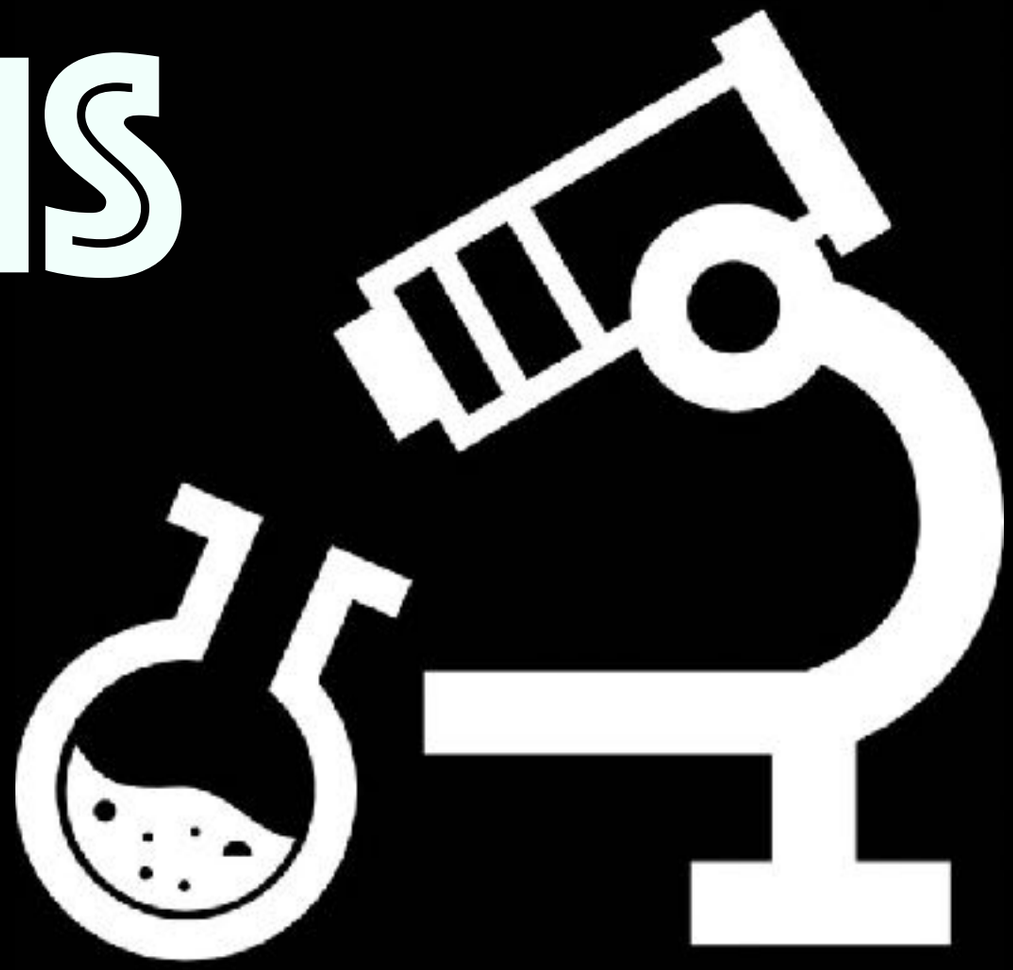
LIFE FORMS



aesthetic and sensory translations
of microscopic animated and inorganic matter

TeZ 2016 - 2022

LIFE/FORMS
materials and code repository

https://git.desearch.cc/TeZ/LIFEFORMS

contact: tez@tez.it

DIY

DO IT YOURSELF is the method of building, modifying, or repairing something without the direct aid of experts or professionals.

Academic research describes DIY as behaviors where individuals engage raw and semi-raw materials and component parts to produce, transform, or reconstruct material possessions, including those drawn from the natural environment.

DIY behavior can be triggered by various motivations previously categorized as marketplace motivations (economic benefits, lack of product availability, lack of product quality, need for customization), and identity enhancement (craftsmanship, empowerment, community seeking, uniqueness.

Do It With Others (DIWO) is a joint project development model that enables like-minded people to collaboratively work on a task, project or any other service.

Do It With Others may also be known as Do It Together (DIT).

from techopedia.com

HACKTERIA.ORG

Open Source Biological Art, DIY Biology, Generic Lab Equipment

As a community platform hackteria tries to encourage the collaboration of scientists, hackers and artists to combine their experitise, write critical and theoretical reflections, share simple instructions to work with lifescience technologies and cooperate on the organization of workshops, temporary labs, hack-sprints and meetings.

Hackteria operates on a global scale, and is based on a web platform and a wiki for sharing knowledge, which enable anyone to learn but also test different ways of hacking living systems.

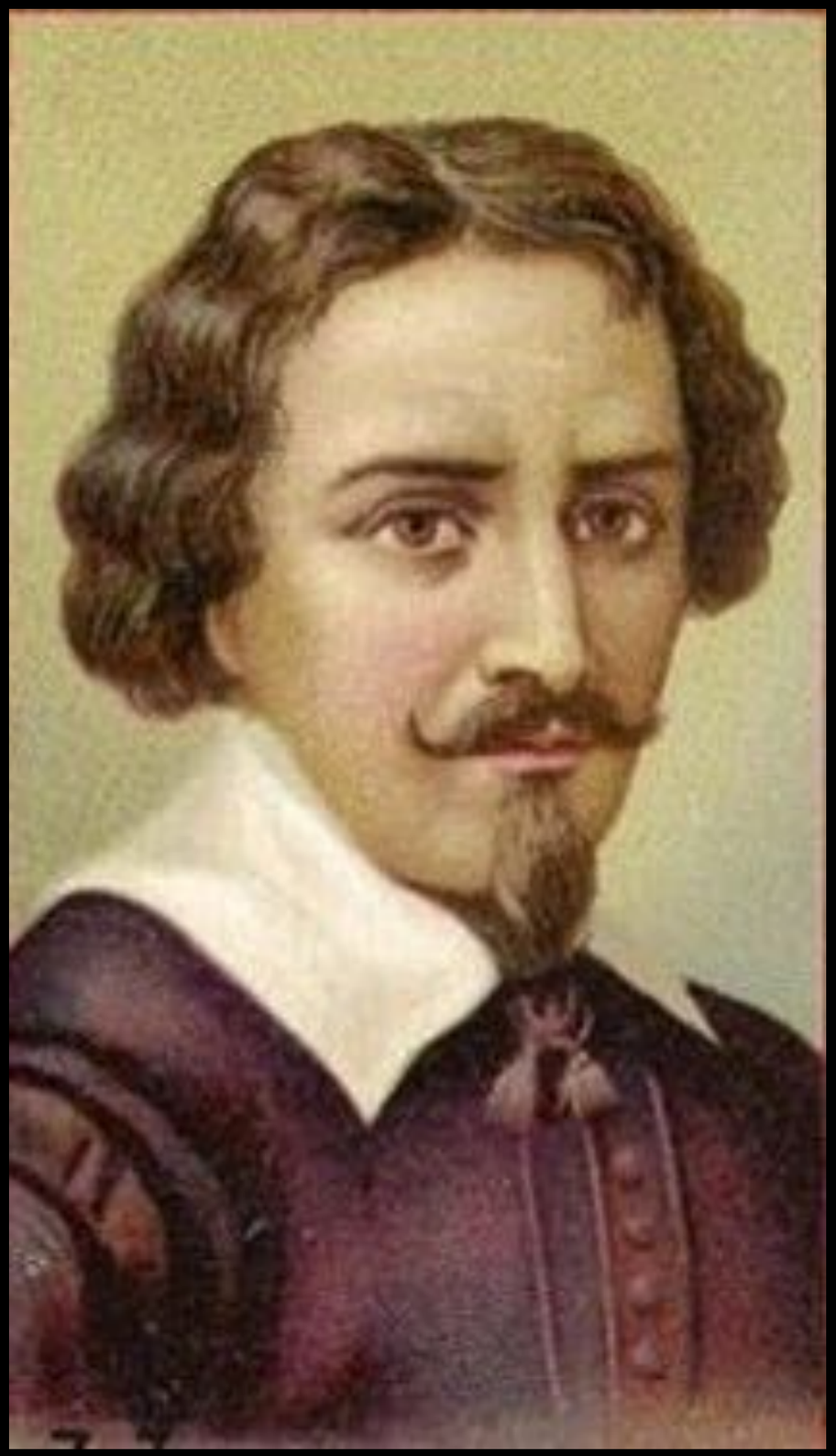
HACKTERIA.ORG

Open Source Biological Art, DIY Biology, Generic Lab Equipment

Most of the tools we use are do-it-yourself (DIY) and open source and are built from widely available and recycled parts found in consumer products such as DVD drives, hard disks and pc fans.

Building the specific devices further helps to understand the basic principles behind and learn more about the technologies and methods used.

The discussions among scientists and engineers in the process of rethinking the devices to make them more accessible are very fruitful and often lead to new and innovative designs.



Zacharias Janssen 1580 - 1632

Birth of the Light Microscope

In late 16th century, two Dutch spectacle makers, **Zacharias Janssen** and his son Hans, while experimenting with several lenses in a tube, discovered that nearby objects appeared greatly enlarged. That was the forerunner of the compound microscope and of the telescope.

In 1609, **Galileo**, father of modern physics and astronomy, heard of these early experiments, worked out the principles of lenses, and made a much better instrument with a focusing device.

Jassen Microscope

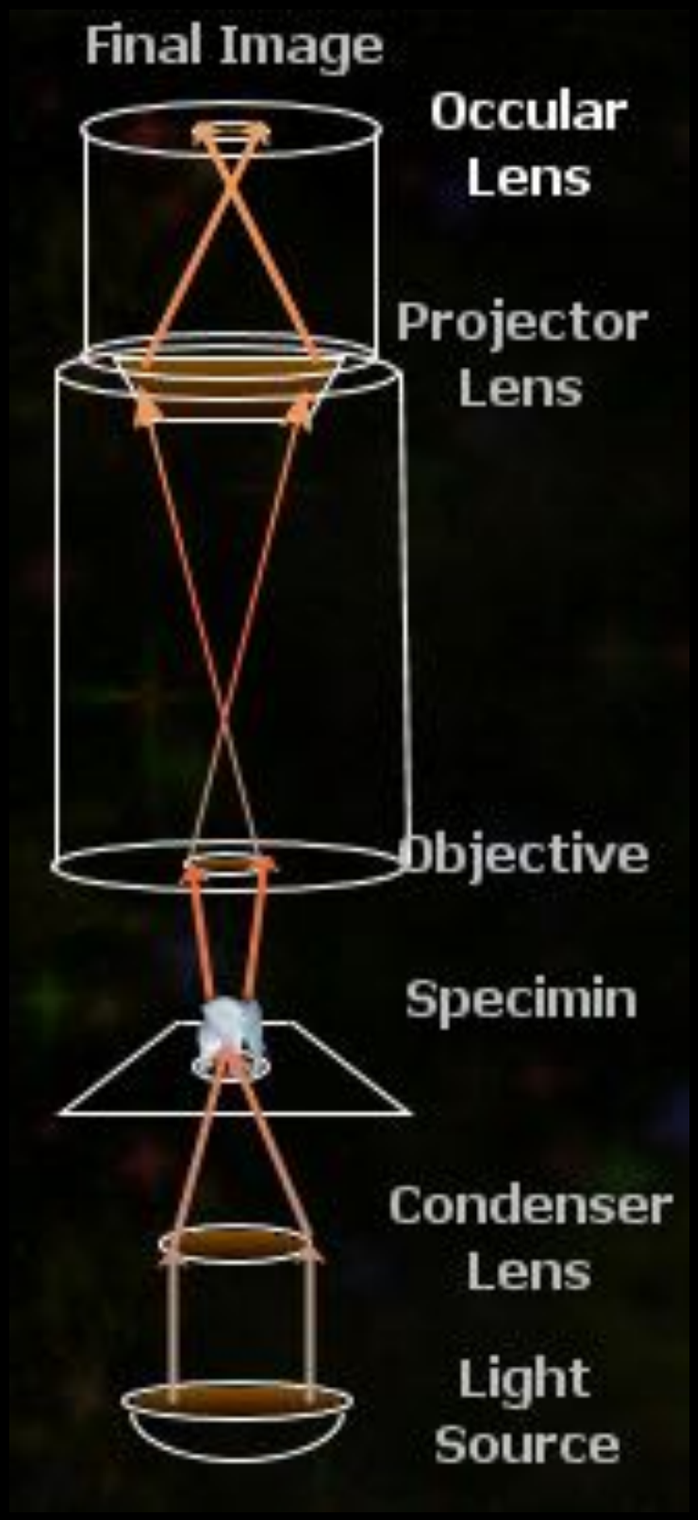
Objective

Eyepiece

Galileo's microscope

occhiolino (circa 1624)

COMPOUND MICROSCOPE



A **compound microscope** is an instrument that is used to view magnified images of small specimens on a glass slide.

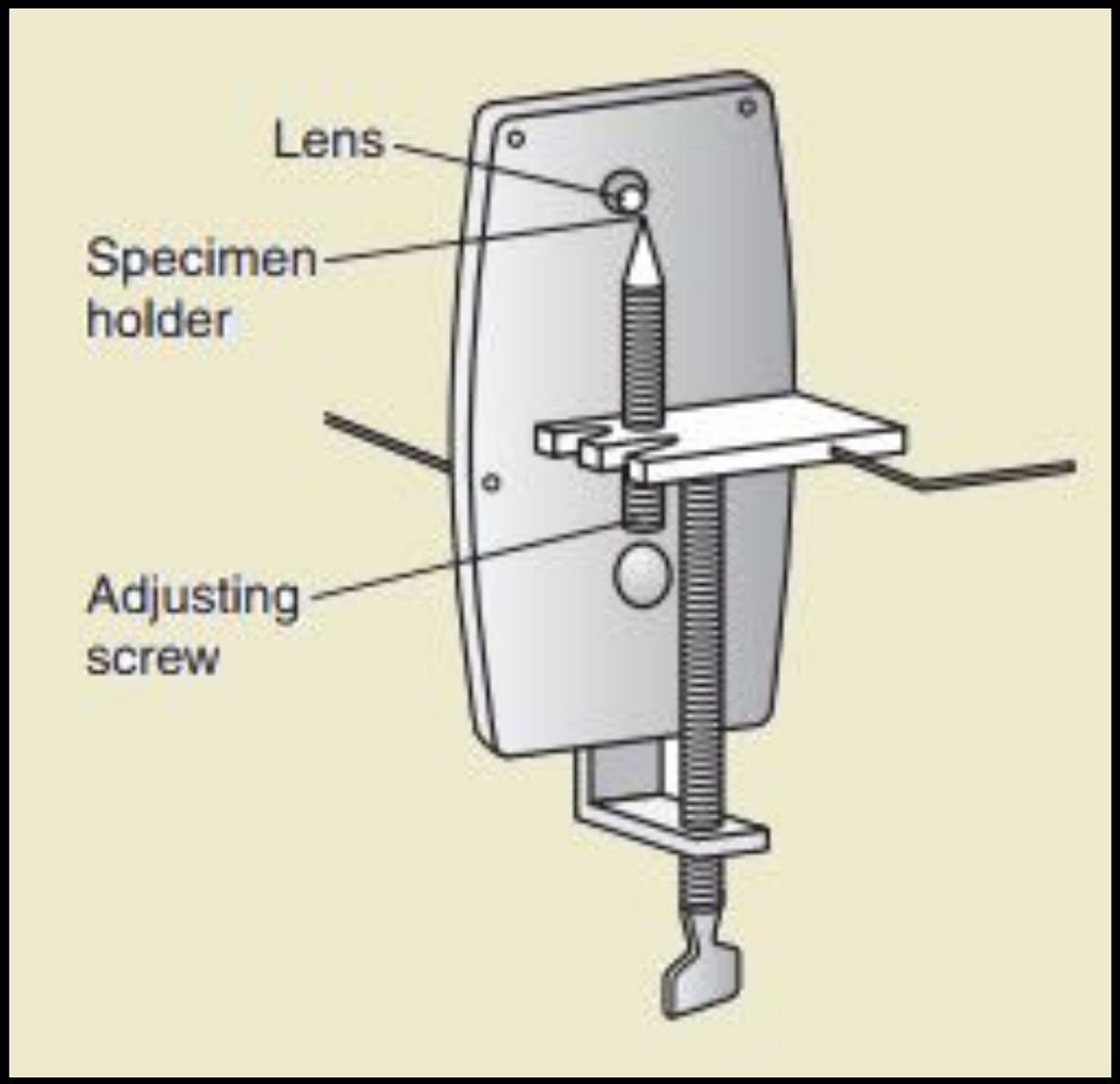
It can achieve higher levels of magnification than stereo or other low power microscopes and reduce chromatic aberration.

It achieves this through the use of two or more lenses in the objective and the eyepiece.

The objective lens or objectives located on the nosepiece have a short focal length and are close to the target specimen where it collects light and focuses the image of the object into the microscope.

The second lens, in the eyepiece, has a longer focal length and further enlarges the image.

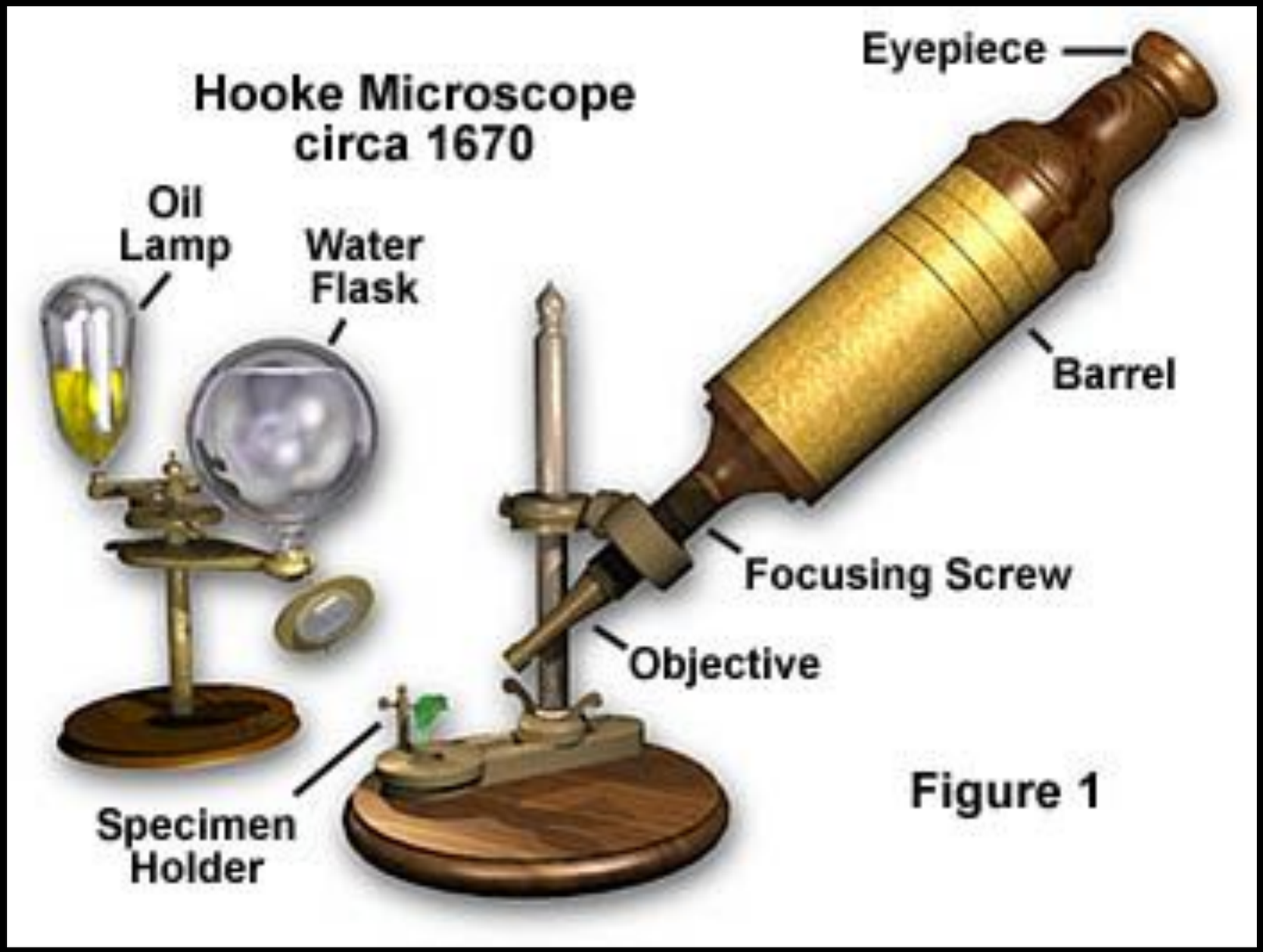
Antonie van Leeuwenhoek 1632 - 1723



Antonie van Leeuwenhoek 1632 - 1723

Robert Hooke 1635 - 1703

Robert Hooke 1635 - 1703



Robert Hooke 1635 - 1703

MICROGRAPHIA:

OR SOME

Physiological Descriptions

OF

MINUTE BODIES

MADE BY

MAGNIFYING GLASSES.

WITH

OBSERVATIONS and INQUIRIES thereupon.

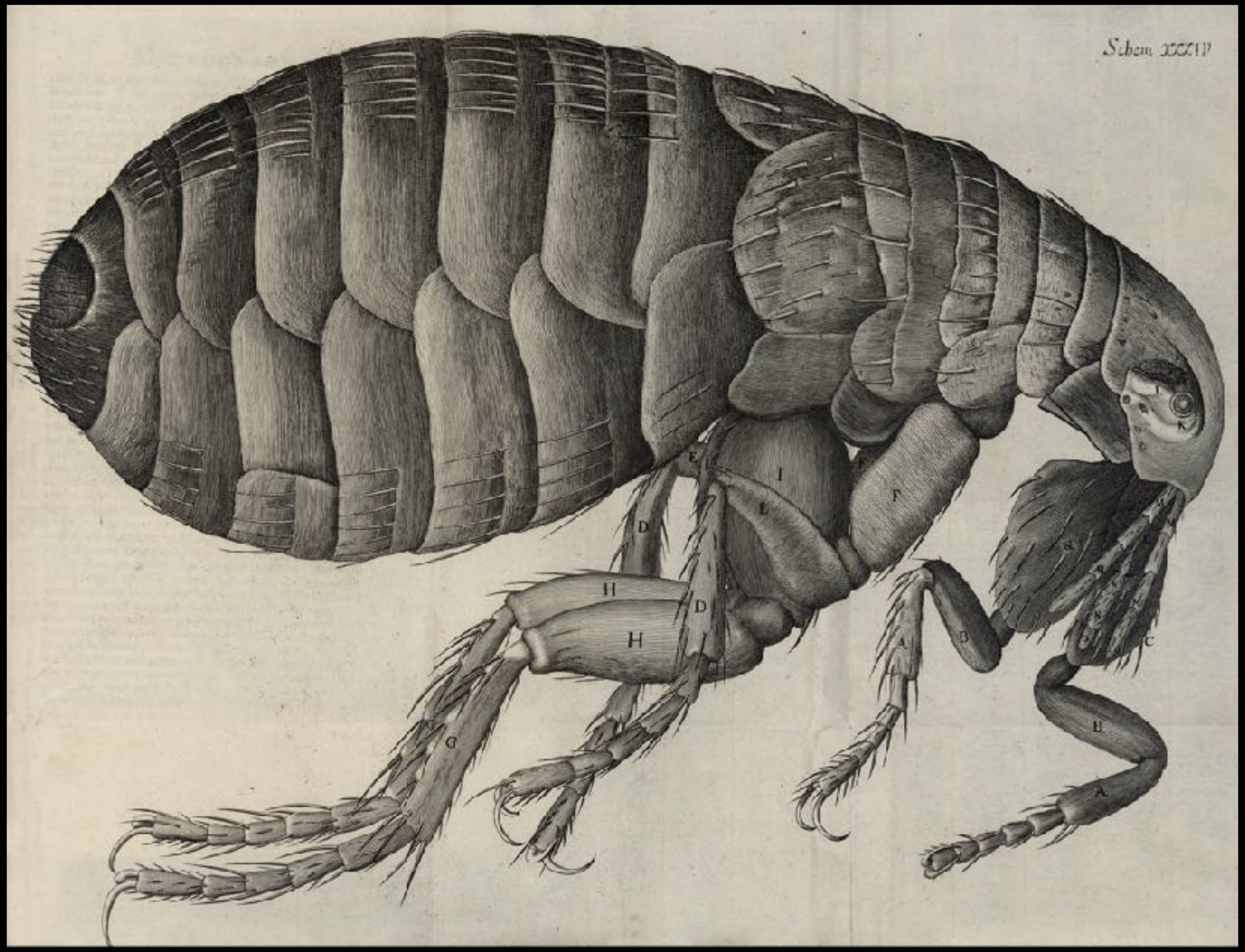
By *R. HOOKE*, Fellow of the ROYAL SOCIETY.

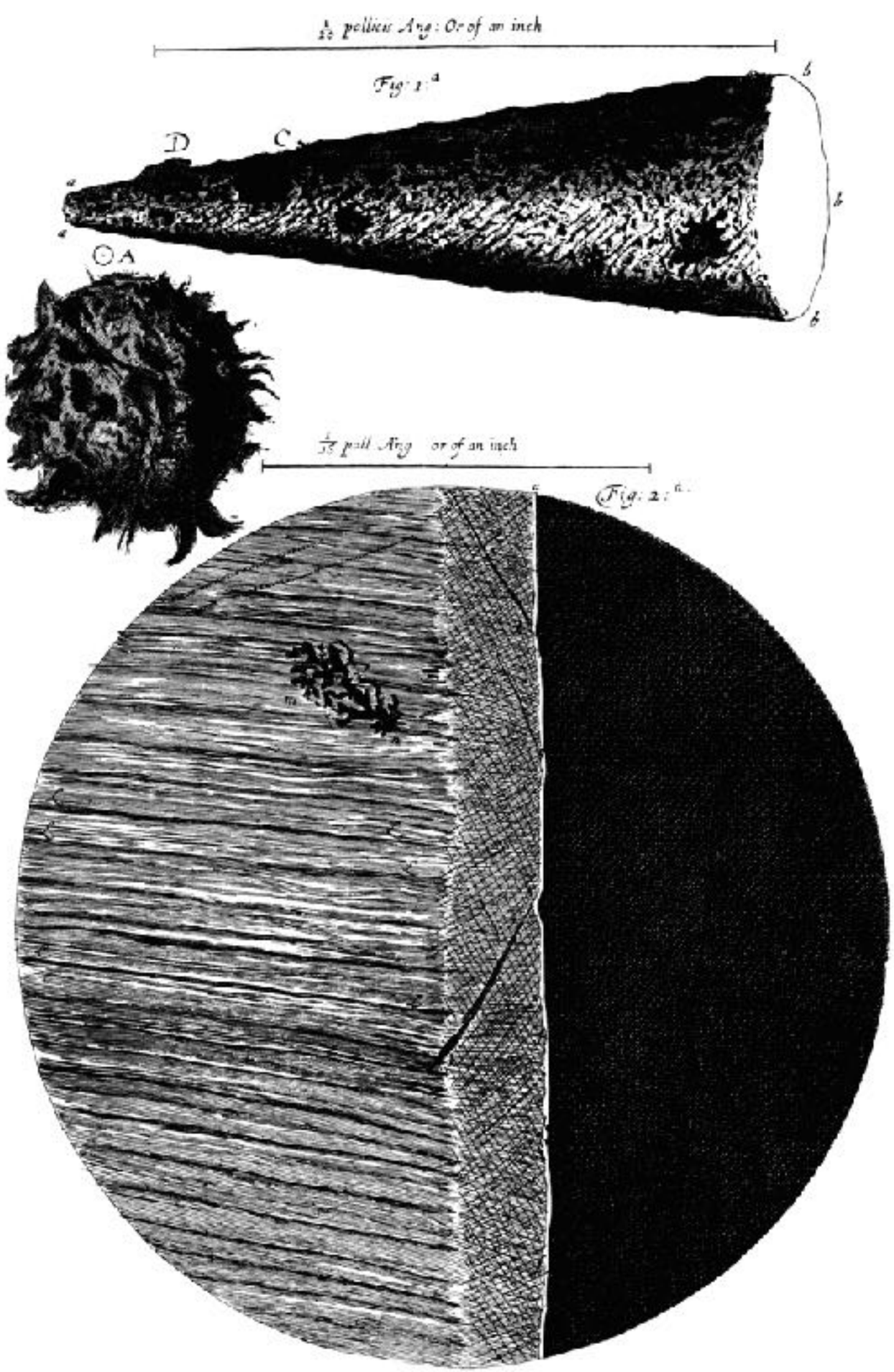
Non possis oculo quantum contendere Lynceus,
Non tamen idcirco contemnas Lippus inungi. Horat. Ep. Lib. 1.

