

INNOVATION EYE



Vol. 1, No.4 July 2015

e-Newsletter of The Coordinating Secretariat for Science Technology and Innovation (COSTI)

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COSTI teamed up with the Ministry of Special Projects



Since COSTI had been assigned to the secretariat of the Senior Ministers and soon after the dissolution of the secretariat it was assigned to the Ministry of Special Projects coming under the Hon. minister Felix Perera from April 9th 2015. Prof Ajith De Alwis, Project Director of COSTI along with the other directors had several successful discussions with Mr. G.K.D. Amarawardena, Secretary to the Minister and other senior officials of the ministry. During the discussions the officials of COSTI were able to point out the importance of the work carried out by COSTI towards the betterment of science and technology of the country. As a result the secretary assured the officials of COSTI that he would extend his full support towards it at all times. In addition, he emphasized the importance of COSTI's further involvement on the already ongoing projects of theirs such as the CKDu issue which is prevalent in the north central area of the country.

From the Editor



“The nation which
does not create
new things
will not rise”

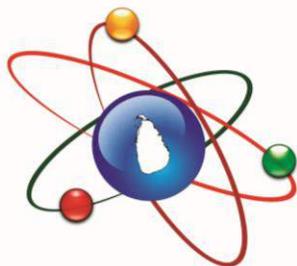
-Cumaratunga Munidasa
(1887-1944)

This is the 4th newsletter of COSTI communication as what we have been engaged with. COSTI was established as mandated by a government decision to coordinate and monitor country's science, technology and innovation activities. The lack of a governing body to look after the countries' ST & I activities in totality does not exist in Sri Lanka and we still feel the absence of such an established entity.

Since its inception COSTI has launched various programs that could promote a new culture within ST & I. It also extended its support to everyone, who needed assistance with regard to R&D and ST & I ventures. In spite of various hardships and a number of upheavals it was able to survive up-to-date in order to serve the country. On behalf of COSTI and its contribution to science, it is fitting to quote the famous phrase made by Emperor Julius Caesar “I saw, I came and I conquered”. Adherence to a similar theme is the secret of its success during the past two years. At this juncture, it is a pleasure to take part in the presentation of the 4th newsletter titled “Innovation Eye”. I am also extremely honored to serve as the editor of the newsletter for the 4th consecutive occasion.

So far COSTI has proven its capability in playing a role in promoting the establishment of policy decisions for the betterment of the people as well as to make good governance in the country and we stress on the use of scientific methods. Since its inception COSTI has taken a leading role in promoting science in the country; it always believes in novel approaches. It had already engaged itself in some key sectors establishing six national councils in each sector. This surely can increase the high-tech exports of the country thereby ostensibly converting science into rupees. All these attempts would ultimately pave the way to increase the GDP of the country and COSTI with the scientific community want to rejoice in being a partner to this worthy cause.

In order to fulfill our dreams and to achieve the set goals we would like to invite all of you to join hands with us during this year. We are interested in receiving your feedback and constructive criticisms on issues raised in this newsletter, Innovation Eye.



COSTI
CONNECTING INNOVATION...



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COSTI News and Activities

President visits the COSTI office



As part of his tour within the Presidential Secretariat, President Mithripala Sirisena visited the COSTI office. Staff was really appreciated of his visit and they were able to have a brief discussion with him.

COSTI launched the National Innovation Dashboard, an opportunity for Sri Lanka to develop and maintain a national research database



COSTI recently launched its National Innovation Dashboard. This is an opportunity for Sri Lanka to develop and maintain a national database of a complete list of people who are engaged in research and innovation activities along with their outputs. This project is spearheaded by the COSTI's IT team under Dr. Geetha Abesinghe. -

This would surely become a national resource center on data and information on R&D in ST & I activities of the country in no time. Although the country has a high literacy rate its position in Global Innovation Index had retarded during the recent years. As such, this will surely act as a catalyst for young and upcoming scientists to come up with new innovations in years to come. [The launch took place at the WCO₂ premises at 'Trace City' on 15 June 2015 (Academic) and 7 July 2015 (Institutes/ Industry)]

