



Department of Biotechnology  
Ministry of Science and Technology  
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**DBT**



National Institute of  
Advanced Industrial Science  
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**DBT - AIST International Laboratory**  
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**Classroom for Advanced & Frontier Education**

**CAFE**

# DAI LAB - CAFE

## Series - 41

Date and Time: **August 1, 2019 (3:30 JST)**

Venue: Central 5-41 2F (Meeting Room Number – 41)

Speaker: **Bakku Ranjith Kumar**

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### **Title: Approaches in biomolecular analysis – A case example in the analysis of storage compounds in the marine algae *Emiliana huxleyi* :**

Robust analytical techniques are required for monitoring metabolite production, functional regulation and also for optimizing culture conditions to maximize synthesis of biproducts in biological systems of interest. Several advanced techniques are available at present for such studies. In this lecture I would like to show how different techniques come into play during scientific studies with an example from Algal research. Here, my work is especially on marine haptophytes like *Emiliana huxleyi* that produce special photosynthetic products such as alkenones (a unique biofuel feedstock), coccolith specific acid-polysaccharides (AP) and other carbohydrates like low molecular mass components (LMCs), which are very useful in bio-geo chemical and physical studies. The physiological functions and metabolic profile of some of the compounds (especially alkenones) are not well known yet. Therefore, we focused to elucidate how alkenones contribute for energy storage and cellular carbon-partitioning in relation to other cellular components. For the purpose, we analyzed the changes in carbon allocation among various cell components like lipids, alkenones, proteins and polysaccharides between cells exposed to N-sufficient (+N) and -limited conditions (-N) in *E. huxleyi* CCMP 2090. As part of this study we analysed macromolecular components in quantitative manner by using different analytical instruments like GC-FID/MS, Total Organic Carbon (TOC) analyzer and colorimetry (Bakku et al. 2018). We discovered that alkenones function as primary storage carbon pools especially under -N condition and that N-supply demand triggers a dynamic change in carbon metabolism by modifying membrane lipid composition and regulating carbon allocation preferences. Further, we also developed a rapid analysis approach using FTIR spectroscopy to analyze some macromolecular components as well as, ESI-mass spectrometry and computational techniques for lipidome analysis. The steps and techniques involved in this study could be implied to various biological systems to understand their metabolic components. Extending this research to other areas, I am currently interested in metabolomic analysis and working towards application of computational techniques to integrate omics data.