LONDON, Printed for *James Allestry*, Printer to the ROYAL SOCIETY, and are to be sold at his Shop, at the *Rose* and *Crown* in *Duck-Lane*. MDCLXVII.

1665

Schem. XXXVI





Observ. I. Of the Point of a sharp small Needle.

Observ. II. Of the Edge of a Razor.

Schem. III

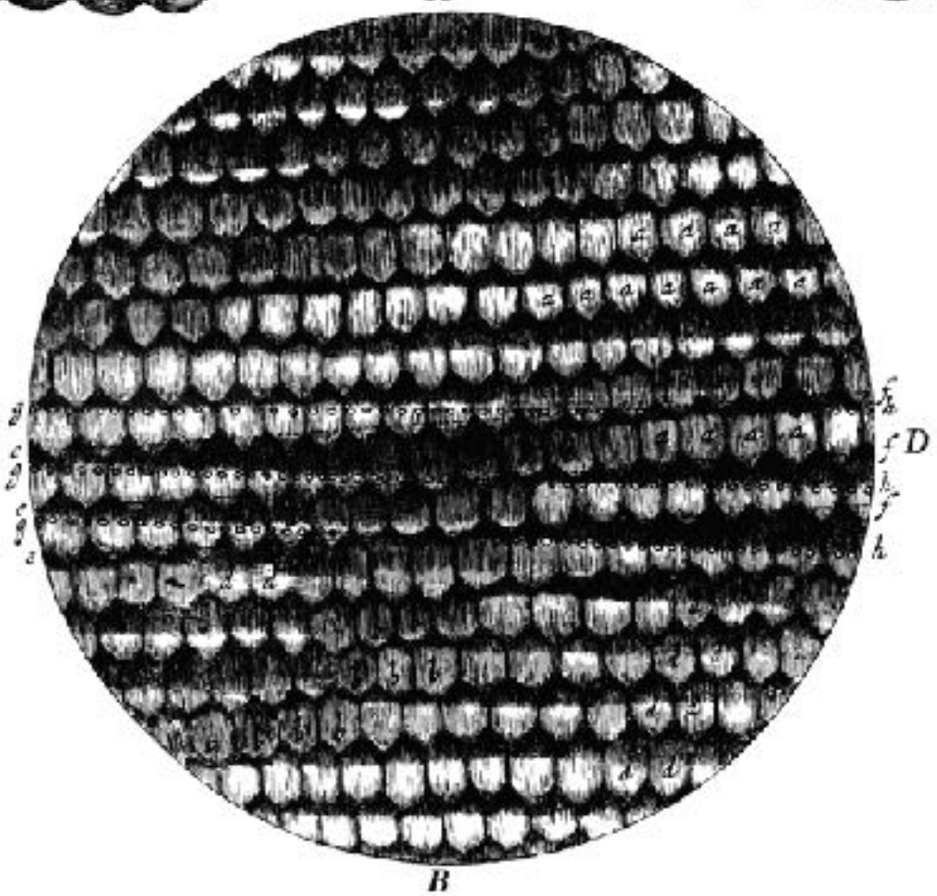
Fig: 1

Fig: 3

Fig: 4

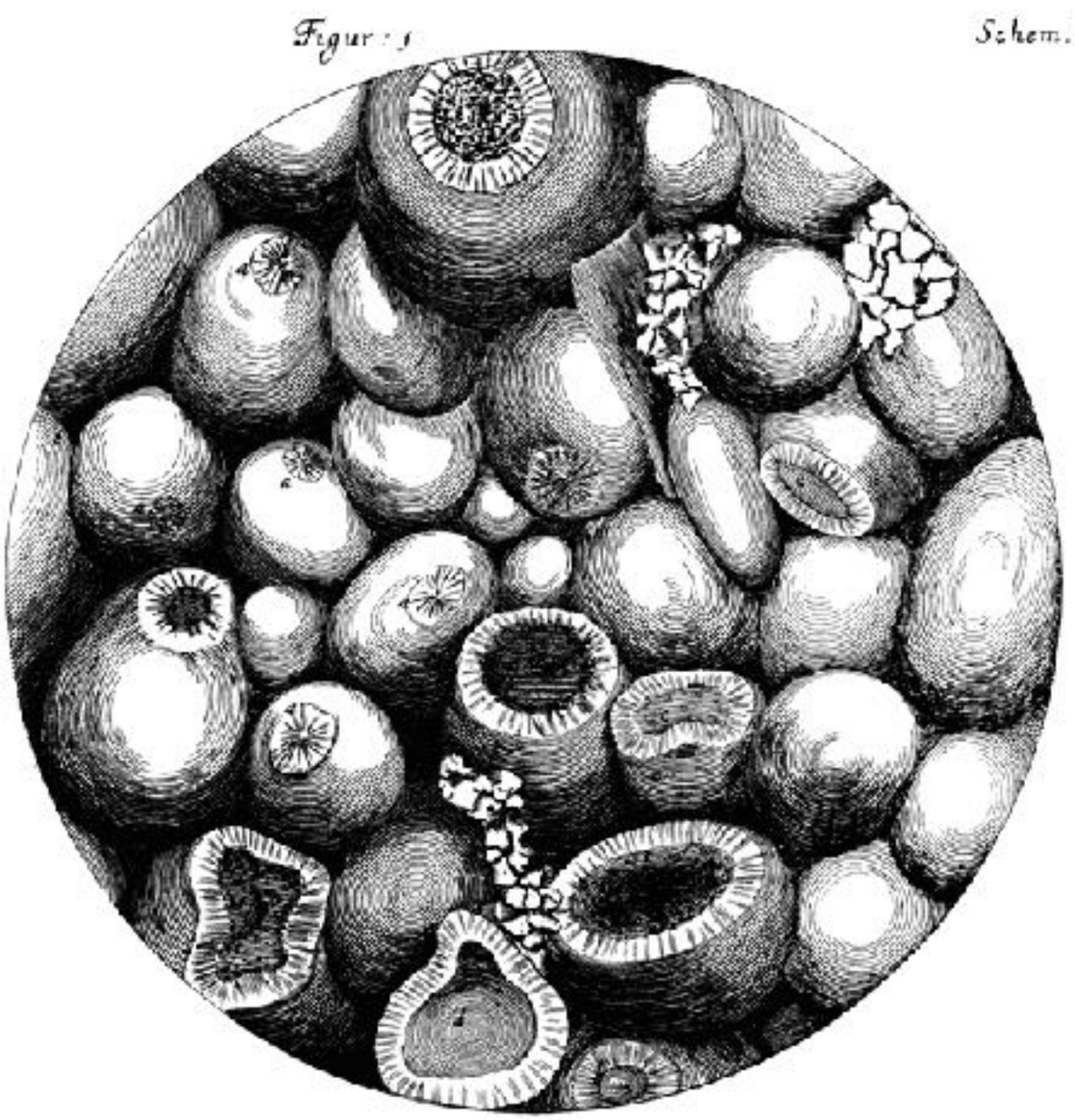
A

Fig: 2



Observ. III. Of fine Lawn, or Linnen Cloth.

Observ. IV. Of fine waled Silk, or Taffety.



Observ. XV. Of Kettering-stone, and of the pores of Inanimate bodies.

Schem. XI.

Fig: 1.

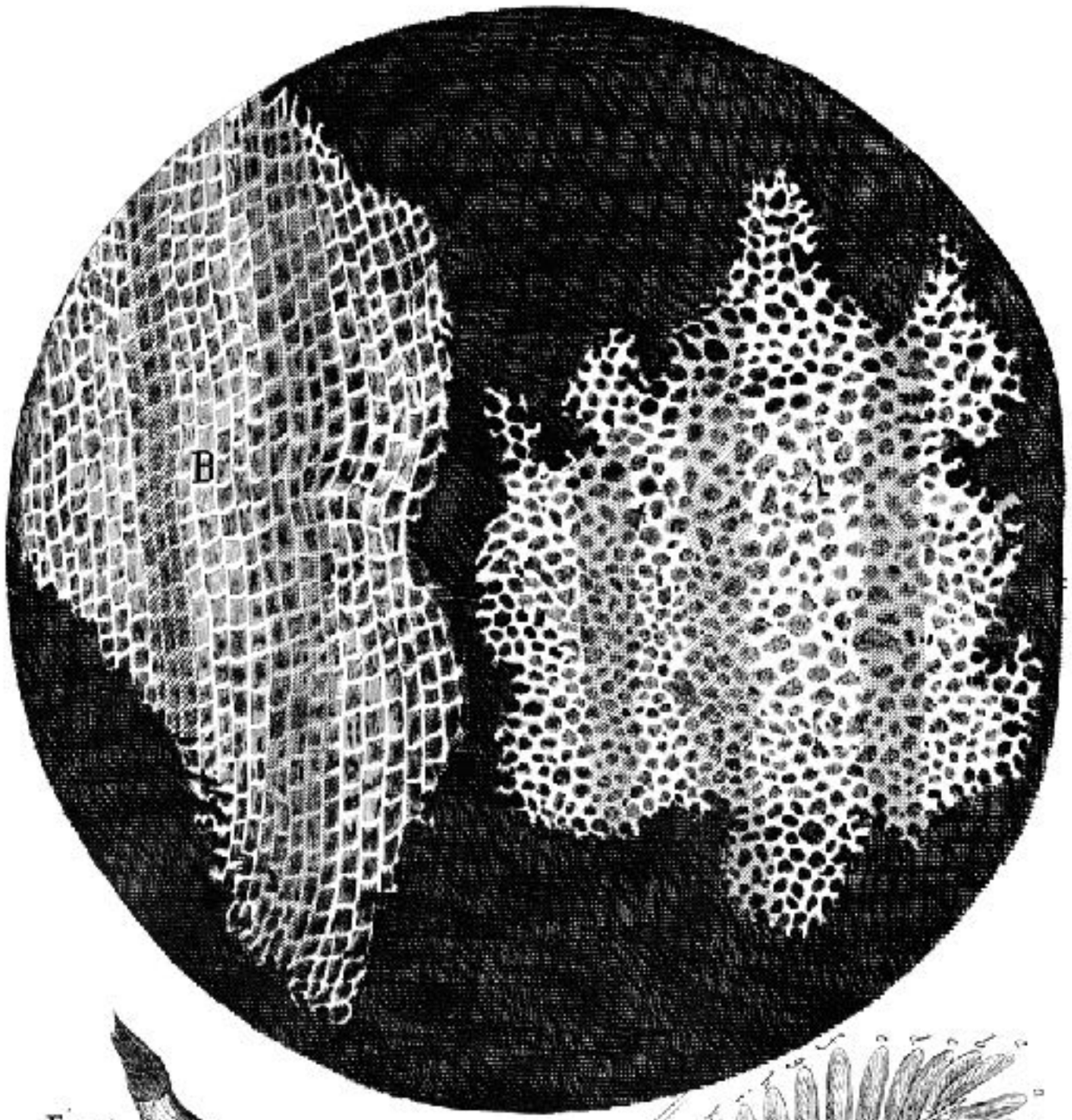
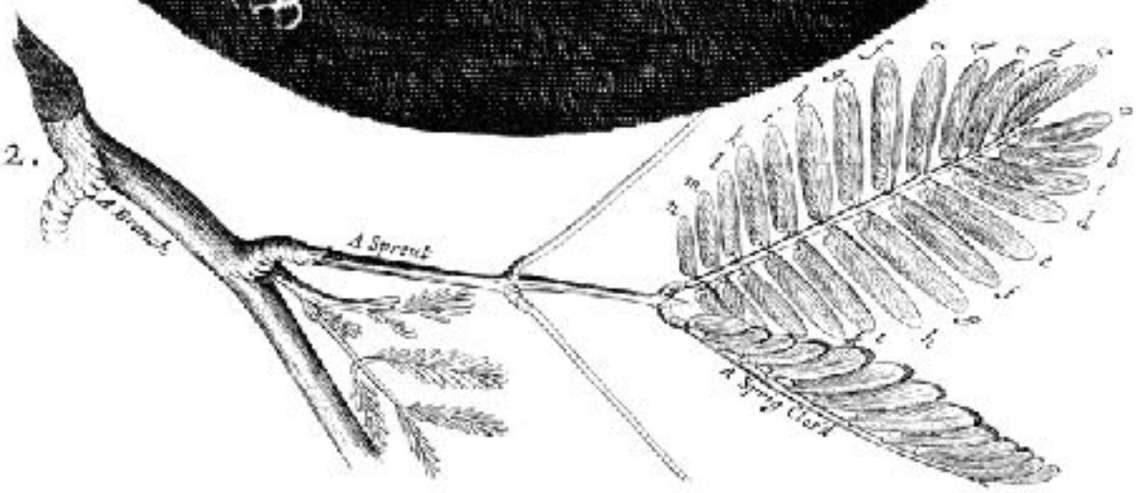


Fig: 2.



Observ. XVIII. Of the Schematisme or Texture of Cork, and of the Cells and Pores of some other such frothy Bodies.

Schem: XIIII.

Fig: 1.

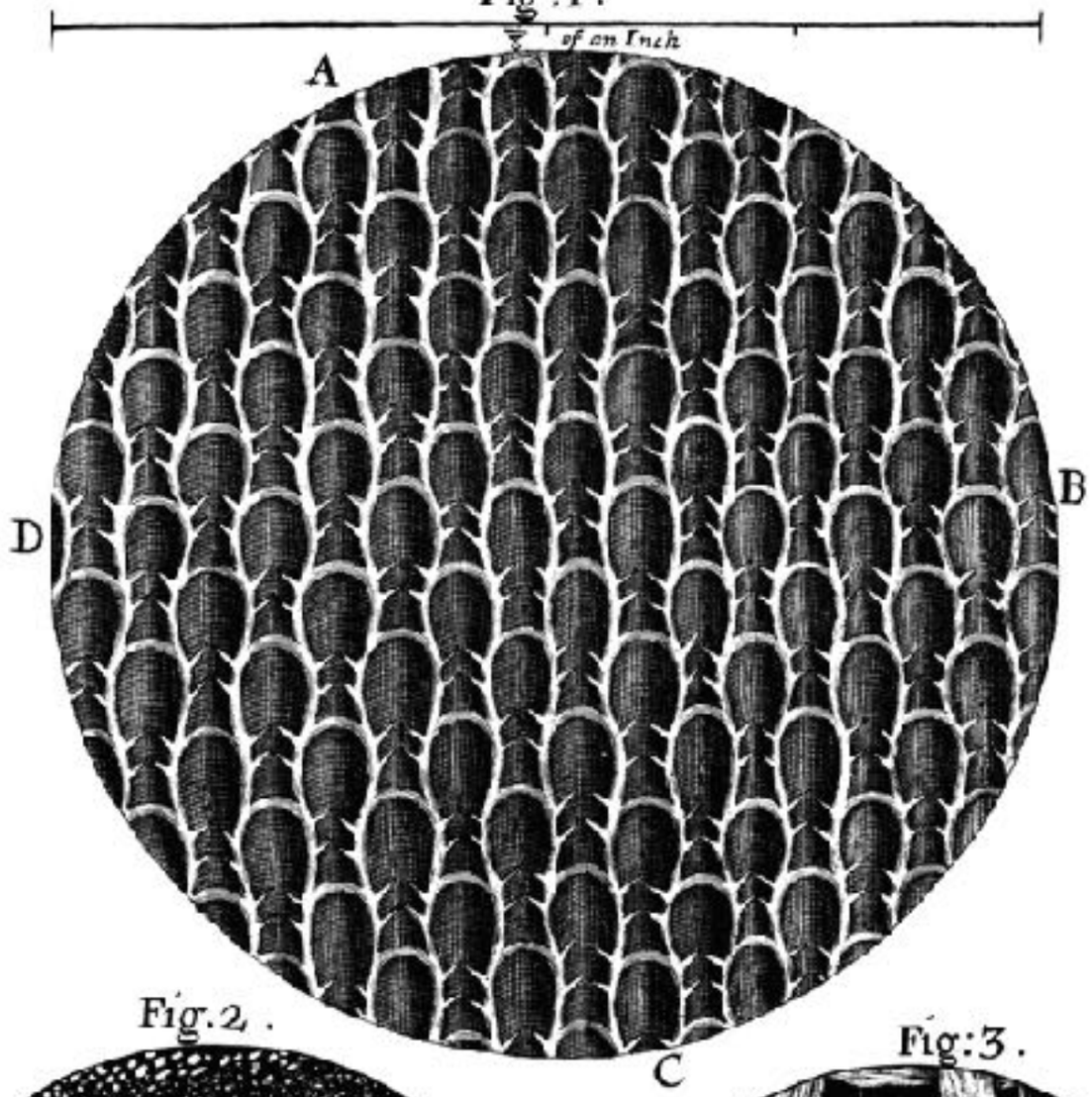


Fig. 2.

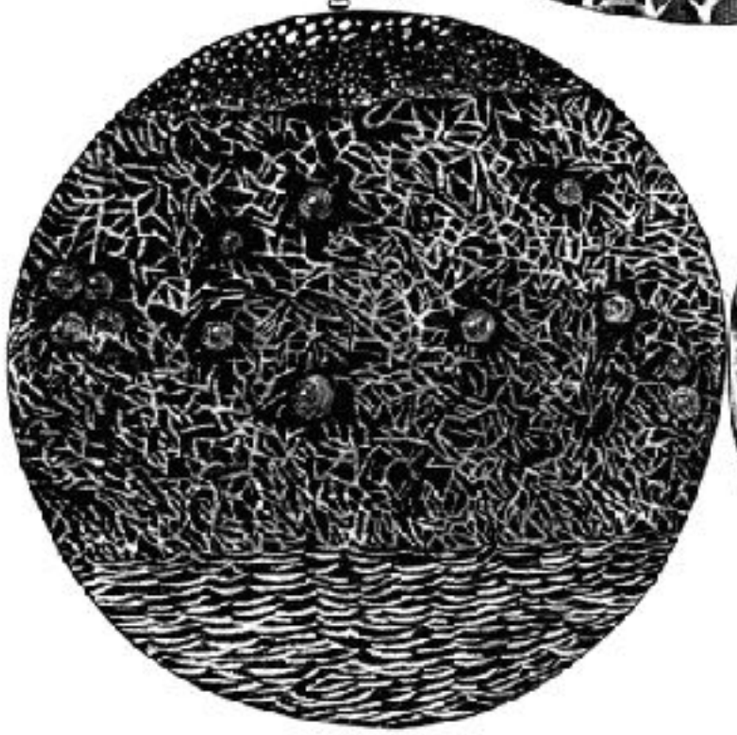
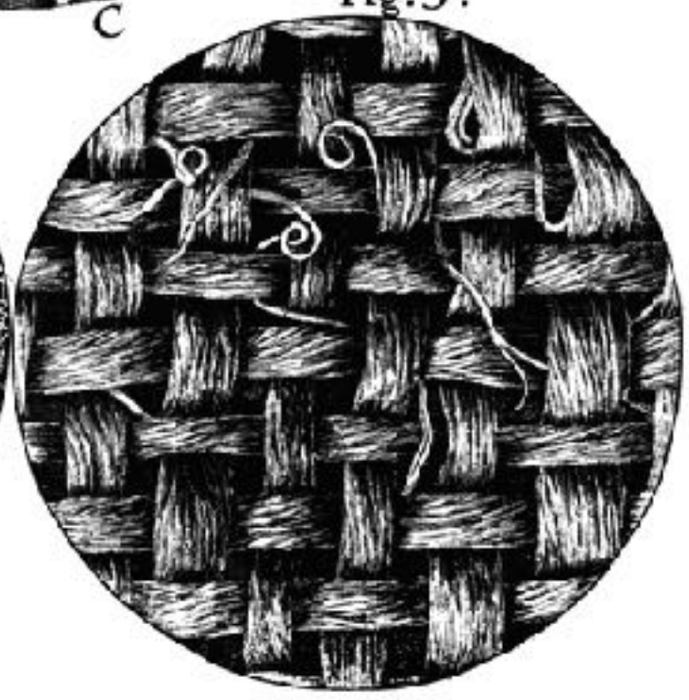
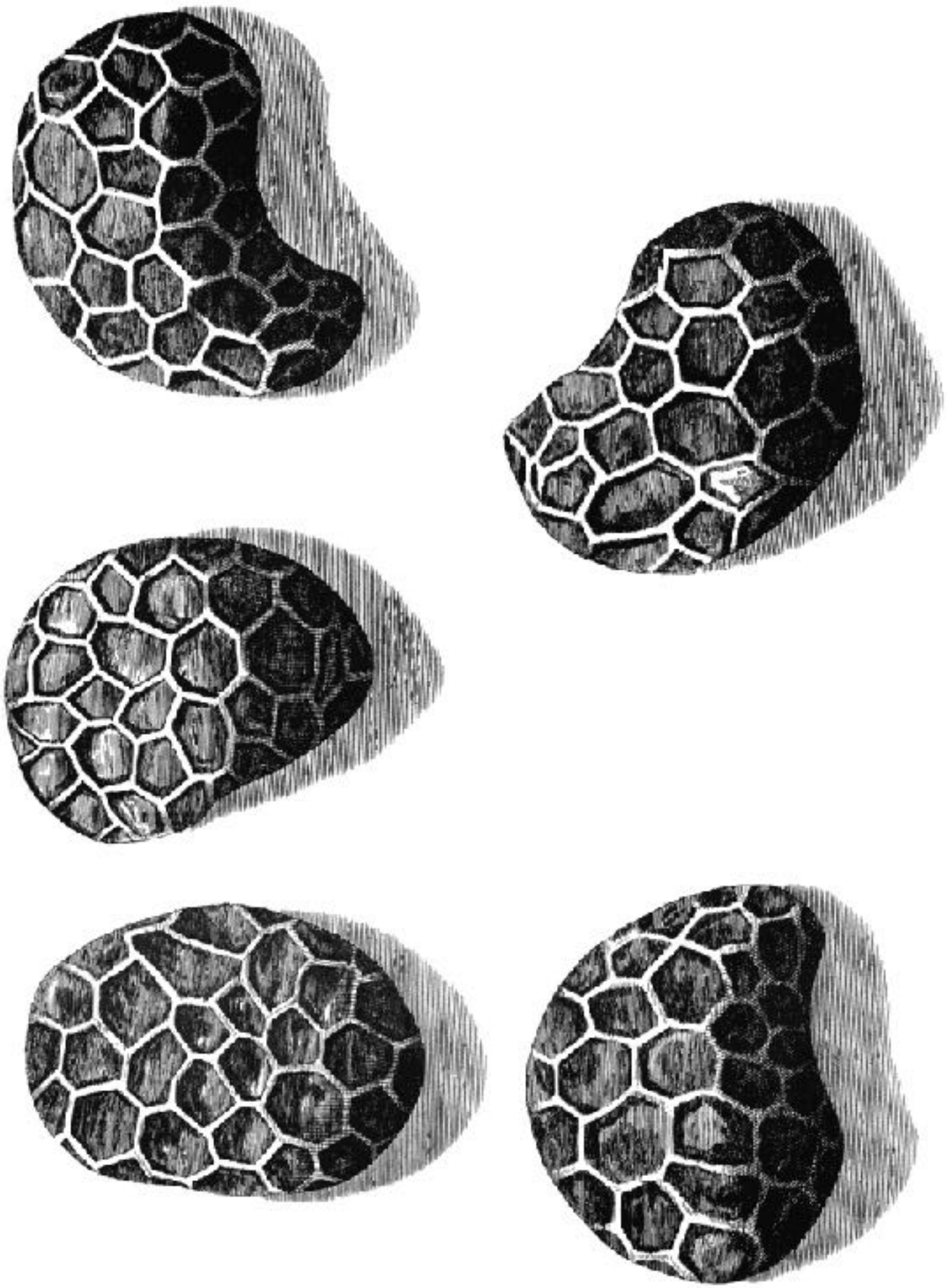


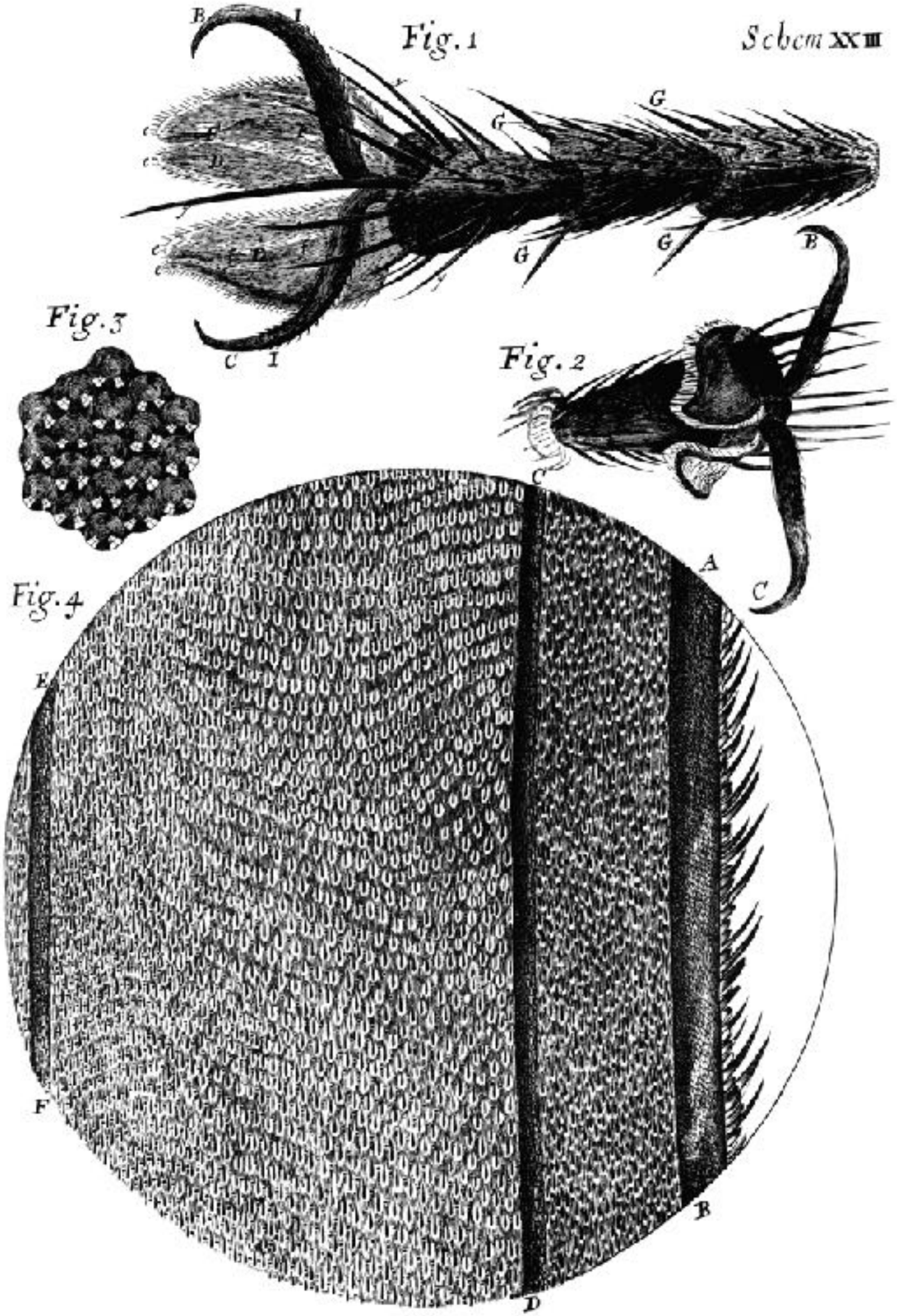
Fig: 3.



