

# *The microcosmos around us*

Vigyanotsav 2019  
University of Hyderabad, 9 February, 2019

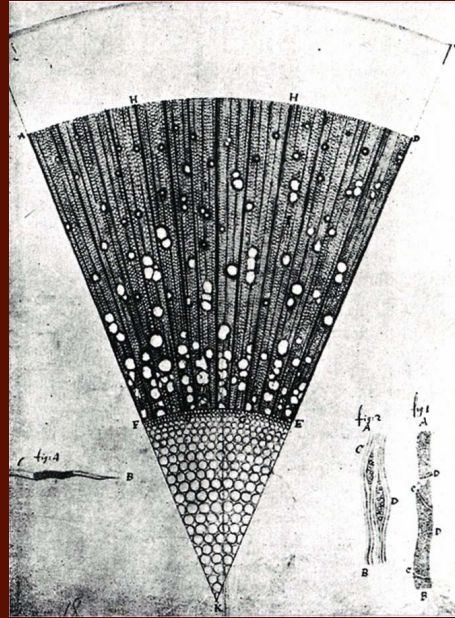
Science Education Group  
TIFR Centre for Interdisciplinary Sciences  
Gopanpally, Hyderabad

# Science in everyday life

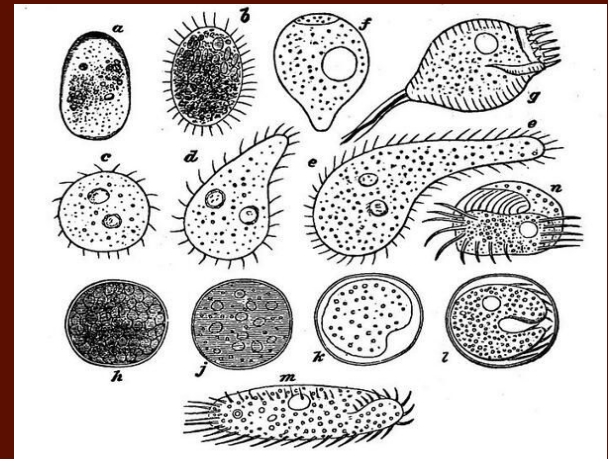
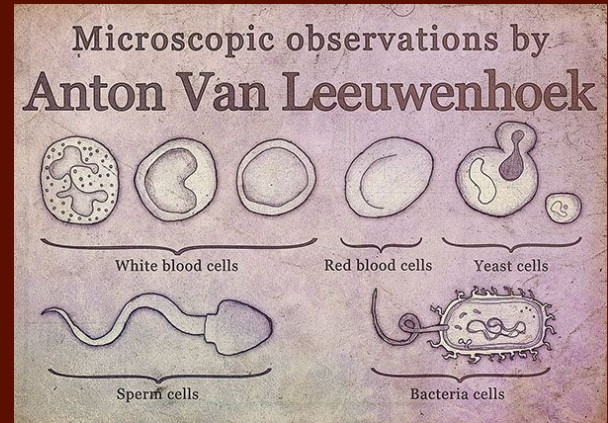
The scientific method begins with an observation that leads to a question about the observed phenomena.

# Observing the unobserved

Antonie van Leeuwenhoek (1632-1723)

