

Institute Colloquium

**AI is not sustainable, what we need is ABI
(Artificial Biological Intelligence)**



April 23, 2025



05:00PM



**Auditorium, North
Campus**

Prof. Giridhar U. Kulkarni

President

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Scientific Research, Jakkur,
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AI is not sustainable, what we need is ABI

(Artificial Biological Intelligence)

Prof. G. U. Kulkarni
Jawaharlal Nehru Centre for Advanced Scientific Research
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Modern computers, while capable of performing complex tasks, face inherent limitations due to their architecture, which is also the reason for being power hungry. The human brain, on the other hand, accomplishes massive parallel processing and unmatched cognitive actions with as little as ~ 20 W power. Inspired by this, efforts are being made worldwide to develop artificial neural networks to mimic intelligence with the help of complex algorithms incorporated on the currently available high-speed computational platforms. However, solving intricate real-world problems which a biological brain routinely deals with in real time, have posed tremendous challenges even to the state-of-the-art computers. A biological synaptic junction, unlike the present day computing units, appears to handle both processing and memory parallelly, an aspect closely linked to its ability to change with the circumstance, termed neuroplasticity. While neuroplasticity in relation to memory and processing is still being investigated, efforts in the literature are increasingly based on mimicking different levels of neuroplasticity using artificial synaptic devices. Neuromorphic computing offers a transformative approach by mimicking the brain's neural processes, enabling low-energy, efficient, and adaptive systems that surpass the constraints of traditional CMOS and Boolean logic.

The presentation will cover relevant literature on the topic while bringing forth the challenges and key findings. Recent results from our laboratory will also be presented.



**Professor Giridhar U. Kulkarni, FASc, FNASc, FNAE, FNA, FTWAS
President**

Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Jakkur P.O., Bengaluru 560 064

Prof. Kulkarni obtained his Ph.D. from Indian Institute of Science, Bangalore in 1992 and carried out postdoctoral research at IISc (92-93) and later at Cardiff University in a Unilever project. He joined JNCASR in 1995 as Faculty Fellow and has been a Professor since 2008. Having been the Chair of Materials Unit till 2011, he has held Dean-Academic Affairs as well as Dean-Faculty Affairs positions before moving to Centre for Nano and Soft Matter Sciences (CeNS) as the Director in 2015. Prof. Kulkarni returned to JNCASR on Jan 2020, to take over as the President while continuing to hold Adjunct Professorship at CeNS.

Prof. Kulkarni has been a visiting Scientist/ Professor at many Universities including Cardiff, Tokyo, Trieste; Scuola Normale Superiore, Pisa; Institut de Sciences Moléculaires d'Orsay, Université Paris Sud and so on. He was an Adjunct Professor at Birck Nanotechnology Centre, Purdue University during 2009-2011. He received International Senior Fellowship of University of Bayreuth 2016-18.

Prof. Kulkarni has supervised nearly 36 students towards degrees- 27 Ph.Ds., 9 master's and has published over 335 publications in reputed journals.

Fellowships

Prof. Kulkarni is a Fellow of all three science academies and the national engineering academy in India. He is also a Fellow of the Asia Pacific Academy of Materials (APAM), Fellow of the Royal Society of Chemistry, a J.C. Bose Fellow and Fellow of the World Academy of Sciences (TWAS).

Prof. Kulkarni has received

1. Material Research Society of India Lecture medal, 1999
2. Sir C. V. Raman Young Scientist award, 1999
3. B. M. Birla Science prize in Chemistry
4. Dr Raja Ramanna State Award
5. The Prof. C.N.R. Rao National Prize for Chemical Research
6. Kannada Rajyotsava Award – 2021
7. Bangalore India Nano National and Innovation award

And many more.

Research Areas

- Twisted Multilayer Graphene
- Self Assembly based Molecular Devices
- Nano & Microcrystallites in Unconventional Lattices
- Alternate Electrodes for Optoelectronics
- Artificial Synaptic Networks for On-Synapse Intelligence