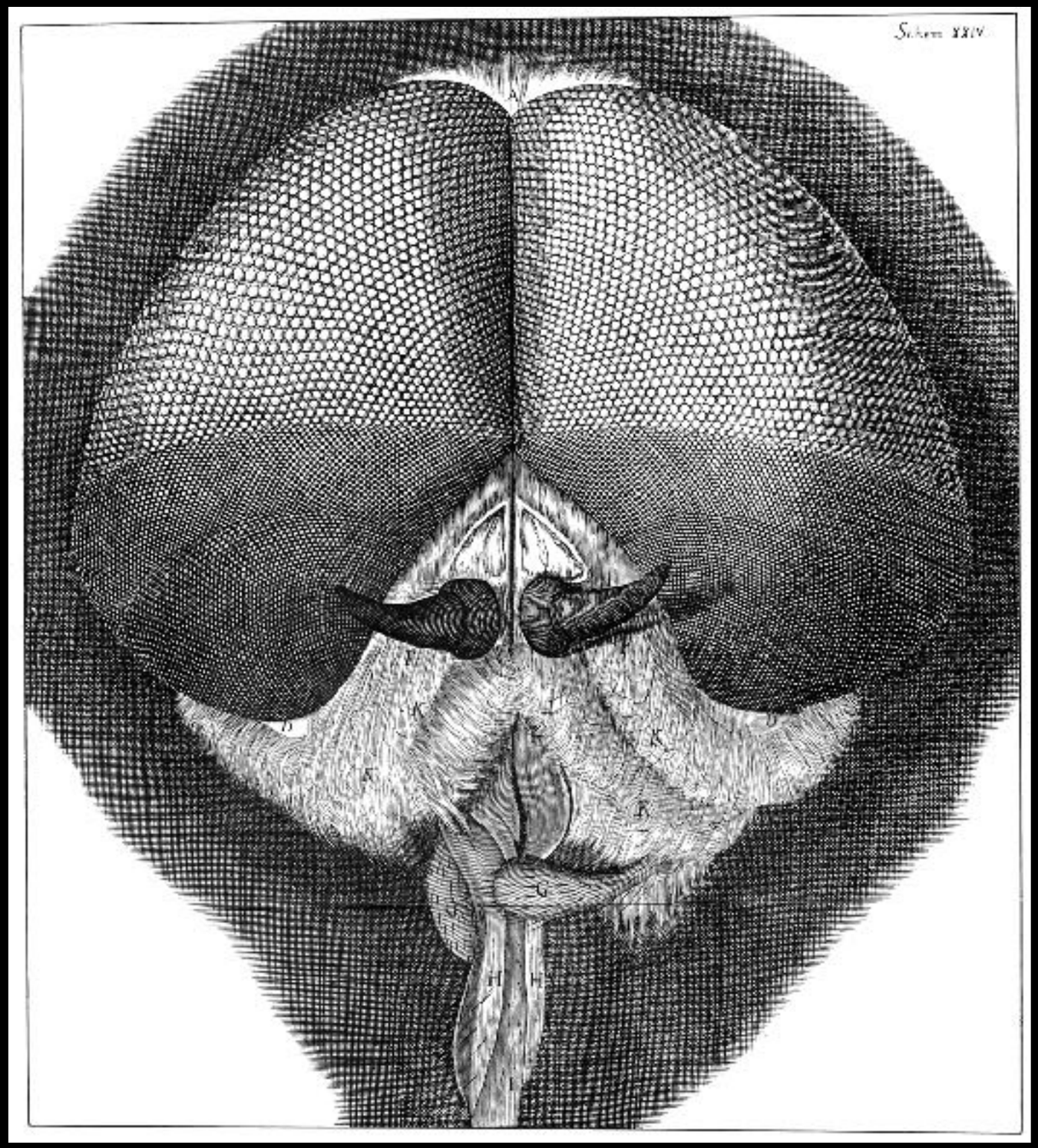
Observ. XXIV. Of the surfaces of Rosemary and other leaves.



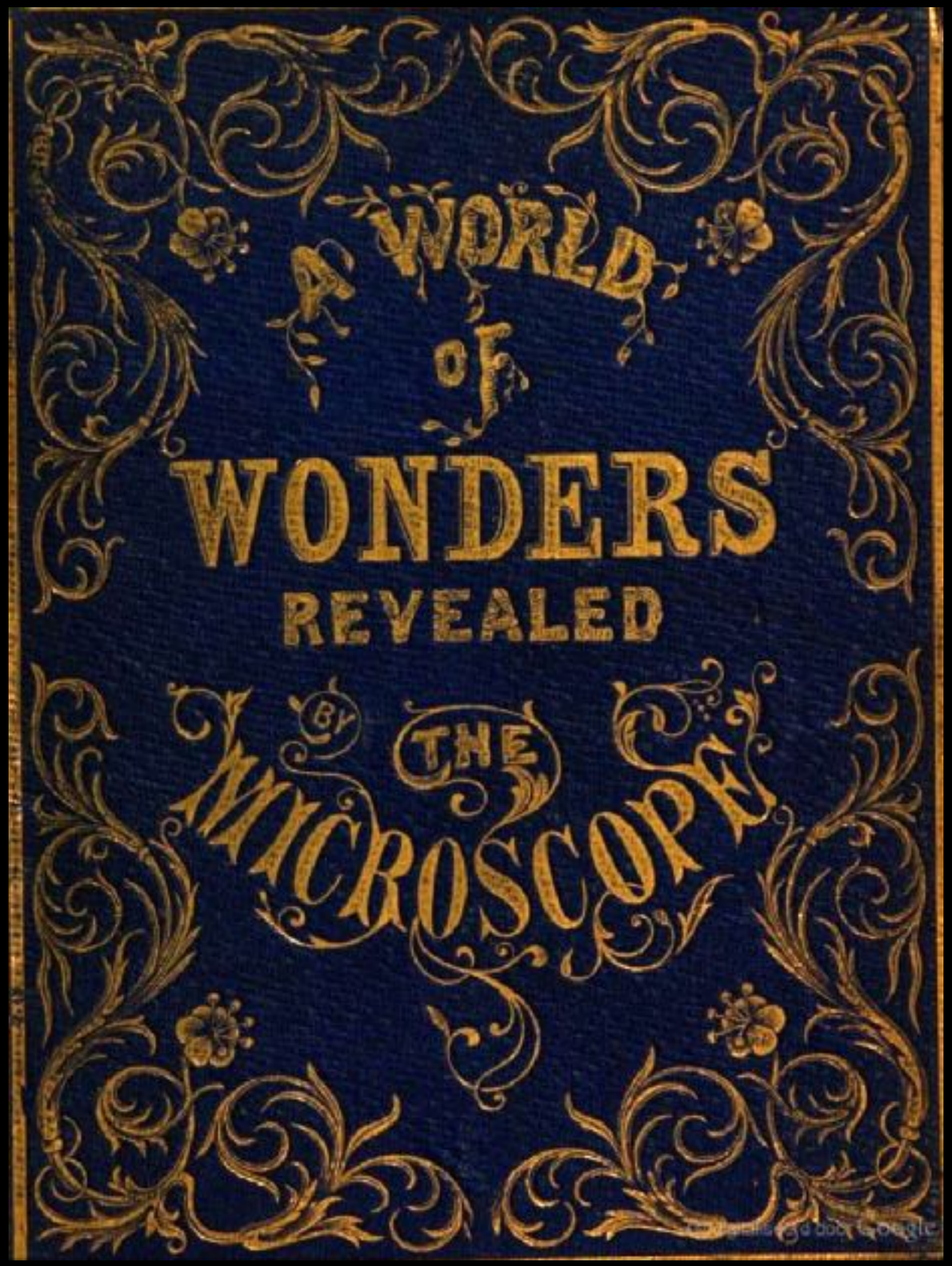
Observ. XXX. Of the Seeds of Poppy.



Observ. XXXVII. Of the Feet of Flies, and several other Insects.



Observ. XXXIX. Of the Eyes and Head of a Grey drone-Fly, and of several other creatures.



Mrs. Mary Ward 1858

A WORLD OF WONDERS

REVEALED BY

THE MICROSCOPE.

A BOOK FOR YOUNG STUDENTS.

WITH COLOURED ILLUSTRATIONS.

BY THE HON. MRS. WARD.

SECOND EDITION.

LONDON:
GROOMBRIDGE AND SONS.
M DCCC LIX.

1

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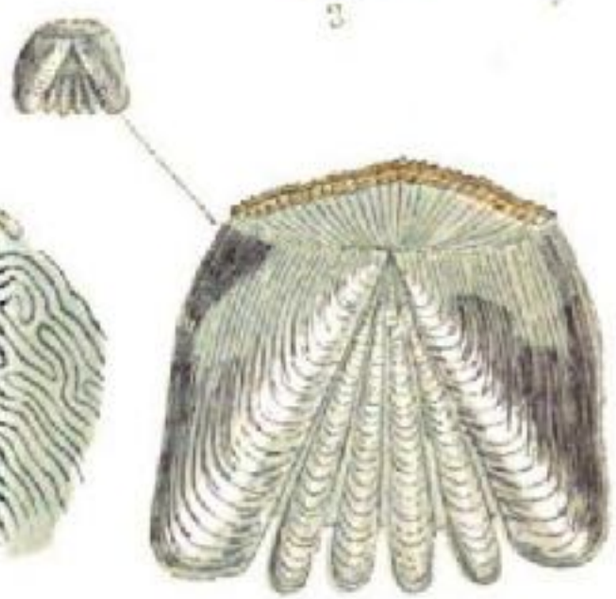

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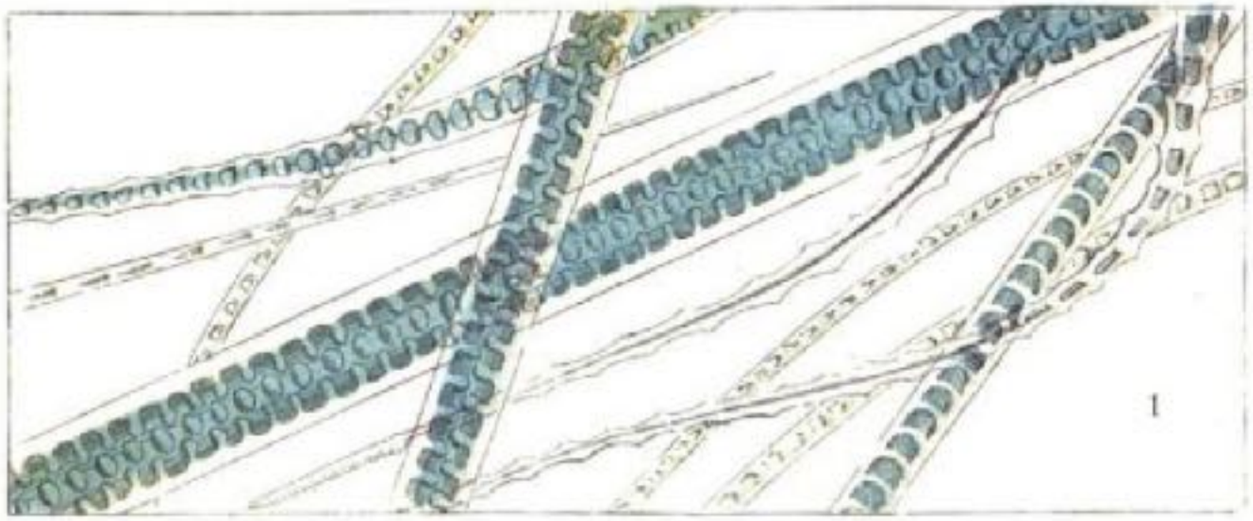
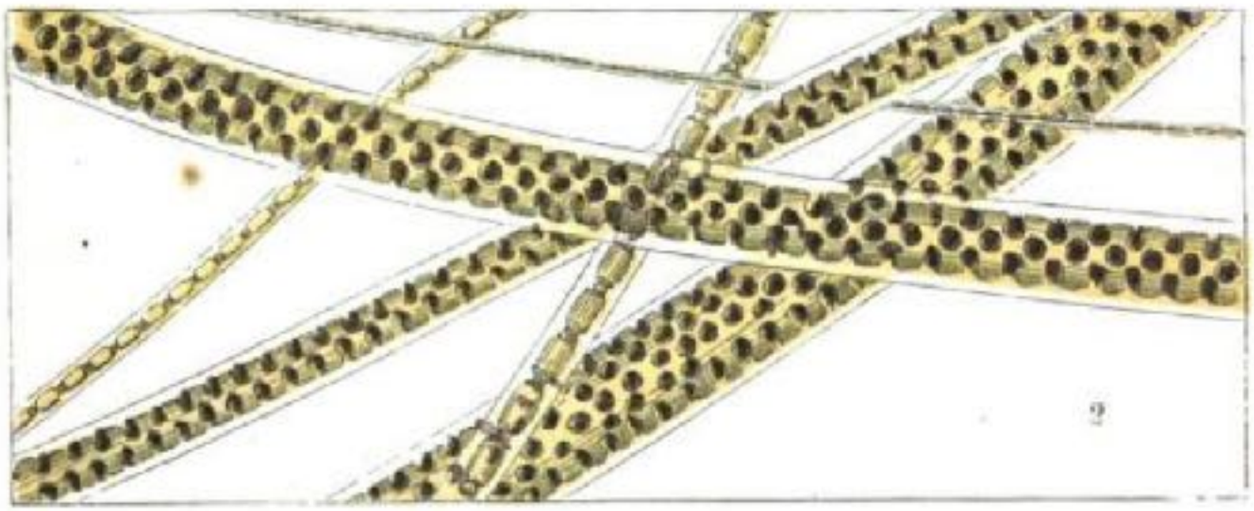
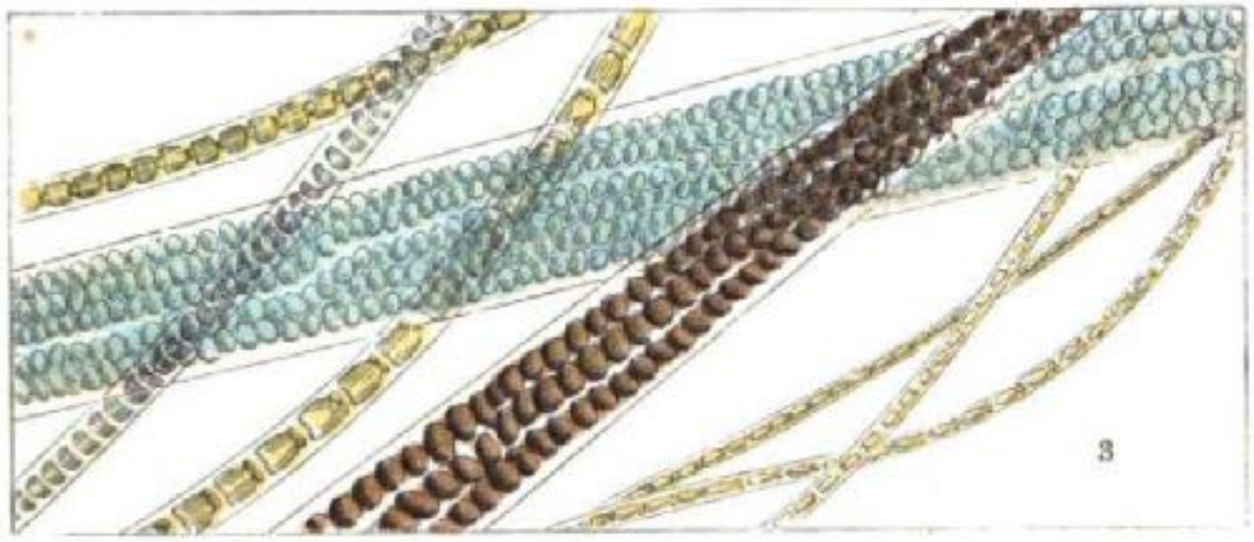


1. Hair of White Mouse.



2. Hair of Common Mouse.



3. Hair of Rabbit.

1

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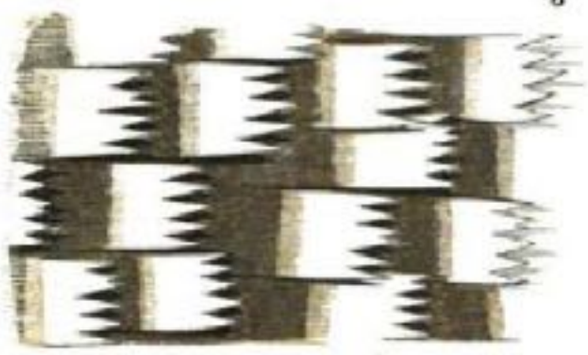
3

4



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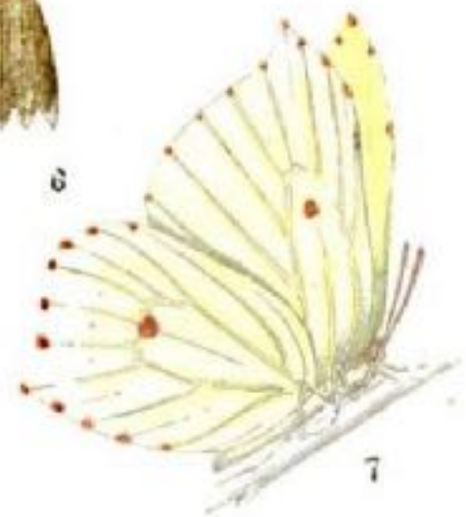

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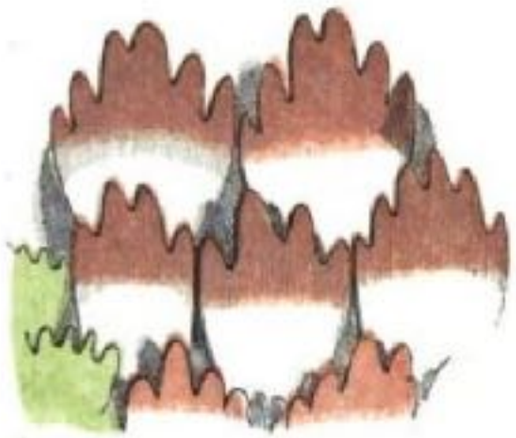
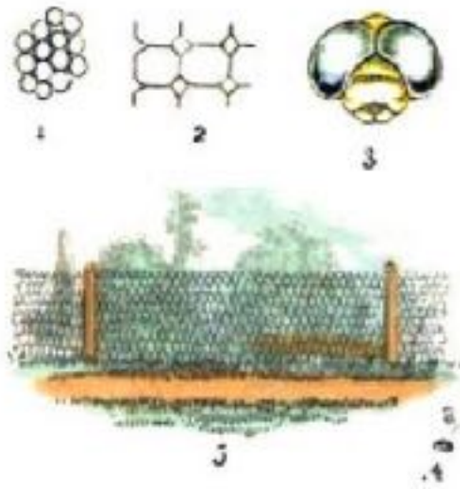
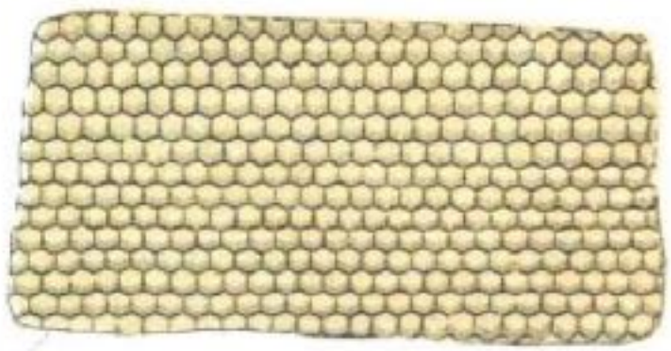


8

1. Wing of Herald Moth. 2. Spot on Herald Moth's wing, magnified 60 diameters.
3. Eye-like spot on wing of Emperor Moth. 4. Part of Eye-like spot, magd. 60 diameters.
5. Scales of Underwing Moth, magnified 80 diameters.
7. Brimstone Butterfly. 8. Scales of Brimstone Butterfly, magnified 150 diameters.
9. Scales of Red Admiral Butterfly, magnified 100 diameters. 10. Scale, magd. 250 diameters.





4 (b)

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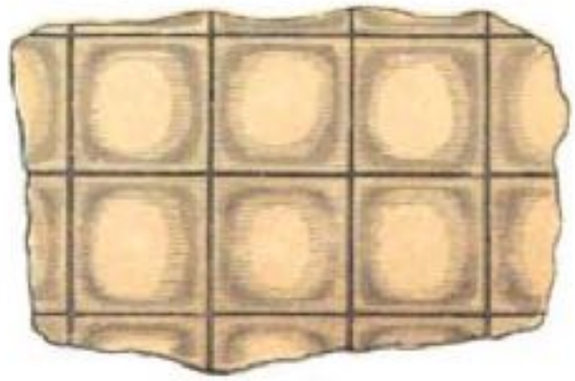
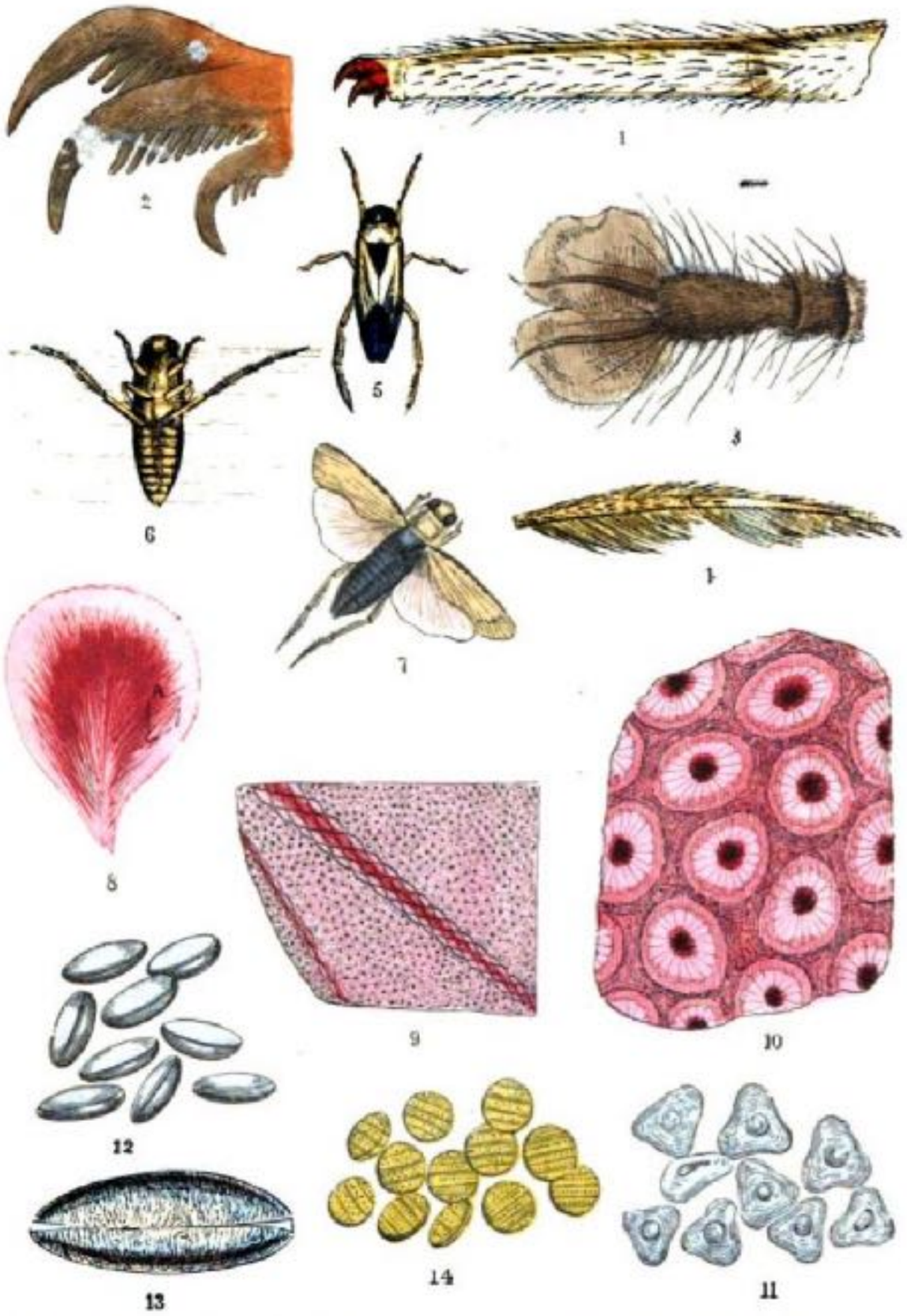


9

3. Head of Dragon-fly. 4. (b) Piece of Dragon-fly's eye, containing 290 lenses; magd. 35 diams.
6. Piece of Dragon-fly's eye, magnified 250 diameters.
7. The same, with view seen through each lens. 8. Part of Cricket's eye, magd. 250 diams.
9. Part of Lobster's eye, magd. 250 diams. 10. Eye-stalk of Crab or Lobster.



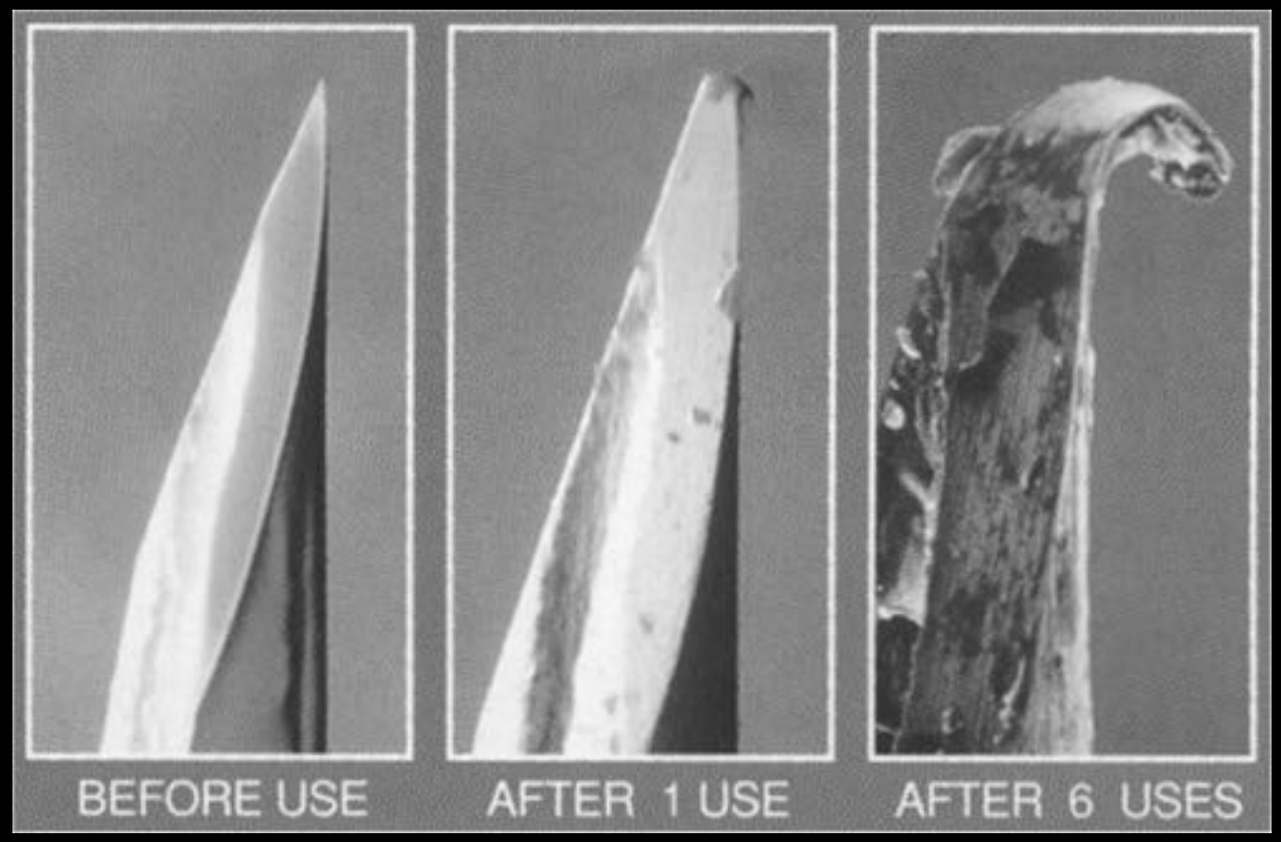
1. Foot of Spider, magnified 18 diameters. 2. Claws of Spider, magd. 100 diams.
3. Foot of Fly, magd. 20 diams. 4. Foot of Boatfly, magd. 4 diams.
5. Boatfly. 6. Boatfly floating. 7. Boatfly on the wing. 8. Petal of Geranium.
9. Piece of Geranium Petal, magd. 8 diams. 10. Minute portion of Petal, magd. 150 diams.
11. Pollen of Clarkia pulchella, magd. 100 diams. 12 Pollen of Crown-imperial, magd. 100 diams.
13. Grain of the above, magd. 300 diams. 14. Pollen of Salvia patens, magd. 100 diams.

OBSERVATIONS

- A printed and a hand-written text on paper / cardboard
- The point of a needle
- Pieces of fabric and paper
- Crystals, sugar, salt, grains of sand
- Plant seeds and other parts of plants
- Small insects (e.g. ants) or other arthropods (e.g. isopods – woodlice) anaesthetised by placing in alcohol solution (20-30%, e.g. an antiseptic solution)
  for around 15 min
- Big Microorganisms (tardigrades, daphnia ?)