COSTI signed an MOU with the NIPO to Establish a Technology and Innovation Support Center (TISC Unit)



COSTI recently joined hands with the National Intellectual Protection Agency (NIPO) to setup a Technology and Innovation Support Center at COSTI called the "TISC". The services rendered by an institute of this type are a long felt need of the country. TISC is intended to provide a variety of services such as providing assistance to local innovators for patent research, patent drafting and filing. Prof. Ajith de Alwis, Project Director of COSTI and Mrs. G.R. Ranawaka, Director General of NIPO signed the MOU at the COSTI office. This is a part of the ongoing 10-part action plan that NIPO has with WIPO.

" Everything is theoretically impossible, until it is done"

-Robert A. Heinlein(1907-1988

COSTI teams up with Ministry of Special Projects to facilitate CKDu support services

CKDu: Reported in Sri Lanka's Dry Zone since early 1990s...

What's the Difference?

CKD
Common Chronic Kidney Disease

CKDu
Chronic Kidney Disease of Unknown Aetiology

Who Gets It?



Older people, both males and females



Working age males



Increasing incidence of a chronic kidney disease of unknown aetiology (CKDu) happens to be Sri Lanka's latest health crisis, especially, in the North Central province. So far, scientists have failed to identify the real cause of this disease. COSTI happened to team up with the Ministry of Special Projects to support the eradication of CKDu from the country. Workshop with the participation of stakeholders was held on 22nd May 2015.

COSTI is having an ongoing discussion to eliminate narcotics; debar the transmission of illegal arms and explosives; and the smuggling of national treasures across Sri Lanka



COSTI is currently part of a committee of government/non-government authorities and departments, capable of sharing their inputs to supplement this national requirement. For example, the committee would recommend an efficient fool-proof scanning system for the detection of contrabands.

COSTI facilitates as installation of an IWMI's prototype weather station at the meteorological department (for testing purposes).



As a preliminary activity to COSTI's initiative to develop a 'national climate observatory system' for Sri Lanka, a locally developed low cost automatic weather station resembling the prototype developed by the International Water Management Institute - IWMI), was installed at the Sri Lanka Meteorological Department as a research initiative.

COSTI member participated in Appropriate Technology Grand Symposium held in Korea



Mr. Asanka Suraweera, scientist at COSTI, participated in Appropriate Technology grand Symposium conducted by KIPO-WIPO in Korea. He is also the manager of the local TISC center established by NIPO at COSTI. This sort of international contacts may pave a path to COSTI scientist to gain experience and promote the application of appropriate technology on behalf of Sri Lankan industries. COSTI thank for the opportunity and the support extended by NIPO.

Lecture Titled “Biomechanics and Aquatic Research” by Prof. Jan Prins



On January 6 th, 2015 an interesting lecture titled “Biomechanics and Aquatic Research: An overview with a Sri Lankan context” was delivered by Prof. Jan Prins, attached to the University of Hawaii, on an invitation made by COSTI. He is a world renowned scientist involved in swimming research and has more than 40 years’ experience in that field. Accordingly, during his lecture he mainly concentrated on the application of biomechanics on land and aquatic-based research.

Lecture titled “Prospects of Cave and Karst Science in Sri Lanka” by Prof. Armstrong Osborne



COSTI was able to persuade Prof. Armstrong Osborne, researcher in Speleology attached to the University of Sydney, Australia, to conduct a lecture titled “Prospects of Cave and Karst Science in Sri Lanka.”

This was held at the auditorium of the Ceylon Chamber of Commerce on 5th of December 2015. Speleology or the Cave Science is something new to this country, but can be easily deployed for the promotion of Sri Lanka’s tourism industry.

COSTI copartner UOP in the 5th International Conference on Sustainable Built Environment



COSTI conducted the session titled “Housing for Sustainable Built Environment” at the 5th International conference on ‘Sustainable Built Environment’ organized by the Faculty of Engineering, University of Peradeniya. The session was intended to promote a dialogue among the housing sector experts to disclose the different types of innovations and policies that would be incorporated to achieve the sustainable built environment.