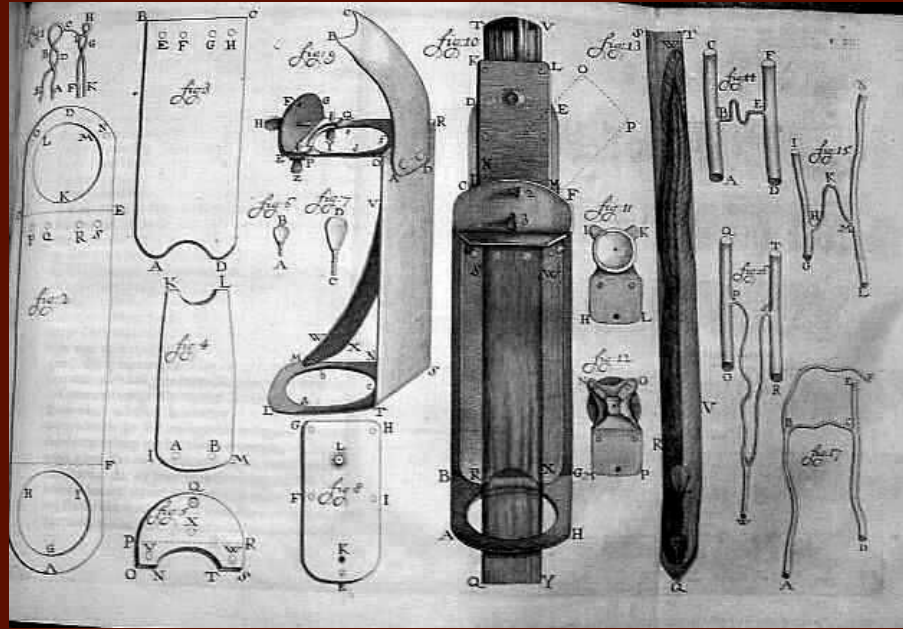


Microscopic section of ash tree wood drawn by Leeuwenhoek



Infusoria-1674 (Protozoa observed by Leeuwenhoek) 3

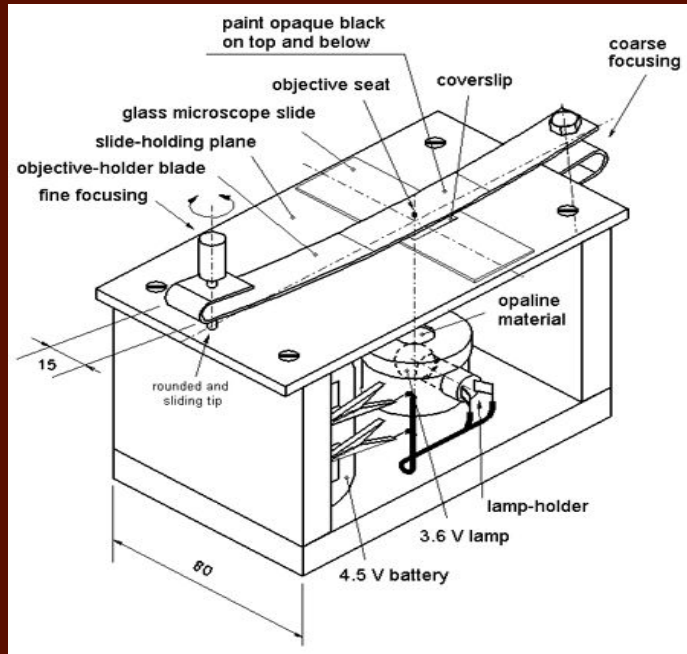
# How did Leeuwenhoek do it?



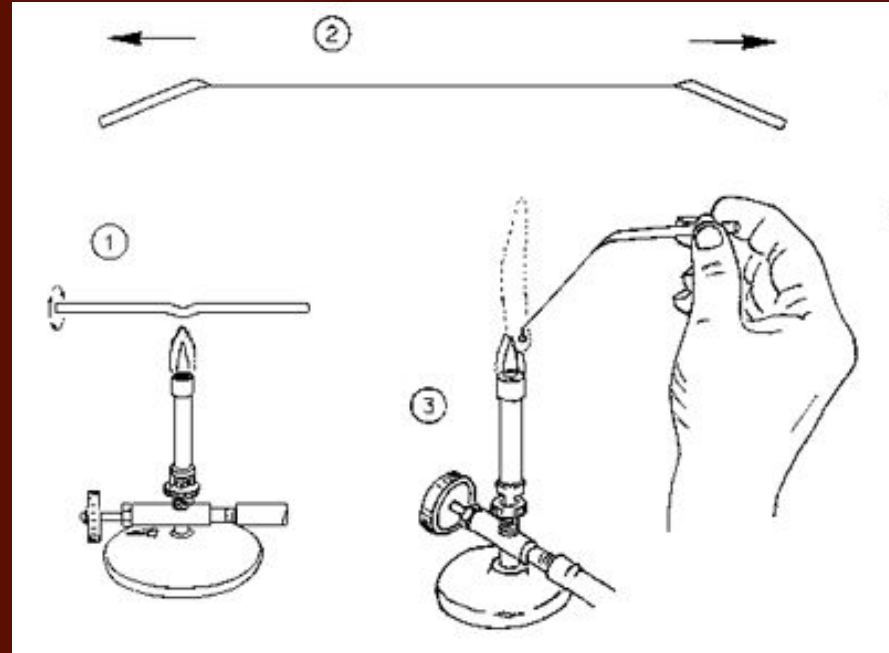
Leeuwenhoek's microscope

# The secret of Leeuwenhoek's microscope

C.L. Stong (1957)