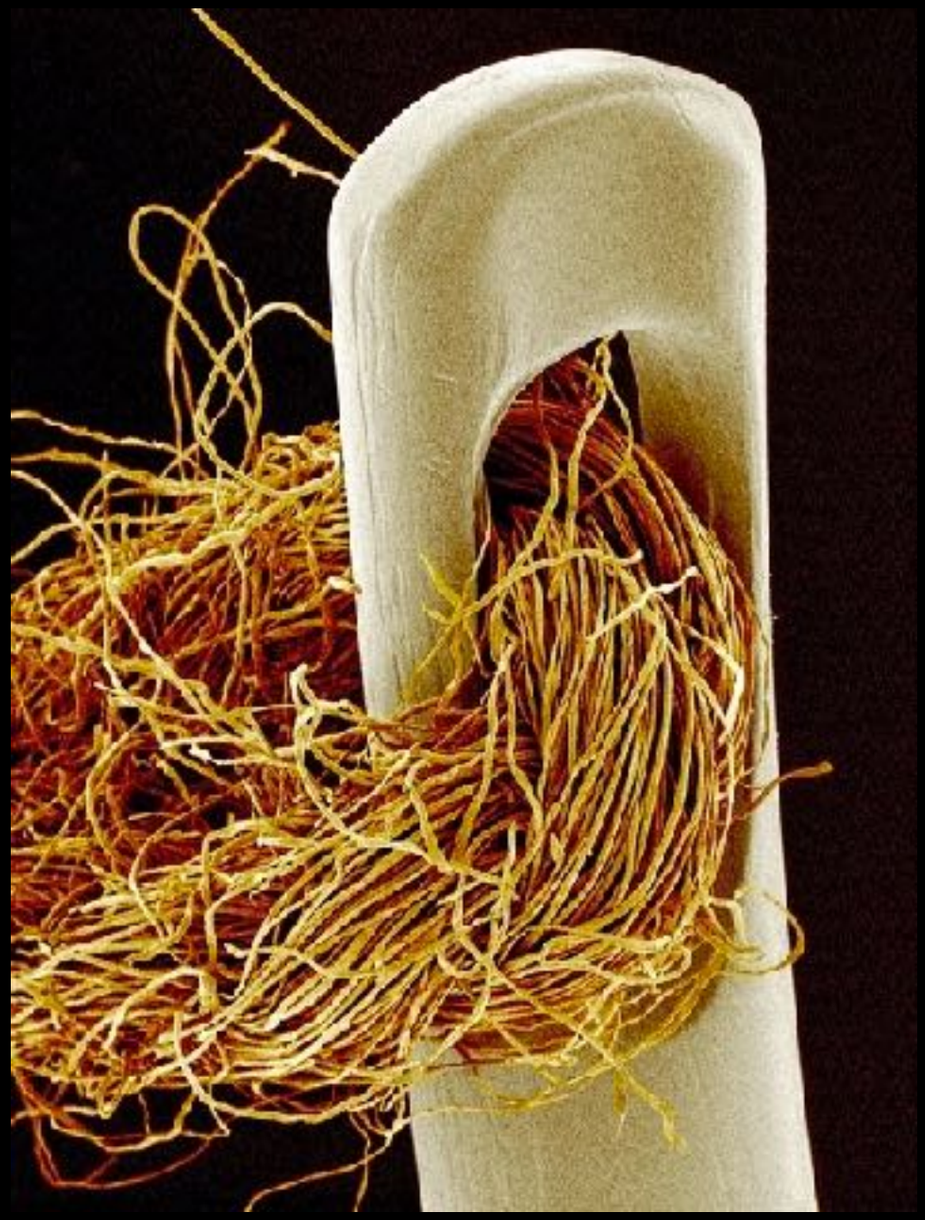
DIFFERENT MAGNIFICATION FACTORS /// DIFFERENT LIGHTS AND FILTERS

OBSERVATIONS



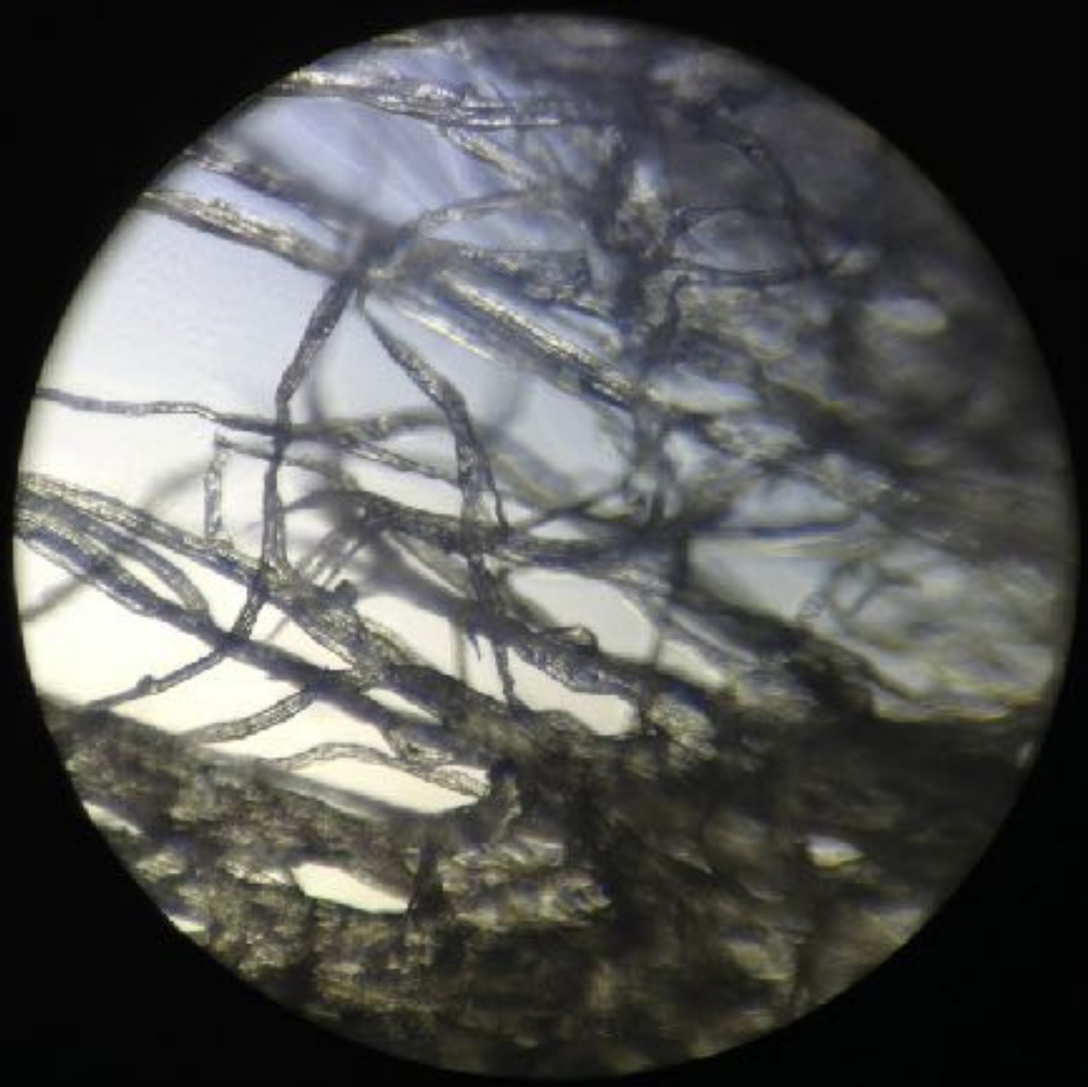
SIRYNGE NEEDLE

OBSERVATIONS



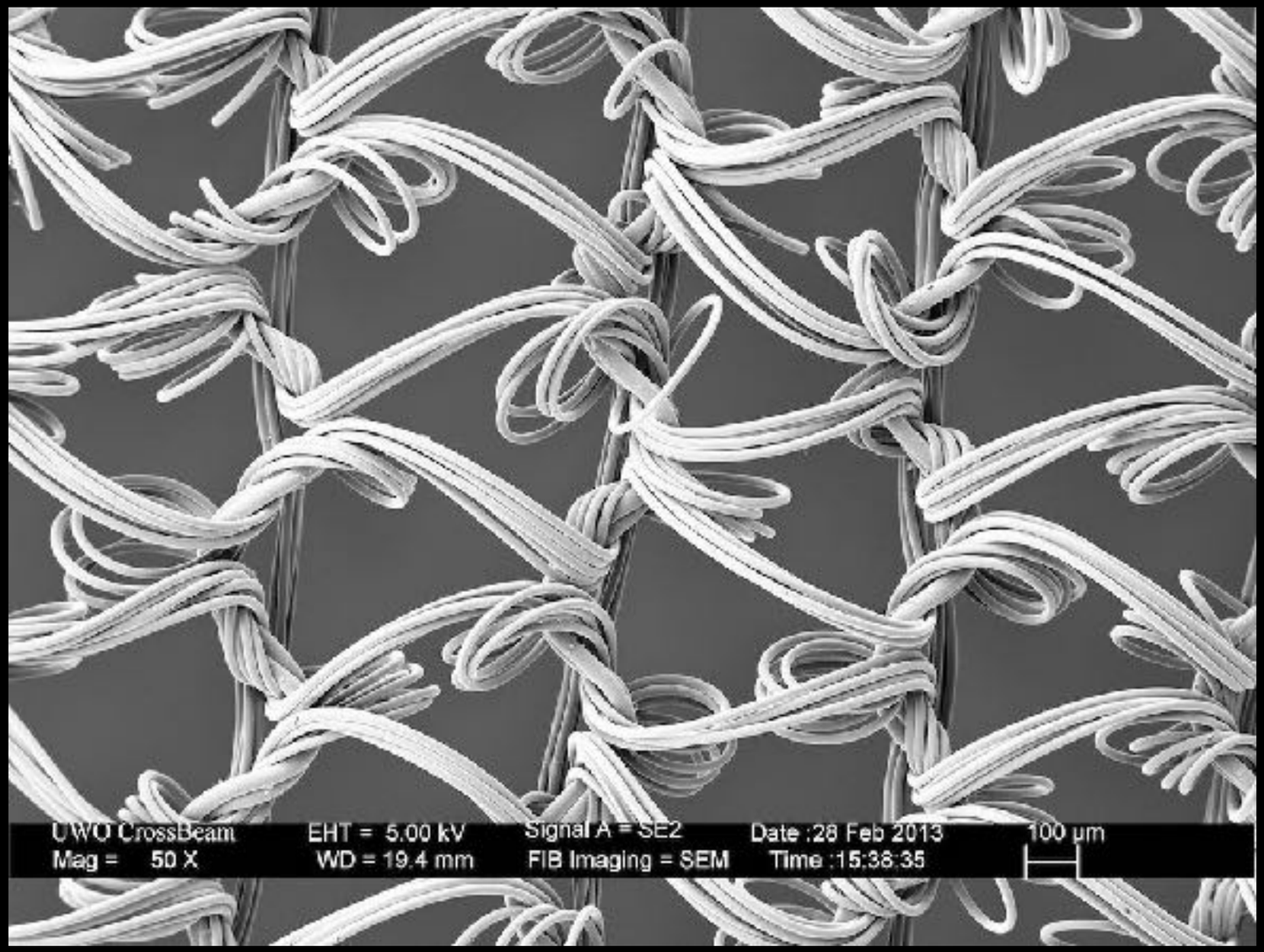
NEEDLE WITH THREAD

OBSERVATIONS



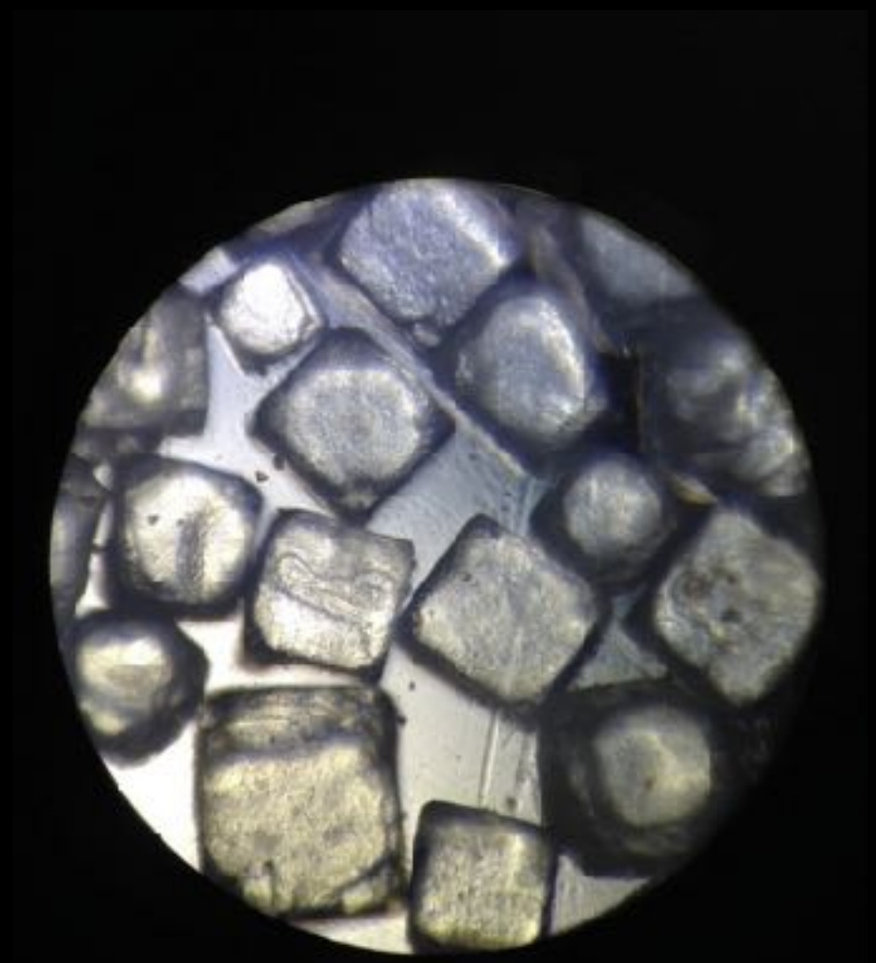
PAPER TOWEL

OBSERVATIONS

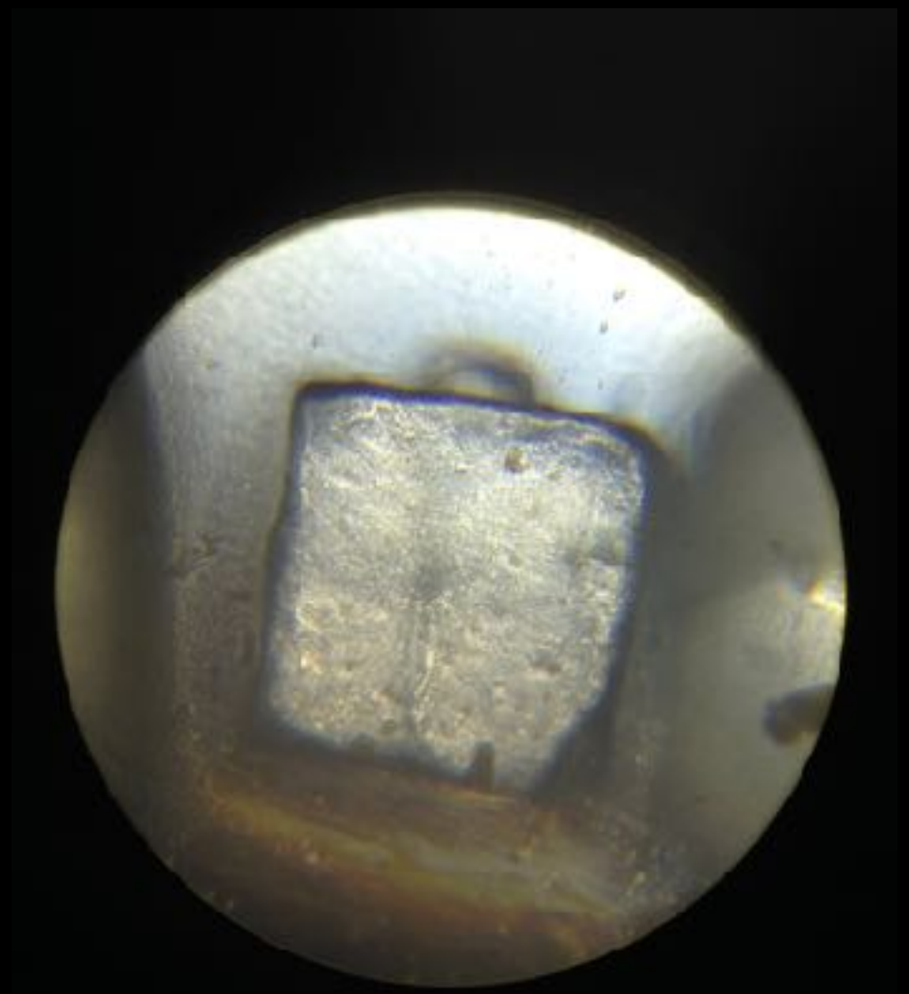


WOVEN NYLON FABRIC 50X

OBSERVATIONS



10x



40x

TABLE SALT CRYSTALS

OBSERVATIONS

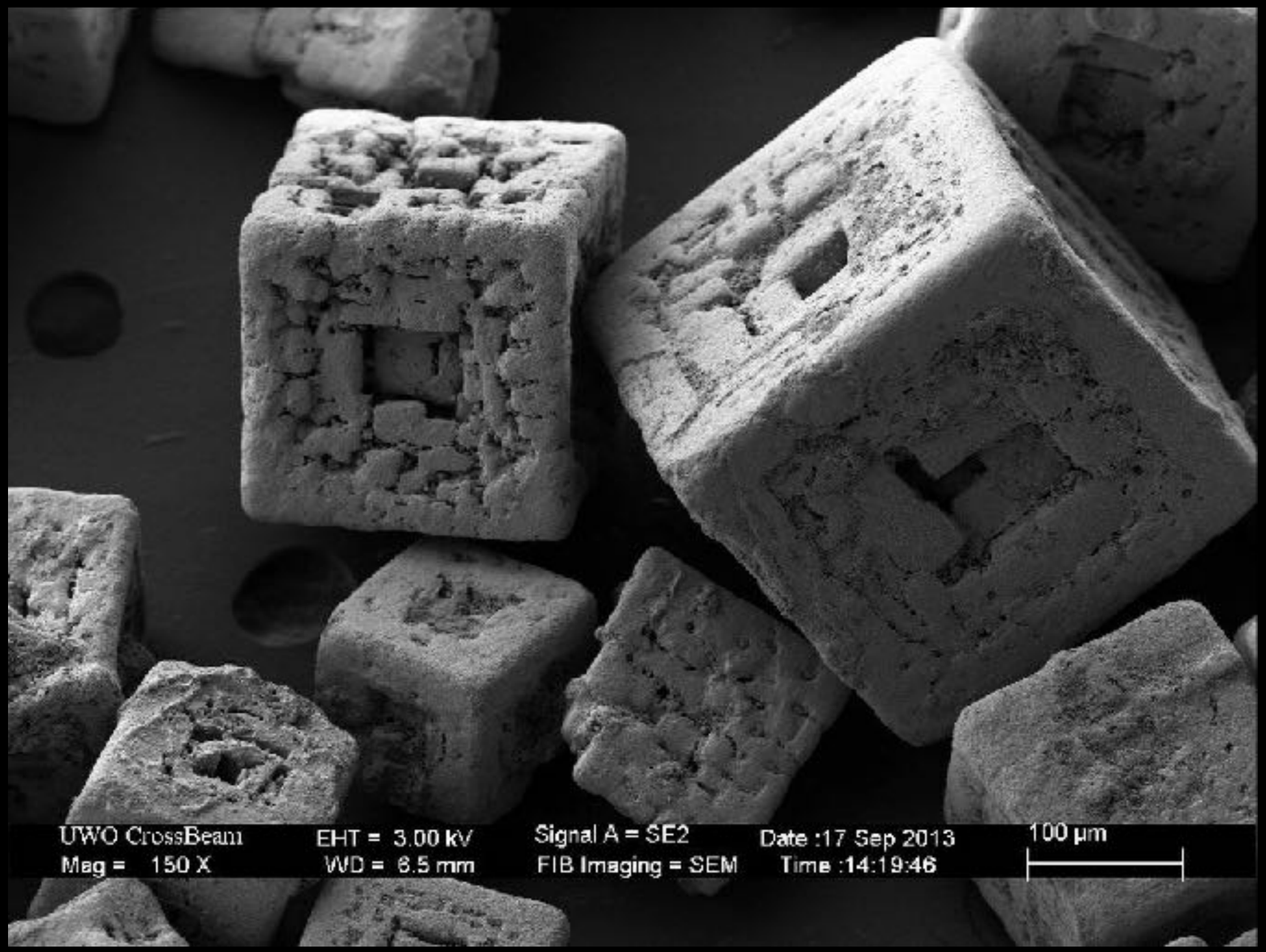
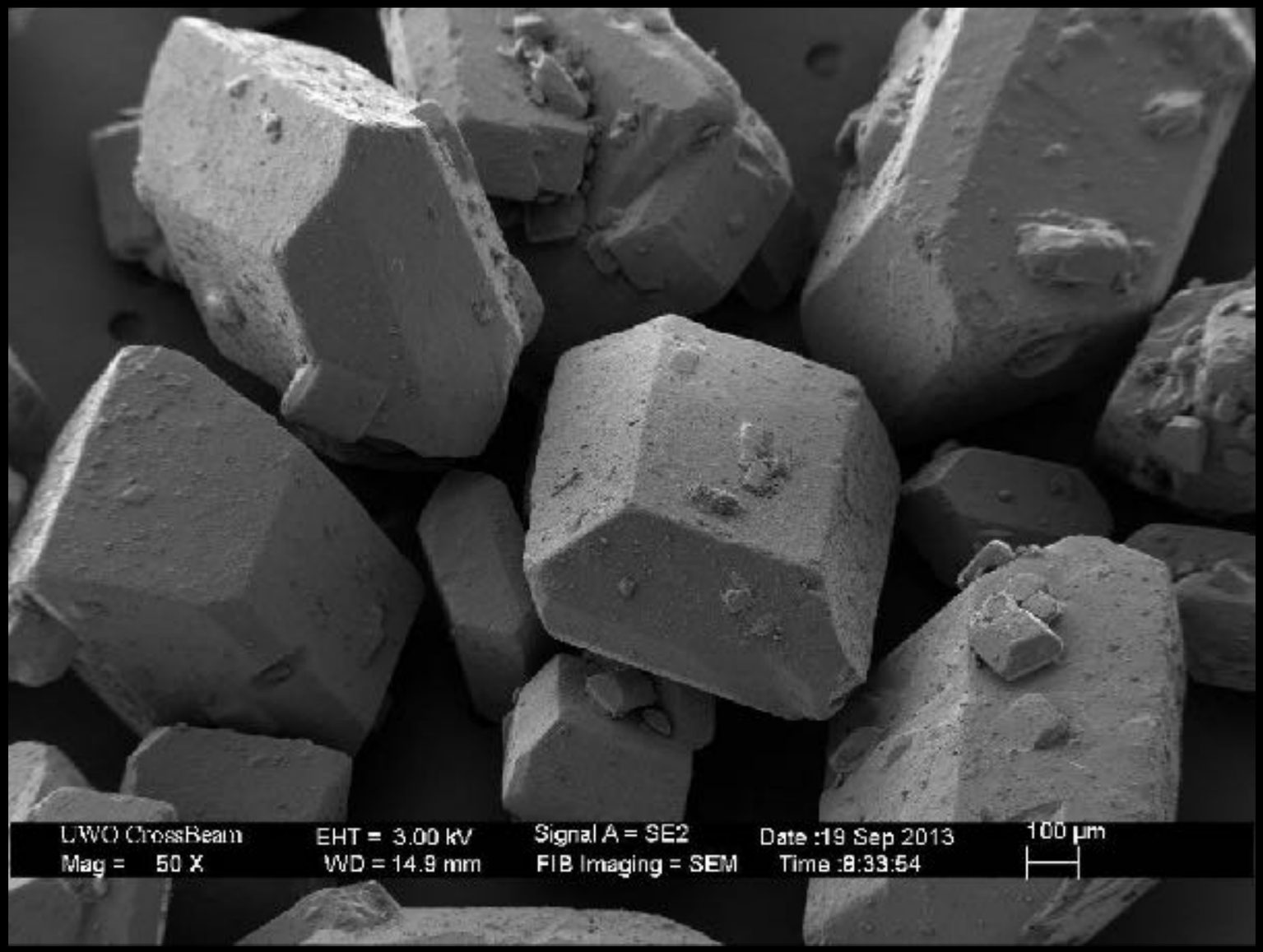