Food for Brain

“Technology is just a tool. In terms of getting the kids working together and motivating them, the teacher is the most important.”

- Bill Gates



SEM & TEM; Best Investment for the Proper Exploitation of Science

Recently Sri Lankan researchers heard the news that two new electron microscopes were imported to the country within a very short time interval. Out of these items, Scanning Electron Microscope (SEM) was assigned to the University of Peradeniya while the Transmission Electron Microscope (TEM) was assigned to the Sri Lanka Institute of Nano Technology (SLINTEC). It is a fact that Sri Lanka has excellent researchers yet good analytical facilities are hard to come by and this is the first instance of importing a TEM to Sri Lanka. These are absolutely necessary to carry out world class research and on our ability to compete with others.

What is an electron microscope? How it is different from the conventional light microscope and what is the principle behind it? These questions could be easily answered by those having a science background, but the general public is quite unaware of this instrument.

In conventional light microscopes, the resolution of the microscopic image depends on the wavelength of the light waves. The wavelength of visible light operates within the range of 400 to 700nm. In a reflecting light microscope, the resolving power lies within this range. The magnification goes hand in hand with resolution. As a result, the magnification of a reflecting light microscope is limited to about 1500X, even if it incorporates the best quality lenses and the latest technology. The resolution is inversely proportional to wavelength. So the improved resolution necessary for most research purposes could only be achieved by using shorter wavelengths that are less than 400nm.

In case they could use short wavelengths, then it would be possible to achieve very high magnification. To achieve this, they can successfully use a beam of electrons as waves (With very short wavelengths). The resulting invention is identified as an electron microscope. Since the electron beam is not within the visible range, the magnified image produced by it could be viewed only on a CCD screen or a monitor. The images are produced on either the monitor or the fluorescent screen. Since electrons only work with conductive material, the object intended for observation must be of conductive material, or coated with conductive material. Generally, non-conductive objects like rocks are coated with either gold or carbon.

In a general scanning electron microscope (SEM), an electron beam scans over the surface of the specimen and yields an image of the physical features of its surface on the monitor screen. Thus, the instrument is very helpful for obtaining a magnified view of the surface of the specimen. Whereas the beam of electrons in a transmission electron microscope transmitted through an ultra-thin specimen gives an enlarged image on the screen. Since the beam is penetrating through the sample there is the possibility of observing the interior of the sample and the beam is also capable of producing significantly higher resolutions. These days, the electron microscopes are equipped with many attachments, which could not only produce magnified images, but are also capable of identifying chemical elements. These could also carry out chemical mapping and many other research applications. As such, importing these types of instruments are ideal investments for the proper exploitation of science. Very soon it may be possible to hear scientific inventions achieved with the help of these new instruments and hope such inventions would be increased by leaps and bounds in time to come.



Transmission Electron Microscope (TEM) - Sri Lanka Institute of Nano Technology (SLINTEC), Homagama.

Dr. Prashan Francis

Robotics; Miracle Machinery Introduced by 21st Century Industry

Quarter century ago people only saw robots in science fiction movies. As such, they had an entirely different view about them. Today robots are a vital part in industries throughout the world and they offer a variety of benefits to mass scale and sophisticated industries. There are many advantages such as speed, accuracy and efficiency. In addition, they save time, money and sometimes save life in difficult situations. Robots are also capable of handling tedious tasks (sorting, packing, etc.) as well as risky jobs (foundry, painting, etc.). The use of robots in industry promotes considerable improvement in product quality and speed.

In addition, robots have the ability to work at a constant speed without pausing for breaks. Hence, they basically exceed the potential of a human worker. Industrial robots increase the workplace safety providing constant performance, time conservation and minimal material wastage.



Historically, robots were designed and programmed for relatively static environments. Later they were developed to suit various applications and industrial requirements. Nowadays, the applications of robots in industries continue to expand throughout the world. The industrial robots can be automatically controlled and reprogrammed.

