Pathology

Module B2.1

Practical Class

Maryse Fiche, Audrey Baur-Chaubert, and Dominique Sandmeier participated in the design of this session.

Welcome

to the Pathology practical classes program.

Please follow the powerpoint guide!

Learning Objectives

After this first class

You should be able to:

- Define Pathology,
- Observe a gross specimen,
- Explain the steps to the realization of a tissue section,
- Compare a normal tissue and a diseased tissue,
- And find in the textbook information pertaining to the lesion you observe on gross specimen and tissue sections.

The pathologists teaching this laboratory session are :

Drs ..

from the Institut Universitaire de Pathologie

The Micropolis classes are based on a **powerpoint file**

that contains empty sections, to be filled in

For example :

. **Answer a question** (write text)

. **Find an illustration** :

-a photograph of a tissue section taken using your ***microscope***

-A figure, table,.. From the ***Robbins*** textbook

or other sources that will be indicated to you.

This session comprises **4 steps**.

The time recommended for each step is indicated (just follow the power point guide).

You can keep your work at the end of the session.

A *corrected* file will be available.

Step 1:
Introduction to Pathology

Recommended time : approximately 15 minutes

Step 1:

Diseases

Pathology

The Robbins textbook

Pathology laboratory classes

You have known of ill people.

From **which diseases** did they suffer?

Find in your small group 4 examples of disease.

- disease 1 :
- disease 2 :
- disease 3 :
- disease 4:

Compare

The sample of diseases that you have identified

With this ranking of the diseases sources of death in the USA (in 2002)

FORMAL NAME	INFORMAL NAME	% ALL DEATHS
(1) Diseases of the heart	heart attack (mainly)	28.5%
(2) Malignant neoplasms	cancer	22.8%
(3) Cerebrovascular disease	stroke	6.7%
(4) Chronic lower respiratory disease	emphysema, chronic bronchitis	5.1%
(5) Unintentional injuries	accidents	4.4%
(6) Diabetes mellitus	diabetes	3.0%
(7) Influenza and pneumonia	flu & pneumonia	2.7%
(8) Alzheimer's Disease	Alzheimer's senility	2.4%
(9) Nephritis and Nephrosis	kidney disease	1.7%
(10) Septicemia	systemic infection	1.4%
(11) Intentional self-harm	suicide	1.3%
(12) Chronic Liver/Cirrhosis	liver disease	1.1%
(13) Essential Hypertension	high blood pressure	0.8%
(14) Assault	homicide	0.7%
(15) All other causes	other	17.4%

Source: National Vital Statistics Report, Volume 53, Number 5 (October 2004)]

Step 1:

Diseases

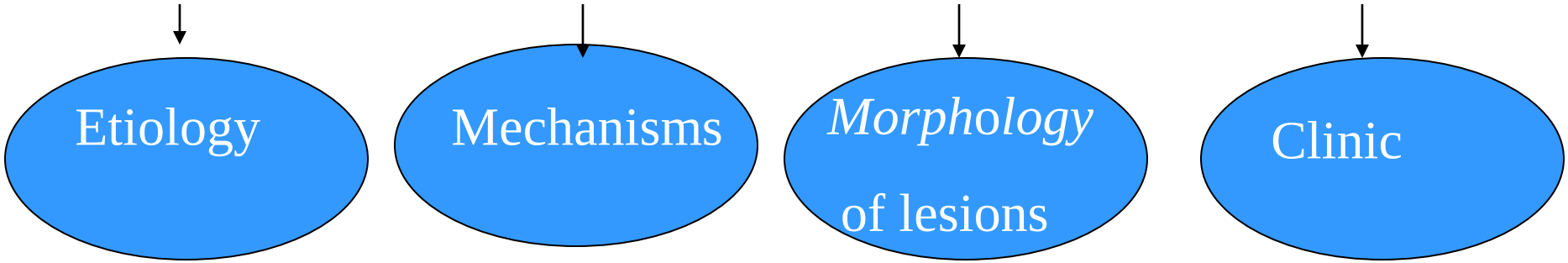
Pathology

The Robbins textbook

Pathology laboratory classes

Pathology:

