Theme Seminar

Sustainable Development through Application of Scientific Research Output

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The progress of humankind and the society depends mainly on application of scientific research outputs for their benefit. The sustainable development of a society or a country, in particular, or the entire world, in general, thus relies on the development of eco-friendly products for the use of humankind and the biota. As such, the researchers involved in developing new inventions should mandatorily consider further stepping forward to convert the invention into a marketable product. However, almost all inventions made in Sri Lanka are finally ending up as documents in the respective higher degree theses and as publications in various journals. Every effort should, therefore, be taken to increase the number of commercial products generated from scientific discoveries.

It is impossible to demarcate basic research and applied research. One may consider the greatest discoveries made by distinguished scientists such as Robert Hooke, Sir Isaac Newton, Albert Einstein and such other scientists are mostly theoretical. However, these discoveries have applications ranging from developing toilet tissues, taking a catch in the cricket tournament, developing motor vehicle engines, jet propulsion, gravitational lens, nuclear energy, GPS system, quantum computing and also in predicting stock market trends. Therefore, the theoretical equations put forward by the above scientists are now in use in almost all areas of human needs. In this lecture, it is expected to demonstrate the sustainable development through harnessing scientific research outputs in seven distinct steps. The first step reveals how to make ground-breaking discoveries. To do so, one has to follow and learn from legends. It is expected to take five distinct examples from the set of legends and to reveal how their scientific outputs came into real world applications. The discussion will then be directed to cutting edge technologies such as nanotechnology and its benefits to a country like Sri Lanka. Scientific research is mandatorily multidisciplinary in nature. Therefore, in the step 2, it is hoped to advise the young and emerging researchers to be involved in multi-disciplinary research in the form of a team work. This point will be highlighted from the research activities carried out in my research group in order to stress the importance of research collaborations. The step 3 is the contributions to the national development. Scientists should get together with industries to help develop industrial products suitable for the future global market. In order to do so, a knowledge in future market trends is required and the R&D activities could then be fine-tuned to suit to develop such requirements since the sustainable retention of products in the global market depends on how the products are modified to suit customers. The step 4 is to contribute to international development and establish career as a distinguished scientist in the global context. Step 5 would be to let the recognition come to you rather than you going behind asking for the recognition. That recognition gained would be of high importance in persuading industries to contribute to the process of converting new developments to a product in the consumer market. As the step 7, the researcher should have a knowledge in market strategies and ways and means of getting the recognition for the products developed. It is always convenient to tie up with the existing state and/or private sector organizations and the respective bodies such as relevant ministries and to work in harmony towards achieving the ultimate goal. Obtaining the state sector sponsorship and finding suitable and trustable commercial partners are useful for the conversion of the research output to a product in the consumer market. The product should comply with all the requirements and the certificates of the tests carried out from an accredited laboratory should be provided. A product would not sustain in the market if it has adverse consequences on the biota, ecosystem and the environment. As such, prime consideration should be devoted to developing eco-friendly, bio-degradable products so as not to give a burden to the environment when the product is eventually discarded to the environment. Step 8 is the self-satisfaction gained by the positive contribution made to the benefit of the humankind.

Prof. Rajapakse *graduated from the University of Peradeniya obtaining a B.Sc. Special Degree in Chemistry with First Class (Honours). He completed his PhD in 1988 at the Department of Chemistry, Imperial College of Science, Technology and Medicine, University of London. He has worked as a Postdoctoral Research Scientist at Imperial College, UMIST, University of Bath, University of Central Lancashire and University of Liverpool, UK and The Max Planck Institute for Polymer Research, Germany. He was a Visiting Senior Scientist at the University of Texas at Arlington and the University of Mississippi, USA, and a Regular Visiting Professor at the Research Institute of Electronics, Shizuoka University, Japan and a JSPS Fellow at the Faculty of Engineering, Shizuoka University, Japan. His research interests include electronically conducting polymers, photodynamic therapy, environmental pollution abatement, gas sensors, conversion of local minerals to value added nanomaterials, custom-made prostheses for orthopaedic transplants, solar cells, fuel cells, supercapacitors, lithium ion batteries and flow batteries, targeted delivery of anticancer drugs, photon up-conversion based hydrogen generation from water photo-splitting, mosquito larvae control, advanced and intelligent textiles. Prof. Rajapakse has over 125 indexed publications and over 200 journal publications in total, together with over 200 conference proceedings and 10 Patent Local Applications and 1 World Patent Application. He has won over 20 awards including the CVCD Award for Best Research in Physical Science and Presidential Awards for Research Publications. Since 1990, he has been attached to the Department of Chemistry, University of Peradeniya, and currently serves as a Senior Professor in Chemistry.*

Theme Seminar

Natural Products – A Sustainable Source of Therapeutics and Nutraceuticals

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Sciences at the interface of chemistry and biology have led to increased opportunities for the identification of lead molecules against various therapeutic targets. For centuries, natural products have served as key sources of therapeutic agents, and still many of current drugs are derived from medicinal plants. However, synthesis of natural products is still a challenging task due to various reasons, including structural and stereochemical complexities. These problems can circumvent with the help of biocatalysis and combinatorial biosynthesis, as enzymes have high selectivity and specificity and they can work under mild conditions in both organic and aqueous media.

During the last four decades, our research has been focused on the discovery of chemical constituents from medicinal plants used in traditional medicines, as well as identifying new biotransformed products with therapeutic potential. This has resulted in the identification of several novel lead molecules against various therapeutic targets. Emphasis has been on the discovery of natural products and their analogs against chronic disorders, including, cardiovascular, cancer, diabetes, inflammatory Alzheimer's and Parkinson's diseases.

Novel analogues of existing drugs such as tibolones (postmenopausal osteoporosis), exemestane (anti-cancer drug), medrysone (anti-inflammatory agent) and many others were synthesized using biotransformation tools. Thus, potent anti-inflammatory, and anti-cancer agents were identified as lead molecules. Furthermore, inhibitors of key enzymes related to several diseases were also identified.

Diabetes is a chronic disease that occurs when pancreatic beta-cells do not produce enough insulin (Type 1), or when the body cannot effectively use the insulin it produces (Type 2). Loss of β-cell mass and function underlies much of the pathology of diabetes. Current treatments for diabetes are unable to halt the decline in functional β-cell mass. Therefore, strategies to prevent β-cell apoptosis are urgently required. Over 1,500 fully characterized synthetic and natural compounds were evaluated for their ability to increase β-cell mass and function in the presence of cytokines (IL-1β, TNF-α, and IFN-γ). The most promising natural compounds, include silymarin, bergenin, cinnamic acid, vanillin, and