



**International Conference on Applied Sciences
Sabaragamuwa University of Sri Lanka**

ABSTRACTS



**ICAPS SUSL
2023**

"Fostering Multidisciplinary Research and Innovation for a Sustainable Future"

**30th and 31st May 2023
Faculty of Applied Sciences
Sabaragamuwa University of Sri Lanka
Belihuloya**



ICAPS SUSL

INTERNATIONAL CONFERENCE ON
APPLIED SCIENCES



*Fostering Multidisciplinary Research and Innovation
for a Sustainable Future*

30 - 31 MAY 2023

FACULTY OF APPLIED SCIENCES
SABARAGAMUWA UNIVERSITY OF SRI LANKA

ICAPS 2023

International Conference on Applied Sciences

<https://www.sab.ac.lk/app/icaps/>

Organized by the Faculty of Applied Sciences of the Sabaragamuwa University of Sri Lanka
30 - 31st May, 2023

ISBN 978-624-5727-37-7

ICAPS 2023 provides a forum for Sri Lankan and international scholars to share the findings of their research and to promote new innovations. The conference specifically provides opportunities for scholars from multidisciplinary fields of applied science research. The proceeding consists of research presentations from six main themes. It encourages academics to look at regional and worldwide trends in their field of study and to share the advancements, technologies, skills, information, and investments.

Editor-in-Chief : Prof. J.M.C.K. Jayawardana

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Published by : Sabaragamuwa University of Sri Lanka

Contact : info-icaps@sab.ac.lk



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Message from the Vice Chancellor

It is with great pleasure that I pen this message to the International Conference on Applied Sciences, Sabaragamuwa University of Sri Lanka (ICAPS – SUSL) 2023 organized by the Faculty of Applied Sciences.

The conference theme “Fostering multidisciplinary research and innovation for a sustainable future” captures the vitally important function of an academic institution; to recognize the crucial need of translating knowledge into innovations and practical solutions in light of the global and societal challenges, further to acting as a knowledge hub. More than ever, the world has now realized that ensuring a resilient and sustainable future for humanity essentially calls for cross-discipline action through networking and collaboration among scientists, practitioners and industry. The Faculty of Applied Sciences has made yet another of its efforts towards the above mission through organizing ICAPS – SUSL.



The ICAPS – SUSL covers a broad spectrum of applied science thematic areas and will spotlight novel approaches in the fields of information technology, food science and technology, earth system science, chemical research, physical science and technology, and developments and research advances in physical education and sports science management.

I believe that the ICAPS – SUSL will make the Sabaragamuwa University of Sri Lanka proud by sparking a tradition to unveil innovative solutions for the social, economic and environmental challenges that are constantly exacerbating both nationally and globally. I take this opportunity to extend Sabaragamuwa University’s gratitude for the esteemed scientists and industry leaders who are joining ICAPS – SUSL as its distinguished speakers. I truly appreciate the organizing committee for their constant efforts in this endeavor and sincerely wish ICAPS – SUSL a resounding success.

Senior Professor R.M.U.S.K. Rathnayaka
Vice Chancellor
Sabaragamuwa University of Sri Lanka

Message from the Dean



On behalf of the Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, it is my great pleasure to extend my heartiest congratulations to its maiden **International Conference on Applied Sciences, Sabaragamuwa University of Sri Lanka (ICAPS-SUSL 2023)** under the theme of “**Fostering Multidisciplinary Research and Innovation for a Sustainable Future**”. I am certain the ICAPS would become a unique event in the Faculty’s annual calendar.

The prime objective of the conference is to provide a platform to promote academic and industrial research, as well as to facilitate researchers and scholars to present their research findings to a wide research community.

Further, this conference provides an opportunity to network with other academics and experts from across the world who work in the same or related fields of study, and to share thoughts on recent advances and technological breakthroughs. Conferences are always a good way to publish research, enable to meet new people from diverse backgrounds and perspectives, enlighten researchers’ way of thinking in their field of studies, and keep them updated. Finally, the conference will make adding research values for a particular subject easier.