The study of diseases includes these 4 aspects:

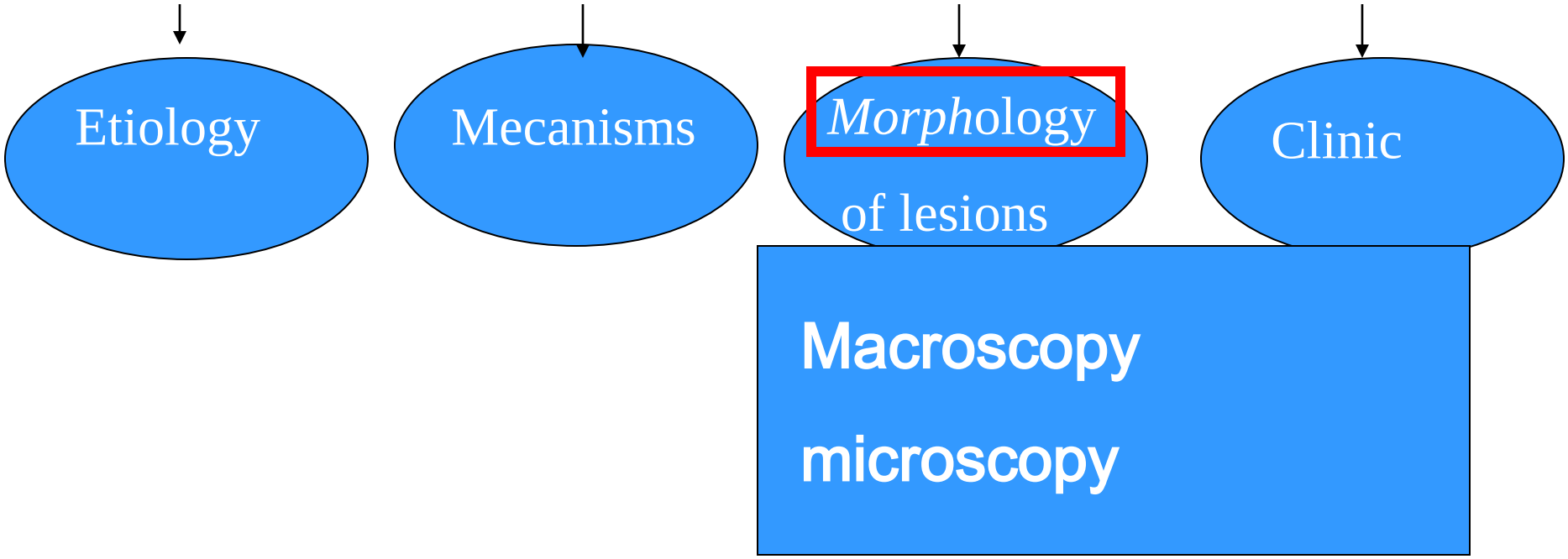


See Robbins

7è & 8è Ed. page 4

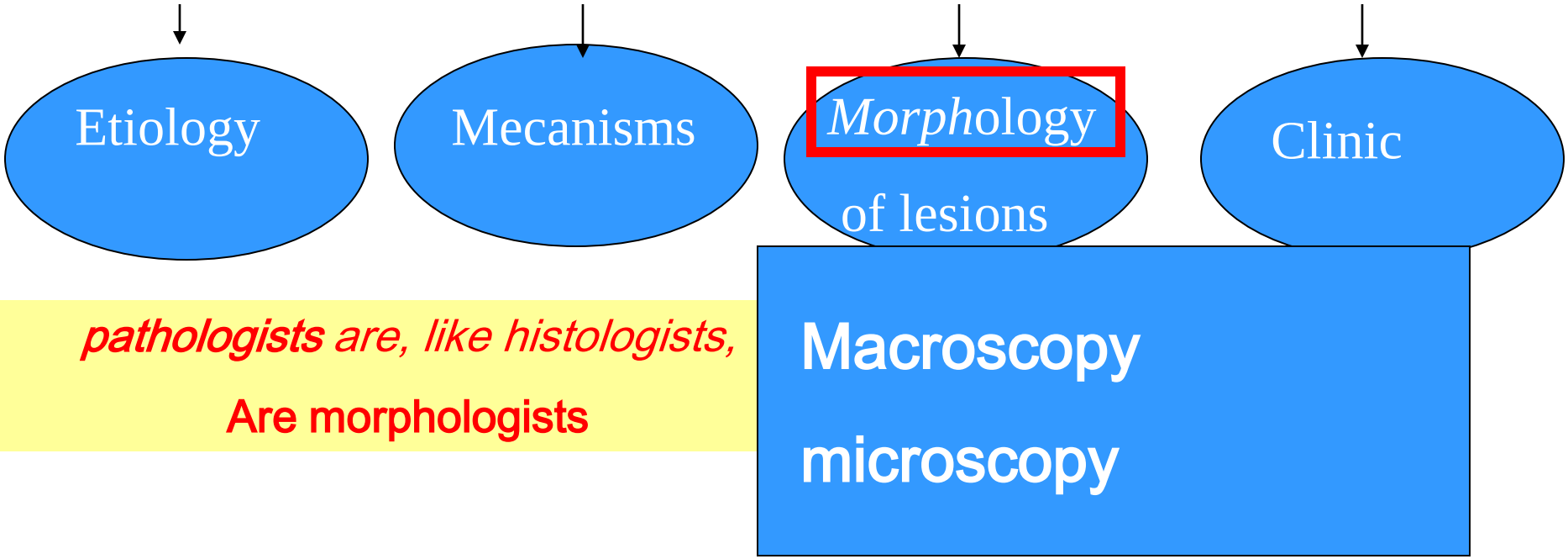
Pathology:

The study of diseases includes these 4 aspects:



Pathology:

The study of diseases includes these 4 aspects:



pathologists *are, like histologists,*

Are morphologists