In some instances robots could be programmed to perform in multipurpose directions leading to three or more axes. The typical applications of industrial robots include welding, painting, ironing, assembling, picking up/placing, palletizing, testing and inspecting product status. Most often these robots accomplish their work with great endurance, speed and precision.

Today, developing countries too implement robotic technologies for their industries to enhance the benefits. In Sri Lanka robotic technology application for its industries is a minimum because most of the manufacturing industries are small to medium scale and rarely involved in the manufacture of high-value commodities. As a result, the manufacturing companies are reluctant to invest huge capital for implementing robotic technology for their industries. Another issue is the necessity for the regular maintenance and the lack of robotic specialists.

The solution is to promote country's high-tech industries, which need the services of robots. At this juncture, Lankan expertise and professionals can play a major role, not limiting their robotic technology to competitions and exhibitions, but engaging on the development of robots for industrial applications. It is a fact that Sri Lanka is a leading software developer in Asia. Hence, it is fully capable of developing software for robotic operations and electronic circuit designs for robots.

To realize these requirements, the Coordinating Secretariat for Science Technology and Innovation (COSTI) intervenes by promoting robotic applications for Sri Lankan industry and also is instrumental in establishing a center for robotics called "center of excellence in robotic applications (CERA)".

Thidasi Dahanayaka

"I believe there are no questions that science can't answer about a physical universe."

-Stephen Hawking

An instance of experience and talent surpassing science

In the modern world every man and woman has to earn an income to survive in this planet. There is no room for fair trade some people names a very high price tag for day's work while most others receive a small fee for whole days' tiresome work. Some struggle for years to become a professional while some achieve similar competence with the least amount of effort just by developing their inborn talents.

In Sri Lanka there are thousands of examples relating to talent and experience of individuals achieving unbelievable performance in their own trade most often surpassing science. Most often these talents are undetected, undervalued and not properly appreciated. As such, most often these expertises vanish without any contribution to the development of the specific trades or the development of the country as a whole.

Anyone visiting Ratnapura or the Eheliyagoda area usually comes across a set of people, sometimes dressed in white, gathered on both sides of the road, especially, in "Ambagha" area in Ratnapura. Most of them are not qualified or trained gem professionals and some had not continued their studies even up to Advanced Level. Yet, these people are truly talented in their own field as a result of vast experience. They have got involved in gem business that is to buy and sell gems as a means of earning their daily bread.

The most wonderful aspect of these traders is that they only have a torch and occasionally a magnifying lens, but some of them have no instruments not even a torch. But they have mastered the gem trade to such an extent that a mere glance is sufficient to carry out a thorough analysis of the gem they intend to buy (Sometimes a matter of millions of rupees). These skills are acquired from their experience supplemented by the ability to make quick decisions. Inspecting a gem for a few seconds with or without a torch, they could arrive at a decision. This decision is consequent to the complete analysis of the gem stone. It includes gem variety identification, synthetic/natural detection and the imagination of a mental picture of the ideal cut/shape that could provide the maximum weight/colour; sometimes a clear idea of the origin of the stone. Most often a delay of several seconds for the inspection could cause the gem to be grabbed by another. As such, the person who makes the fastest and accurate decision always succeeds in these roadside gem deals. Most often their decisions are accurate.



Roadside gem dealer inspecting a gem without any instrument

So many times foreign professionals and experts in the field of gems/mineralogy who visit these areas in order to buy gems are astonished with the inherent talent of these people. Some of the professionals mentioned that even with their training and the use of modern gem identification instruments coupled with ultra-modern analytical instruments it would take days to match the analysis (conclusion) made by the roadside gem traders. Hence, this is truly an instance of experience and talent surpassing modern science. If a researcher can provide the scientific knowledge to this sort of traders it would surely be an asset to the country. We just do not bring in technical expertise to combine with traditional knowledge and realize a better situation.