Glass sphere microscope



Preparing the Objective lens

# Today's techniques

- Micro-scale plastic molding
- Centerless ball grinding



Optical fibre coupler



Medical endoscope



Phone camera



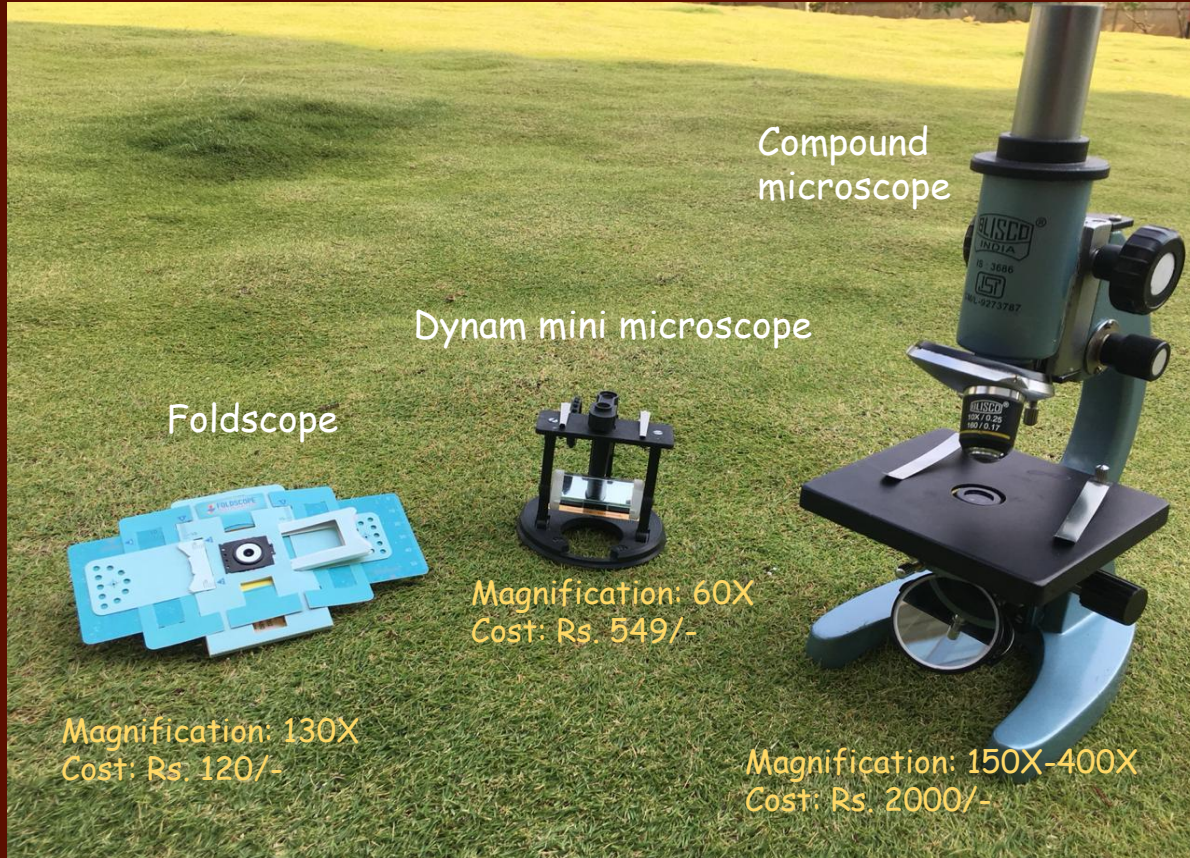
Hairpin microscope

**A lens for 15 Rupees!!!**

# Two biomechanical engineers



# Some common microscopes





# A microscope for all !!



Sample observation through Foldscope at Manikpur Ashramshala