TABLE SALT CRYSTALS

150X

OBSERVATIONS

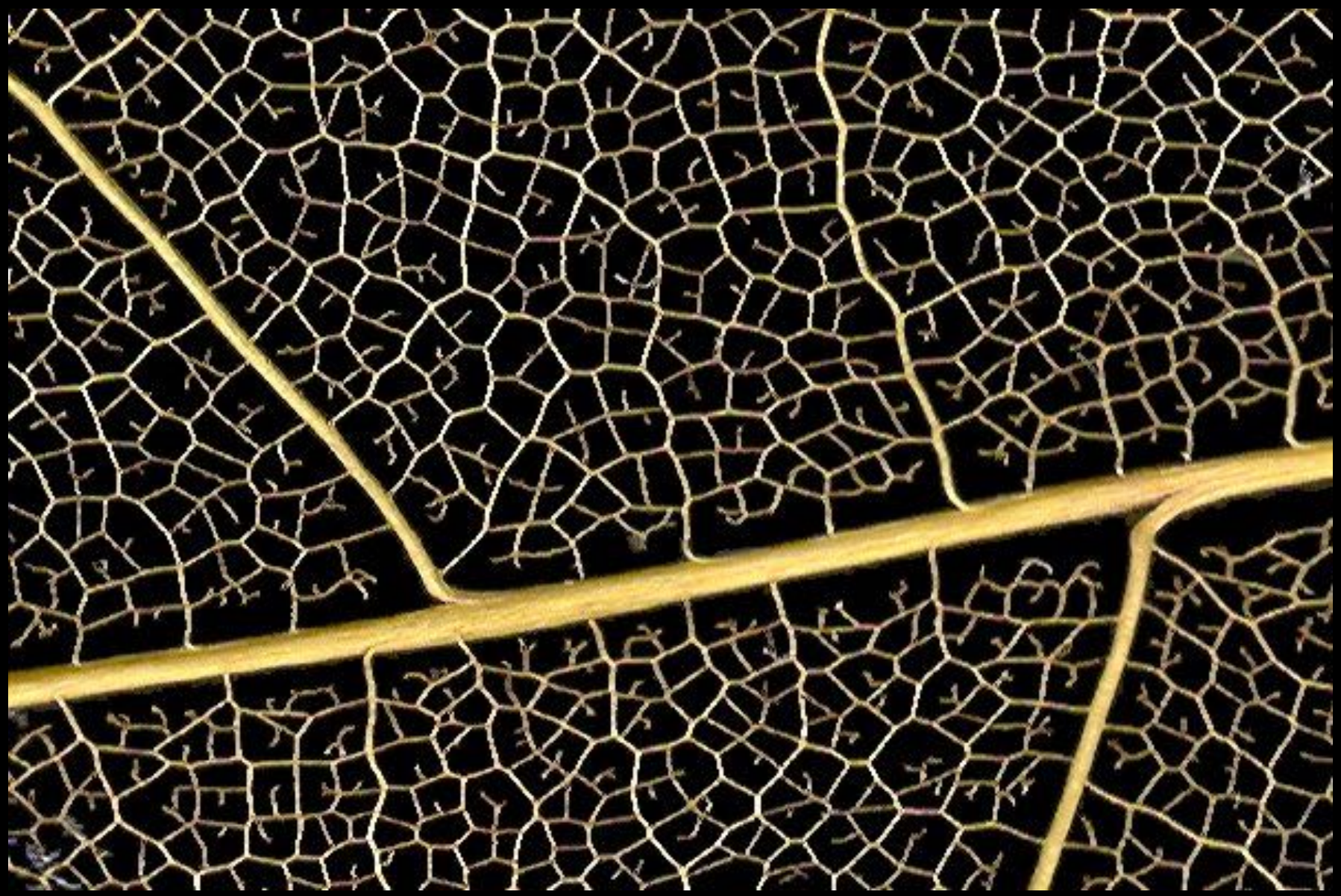


GRANULATES OF SUGAR 50X

OBSERVATIONS

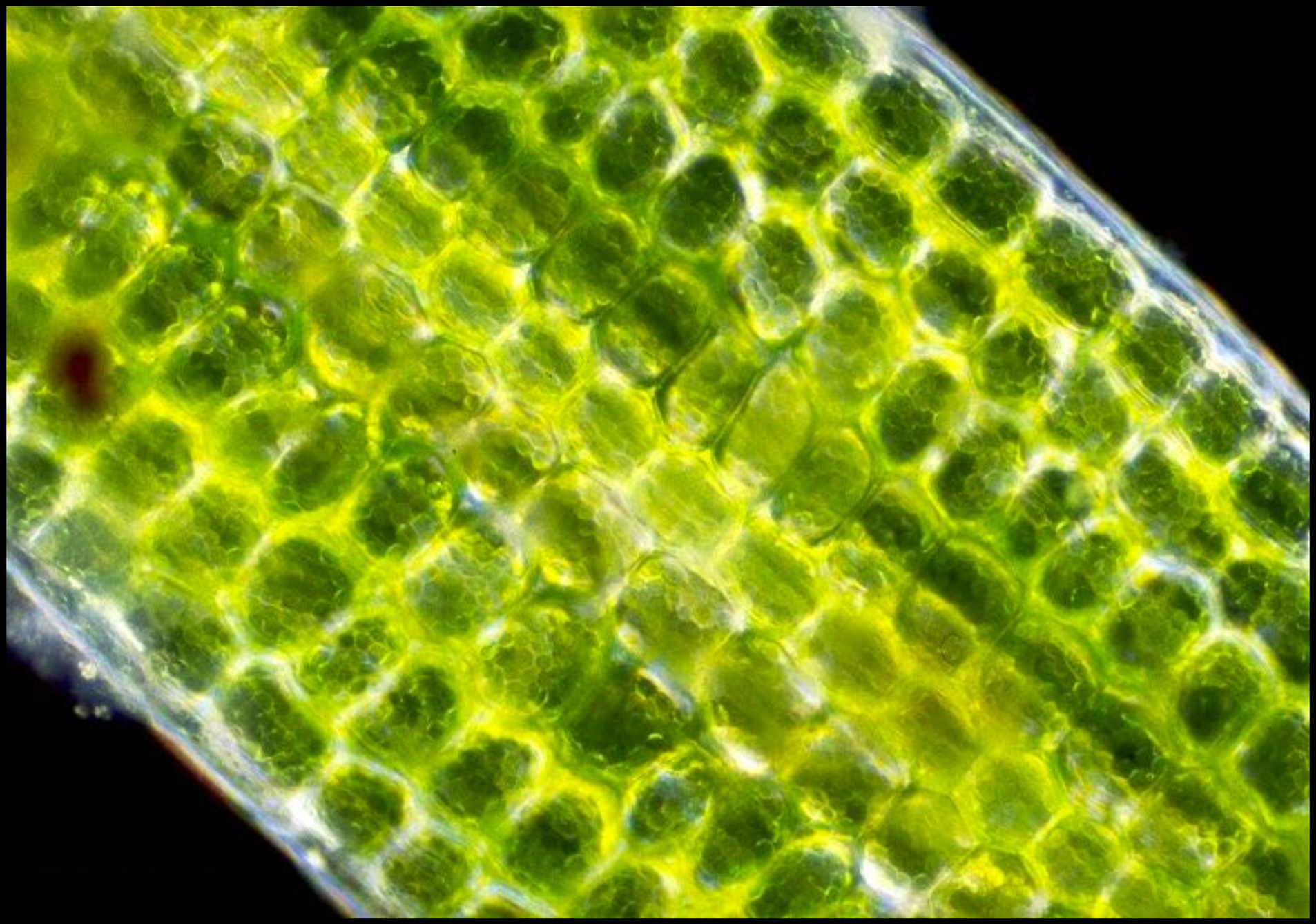
POPPY SEEDS

OBSERVATIONS



LEAF VEINS

OBSERVATIONS

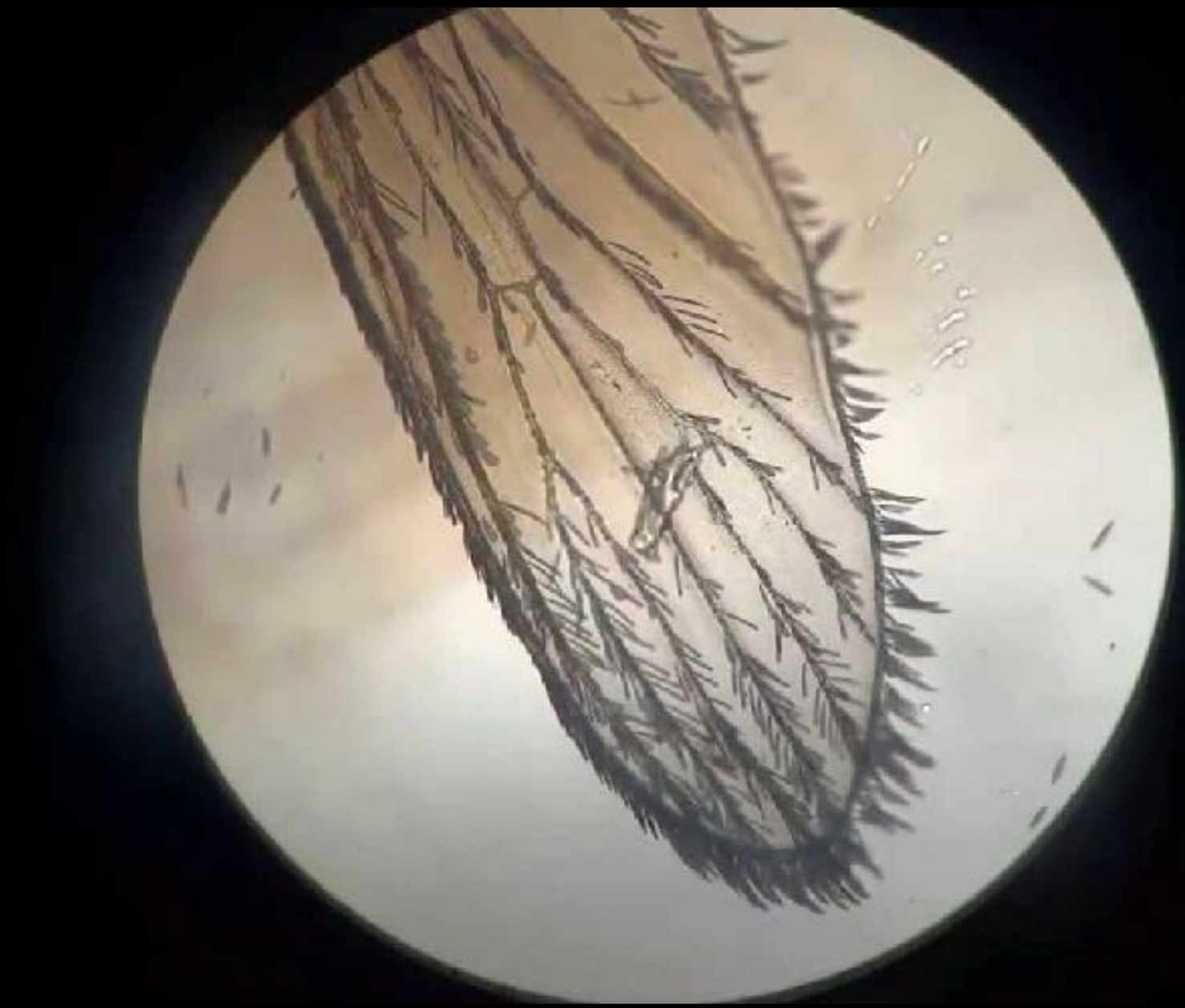


LEAF FROM THE PONDWEED MYRIOPHYLLUM 120X

OBSERVATIONS

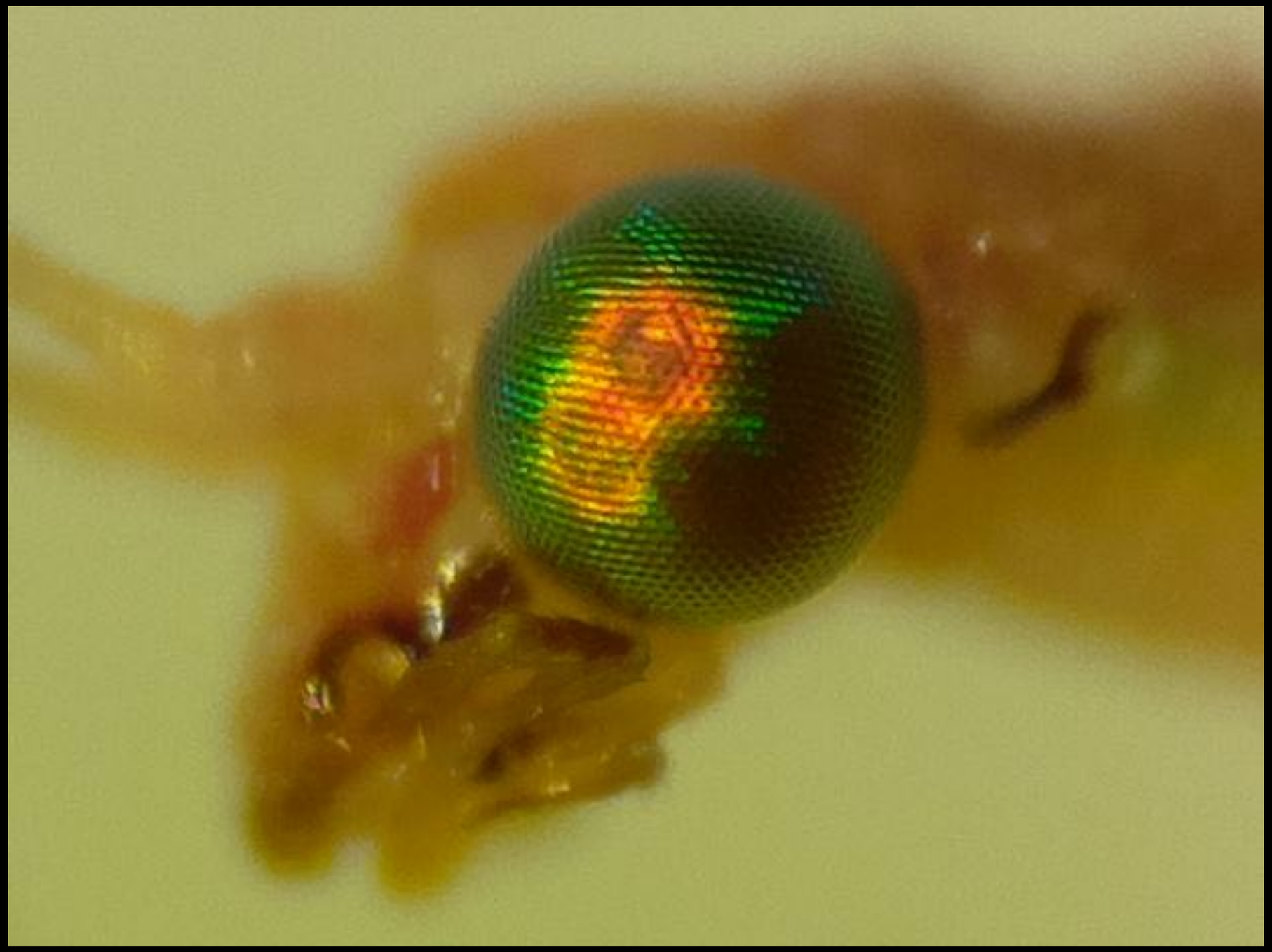
INSECT’S LEGS

OBSERVATIONS



INSECT’S WING

OBSERVATIONS



INSECT’S EYE

OBSERVATIONS

INSECT WITH RAINDROPS

OBSERVATIONS

INSECT WITH RAINDROPS

OBSERVATIONS

INSECT WITH RAINDROPS

OBSERVATIONS

TARDIGRADE (WATER BEAR)

OBSERVATIONS

TARDIGRADE (WATER BEAR)

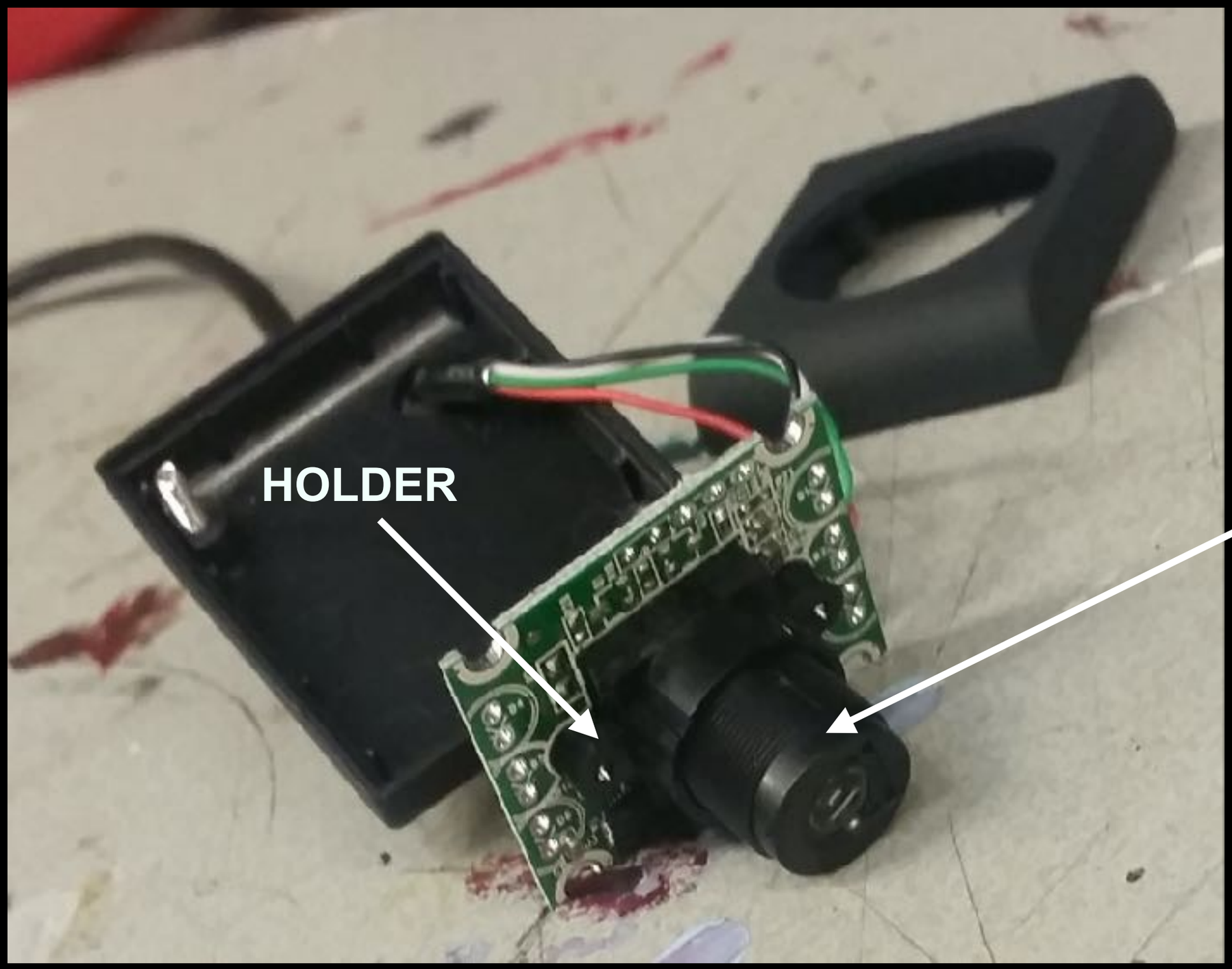
LIFE/FORMS
materials and code repository

https://git.desearch.cc/TeZ/LIFEFORMS

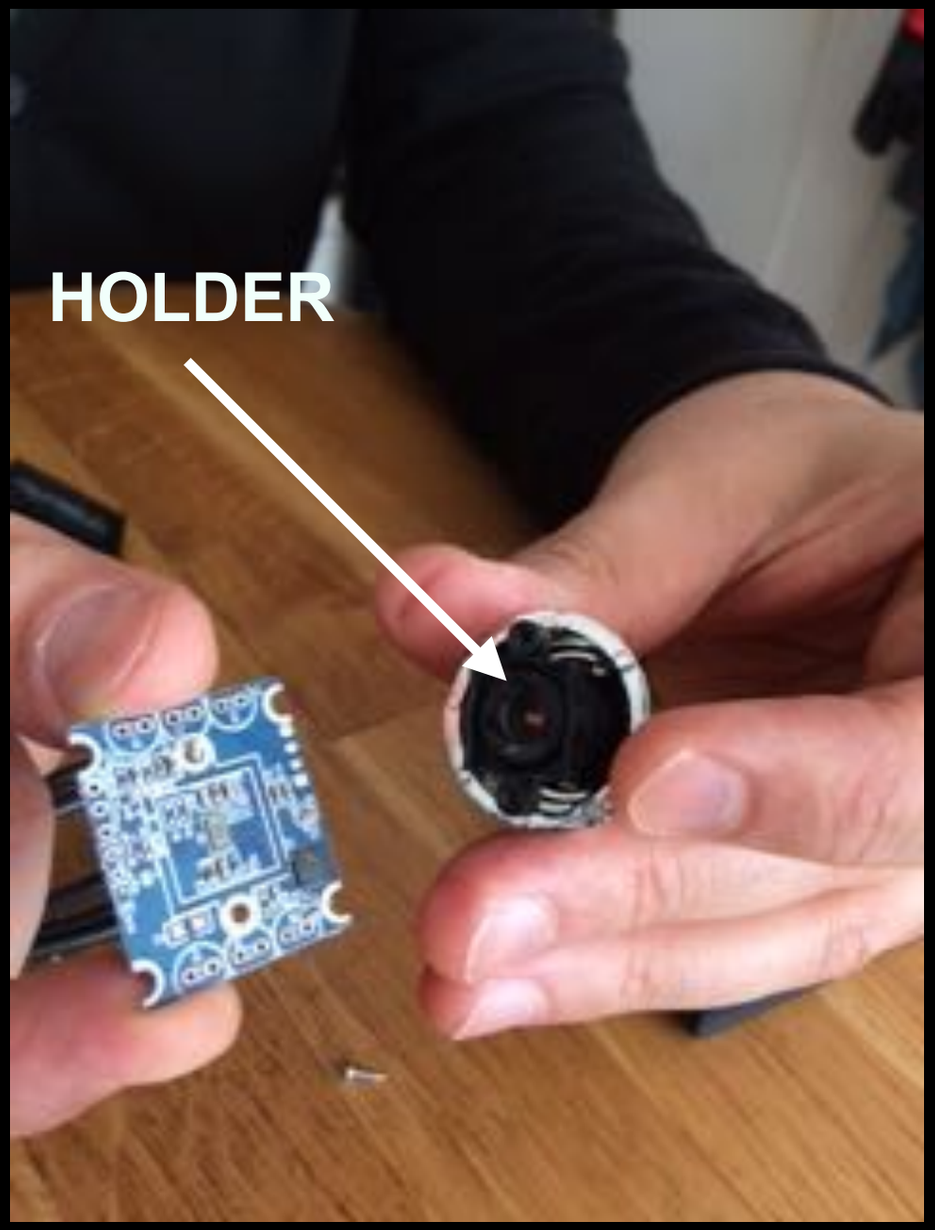
THE WEBCAM MICROSCOPE HACK

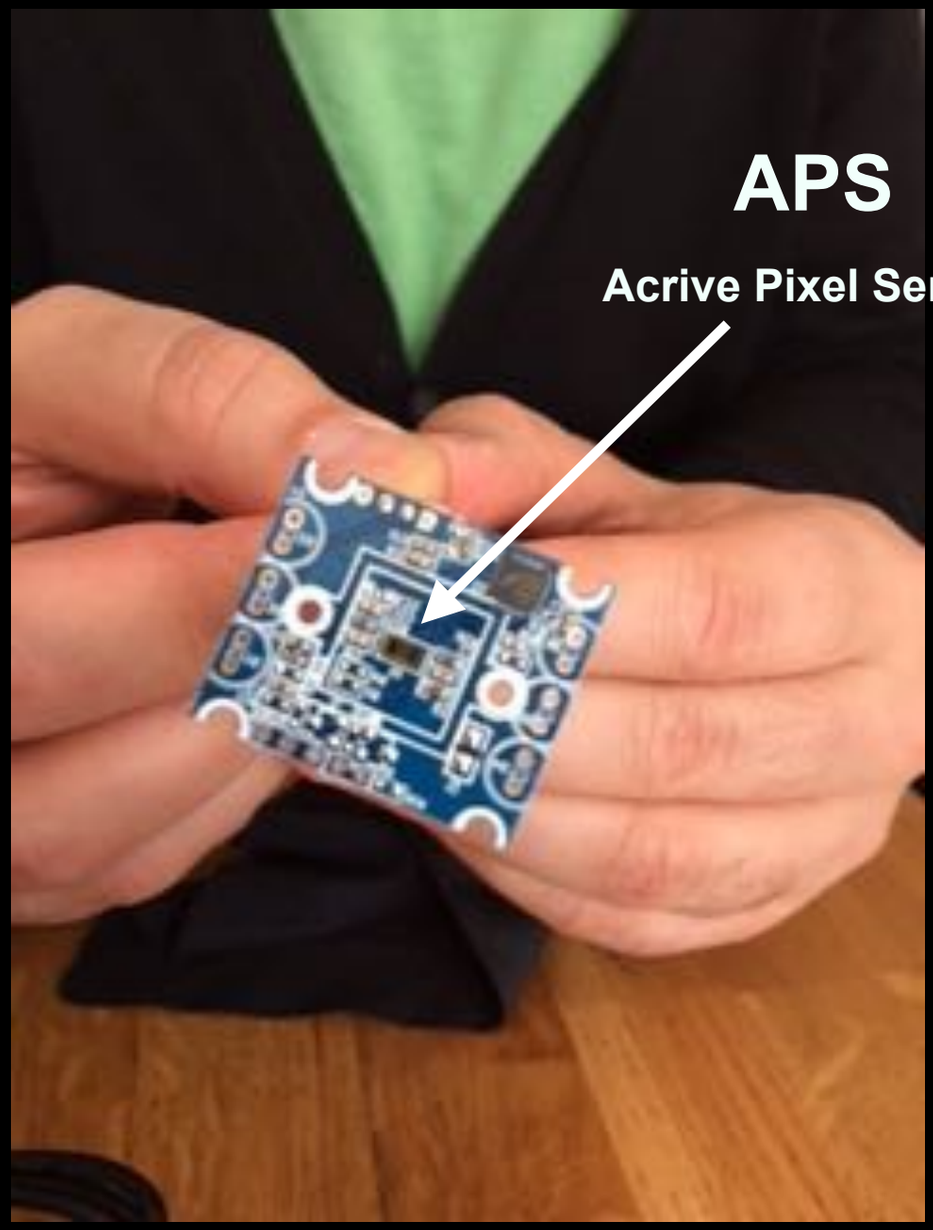
THE WEBCAM MICROSCOPE HACK

THE WEBCAM MICROSCOPE HACK



THE WEBCAM MICROSCOPE HACK





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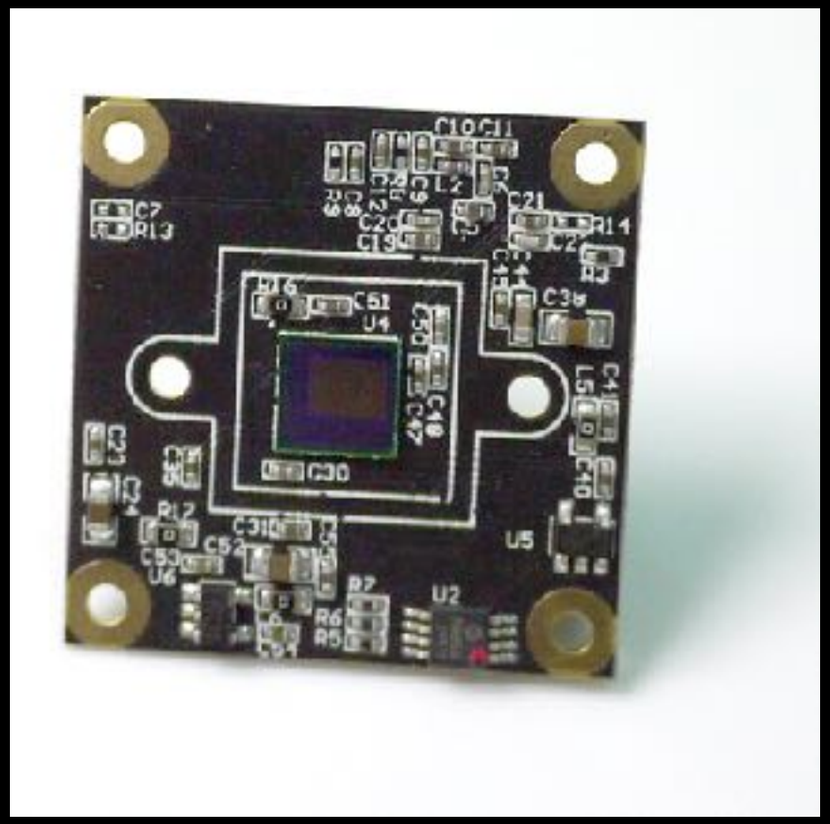
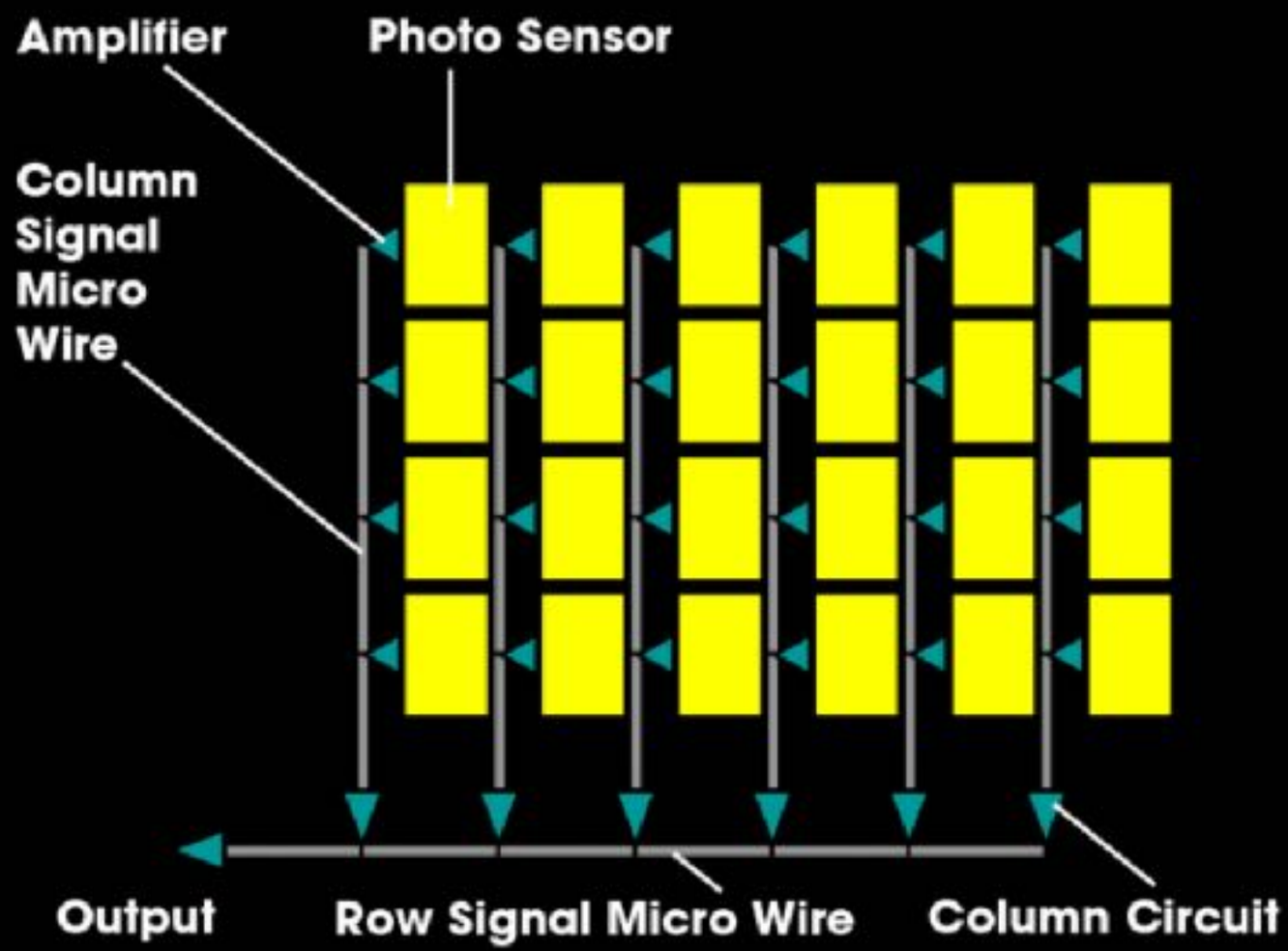


An active-pixel sensor (APS) is animage sensor consisting of an integrated circuit containing an array of pixel sensors, each pixel containing a photodetector and an active amplifier.

There are many types of active pixel sensors including the CMOS APS used most commonly in cell phone cameras, web cameras, most digital pocket cameras since 2010, and in most DSLRs.

Such an image sensor is produced by a CMOS (and is hence also known as a CMOS sensor), and has emerged as an alternative to charge-coupled device (CCD) image sensors.