example : bronchial cancer

Etiology

Méchanisms

Morphology of **Lesions**

Clinic

Tobacco

metaplasia
Neoplasia

Gross: bulk in a bronchus
Micro: carcinoma

Nothing, silenc

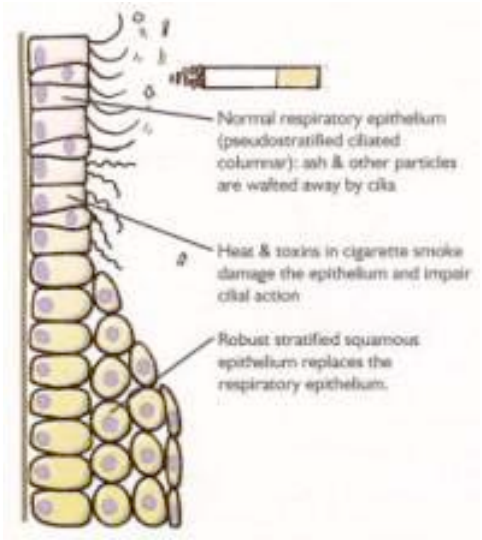
cough

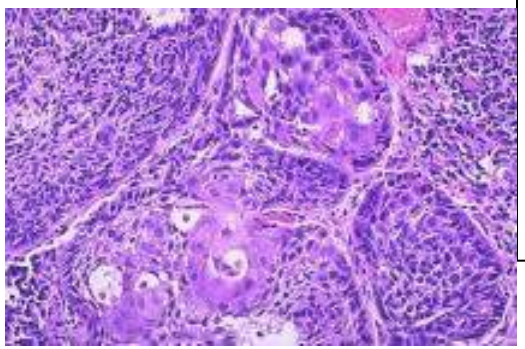
Bloody expectoration

abnormal Imag

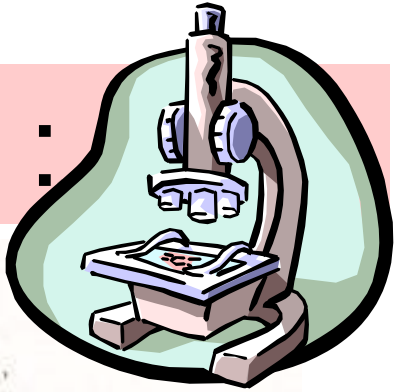
Evolution :