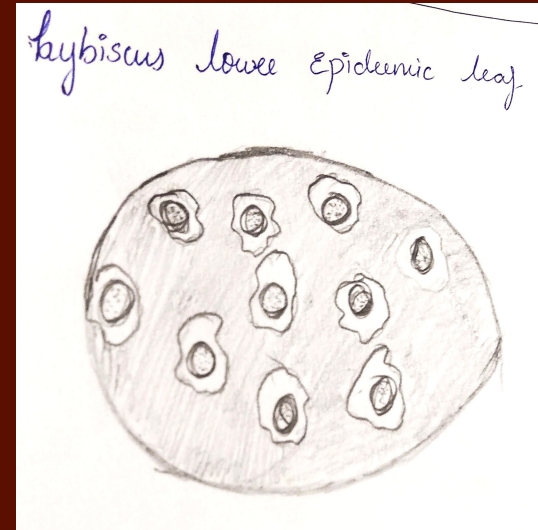
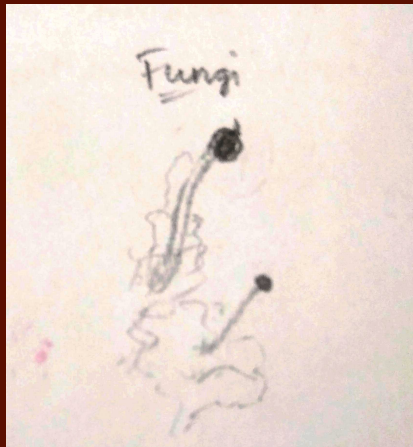
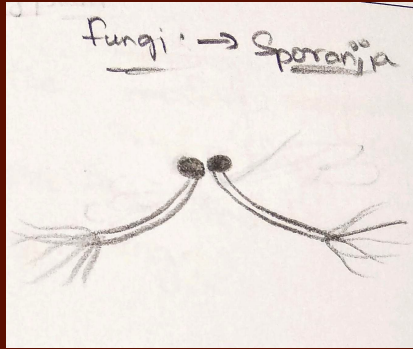
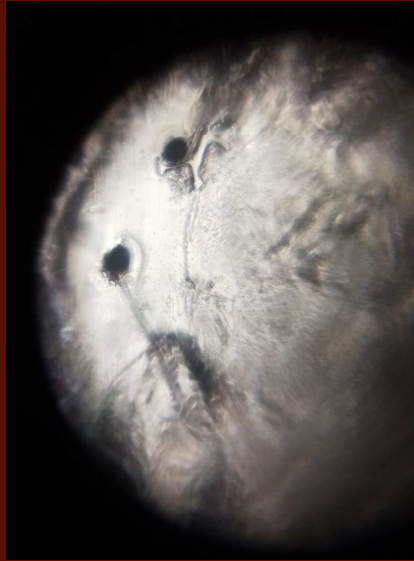
Foldscope session with middle school children, Ashramshala, Dhanora



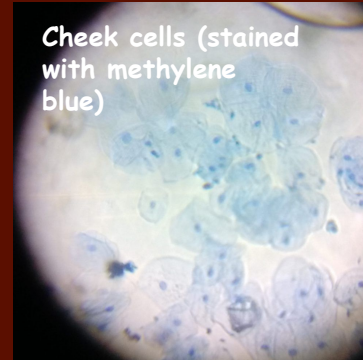
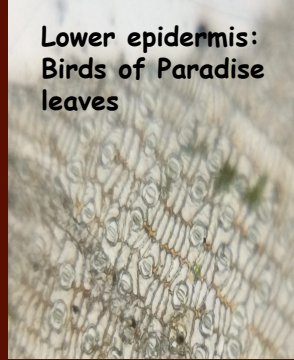
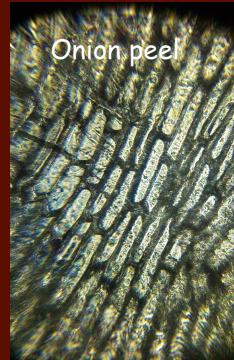
TSWREIS students with their Foldscopes

