

RESEARCH ACTIVITY

- Assessment and monitoring of the damage from deterioration due to the growth of phototrophic biofilms on stone monuments (Hindu temples) and on frescoes, marble and plaster in archeological hypogea (Roman Catacombs)
- Confocal laser scanning microscopy studies (CLSM) to investigate the relationships between biofilm-forming microorganisms and substrata
- Microbial diversity assessment by means of a polyphasic approach (LM, CLSM, ecophysiology, exopolymeric secretion characterization, molecular studies)
- Development of non-invasive and non-destructive techniques as an alternative to the use of biocides against biological colonization of confined environments
- Microbial responses to stress conditions (UV, light, drought, temperature)

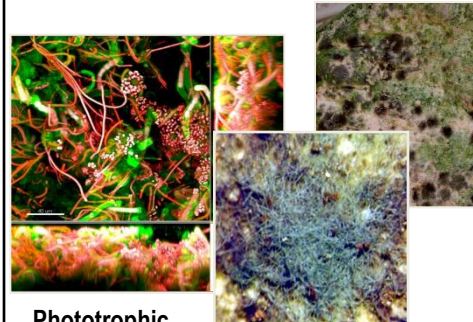
RESEARCH TEAM

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Hindu temples at
Bhubaneswar (India)



Phototrophic
biofilms



Portable Spectroradiometry
[Nature 433: 13 Jan 2005,
www.nature.com/nature



Catacombs of St.
Callistus (Rome)



Spectral cabinets developed
specifically to test the effect of
monochromatic light on phototrophic
biofilm growth

RESULTS

- Cyanobacteria are generally the major microorganisms present in phototrophic biofilms responsible of biodeterioration stone monuments. Many species have been identified and their biodeteriogenic potential evaluated
- Non-invasive sampling techniques to avoid damage of the valuable substrata and non-destructive sampling methods to maintain biofilm integrity were applied, such as the adhesive tape method, the *in situ* measurement of environmental and light parameters, portable spectroradiometry, PAM determination of photosynthetic activity.
- The wavelengths that sustained the growth of phototrophic biofilms were characterized and the 'in situ' development of the biofilm was monitored

APPLICATIONS

- Within the framework of national and European projects, monochromatic lamps have been tested and a significant reduction in the growth of phototrophic biofilms was observed; monochromatic lamps were also installed in a cubiculum of the Catacombs of St. Callistus (in collaboration with the 'Pontificia Commissione di Archeologia Sacra' of Rome) with success and large reduction of phototrophic growth on the frescoes was observed.