Report for the lecture workshop

The lecture workshop on "Microbes, Minerals and Environment" was a two day venture organized by the School of Bio Sciences and Technology, VIT University, Vellore, Tamil Nadu in association with Indian Academy of Sciences (IASC) Bangalore, National Academy of Sciences (NASI) India and Indian National Science Academy (INSA), New Delhi. The event was scheduled from 24th to 25th of January 2013. The registration commenced at 8:00 A.M. The spot registration was done for some students who travelled more than 250 km (Salem district) only to attend this Lecture workshop. The 20 girl participants from Auxilium Women's College orphanage who do not have access to internet also came with the request for spot registration. Even though many internal students were turn down from registration special consideration was given to these special cases. The overwhelming response was well acknowledged through the registration of around 200 participants.

The workshop started off with the inaugural ceremony. The Coordinator Dr. Anand Prem Rajan, SBST, VIT University welcomed the gathering followed by the presentation of an overview of the workshop by the Convener, Prof. K. A. Natarajan, IISc, Bangalore. He gave the captivating and elaborate power point presentation on the programs and activities of Science Education Panel, Fellowships available for teachers and students, Refresher courses, trainings etc. As most of the audience were unaware of these types of programs, the teachers and students pored in questions to explore their chances to avail these avenues through IASC, NASI and INSA. VIT management thanked Science academics for giving this chance of conducting Lecture workshop. The inauguration was followed by the lecture session that spanned over the next two days.

The inaugural session was immediately followed by the commencement of the lecture sessions. The first lecture was delivered by convener of the workshop, Prof. K.A. Natrajan, IISc, Bangalore, on the topic of "Microbial aspects of environmental pollution and control with respect to mining". It captivated the audience with the Indian and Global aspects of controlling pollution in respect to mining. His presentation challenged young minds to come up with similar innovative and novel solutions for India. The audience reciprocated by raising many questions with respect to mining and environmental pollution.

The speaker for the next talk was the Dr. S. Shivaji, CCMB, Hyderabad, gave lecture on the topic of "Microbial biodiversity of cold habitats: Antarctica, Arctic and Himalayan glaciers". He explained about comparison of bacterial diversity in cryoconite holes on neighboring glaciers. He also gave more information about Morphological examination of
phototrophic microbes has been useful in comparison of Arctic and Antarctic cryoconite holes. His presentation made Indians proud as the organisms isolated and characterized by his team were novel resulting in biological nomenclature of these microbes with Indian origin.

The next talk was given by Prof. K. A. Natarajan, IISc, Bangalore, on the topic of "Bioleaching: Mechanisms and processes". He gave an insight on advantages of bioleaching, instead of using chemical-reducing agents to facilitate the reduction and dissolution of manganese and iron oxide in the ocean nodule. He also discussed electrochemical reduction based on two approaches, namely, cathodic polarization and galvanic interaction which can also be considered as attractive alternatives. Galvanic leaching of ocean nodules in the presence of pyrite and pyrolusite for complete recovery of copper, nickel and cobalt were highlighted in his lecture. He discuss about his work of bioleaching of ocean nodules using autotrophic microorganisms, such as *Thiobacillus ferroxidans* and *T. thiooxidans*, which resulted in significant dissolution of copper, nickel and cobalt at the expense of microbiologically generated acids. Various electrochemical and biochemical mechanisms were also outlined which proved to yield almost complete dissolution of all valuable metals.

Post lunch, the session started with a talk by Prof. K.A. Natarajan, IISc, Bangalore. He shows a very informative "Video presentation on mining and environment". He also showed how these mining, polluted the area such as land, water, metals, rocks etc. one of the video showed usage of mining microorganisms (bioleaching organisms) for the bioremediation and restoration of polluted areas. These memorable videos were most appreciated and discussed topics of the day as the audience will virtually carried from auditorium to the mining fields.

The speaker for the next talk by Dr. S. Shivaji, CCMB, Hyderabad. He presented a detailed insight on "Psychrophilic bacteria as models for understanding survival at freezing temperatures". On this topic he gave more information about *psychrophilic bacteria*. It has ability to survive and proliferate at low temperatures implies that they have overcome key barriers inherent to permanently cold environments. These challenges include: reduced enzyme activity; decreased membrane fluidity; altered transport of nutrients and waste products; decreased rates of transcription, translation and cell division; protein cold-denaturation; inappropriate protein folding and intracellular ice formation.

Followed by that Dr. S. R, Dave, Gujarat University, Ahmedabad gave an excellent lecture on "Microbial diversity and its applications". He gave the wide spectrum of microbial diversity on
earth and correlated it with our day-to-day activities. It was an eye opener for students from
colleges studying zoology, botany and allied sciences, hailing from remote places.

The first day culminated with this session with the participants being given the details of the
next day's schedule.

The second day of the lecture workshop (25th January 2013) started off with the first talk by Dr.
S. R. Dave, Gujarath University, Ahmedabad on Role of Microorganisms in remediation of
metallic pollutants”. He discussed about the various mechanism of bioremediation and listed
out important organisms for bioremediation.