TSWREIS students folding the Foldscopes during Workshop

# Students observe, draw and question



# Images / videos under Foldscope



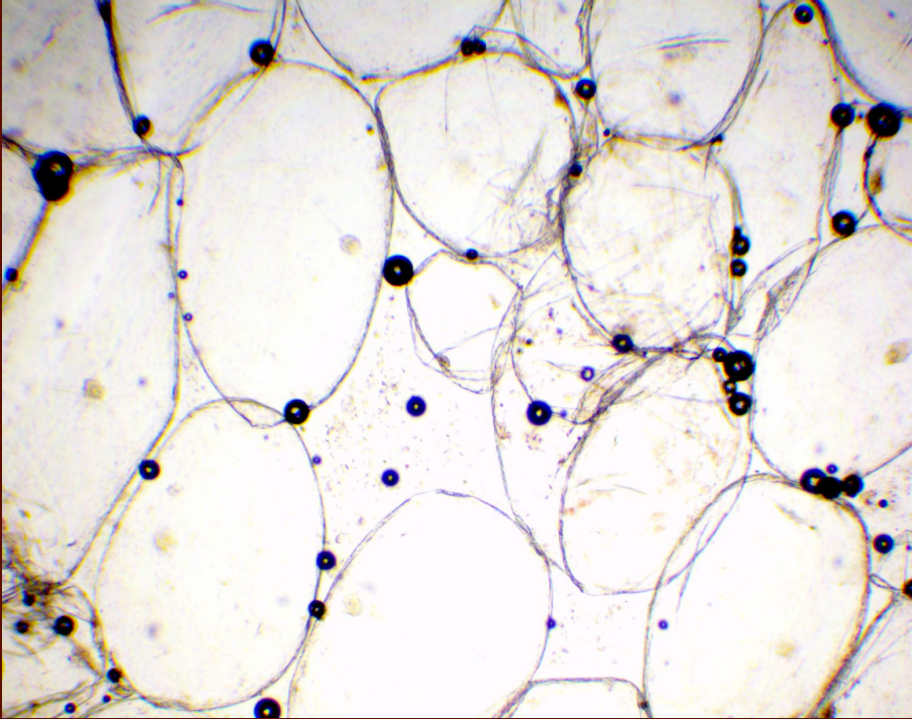
Search : TIFR microcosmos

# Science in the kitchen

Are tomatoes alive?



# Are tomatoes alive?



Tomato pulp (Pericarp) cells

Source: <http://saurabhg.com/microscopy/tomato-cells-microscope/>

# Are tomatoes alive?

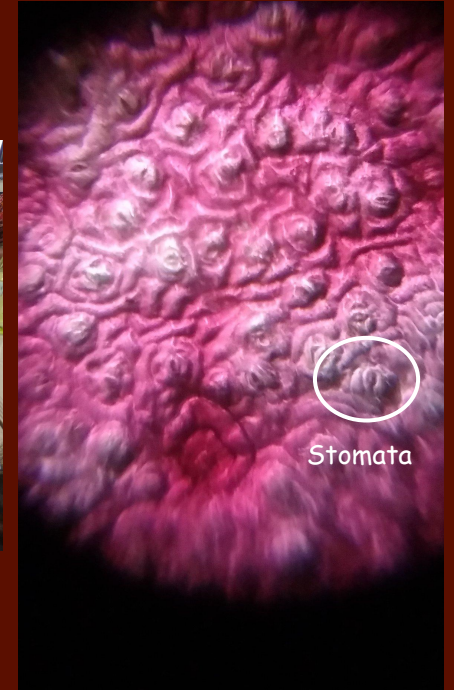


Image Source:  
<https://www.researchgate.net/publication/262055762>

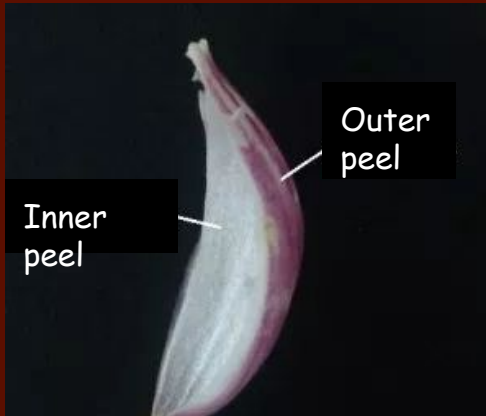


Image Source:  
<https://www.gardeners.com/how-to/selecting-the-right-tomato-variety/5259.html>