THE WEBCAM MICROSCOPE HACK



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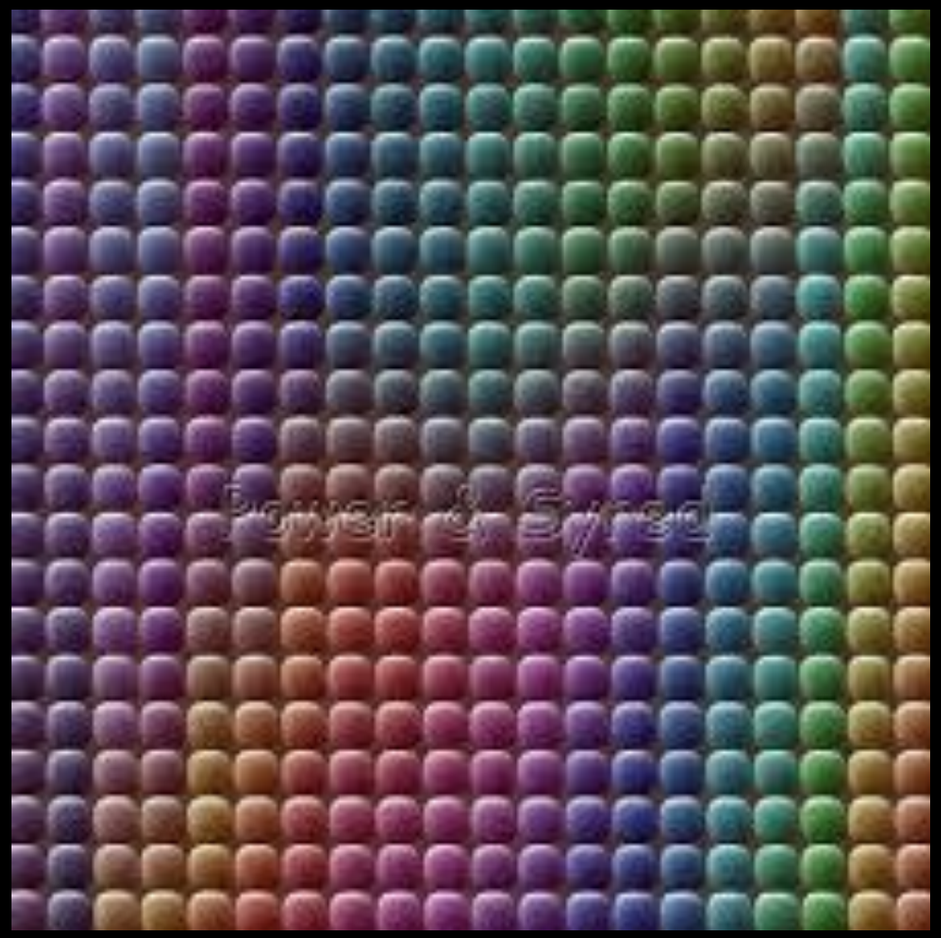
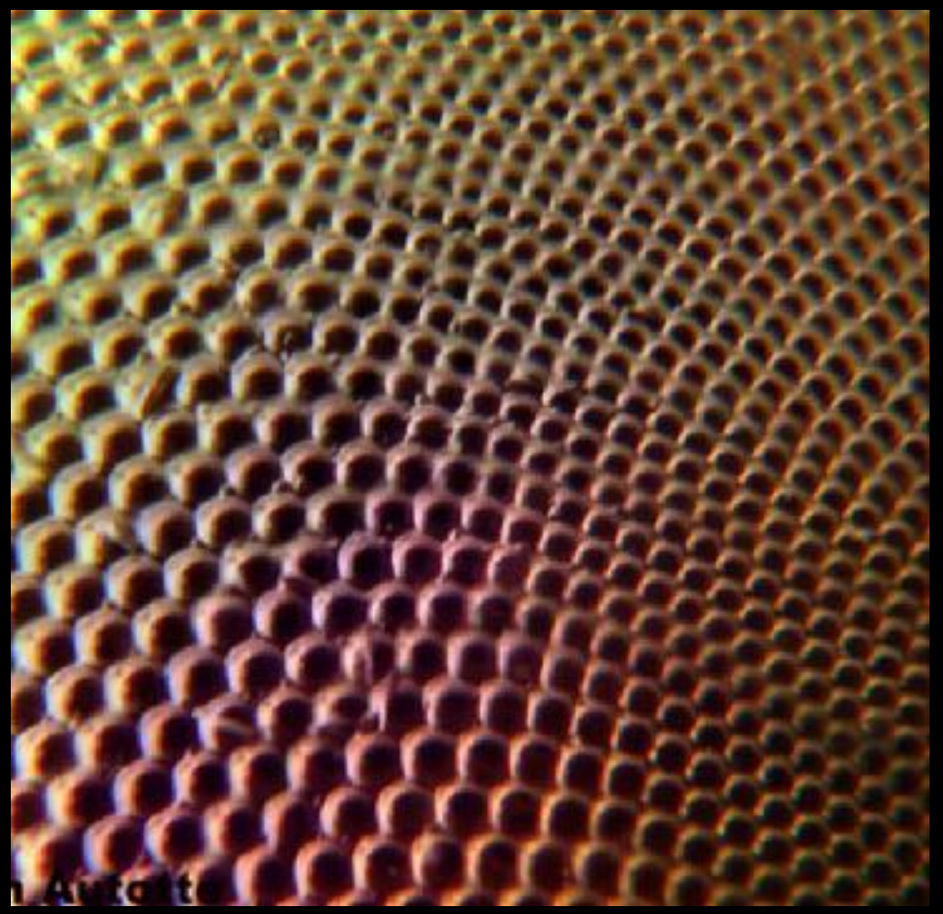
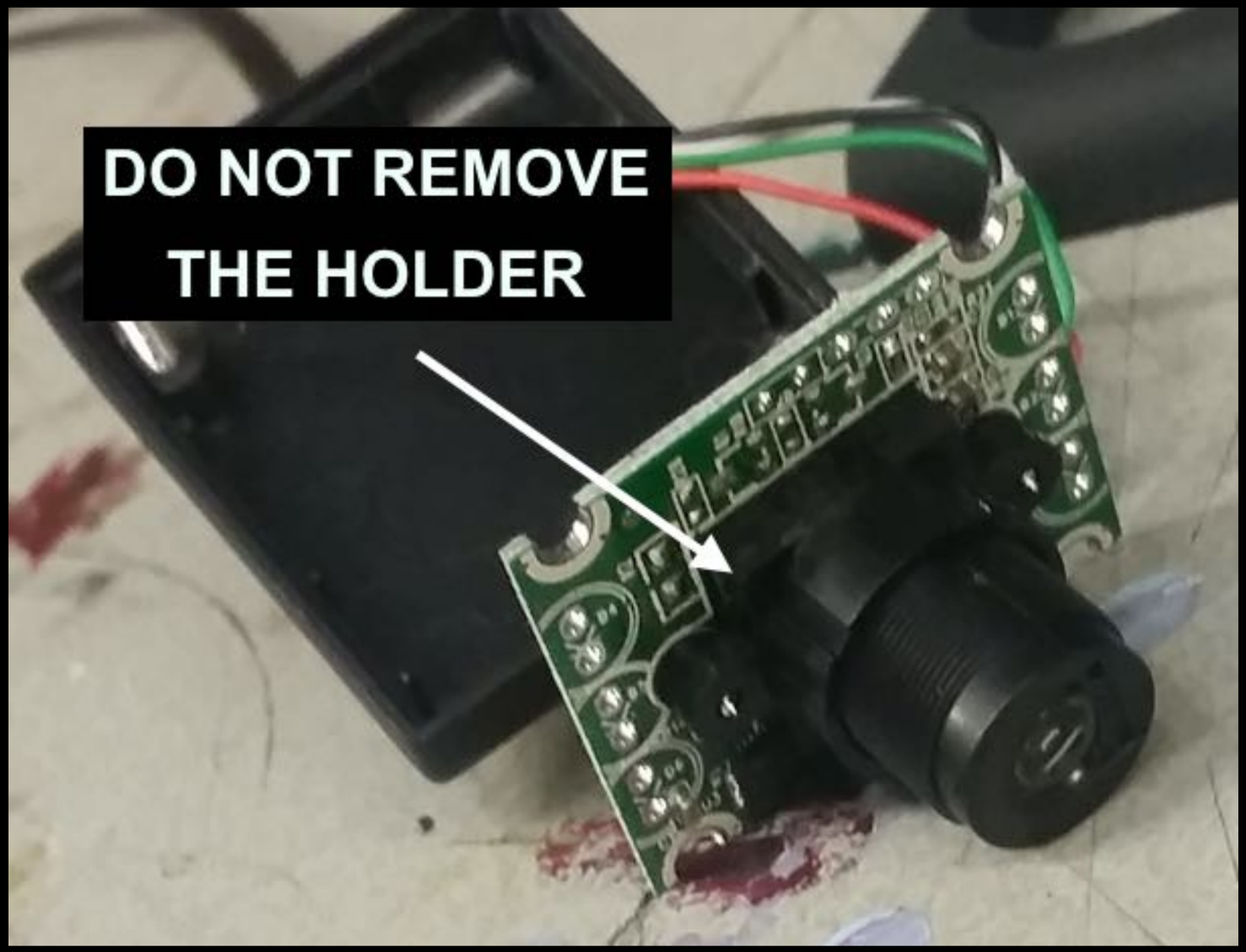


CMOS SENSOR



EYE OF A FLY

THE WEBCAM MICROSCOPE HACK



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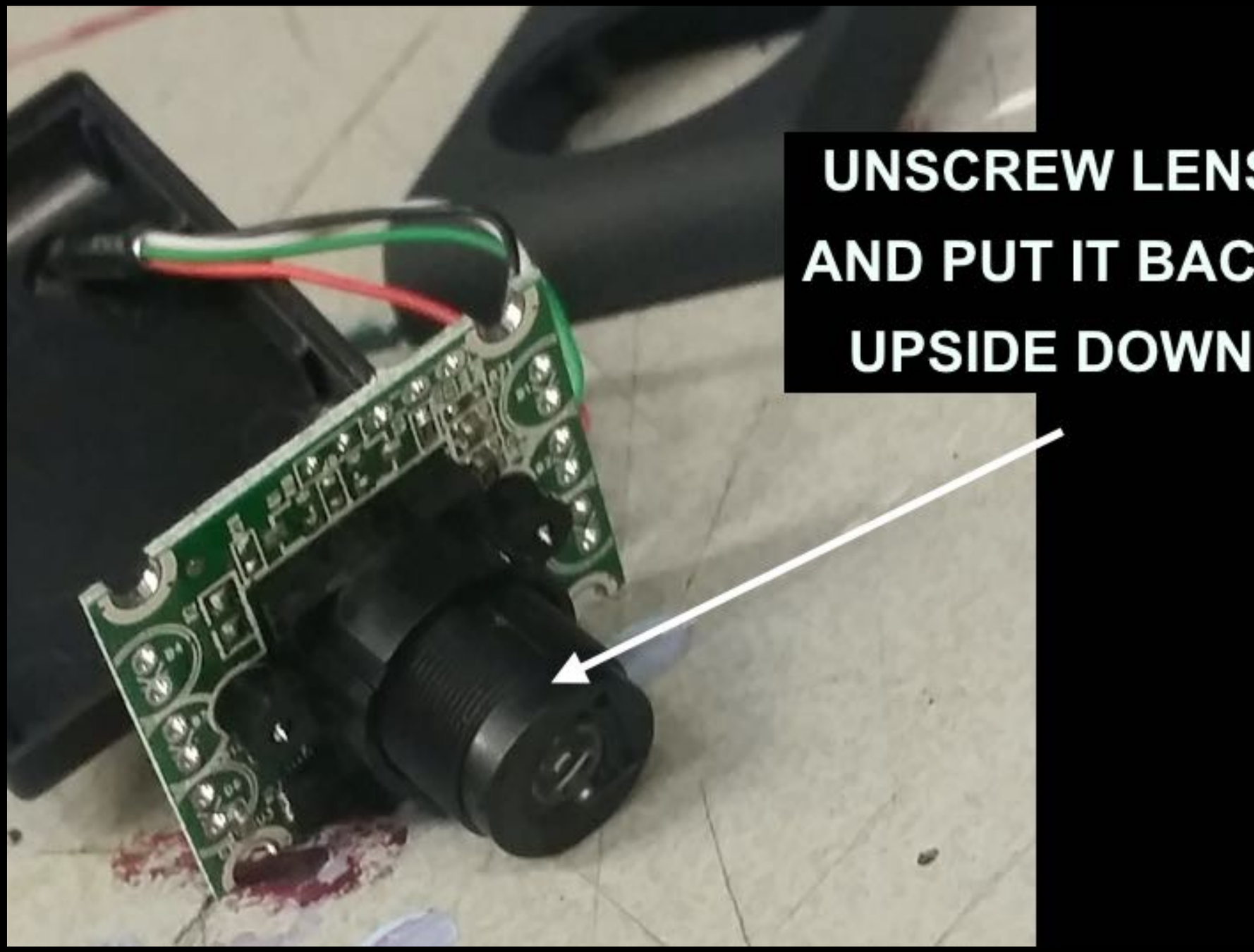

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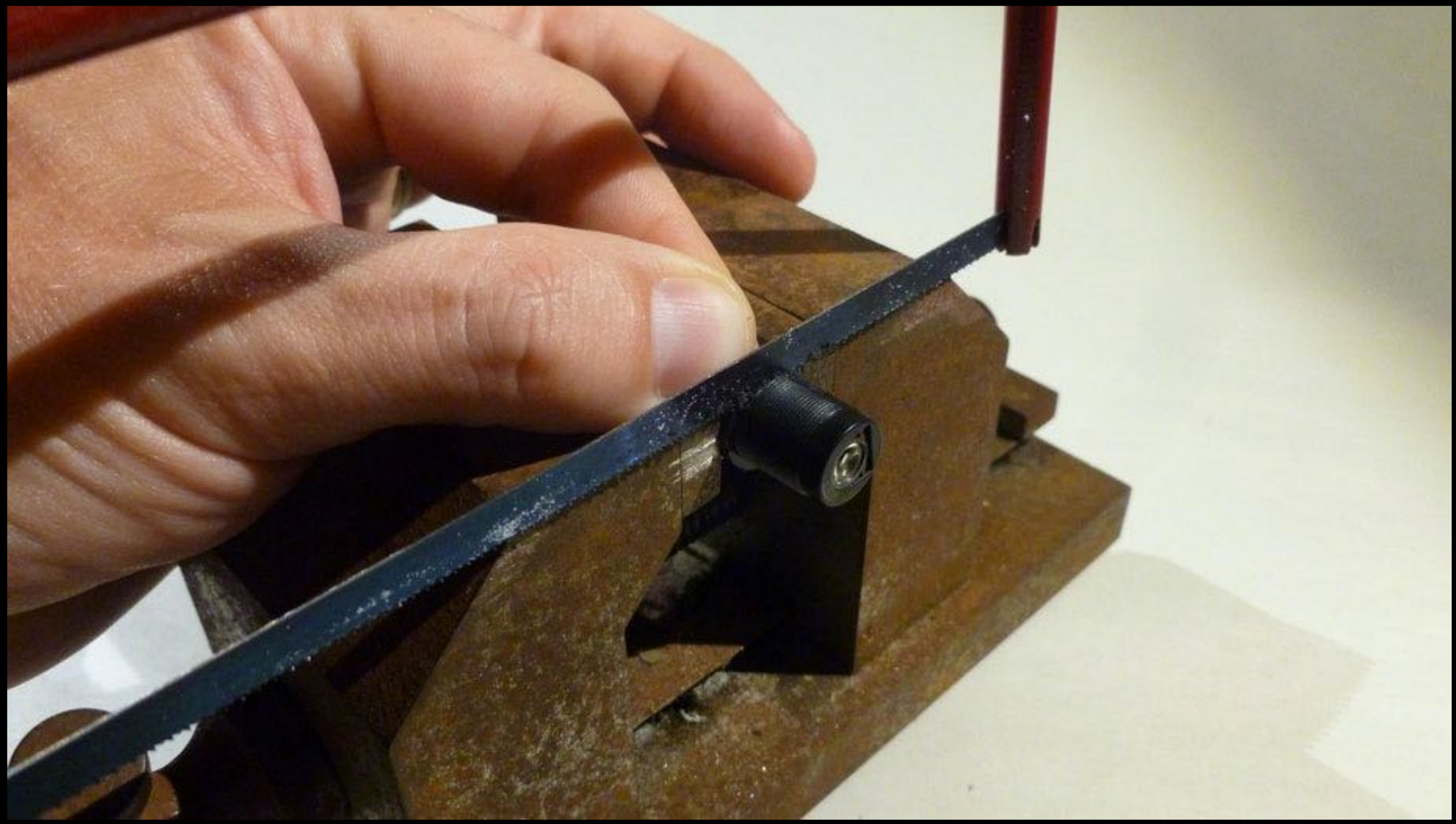

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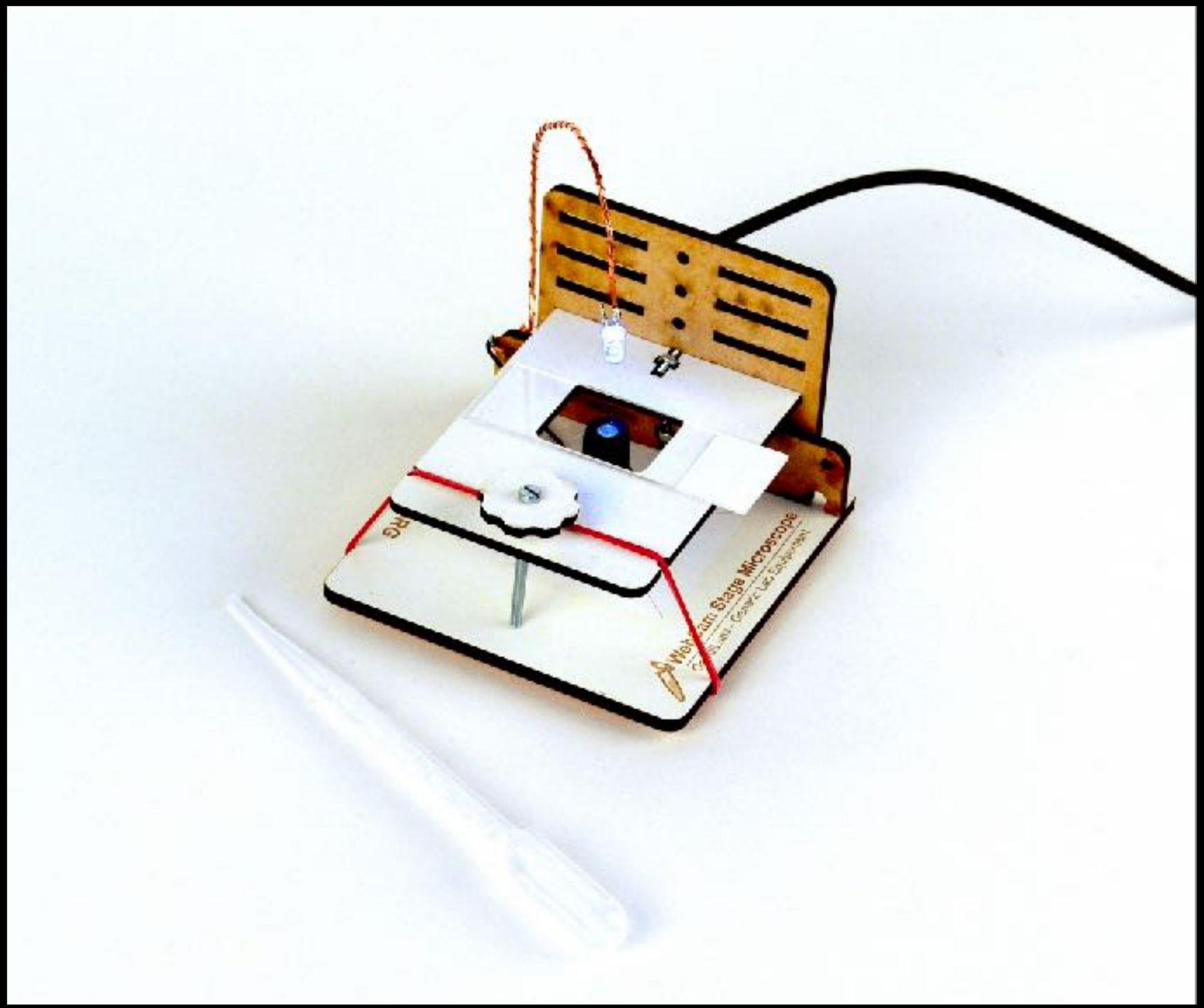

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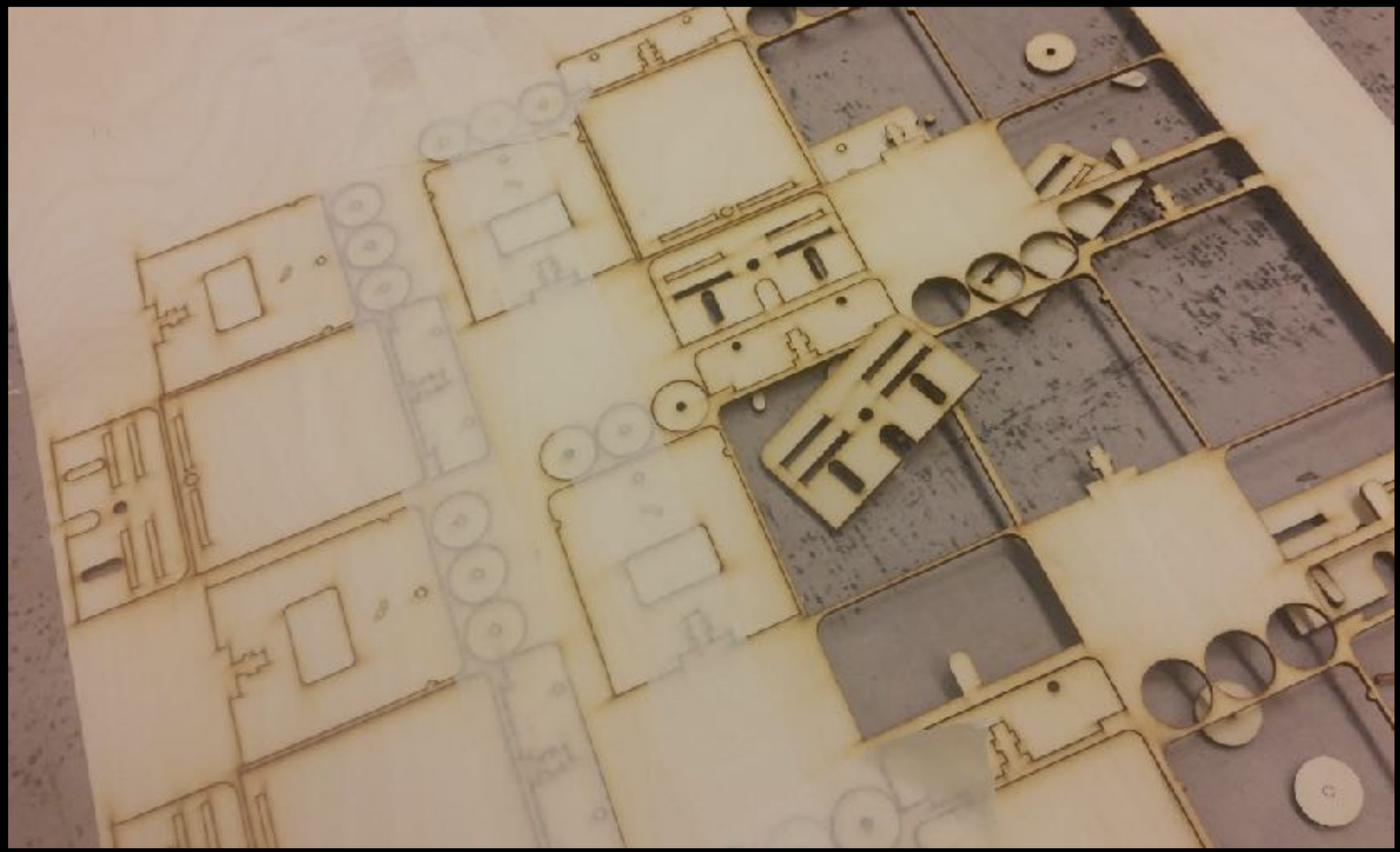
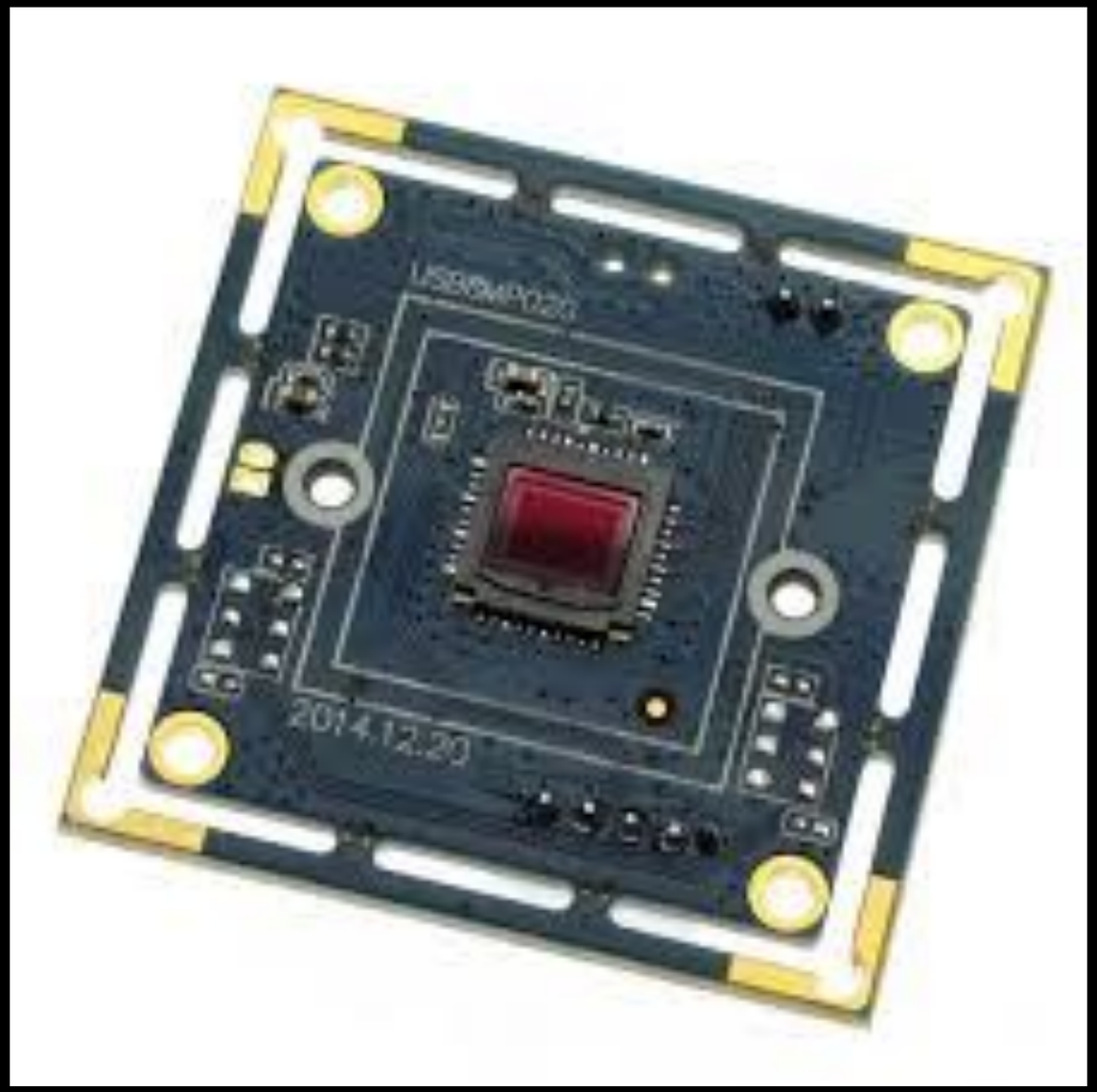