Dr. Prashan Francis

Mathematics is an Integral Part of the Weather Forecasting System

Weather has influenced people's lives for thousands of years. In the past weather was predicted by observing the sky, the oceans and the changes that take place within the environment. The science that deals with weather is known as meteorology. Weather prediction or forecasting involves multi-disciplinary scientific processes. Weather information is very vital for the smooth running of country's activities. The forecasting of weather patterns are supposed to provide information for periods in between few hours to few months. The information includes the amount of rain fall, temperature; wind speed/direction; humidity and pressure.

Nowadays numerical weather predictions use mathematical models of the atmosphere and the oceans based on the available data of present and past weather patterns.-

These developments started way back in 1920, but properly developed subsequent to the introduction of computers. Since the incorporation of thermodynamics, hydrodynamics and the some areas of physics, computers were essential to carry out such predictions. The present and past weather information of an area can be analyzed to formulate a hypothesis. The cataloging of weather information carried out under different scales could simplify the prediction process.

Mathematical models for weather forecasting uses real time data to generate initial conditions (This is called Assimilation). Hence, modern forecasts based on mathematical-models are more precise. In Sri Lanka restructuring of the initial methodology is necessary to capture the local weather data. Sri Lanka has 22 main meteorology stations, 38 agricultural stations and more than 400 rainfall stations distributed throughout the country. It is necessary to have more stations, especially, in the coastal belt to capture the weather data efficiently. In addition, more research is needed to develop different model types that are more capable to capture the weather changes that take place within the country. This would lead to more precise forecasts on weather patterns and ultimately promote the rapid development of the country. Since the capital needed for this type of research is a minimum (Several powerful computers would be sufficient). COSTI has identified the need to promote this research in order to maximize the efficiency of country's day to day work.

Electric Vehicles; Are We Heading In The Right Direction?

It is a well-known fact that transport problems in Sri Lanka are often an impediment for accessing human necessities such as healthcare, transportation, shelter, education, food and other categories. Vehicles consume more than 75% of the fuel imported to the country. On the other hand, the emissions of motor vehicles considerably result in air pollution. According to the records of the ministry of transport for the year 2014, 72% of Carbon Monoxide had been emitted by motor cycles and motor tricycles and 68% of Nitrogen Oxide together with 62% of Particulate matter was emitted by heavy busses and trucks. Emissions of diesel vehicles cause severe environmental deterioration around the suburban areas.

Electric vehicles (EVs) could be a solution to these problems because they are an energy efficient and environmental friendly mode of transport. Way back in 2005 eminent scientist Dr. Ray Wijewardhana owned an EV (Indian made REVA). Unfortunately, in spite of his tiring efforts, the Department of Motor Traffic didn't authorize electric vehicles.

Thereafter, many scientists attached to various institutions developed electric vehicles having a variety of benefits as well as drawbacks. In addition, these vehicles could be charged during off-peak hours when the electricity charges are at a minimum (night) and their emissions are negligible.

Mathematical Modeling in Meteorological Forecasting

- Aviation/ transportation weather
- Air quality
- Urban weather
- Fire weather
- Severe weather
- Hydrology and Flooding

In Sri Lanka 80% of electricity is generated from thermal sources. It is easier to manage and treat emissions of one fixed location (thermal power plant) than the management of emissions of many ordinary vehicles; hence EVs are still preferred.-



Young inventor with his prototype electric car named ELCA

As such, it is very important to establish a state funded engineering design center for the collaborative development of suitable vehicle designs for the local and international market.

LOCAL CAPACITY

However, along with the vehicle design and production, it is vital to give equal attention for the manufacture of components required for vehicles, especially, batteries. On the other hand, current Lithium-ion batteries used for EVs are responsible for 60% weight of a car. So the reduction of battery weight, instant charging techniques, development of turbo and hybrid technologies are some of the critical areas currently being researched. Some of the research currently takes place in Sri Lanka are summarized as follows:-

1. *Novel pulse charging topology with soft switching and isolation.*
2. *Control of battery and energy storage techniques.*
3. *Broad research relating to Lithium ion and Lithium polymer battery technology in collaboration with the Tokyo Institute of Technology and the University of Wollongong.*
4. *Researched for the last five years on the concept of Vehicle to Grid (V2G).*

It is very important to allocate funds via allied ministries to develop local technology. Sri Lanka Standard Institute and Institute of Policy Studies have great responsibilities toward this worthy cause. To ensure the success in EV manufacturing in Sri Lanka, innovations are crucial. In order to accomplish this task, innovators, scientists and government organizations must cooperate with one another. If everything goes according to plan, very soon Sri Lanka can make an enormous profit and also play a major role in the EV market.

