possible bureaucratic impedence.

In conclusion Dr. Oldham said that he would try to visit Sri Lanka for a longer period of 4 or 5 days perhaps in May this year when he would be able to further strengthen contacts which were established during this brief visit.

Meetings

June 30th — July 5th

International Seminar on Scientific and Technological co-operation among the Non-aligned Nations.
Sponsor: Sri Lanka Association for the Advancement of Science.

Venue: Hotel Oberoi.

28th November — 3rd December 1976.

Ninth Biennial meeting of the Commonwealth Science Council (CSC).

6-12 February 1977.

Third Asian Symposium on Medicinal Plants and Spices —ASYMPS—3.

Publications

NATIONAL SCIENCE COUNCIL JOURNAL

The National Science Council of Sri Lanka has published Vol. 3 No. 2 of the "The Journal of the National Science Council of Sri Lanka". Copies which cost Rs. 12.50 each can be obtained from the Accountant, National Science Council of Sri Lanka, 47/5 Maitland Place, Colombo 7.

The Journal is primarily meant to encourage scientists of Sri Lanka to publish the results of their research on fields of research of particular relevance to our country.

Vol. 3 No. 2 includes papers in the fields of the physical and natural sciences and medicine.

manuscripts

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(1) An 'article' which surveys a field of knowledge but does not necessarily report new observations. Where appropriate an interdisciplinary approach and/or a discussion of the social and economic consequences of advances in science and technology will be preferred. Language and contents should be intelligible at least to the intelligent lay public; technical concepts should be explained in accordance with this aim.

The author's name and address should appear on a 'title page', together with a brief (maximum 75 words) indication of the contents of the article.

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1. Is it an original and significant contribution to knowledge?
2. Does it have interdisciplinary or general interest?

A communication should in general, not exceed 600 words. Figures and tables should be used sparingly. The author's names should appear underneath the title with a footnote indicating address.

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As a standard for spelling, Vidurava uses the Shorter Oxford English Dictionary (3rd Ed, 1944).

References should be cited in the text by the year of publication -e.g.- Wikerson (1934)—and should be arranged at the end of the article in the alphabetical order of the author's names—WILKERSON, JIA. (1934) J.Biol. Chem., 104541. References to books should give the year of publication, the title of the publication, the number of the edition, the place of publication, and the name of the publisher. Abbreviations of titles of periodicals should conform with those in common use in the field of the subject matter of the contribution.

Figures and diagrams should be submitted in a form which is suitable for direct reproduction and two photostat copies provided for the use of referees. Footnotes should only be used when they are essential. They should be placed within horizontal rules immediately under the lines to which they refer.

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(*National Science Council of Sri Lanka has funded the compilation and printing of this series*)

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