# Observing cells on leaf surface

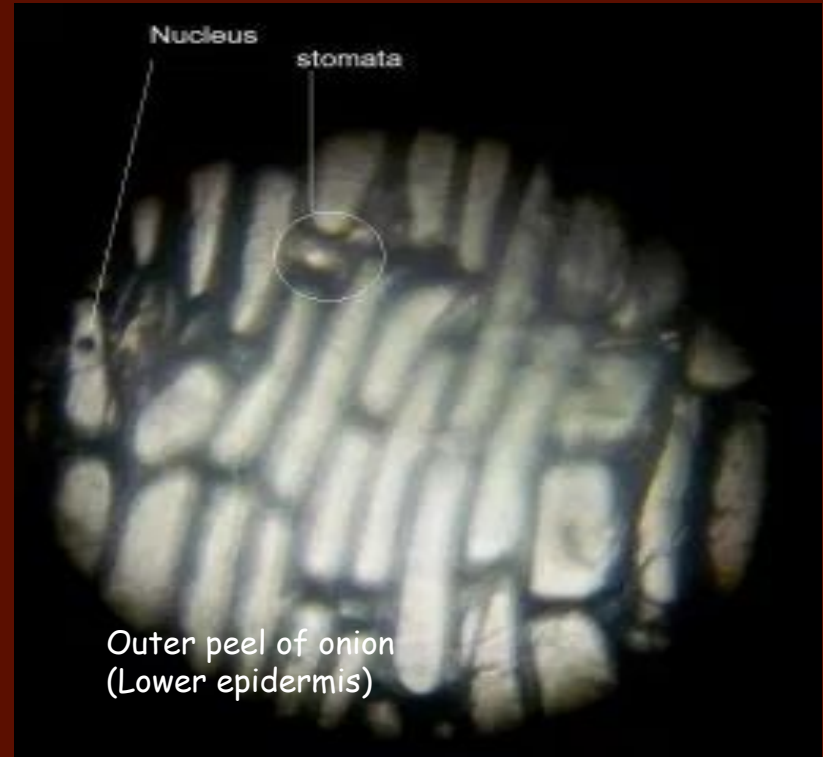


# Observing onion cells





# How are onions similar to leaves?



# What grows on onions?



Outer skin peeled to show the fungus



Conidiophore on the edge of the dry onion skin



Spores eject out under water

# Fungus on onions

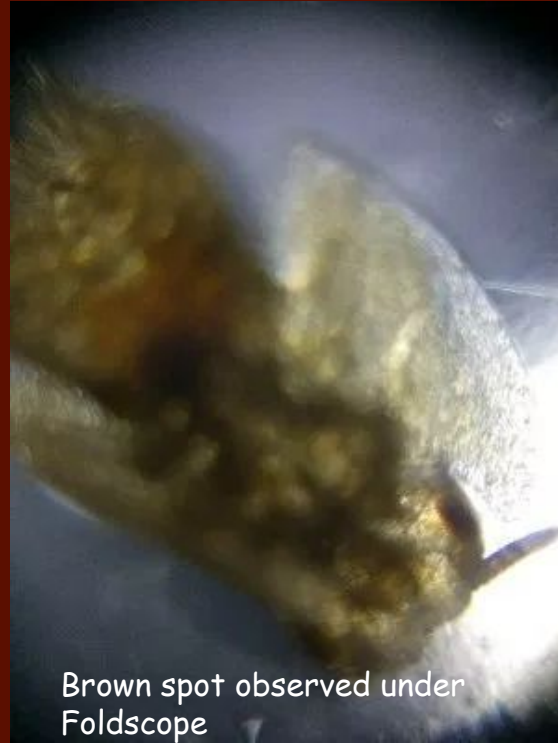


<https://youtu.be/h8IaEGWnMzA>

Cornell's Speedy Bio

*Aspergillus niger*

# Spots on curry leaves



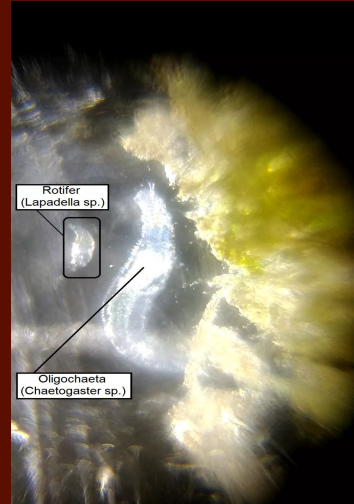
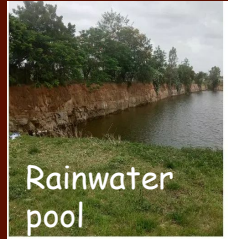
# Patthar phool / Kalpasi



# What is that?



# Water samples

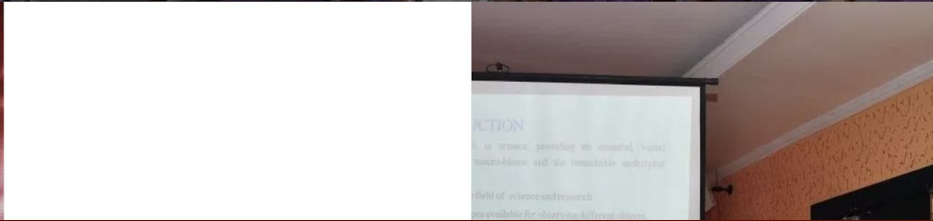