THE WEBCAM MICROSCOPE HACK

THE SMARTPHONE MICROSCOPE HACK

THE SMARTPHONE MICROSCOPE HACK

THE SMARTPHONE MICROSCOPE HACK



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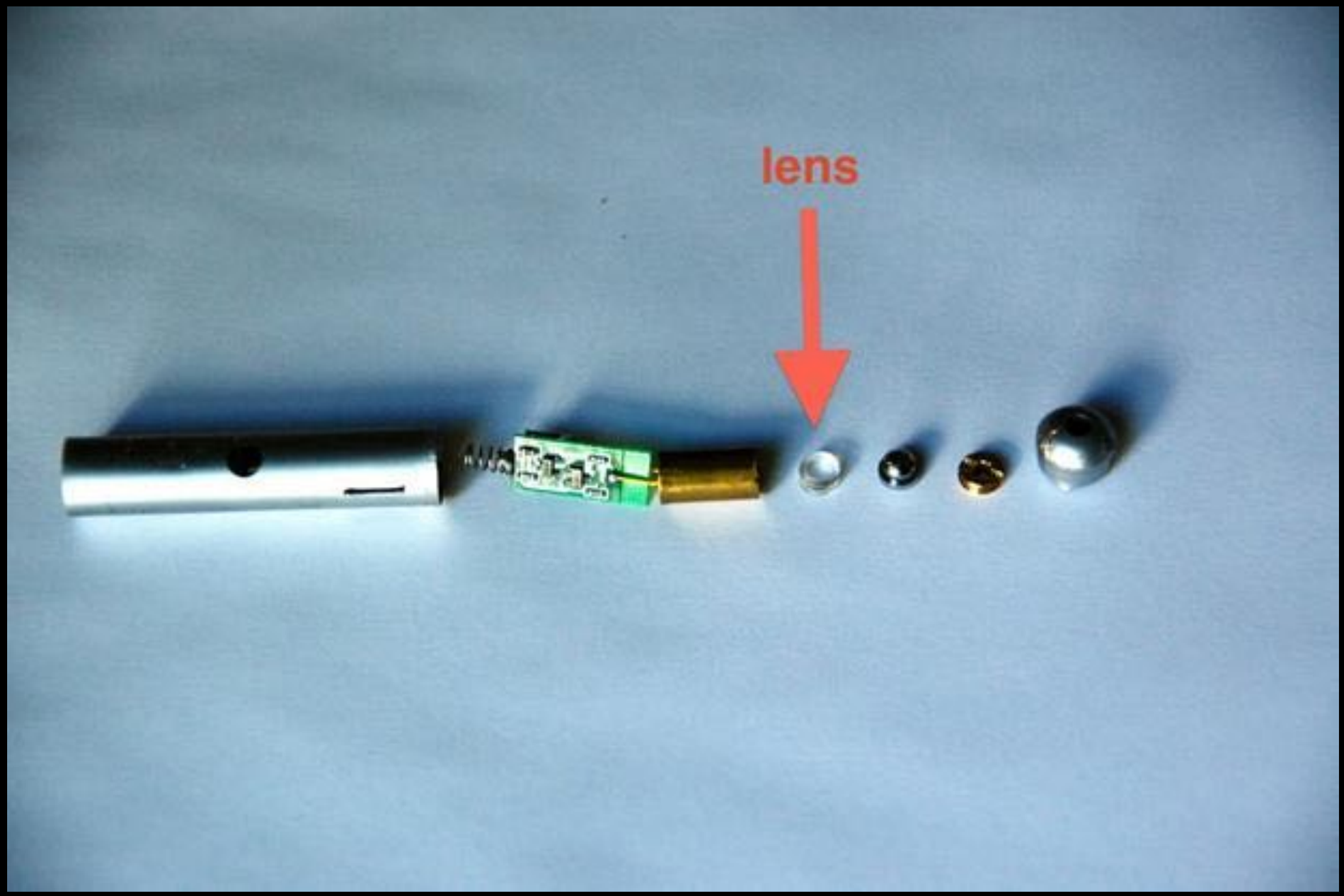

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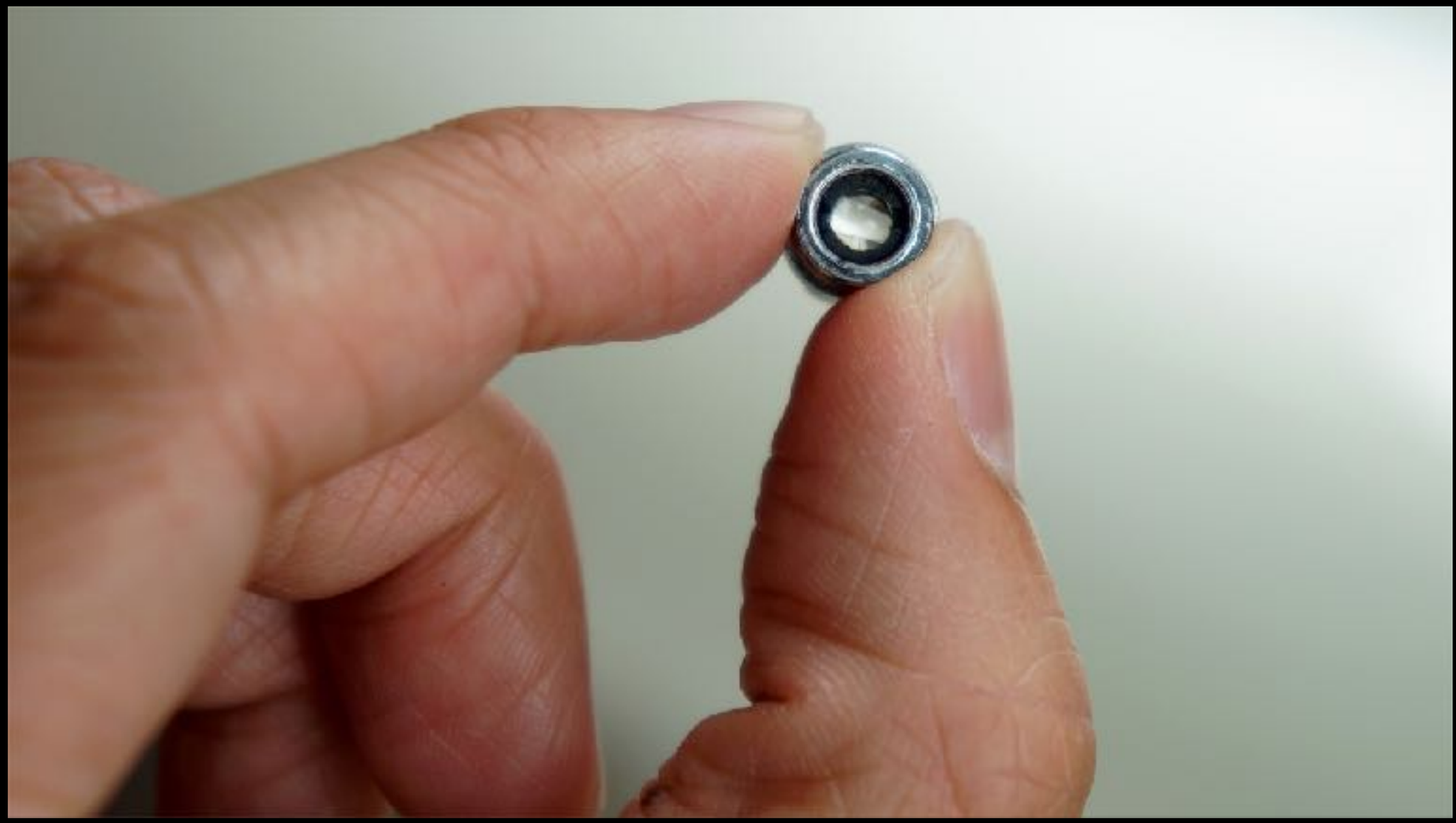


THE SMARTPHONE MICROSCOPE HACK

5pcs Plastic Laser Collimating Lens for 200nm-1100nm Diode Lasers M9*0.5 Holder

object state: **New**

Number of: 1 More than 10 available / 20 sold

Price: **US $4,61**

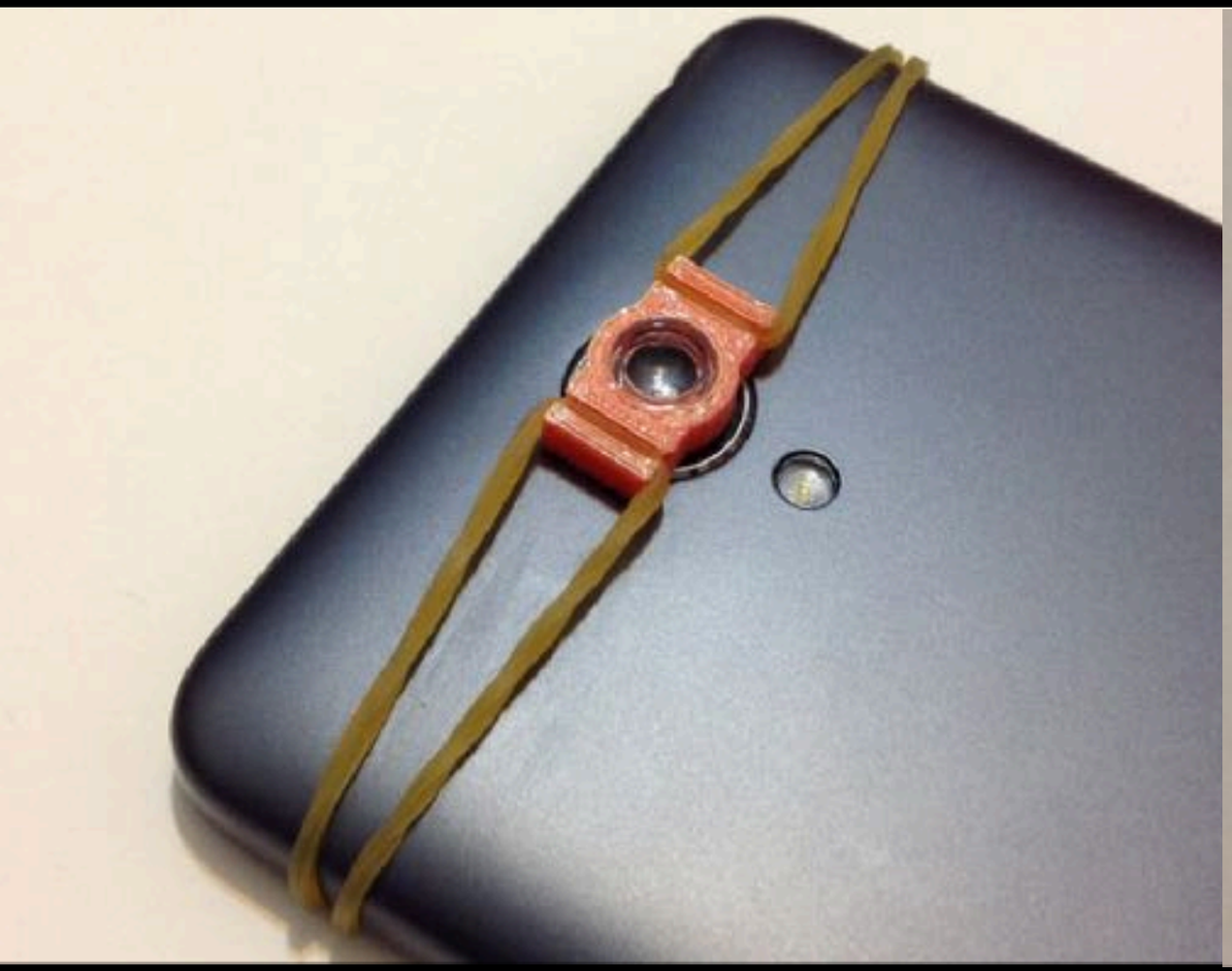
Ongeveer **EUR 4,23**

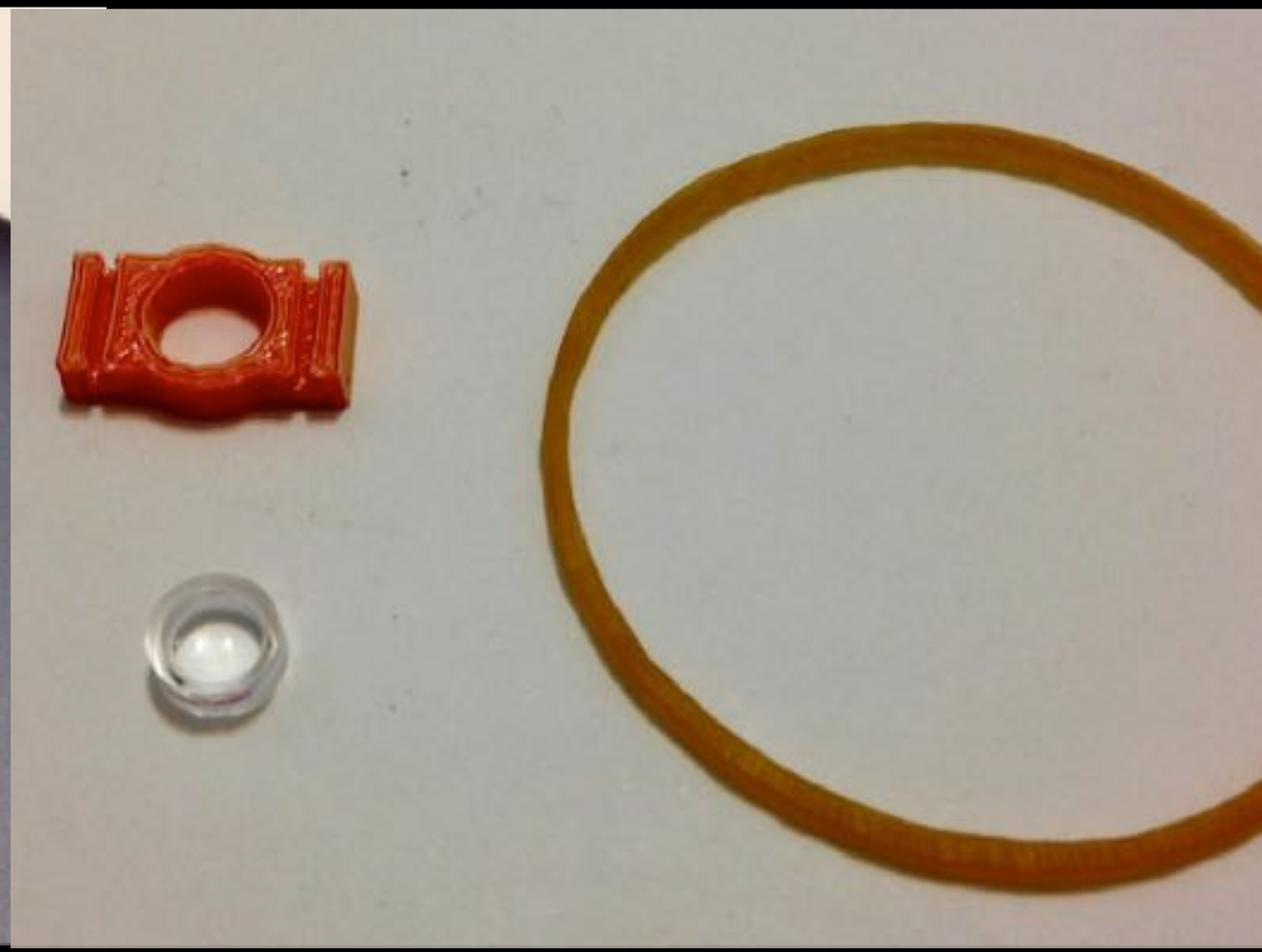
~~US$4.91~~ **Save 6 %**

Ebay NL - April 2022

THE SMARTPHONE MICROSCOPE HACK

THE SMARTPHONE MICROSCOPE HACK





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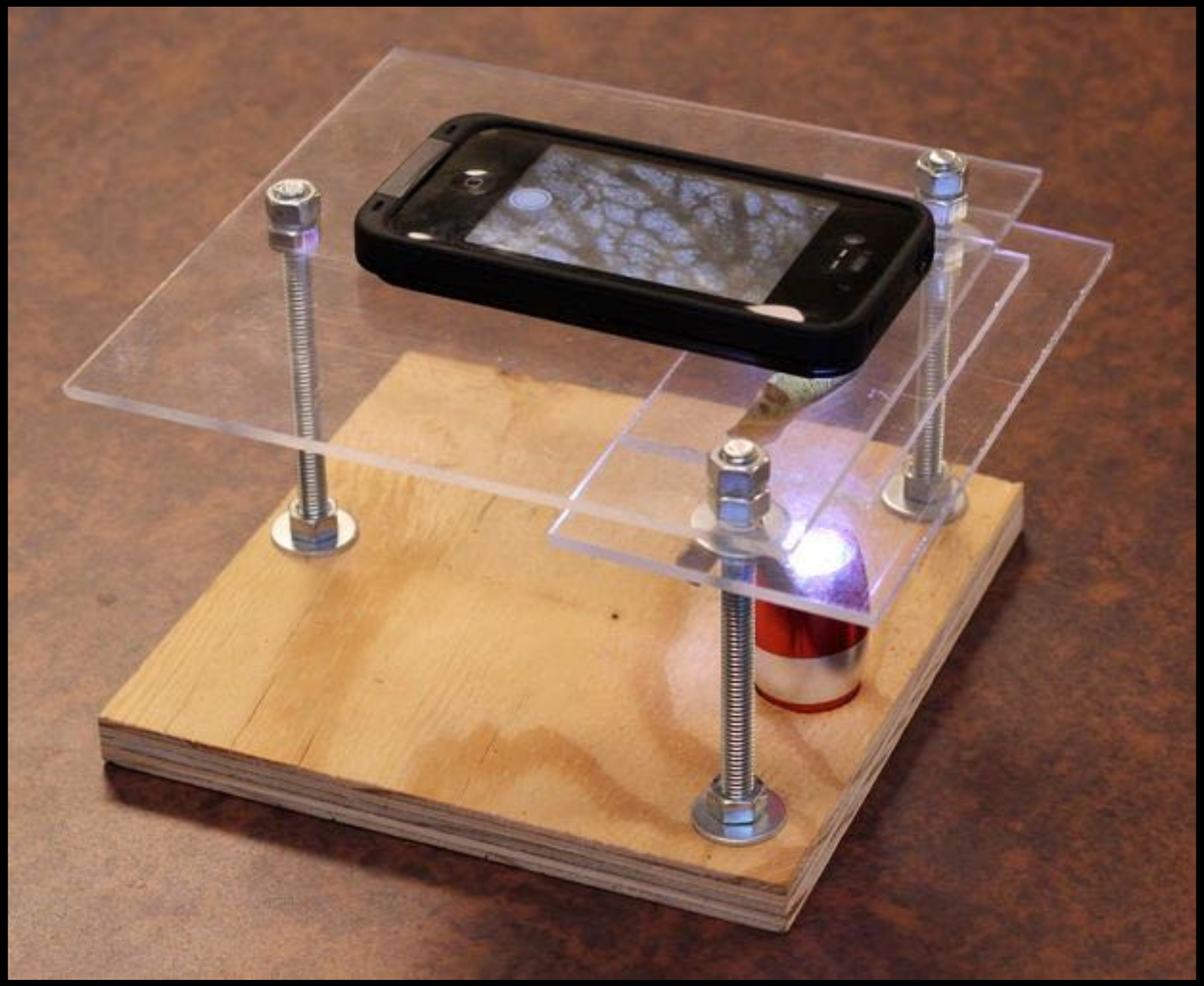

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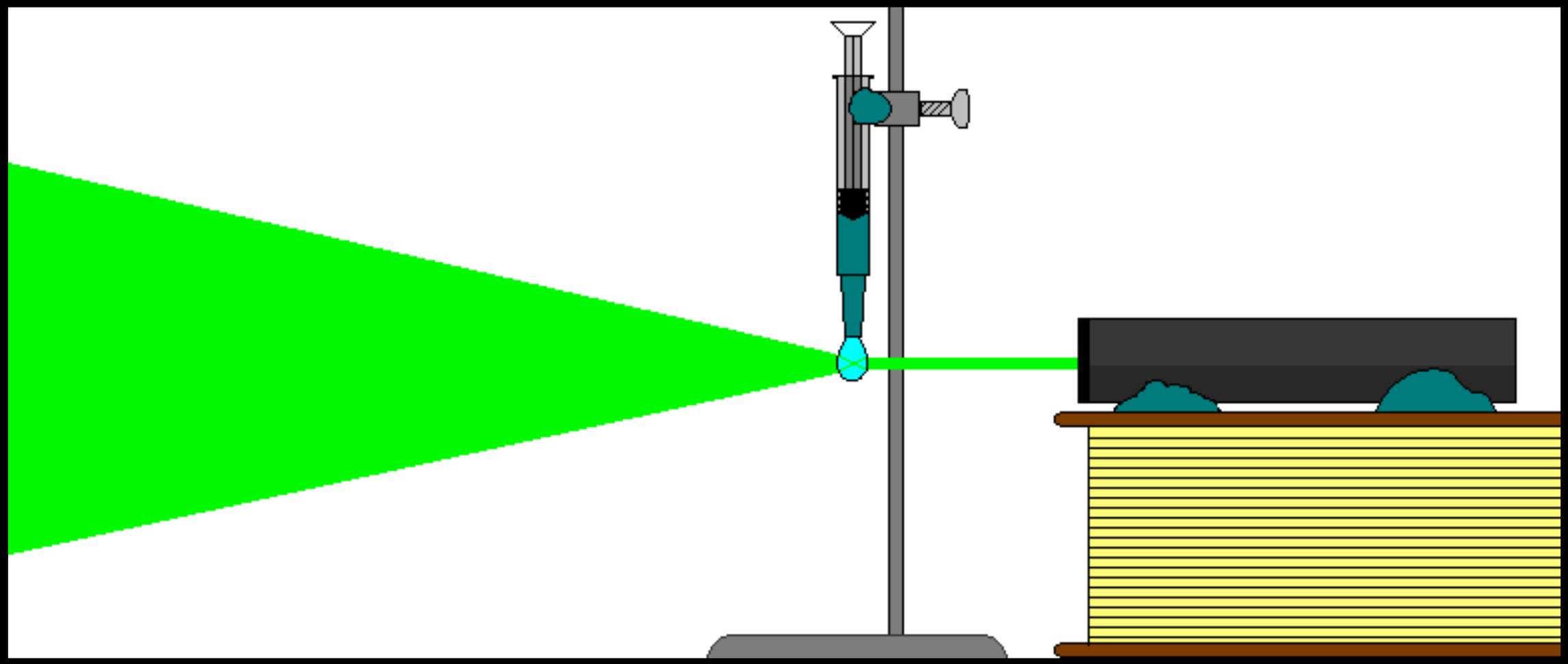
LASER MICROSCOPE

LASER MICROSCOPE



LASER MICROSCOPE

https://www.thingiverse.com/thing:2755871

FLYPI MICROSCOPE

A 3-D printable open source platform for fluorescence microscopy, optogenetics and accurate temperature control.

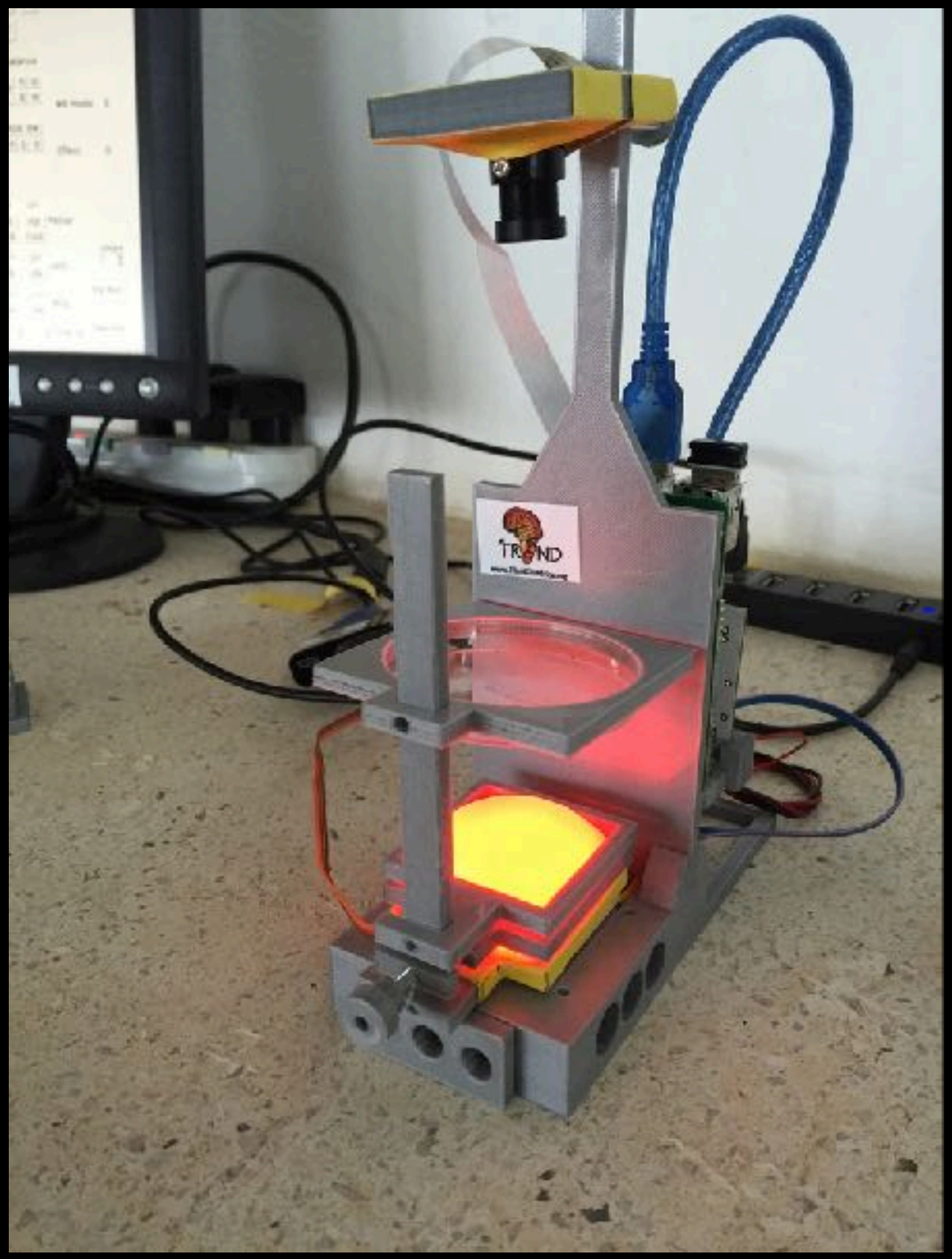
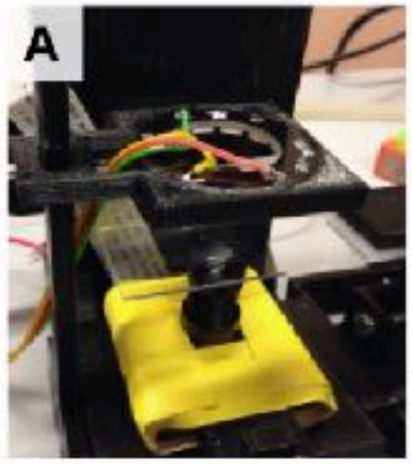
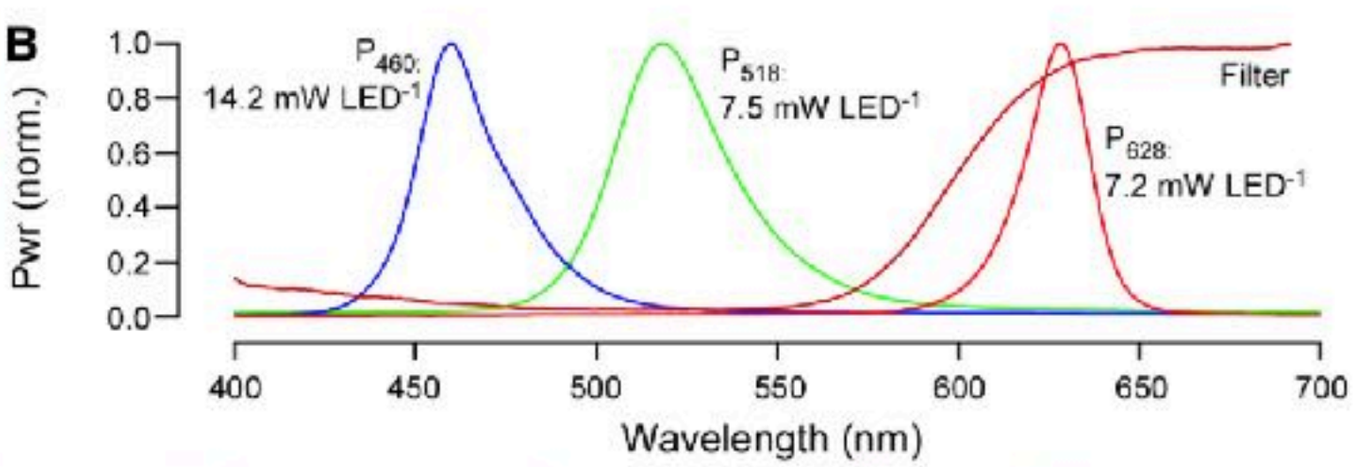
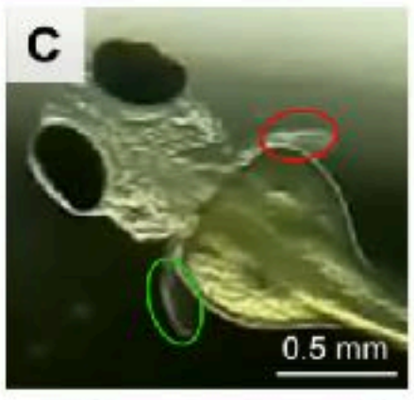
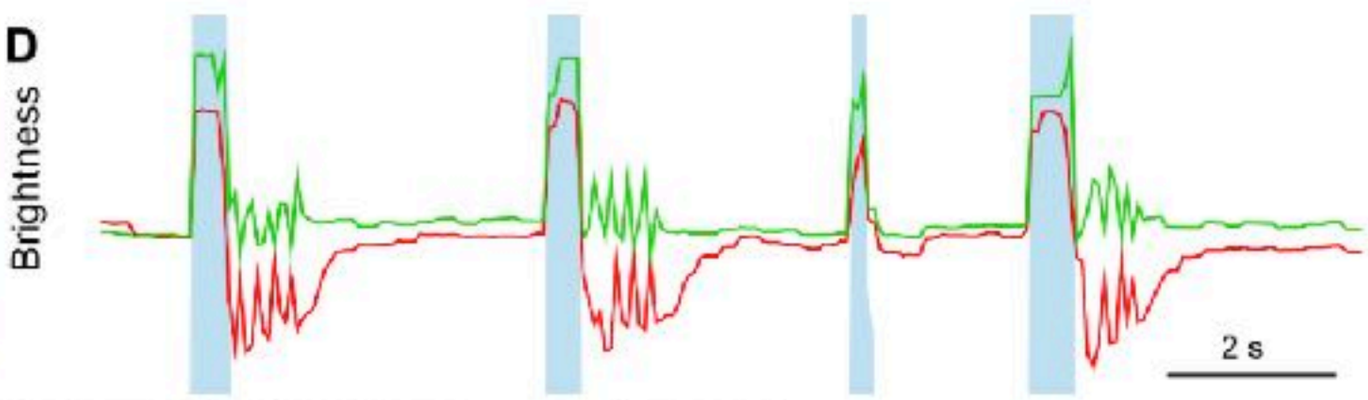