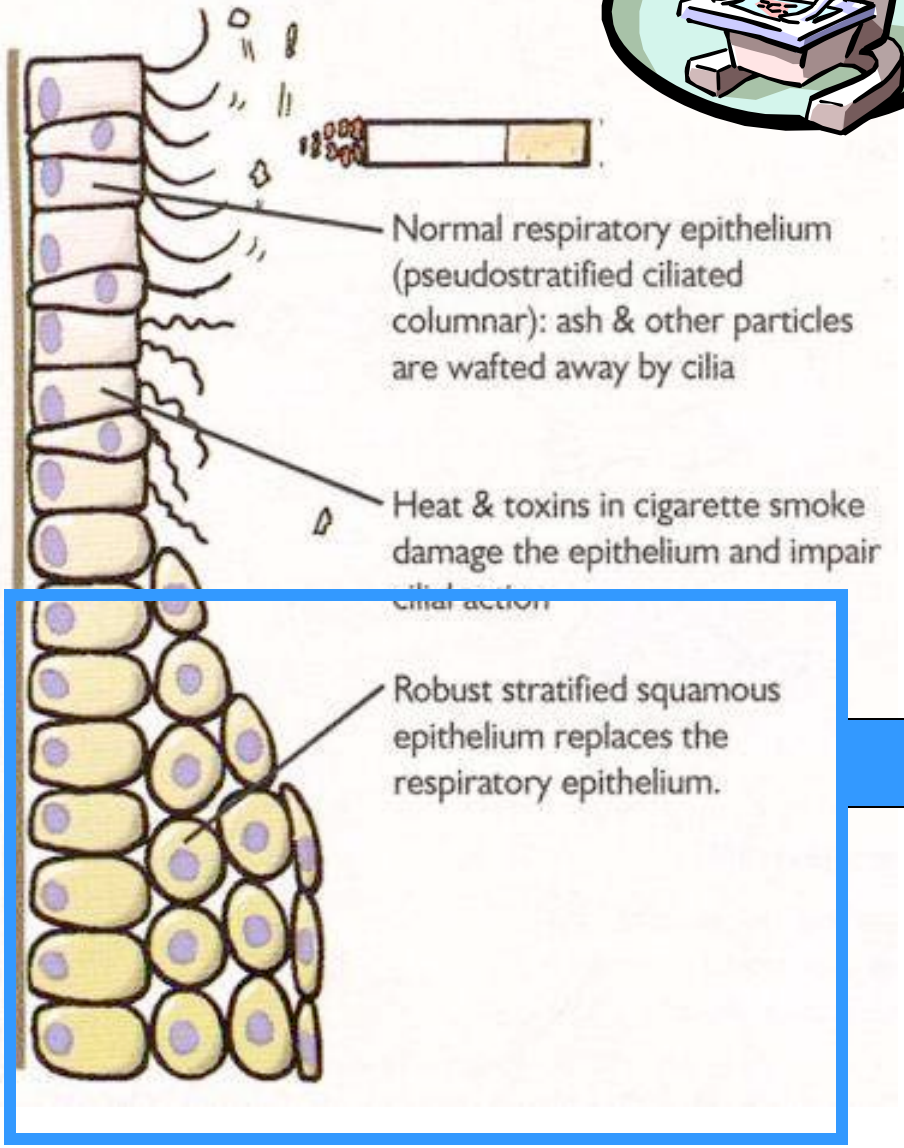
death





Your turn :





You can observe the squamous **metaplasia** of the bronchial epithelium on **section number 2**

Section 2 : insert here two images

normal bronchial epithelium

metaplastic epithelium

Metaplasia : transformation **of a normal tissue** (here: a respiratory epithelium: non-stratified, with ciliated cells and mucin secreting cells) **into another normal epithelium (here: a squamous** epithelium**,** multi-stratified, with no ciliated nor mucin secreting cells).