Daham Shyamalee

Cooking in clay pots can enrich human health in the long run

In recent years there are many incidents on record, revealing certain food varieties and additives that are harmful to humans. Knowingly or unknowingly people add substances such as harmful food preservatives intended to add extra time, extra flavour and extra attraction in order to accrue short-term benefits.

In this manner Sri Lankans consume a whole lot of toxic material along with their daily food quota. This practice should not continue unrestricted. Therefore, days ahead are ideally suited to take drastic action to restrain this trend. On the other hand, some people consume harmful substances due to their negligence, laziness and hurry. While those with colonial mentality try to imitate European or American trends that are alien to this country. Cooking with aluminum utensils is one such hazard because people are liable to consume toxic substances apart from incurring a higher price for the sophisticated utensils. Due to this trend during the past few decades the importance of clay utensils diminished and aluminum and non-stick cooking utensils became popular. The other reason behind this is the use of gas and electric cookers in most households and the inability of most clay utensils to withstand high heat.

During day to day cooking it is customary to add acidic ingredients like vinegar and lime to acquire taste or flavour; these in turn react with these aluminum utensils to produce substances harmful to human health; thus, the continuous use of these utensils could create several health-hazards. In addition, with the use of these utensils, it is not easy to obtain the unique flavour of the traditional curries such as 'Ambul thiyal' (Fish curry) and 'Polos ambula' (Vegetable curry), etc.

Due to a variety of awareness programs broadcast over the media advertising good effects of clay pot usage, housewives got into the habit of using clay utensils for day to day cooking. Obviously, they are deeply concerned about their health and appearance. Quite recently, they have identified clay utensils as the ideal utensil to prepare a healthy meal. Yet, to place traditional pots and pans over a gas or electric cooker is a problem. To overcome this problem some research organizations of the country invented a new type of clay utensil with an almost flat bottom ideally suited for gas or electric burners and capable to withstand high temperatures as well. These could also save energy by prolonging the heat for a short time even after discontinuing the heat source. Therefore, once again people are granted the choice to enjoy traditional curries having unique tastes while maintaining good health as well.



Please note that the ideas and opinions expressed in the members corner are solely the authors personal views and not COSTI's institutional

All workshop reports ready for download @ COSTI web

Red clay cooking utensils ideally suited for gas and electric cookers

These days, there is a great demand for these newly manufactured utensils in the local market. Similar pots called “Donabe pots” are very popular in Japan. Hence, with little improvements to our conventional pots (withstand for high heat and having flat bottom) a good export market could be created to generate more foreign income to the country.



Donabe pots, mostly used in Japan

Finally, COSTI’s role here will be to educate the general public about the health benefits of using clay pots for the preparation of day to day food and to promote the manufacture of high quality clay pot/pans that can withstand high heat. This way both parties could gain and this obviously brings to one’s mind the saying “killing two birds with one stone”.

Dr. Prashan Francis

**We need your feedback!
We welcome your ideas!**

The Innovation Eye is published quarterly. We love to hear your ideas and suggestions on ways to improve our communication with you, write to us:

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The Coordinating Secretariat for Science, Technology and Innovation (COSTI) was established on February 1, 2013 as mandated by the cabinet decision of September 9, 2011 with the specific aim of coordination and monitoring of Science, Technology and Innovation activities in the country. It will also work towards promoting value addition and commercialization in line with the National Science Technology and Innovation (STI) Strategy of Sri Lanka approved by the Cabinet in August 2010.

Like to know about COSTI's road map? Read the "Science, Technology and Innovation strategy for Sri Lanka: National Coordination and Monitoring Framework"

To download, click on the image or visit :
<http://www.costi.gov.lk>

