## *Contact information*

### Course Directors

**Dr. MJ Baig**
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### Course coordinator

**Dr. Sagar Banerjee**, Technical Officer, TEM
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## *Host Institute*

ICAR-National Rice Research Institute (NRRI) (formerly CRRI), the premier rice research institute of India, was established in 1946. NRRI is serving the nation from the last 75 years with innovative research and technologies and contributed significantly in 'Green Revolution' of India. NRRI, a multidisciplinary institute has more than 90 scientists belonging to five divisions viz. Crop Physiology & Biochemistry, Crop Improvement, Crop Production, Crop Protection and Social Sciences and three regional research stations. Besides, having>100 acres of research farm, library, classroom and guesthouse facilities, NRRI has state-of the-art laboratories with most advanced instrument facilities. NRRI has a transmission electron microscopy (Jeol JEM 1400 120 kv) facility.

## *How to reach*

Cuttack is well connected by road, rail and flight to all major cities in India. The nearest airport is Bhubaneswar, 25 KM from the institute. Cuttack railway station is 5 KM from the NRRI campus. The city has well connected AC/Non-AC daily bus service to nearby cities viz. Kolkata, Ranchi, Vizag, Hyderabad etc.

## *Confirmed speakers*

| SN | Name of speaker | Organisation/ Institute |
|---|---|---|
| 1 | Dr. SC Yadav | AIIMS, New Delhi |
| 2 | Dr. Dipty Singh | NIRRH, Mumbai |
| 3 | Dr. RP Pant | ICAR-IARI, New Delhi. |
| 4 | Dr Priti Bhardwaj | NCBS, TIFR, Bangaluru |
| 5 | Mr. Anuraag Singh | SAIF-DST, AIIMS, New Delhi. |
| 6 | Mr. PK Vaishnav | SAIF-DST, AIIMS, New Delhi. |

## *Address for correspondence*

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TEM

# Accelerate Vigyan Karyashala DST-SERB sponsored workshop on

# Hands on Training on Transmission Electron Microscope (TEM)

**(Through Virtual Mode)**

**At**
**ICAR- National Rice Research Institute Cuttack**


*ICAR-National Rice Research Institute*
*Cuttack 753006, Odisha*

## *Background*

The unaided human eye can distinguish two points that are 0.2 mm apart. The light microscopes further increased the resolution upto 1000 times as compared to the naked eyes. However, a revolution started in the field of microscopy when Dr. Ernst Ruska developed the first electron microscope in 1931 with a resolution of 100 nm. The modern electron microscopes can achieve a resolving power of up to 0.2 nm. Therefore, today the electron microscopes are transforming our knowledge in a rapid pace. Using beams of electrons to magnify structures up to 10 million times their actual size, these powerful instruments allow researchers to examine objects at levels of detail that were once unimaginable. This workshop will introduce students to principle, techniques, instrumentation and applications of transmission electron microscopy (TEM). The students will have both a basic understanding and a hands-on session for each module. Overall, the workshop will be beneficial to students starting their PhD and in their postgraduate degree who are interested to learn about transmission electron microscopy and its applications.

*Transmission Electron Microscope*

## *Course content*

The main modules covered are:

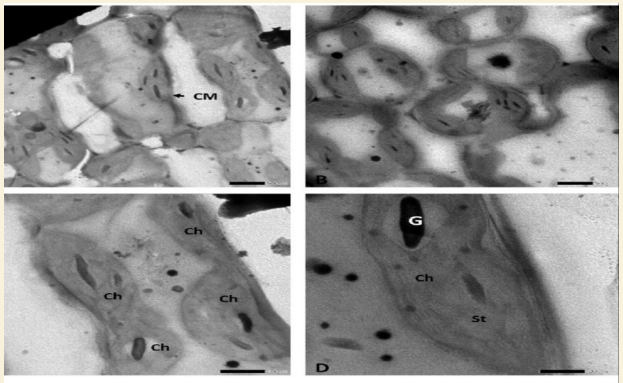
**(1) Introduction to principle and techniques of TEM**: This module will introduce the students with the history, necessity and development of TEM. Participants will learn about the principle of TEM, how it is distinct as compared to other microscopes, and techniques used for observing tiny structures such as ultrastructure of cells.

**(2) Specimen preparation for TEM**: In this module, students will learn and have hands on experience on various steps in specimen preparation like primary fixation, secondary fixation, dehydration, clearing, infiltration, resin preparation and embedding.

**(3) Ultrathin sectioning through ultramicrotomy, staining and imaging**: In order to observe ultrastructure of cells, ultrathin sectioning of the resin embedded specimen is necessary in TEM. In this module, the students will learn about the sophisticated technique of ultramicrotomy starting from preparation of glass knives, trimming of blocks and ultrathin sectioning. In addition, heavy metal staining and imaging through TEM is also included in this module. The students will also understand about various hazardous chemicals to be used in this technique and standard operating procedure and precautions while using them.

**(4) Cryo-electron microscopy and immunoelectron microscopy**: In this module, the students will learn about the principles and applications of cryo-EM and the procedure for cutting ultrathin frozen sections especially for use in immunohistochemical techniques. The students will learn about the shortcomings of conventional TEM like the use of harsh chemicals and high temperature and how they are nullified by cryo-TEM.

In addition, this module also covers immunoelectron microscopy, which is a technique used to detect surface and intracellular antigens under electron microscopes, employing antigen-antibody reactions.




Electron micrograph of rice leaf tissues under low light stress. (Ch- Chloroplast; G-Grana, St- Stroma, CM- Cell Membrane)

## *Who can participate?*

Students and research scholars pursuing M.Sc./M.Tech. or Ph.D. in a relevant subject are eligible to apply. The number of participants will be limited to twenty five only.

## *How to apply*

**REGISTRATION IS FREE**

Interested candidates can fill and submit the following online application form:

https://docs.google.com/forms/d/1zIzos4CkHC9Z3otOBSy_2WoCLJRxcjR_AE8WXOq-S3A/edit

## *Important Dates*

**Last date of application:** 31 January, 2022
**Selection and intimation to the participants:** First week of February 2022
**Workshop:** 15-22 February, 2022 (Through virtual mode)