The next talk was presented by Dr. Ligy Philip, IIT Chennai who captivated the audience with
her talk on “Bioremediation of chromium contaminated soils and aquifers”. The
presentation gave information regarding removal of Chromium (VI) hinges upon the formation
and stability of Chromium (III) precipitates. She illustrated about the challenges faced during
transfer of technology from laboratory to field trials. Audience were thrilled to see the
bioremediation of huge heaps of sludge and contaminated soils in the Ranipet Industrial area by
forming a biological barrier using bioremediation organisms on the path of natural movement of
ground water.

The speaker for the next talk by Dr. John A Jude, CMC, Vellore on “Bacterial Zoonoses: Environmenal
Contributions” He discussed about the role of biological and non biological
environment in the spreading of disease. The medical flavor was added to the Lecture workshop
in which he showed the hair raising pictures of the bacterial zoonoses cautioning the audience
with new emerging disease and managing the biological risk at the time of emergence of new
disease.

After the lunch session, talk by Dr. Preston Devasia, Consultant in Biotechnology & Biodiversity,
Singapore, on “Microbial biofilms and the adhesion of Acidithiobacillus
ferrooxidans to mineral surfaces”. The speaker acquainted the audience about the Direct
contact mechanism in bioleaching at the time of mineral adhesion of Acidithiobacillus
ferrooxidans and subsequent enzymatic attack. Prior bacterial adaptation to sulfide mineral
substrates influences bacterial ferrous ion oxidation rates. It is highly beneficial to understand
major biooxidation mechanisms with reference to solution- and mineral-grown cells in order to
optimize bioleaching reactions.
The session was further carried forward by another interesting talk by Dr. Amitava Mukherjee, VIT University, Vellore on "Biomineralization: Nature's Footsteps". In this lecture he explained about biomineralization and demonstrated the nature's blueprint in the survival strategies and provides a chemical and physical environment that controls the nucleation and growth of microorganism in unique mineral environments.

The two day lecture workshop was concluded with a valedictory function presided by dignitaries where certificates of participation were distributed. Also participants volunteered for the feedback on the entire workshop proceedings.

The workshop witnessed an opulent partaking where around 200 participants including students, research scholars as well as faculty members were enthusiastically present. Each of the talk was concluded by getting the floor open to audience for discussion. The participants volleyed questions of diverse concerns and were aptly replied to by the individual speakers. The participants and the speakers discussed and exchanged views at large. On a whole, the lecture workshop catered to the participants the essence it etched for.
Schedule

24.01.2013 (Day 1)

Registration
Inaugural function
8:30-10:00 am
10:00-10:30 am

10:45 am
Prof. K.A. Natarajan, IISc, Bangalore.
*Microbial aspects of environmental pollution and control with respect to mining*

11:30 am
Prof. K.A. Natarajan, IISc, Bangalore.
*Bioleaching: Mechanisms and Processes*

12:15 am
Dr. S. Shivaji, CCMB, Hyderabad.
*Microbial biodiversity of cold habitats: Antarctica, Arctic and Himalayan Glaciers*

LUNCH BREAK

2.00 pm
Prof. K.A. Natarajan, IISc, Bangalore.
*Video presentation on Mining and Environment*

2:45 pm
Dr. S. Shivaji, CCMB, Hyderabad.
*Psychrophilic bacteria as models for understanding survival at freezing temperatures*

3:15 pm
Dr. S.R. Dave, Gujarat University, Ahmedabad.
*Microbial diversity and its applications*
25.01.2013 (Day 2)

10:00 am  Dr. S.R. Dave, Gujarat University, Ahmedabad.
Role of Microorganisms in remediation of metallic pollutants

10.45 am  Dr. Ligy Philip, IIT Chennai
Bioremediation of Chromium contaminated soils and aquifers

TEA BREAK

11.10 am  Dr. John A Jude, CMC, Vellore
Bacterial Zoonoses: Environmental Contribution

LUNCH BREAK

2.00 pm  Dr. Preston Devasia, Consultant in Biotechnology and Biodiversity, Singapore
Microbial biofilms and the adhesion of Acidithiobacillus ferrooxidans to mineral surfaces

2.45 pm  Dr. Amitava Mukherjee, VIT University, Vellore
Biomineralization: Nature’s Footsteps

4.00 pm  Valedictory function
Science Academies Lecture Workshop on “Microbes, Minerals and Environment”.
Jan 24 - 25, 2013

Details of Participants

<table>
<thead>
<tr>
<th>SL.NO</th>
<th>Name of the University / College</th>
<th>Students</th>
<th>Faculty</th>
<th>Total No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Annamalai University</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>C.L.R.I Chennai</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>K.S.R Col of Tech</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Karpaga Vinayaga Col of Engg and Tech</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>M.M.E.S Women’s Arts and Sci Col</td>
<td>12</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>Md. Sathak Col of Arts and Sci</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Presidency College</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Thiruvalluvar University</td>
<td>13</td>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>9</td>
<td>Voorhees College</td>
<td>4</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Auxillium College</td>
<td>12</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>11</td>
<td>Vivekanandha College</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>Micro Labs, Hosur</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>C.Abdul Hakeem College</td>
<td>1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>VIT University</td>
<td>140</td>
<td>10</td>
<td>150</td>
</tr>
</tbody>
</table>

NET TOTAL 210