Thus, the outcomes of some of the research contributions of this conference would have an immense chance to produce new products, create new jobs and new industries, cut costs of production, and as a result, make significant contributions to our country’s economic growth and overall national welfare. Amid countless challenges posed by the COVID-19 pandemic on the one hand and the turbulent economic crisis in the country on the other, conducting an International Research Conference is a massive responsibility for the Organizing Committee and it is highly admirable.

I would like to thank the Vice Chancellor, distinguished keynote speakers, the reviewers, the sponsors, and the participants. Further, I want to extend my thanks to the organizing committee and all staff members of the Faculty of Applied Sciences for an excellent effort in organizing the faculty’s first international conference. This event would not have been successful without their guidance and constant support. Last but not least, I would like to convey my sincere wishes to all the presenters of the ICAPS-SUSL 2023.

Professor E.P.N. Udayakumara
Dean - Faculty of Applied Sciences
Sabaragamuwa University of Sri Lanka

Message from the Conference Chair

It is with great pleasure that I welcome you all to the International Conference on Applied Sciences - Sabaragamuwa University of Sri Lanka (ICAPS - SUSL 2023) on “Fostering Multidisciplinary Research and Innovation for a Sustainable Future” to be held on 30th and 31st May 2023 at the Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka. Dissemination of knowledge and making avenues to discuss research findings would allow the scientific community to enhance critical and logical thinking abilities and to become productive scientists. ICAPS - SUSL 2023 is organized as a set of six tracks encouraging a multidisciplinary approach to research and generating knowledge. Furthermore, the conference has created a platform sharing modern technological advances in the latest research and intellectual discourse.



I would like to extend my gratitude to Snr. Prof. R.M.U.S.K. Rathnayaka, Vice Chancellor, Sabaragamuwa University of Sri Lanka, Prof. E.P.N. Udayakumara, Dean, Faculty of Applied Sciences, Prof. J.M.C.K. Jayawardana, the Chair, Scientific Committee, and other committee members for their tremendous effort to make this event successful. Furthermore, all senior academics, heads of the departments, academic staff, administrative, academic supportive staff, and non-academic staff who contributed to making this event a success are greatly appreciated. I must also thank our sponsors who generously supported the ICAPS - SUSL 2023.

Finally, I invite you all to enjoy innovative experiences at the conference and an enjoyable stay at Belihuloya. I wish you all a highly fruitful academic experience at the ICAPS - SUSL 2023.

Professor R.M.K.T. Rathnayaka
Conference Chair
International Conference on Applied Sciences
Sabaragamuwa University of Sri Lanka

Keynote Address by Dr. Rohan Pethiyagoda

Integrating Science into National Policy

The COVID-19 pandemic elegantly illustrates the difficulty of basing national policy on a scientific foundation. Should outdoor mask-wearing be compulsory? What is the least ‘social distance’ that is effective? Should schools be closed? How safe and effective are vaccines? What would be the consequences of central banks printing money in the face of plummeting government revenue? It is clear in retrospect that most nations-including Sri Lanka-failed to utilize available scientific data and principles when devising their policy responses to these challenges.



In this address, citing examples, I review Sri Lanka’s national response to some past crises, starting from the British colonial period. In many important cases, science failed to provide solutions. In others, it was notably successful. The disengagement of science from the policy process, however, appears to be a new phenomenon that is enabled by the combination of political expediency and nationalistic post-colonial ideology.

Recent years have seen policy becoming progressively divorced from science. As this trend unfolded-in agrochemical policy post-2015, for example-scientists often remained resigned to their fate, rarely venturing to predict the adverse consequences of new policies or seeking to reverse them. Alongside this has been a decline in science that is arguably a consequence of weak secondary-school science education and the under-funding of scientific institutions in the face of the spiralling cost of research. These in turn have led to the social prestige of scientists declining, together with the influence and relevance of scientific institutions. The problem has been further confounded by the ‘democratization’ of science, in which social media serve to disseminate misinformation in a ‘post-truth’ environment.

I argue that while these are serious problems, there are grounds for optimism if tertiary educational institutions, especially in science, technology, engineering and medicine, apply high standards of scientific education. But so long as scientists remain diffident and afraid to contest misguided policies, change is unlikely.