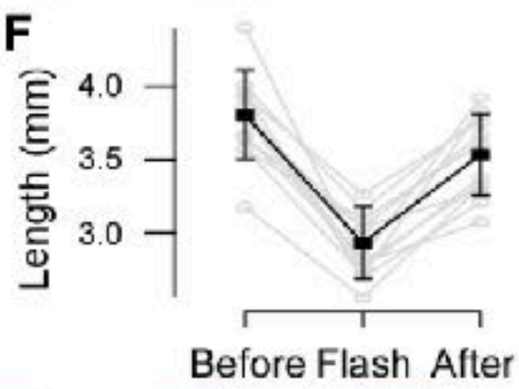
Figure 5 - Optogenetics

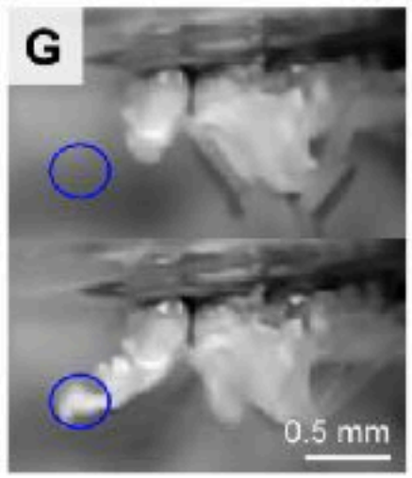


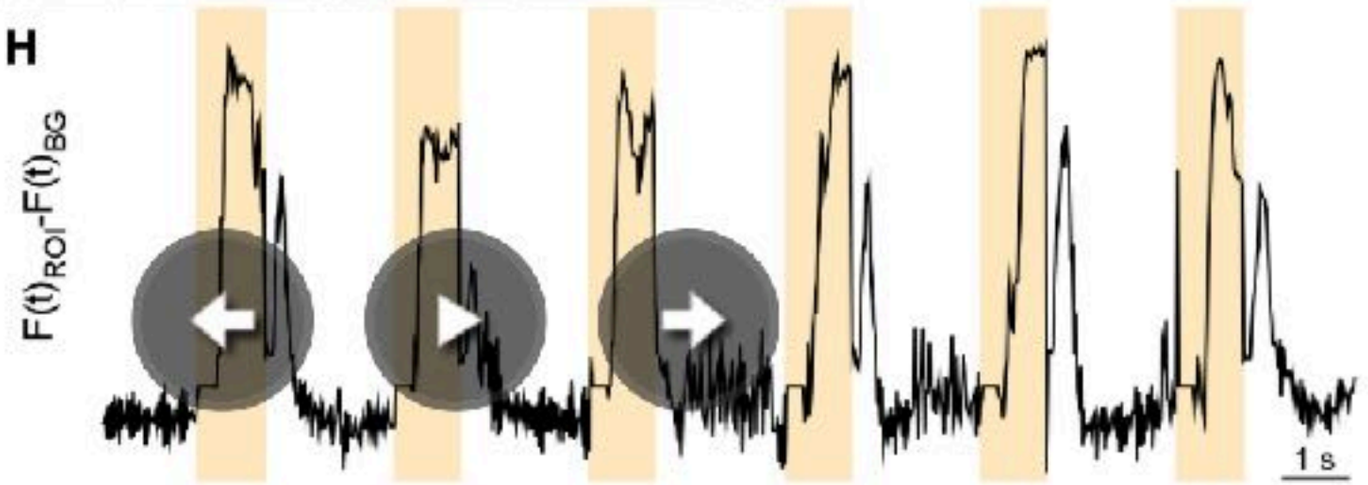




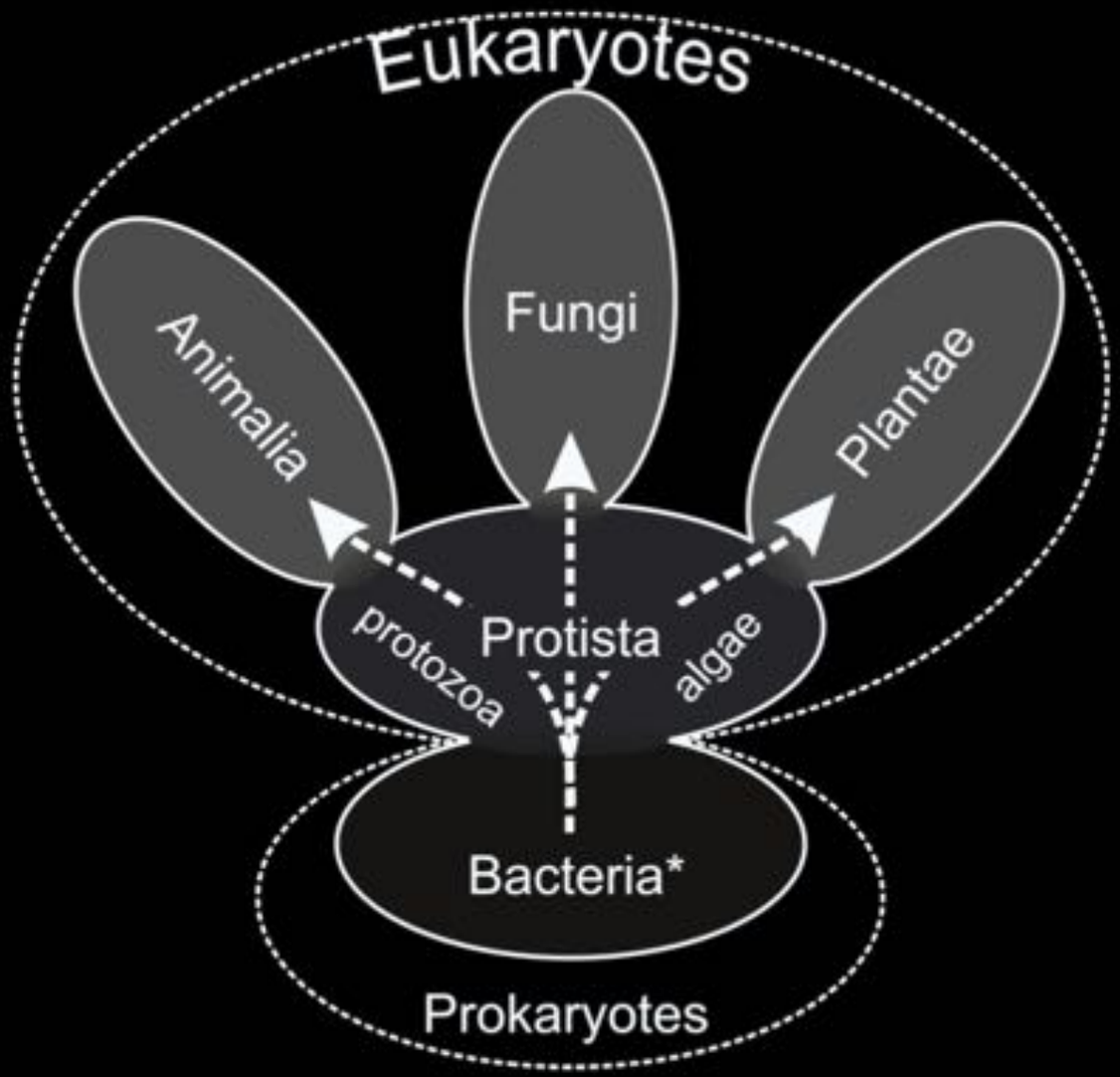








MICROORGANISMS



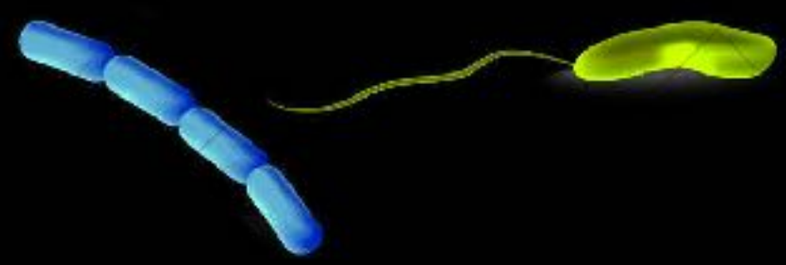
- **Prokaryotes**: simple cytoplasm with few internal structures (No internal organelles, such as a nucleus or mitochondria). Cells are very small. All Bacteria are prokaryotic.

- **Eukaryotes**: more complex cytoplasm with lots of internal organelles. Cells are generally much larger than prokaryotes. All life forms, except bacteria, are eukaryotic.

5 GROUPS OF MICROORGANISMS

1. **BACTERIA** (Kingdom Bacteria)

- **Prokaryotic cell structure**
- **Small cell size**
- **Lack internal organelles**
- **Common shapes are spheres (cocci) and rods (bacilli)**
- **Some form long filaments**
- **Some are photosynthetic (called ‘cyanobacteria’)**



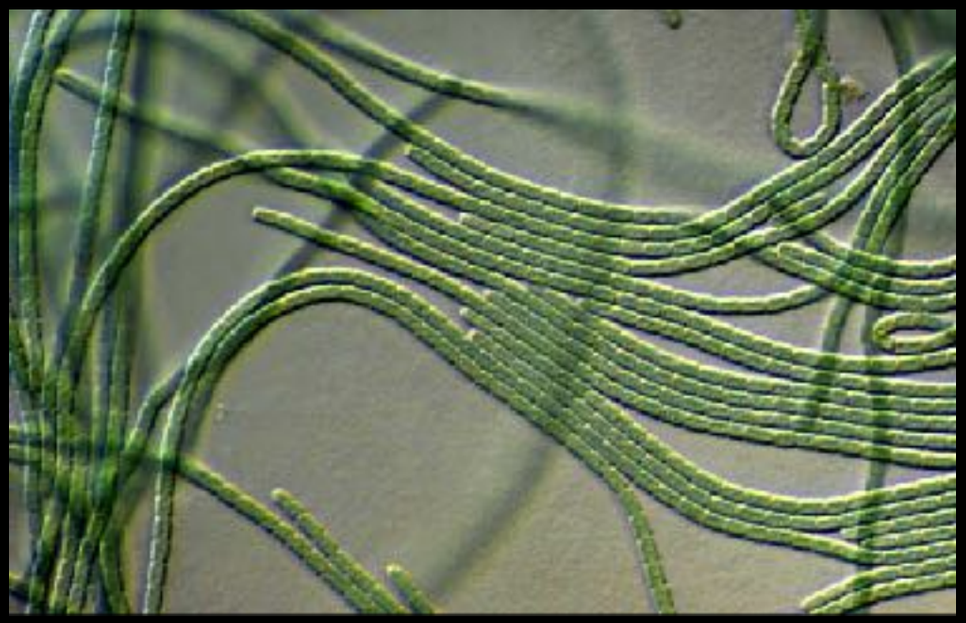
5 GROUPS OF MICROORGANISMS

1. **BACTERIA** (Kingdom Bacteria)

(both of these are photosynthetic cyanobacteria, and tend to have a bluish-green color)

• ***Oscillatoria*****:** occurs as long filaments, but the individual cells are very hard to discern.

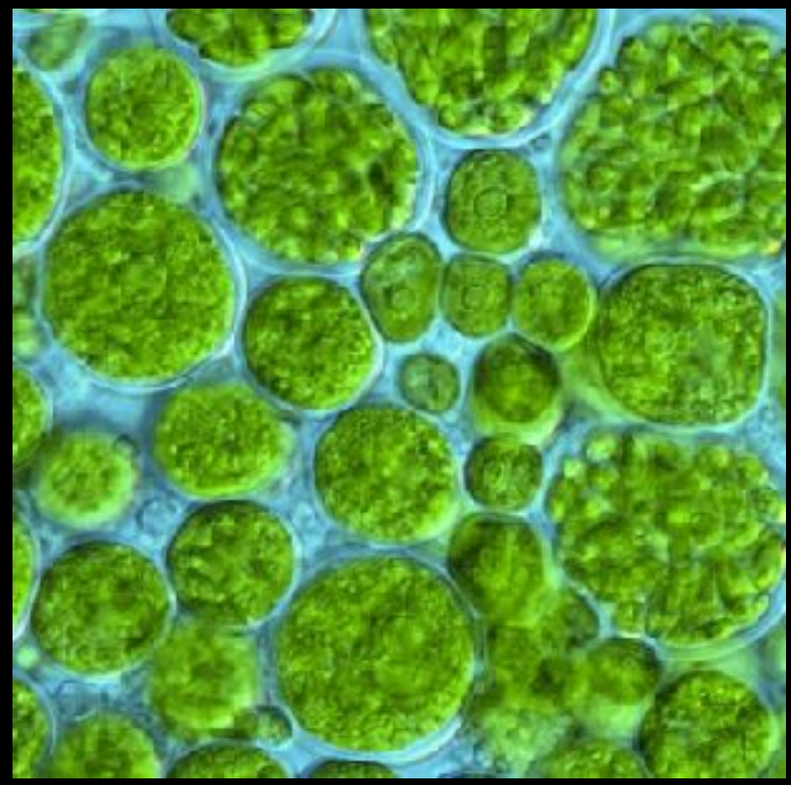
• ***Anabaena*****:** tends to occur in short strands of small spherical cells



5 GROUPS OF MICROORGANISMS

2. **ALGAE** (Kingdom Protista)

- **Photosynthetic and often green due to presence of chlorophyll**
- **Large, eukaryotic cell structure**
- **Internal organelles, including nuclei, chloroplasts and mitochondria**
- **Can occur as single cells, filaments, or cell colonies**



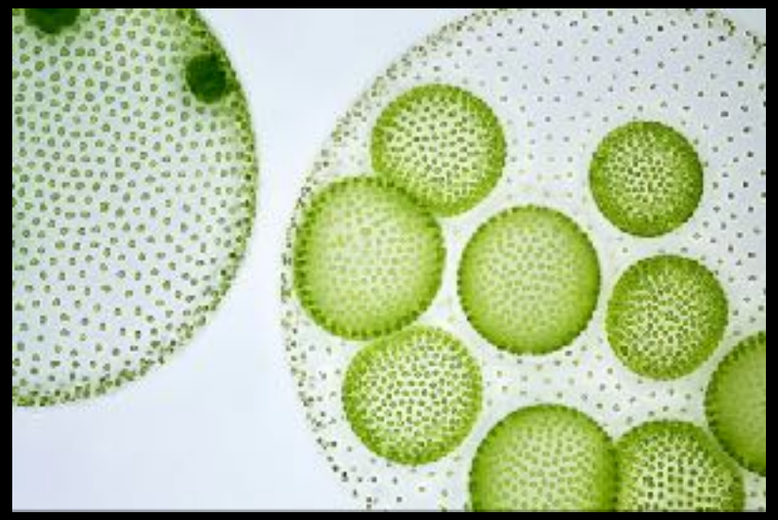
5 GROUPS OF MICROORGANISMS

2. **ALGAE** (Kingdom Protista)

***Euglena*:** is an example of a single-celled alga, that is motile by use of thin, hairlike flagella.

***Spirogyra*:** occurs as a long filament of cylindrical cells linked end-to-end. The chloroplast in *Spirogyra* has a fascinating spiral shape. Look for the faint cell walls that separate individual cells of the filament.

***Volvox*:** one of the most beautiful of algae, it occurs as a **colony** of cells arranged in a large hollow ball. The cells possess hair-like "flagella" that beat in unison to propel the colony through the water. As shown in the diagram above, small green *Volvox* cells make up the shell of a hollow sphere, and newly forming 'daughter colonies' appear as dark green cluster within it.



5 GROUPS OF MICROORGANISMS

3. **PROTOZOA** (Kingdom Protista)

- **Heterotrophic (not green)**
- **Eukaryotic cell structure**
- **Almost always unicellular**
- **Some motile using numerous cilia (similar to but smaller than flagella)**

5 GROUPS OF MICROORGANISMS

3. **PROTOZOA** (Kingdom Protista)

Paramecium: a very large motile protozoan

Vorticella: vase-shaped cell with a long stalk

Amoeba: cells lack a defined shape and move by flowing of cytoplasm

5 GROUPS OF MICROORGANISMS

4. **MICROSCOPIC ANIMALS** (Kingdom Animalia)

- **Heterotrophic (not photosynthetic)**
- **Multicellular, with tissues, organs and appendages of specific functions.**
- **Can be as small as single celled protozoa, or just visible to the unaided eye.**

5 GROUPS OF MICROORGANISMS

4. **MICROSCOPIC ANIMALS** (Kingdom Animalia)

- **Rotifers:** are no larger than many types of protozoa. Note that it has a distinct mouth opening and a clearly discernable internal digestive system.

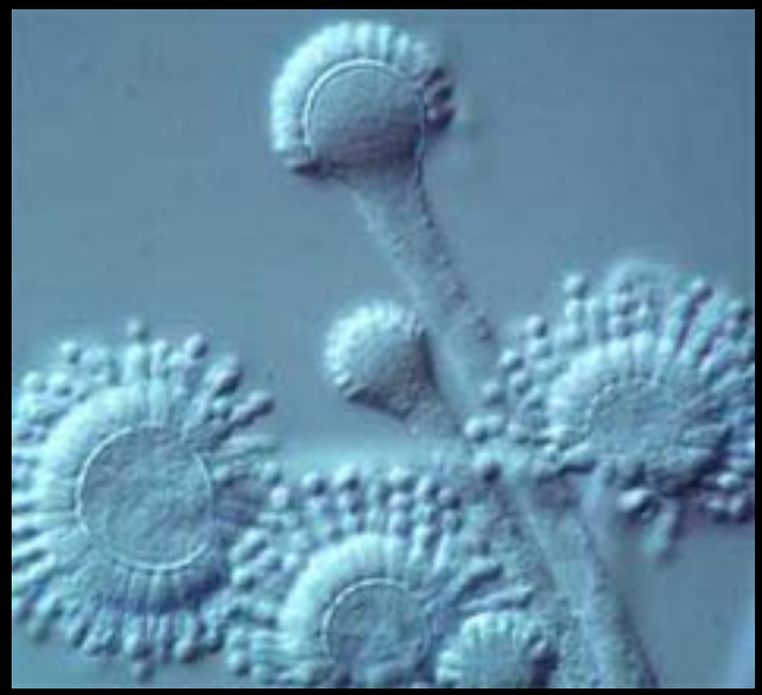
- ***Daphnia:*** related to crustaceans such as crabs and lobsters (notice the hard shell covering much of the body). When examined under the microscope (4x or 10x objective) the remarkable structural complexity of these animals can be seen.
The body possesses appendages that aid in swimming and gathering food.


Tardigrades can endure hellish temperatures well above water's boiling point and have been adapting to difficulty for 530 million years.
Tardigrades can take a bath in liquid helium and withstand temperatures as low as 1 degree above absolute zero—as low as you can go.
Tardigrades shrugged off all five global mass extinctions and are so successful they are likely to outlast us even if we destroy ourselves.
Tardigrades can enter a state of cryptobiosis, lie dormant for 100 years, and then come back to life with just a single, tiny drop of water.
Tardigrades can survive the vacuum of outer space and handle six times the steel-crushing pressure of the ocean's deepest point.
Tardigrades are able to tolerate 500,000 rads of ionizing radiation, hundreds of times higher than the lethal dose for a tender human.
4. MICROSCOPIC ANIMALS (Kingdom Animalia)
TARDIGRADE

5 GROUPS OF MICROORGANISMS

4. **FUNGI** (Kingdom Fungi)

- **Heterotrophic (not photosynthetic)**
- **Occur as long filamentous cells (molds) or spherical cells (yeasts)**
- **Reproduce with the production of small spherical spores**

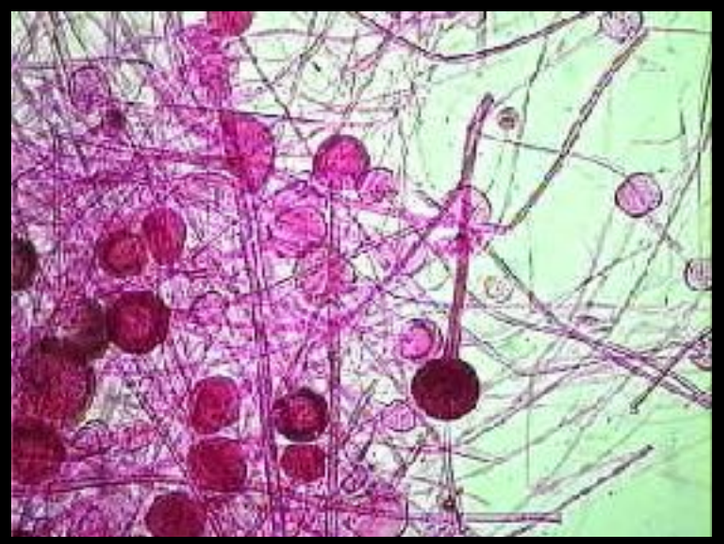


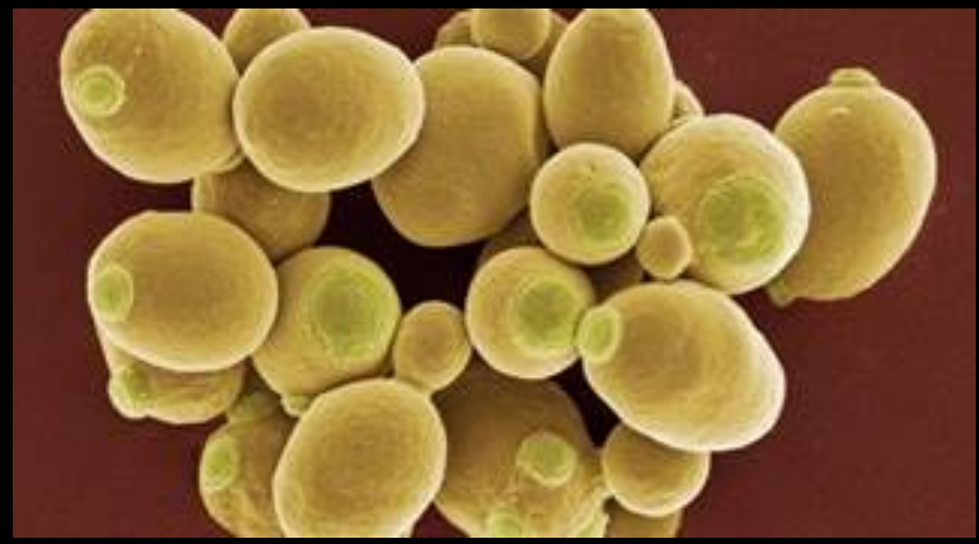
5 GROUPS OF MICROORGANISMS

4. **FUNGI** (Kingdom Fungi)

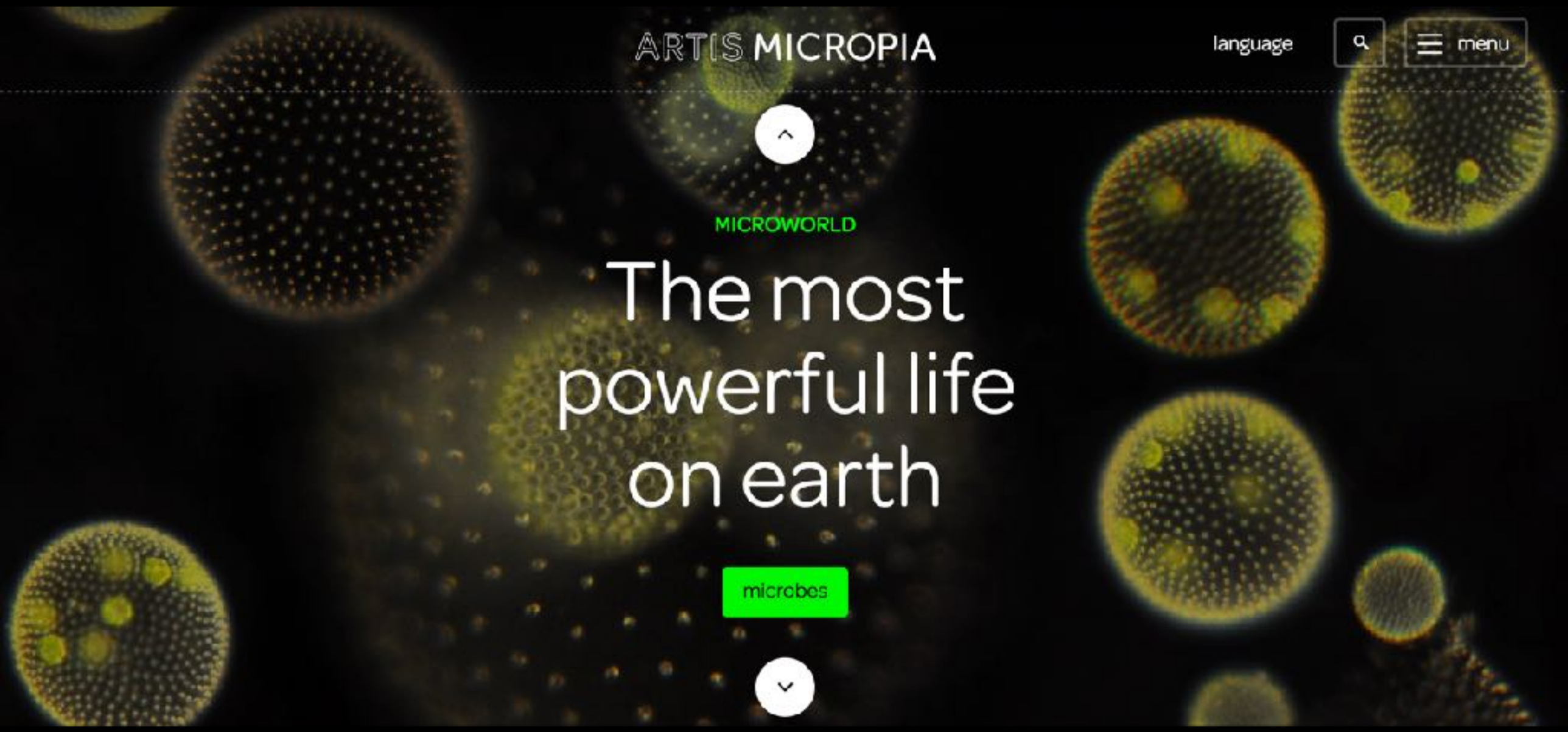
- ***Rhizopus*: an example of a mold-type fungus. The cells occur as long filaments (strands). A culture may also contain many spherical spores and stalked 'sporangia' on which the spores form.**

- **Bakers yeast (*Saccharomyces*)*:* fungi that form spherical cells are called 'yeasts'. *Saccharomyces* is the genus used in the baking and brewing industries. They reproduce by forming small cells that bud off of the larger cells.**





www.micropia.nl



MICROSAFARI

it’s here!!

WATER BEAR DONT CARE

FIELD TRIP - COLLECTING SPECIMEN

FIELD TRIP - COLLECTING SPECIMEN

FIELD TRIP - COLLECTING SPECIMEN

FIELD TRIP - COLLECTING SPECIMEN

FIELD TRIP - COLLECTING SPECIMEN

10 Microorganisms You Can Find in Drinking Water

There are invisible monsters living in your tap water, creatures that swim and multiply by the billions inside every drop of brisk, refreshing water you slurp down your gullet, tiny demons that…well, okay, they're actually not all that bad.

All water has bacteria and protozoans to some extent, most of them completely harmless.

But once you see what they look like up close and personal, you might never get the image out of your head.

https://listverse.com/2013/04/12/10-microorganisms-you-can-find-in-drinking-water/

CRYSTALS (under the microscope)