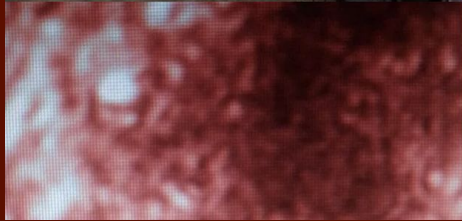


Communicate your methods and findings

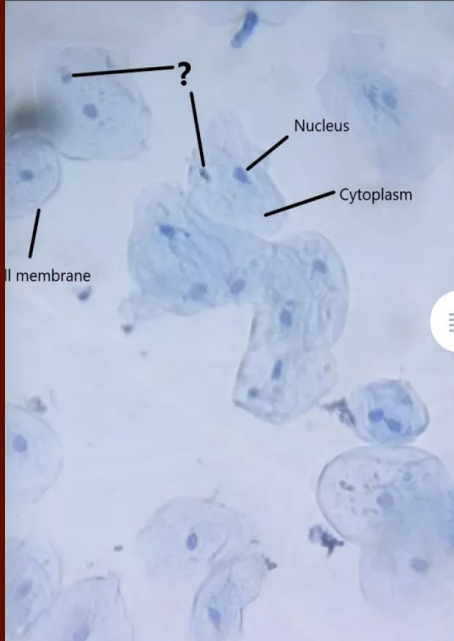




# Welcome to the Foldscope Community



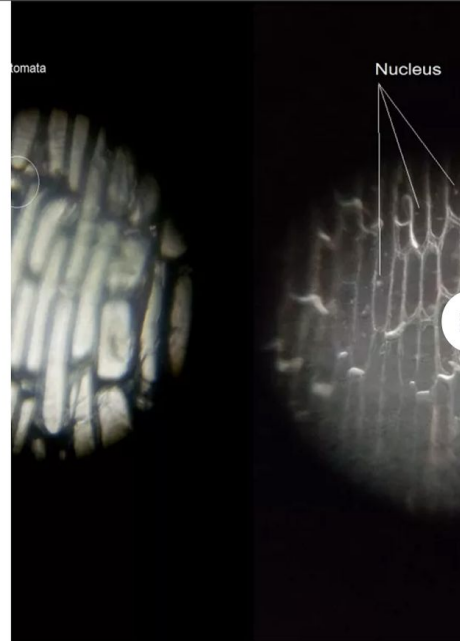
**Attended and  
Paper presented  
on Foldscope: A**



## Cheek and inner lip cells

At about 60 microns in size, human cheek cells are larger than most other animal cells (which are typically 10-30 microns). They are also easily found, by gently chewing the inside of your cheek and scraping out the surface with a spoon or a finger. These are some