Dr. Rohan Pethiyagoda
Researcher
Australian Museum
Sydney, Australia

Keynote Address by Professor Toru Sasaki

Prospects for Energy, Material Applications, Biology, and Spacecraft Development Using Various Plasmas

Plasma is a highly reactive state consisting of ions, electrons, and neutral particles. Therefore, it is used for energy, environment, functional material synthesis, biological applications, and spacecraft development. In this lecture, the basic characteristics of plasma will be explained, and specific applications will be discussed. In the new energy field, inertial confinement fusion ICF is one method of generating energy from plasma. ICF is currently being investigated using high-power lasers, and it has been observed that the output energy is large relative to the input energy. However, alternative drivers are needed because the energy efficiency of lasers is not sufficient. Heavy-ion-beam (HIB) ICF has been proposed as an alternative method. The recent progress of HIB ICF will be discussed.



The atmospheric pressure plasma for materials synthesis and medical applications is studied to apply the conventional field. Atmospheric pressure plasma can deliver high-energy electrons and low-energy heavy particles, i.e., low-temperature processes. The energetic electrons excite and ionize atmospheric gases, which creates highly reactive conditions. Noble metal nanoparticles can be synthesized by irradiating atmospheric pressure plasma in specific solutions, and functional groups are attached to the nanoparticle surfaces. Furthermore, we demonstrated protein adhesion control by irradiating atmospheric pressure plasma jet to the biocompatible surface to adhere to human-induced pluripotent stem cells. We have also achieved non-thermal treatment using atmospheric pressure plasma with chemical compounds requiring heat treatment.

Laboratory-based astronomical research and space propulsion are among the technologies applying plasma. The status of the development of high-thrust propulsion systems based on magnetohydrodynamic phenomena and propulsion systems using high-repetition laser beams will be discussed. The acceleration of cosmic rays by fast plasma flow using pulsed power discharge and its acceleration mechanism will also be discussed.

Plasma-based technologies are widely used and there is potential for further technological development. There is also the possibility of creating new industries, especially where there are no existing industrial facilities.

Professor Toru Sasaki

Department of Science of Technology Innovation
Department of Electrical, Electronics, and Information Engineering
Nagaoka University of Technology, Japan

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**Computer Science and IT
Innovation for a Sustainable and
Resilient Society**



Plenary Speech by Prof. Yuta Nishiyama

Theoretical Life Science to Understand an Ambiguous Relationship Between Part and Whole of Living Systems

Living system refers to life phenomena in terms of information science. Considering the wholeness of a system resulting from interaction between its components, system theory finds “the whole is greater than the sum of its parts”. Note that the sum of its parts is logically different from the single whole. Therefore, an attempt to link them together falls into a contradiction, e.g., liar’s paradox. Although several restrictions have been proposed as solutions, they are missing positive aspects of leaving the contradiction alone which makes the system dynamic. We have focused on outside of the frame mediating between part and whole of the living system, leading to an ambiguous relationship. In this talk, we introduce studies of multimodality and collective behaviors to reveal the structure and the mechanism underlying ambiguity. A sense of body ownership, feeling “this is my body”, has been investigated in the context of synchronous multisensory stimulation (leading to “Me”) versus asynchronous one (leading to “Not me”), where “Me” is clearly separated from “Not me”. However, we found that they can stand together in several experiments: estimating a degree of integrated information of several bio-signals during the rubber hand illusion, measuring subjective feeling of reality while walking with no visual body, and inducing disownership feeling over one’s hand. Additionally, they are mediated by apparently unrelated things: a sense of taste, pain perception, metabolism, and bimanual coordination. Animal and human groups can achieve united collective behaviors even if individuals in the group are freely moving. We introduce soldier crabs which individuals departing from their neighbors make the collective behaviors dynamic. Crabs inspired mutual anticipation mechanisms (i.e., read each other’s movement). The mutual anticipation can be found in the human crowd and facilitate a self-organization process. We expect that understanding the ambiguity will provide a way of managing to sustain living systems.



Prof. Yuta Nishiyama

Associate Professor

Department of Information and Management Systems Engineering

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