

**Lecture Programme for students of class XI and XII,
in association with National Academy of Sciences, Prayagraj
to be held at the Chennai Mathematical Institute, Siruseri
on 14th & 15th July 2023.**

Friday, 14 July 2023		
Time	Speaker	Title
10.00—11.15	Shailender Swaminathan	<p>Deciphering the Human Brain and Mind Through the Lens of the Economic, Environmental, and Social Dynamics of the 21st Century.</p> <p><u>Abstract:</u> The global trends are changing our brain physiology and our mental health, and we are discovering that changes in our stimulus and social environment have an impact on our brain and mind, much more than we have previously appreciated. They have resulted in the following: (a) The social and cultural consequences of our technology environment are leading to a rapid decline in mental well-being of younger generations; (b) Increasing prevalence of toxins in our food and water disrupt our endocrine systems and lodge in the brain with growing impact to brain health; (c) Diverging access to stimuli arising from economic inequality are causing a rapid divergence in our brain physiology with potential implications for cognition and brain health. In this talk, we will discuss some of the work and findings that are emerging from this line of inquiry.</p>
11.15—11.45	Tea break	
11.45—13.00	Sitabhra Sinha	<p>How to make an animal from “0”</p> <p><u>Abstract:</u> All of us - worms, cats or humans - began as a single cell. And yet when you look into a mirror you see tens of trillions of cells arranged into a well-knit structure that clearly marks you out as a human being, even though you differ recognizably from other members of the species. So what makes it possible for your body - or any multi-cellular organism, for that matter - to self-organize, i.e., build itself into this characteristic human form? The usual knee-jerk answer is “DNA” - or to be clearer, that the instructions are in the DNA - in our case, the human genome. While not wrong, if you think a bit more you realize that the answer is not very illuminating! For one thing, DNA encodes recipes for making various types of protein molecules - so how does that allow you to build the typical form of, say, a human hand? And to compound the mystery, every single cell in our body has the same DNA - and yet, some become neurons and form the brain, others become muscle cells, kidney cells, liver cells, etc. Moreover, they have to do this respecting the characteristic body plan of an organism - as it's not very useful to have eyes sprout from your toes! In this talk we will delve into this key puzzle of biology and see how physics and physical concepts (such as symmetry-breaking, pattern formation and self-organized ordering) can help us grapple with it in meaningful ways</p>
13.00—14.00	Lunch	
14.00—15.15	Amit Kumar Sinhababu	<p>The joy and pain of factoring</p> <p><u>Abstract:</u> We would discuss three problems that students have seen in school: factoring integers, factoring polynomials, and testing if an integer is prime. Through these problems, we would give a glimpse into the world of algorithms, complexity, and cryptography and how algebra plays a role in designing algorithms.</p>
15.15—15.45	Tea break	

Saturday, 15 July 2023		
Time	Speaker	Title
10.00-11.15	Madhavan Mukund	Will stochastic parrots take over the world? <u>Abstract:</u> Large language models such as ChatGPT have been all over the news recently. We will describe how such systems are built and address some of the philosophical questions surrounding their capabilities.
11.15-11.45	Tea break	
11.45-13.00	Tarun Souradeep	LIGO-India: Frontier mega-science@home <u>Abstract:</u> The historic discovery of gravitational waves through direct detection by the LIGO observatories in the USA, in principle, opened up a new window to the cosmos. In practice, however, the true launch of gravitational-wave astronomy will await a capable global array of LIGO like observatories including the LIGO-India observatory recently flagged off by the Union cabinet of India. The talk present the fascinating science and technology of LIGO-India, its current status and the immense challenges ahead.
13.00-14.00	Lunch	
14.00-15.15	Viswanathan K S	The Art of Studying Chemistry <u>Abstract:</u> Chemistry has been traditionally seen as a subject where you are required to memorize a large number of molecular formulae and reactions and an endless set of rules, each of which has a number of exceptions. Very little logic appears to be employed in the study of chemistry. In reality, the study of chemistry is far from the above picture. Chemistry addresses questions such as why does a material have the property it does. How can one be used for a different purpose? Through a set of experiments, we will discuss the way chemistry addresses problems in real life.
15.15-15.45	Tea break	