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## Onion outside in

We started with an onion from the outside. First there's a dried up layer or 'tunic' that we don't eat. The cells in the tunic must be dead. Even the cell walls are disintegrated, quite unlike the dead xylem cells that we saw in matchsticks. Later we found, in the wonderful Walter

[READ MORE](#)

## Matchstick cells

The school year has begun, with new textbooks, new stuff to learn,



## Life in a pedestal pond

Hyderabad was once a city of



BIOLOGY

# Pollen grains in Hibiscus

Posted by TSWREIS DHARMARAMB on AUGUST 11, 2018



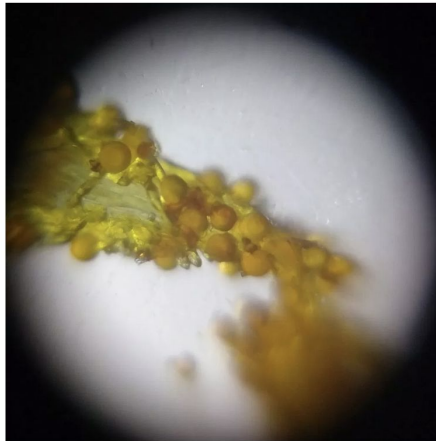
Pollen grains in Hibiscus flower.

This slide was prepared by VIII Class students (Sneha and Rakshitha) under the guidance of Archana ma'am-Dharmaram.

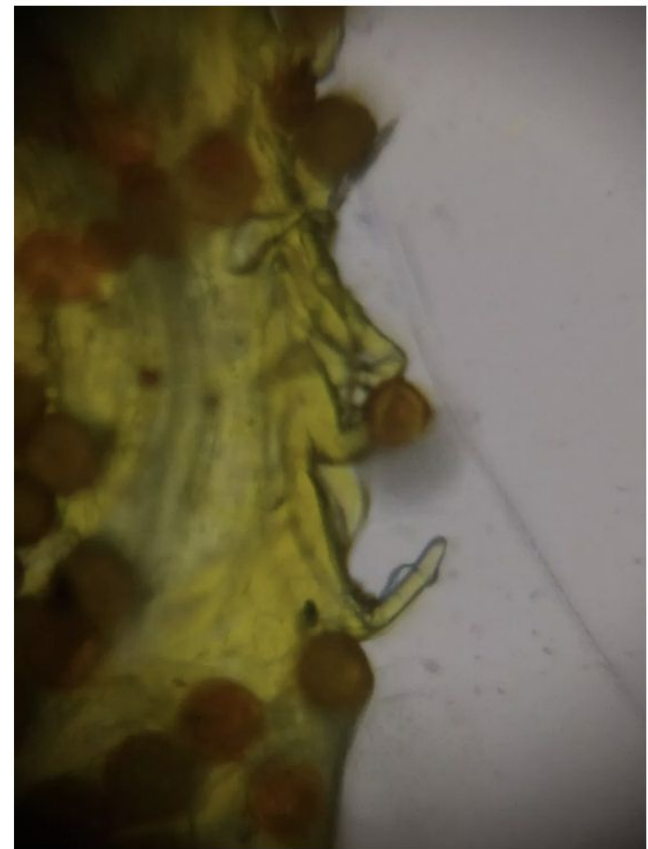
# Parts of a Portulaca oleracea flower

Posted by UDITSANS on MAY 28,

The stigma had five lobes. These are pictures of some of the lobes, with pollen grains stuck to them.



An edge of a lobe with pollen grains stuck to it



A zoomed-in view of a lobe with pollen grains stuck to the hair-like structure

# You too can do it!

Begin with observations

Ask questions

Connect the macro with the micro

Connect textbook facts with reality

Make sense of observations

Communicate you learning!

You may use microscopes in your school lab  
Or foldscopes

# Ways of getting Foldscoptes

From [foldscope.com](https://foldscope.com): classroom kit (20) +  
import duty -- Rs.150/-

Sponsored by Department of Biotechnology

From Flipkart or Amazon -- more expensive

Thank you!

Presentation by:  
Debashree, Ashalatha, Jayashree