Step 1:

Diseases

Pathology

The Robbins textbook

Pathology laboratory classes

Robbins

a reference for medical students and doctors

The Content pages (Xiii et XiV)

show you that the textbook comprises two parts:

. *General pathology*

and

. *Systemic Pathology*

Robbins

General Pathology is the study of the mechanisms of disease : inflammation, neoplasia,…

Diseases in various organs : liver, heart, ... Involve various mechanisms.

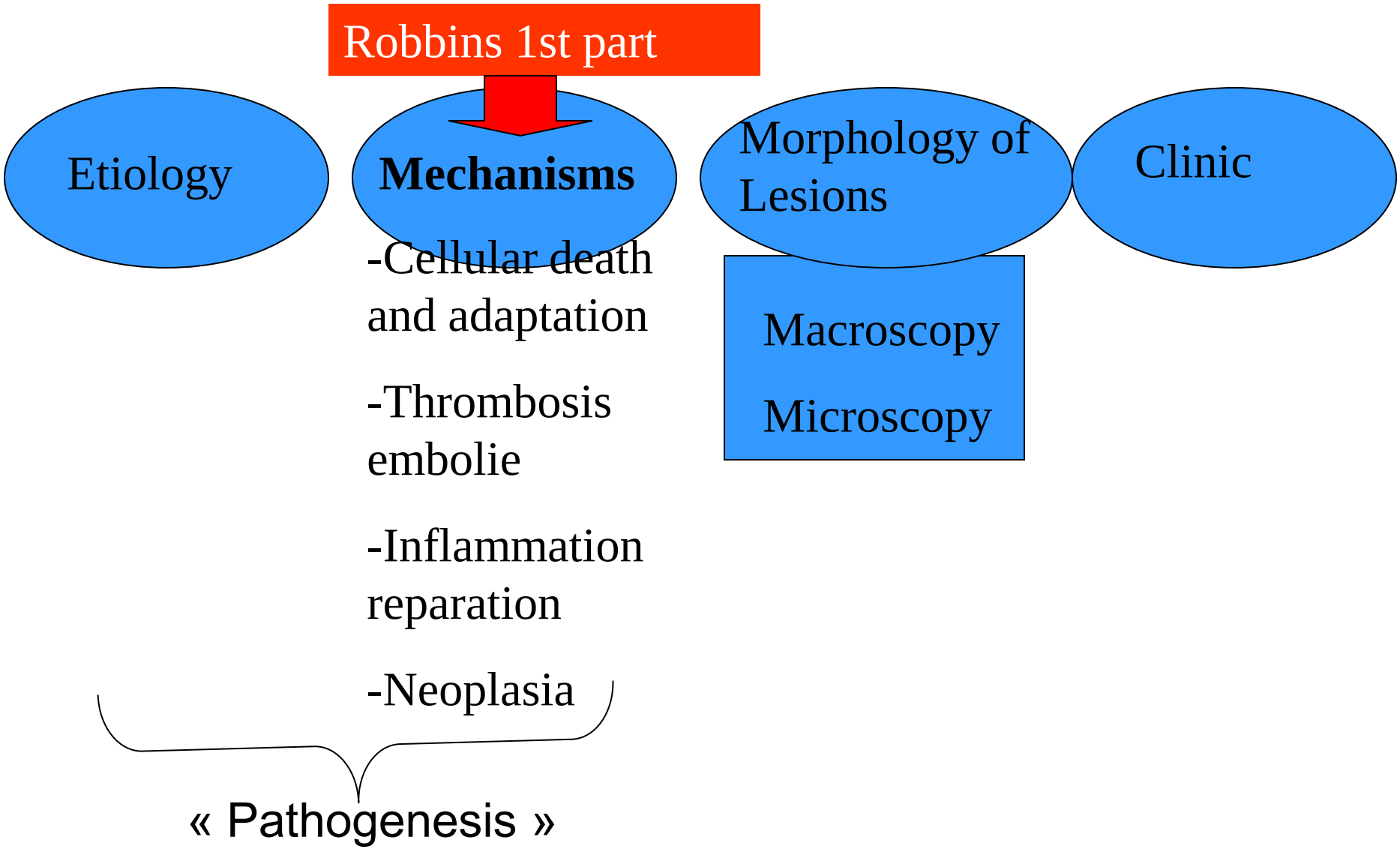
during steps 2 and 3 you will be able to use:

Chapters 1 & 2 : cellular adaptation

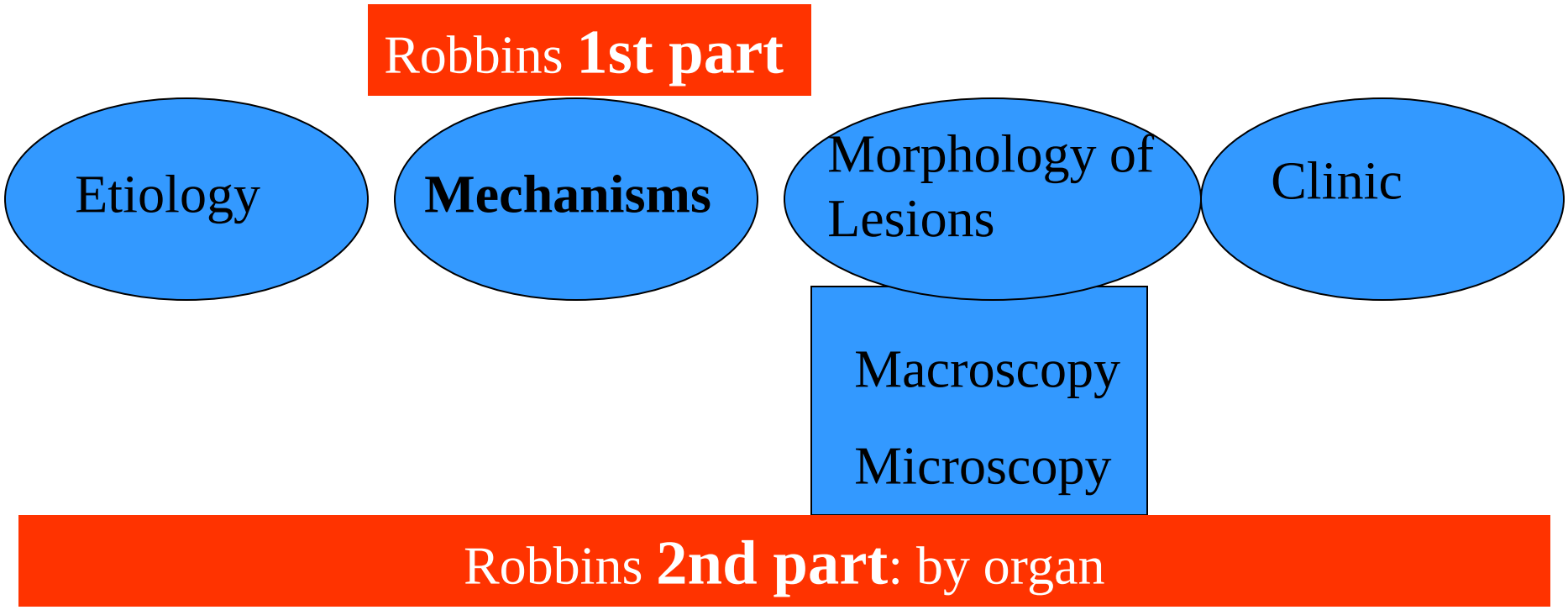
and

chapiter 18 7/8th edition**: liver diseases.**

Pathology in the *Robbins textbook*



Pathology in the *Robbins textbook*



Example

If you look in the index for

« **steatosis** »

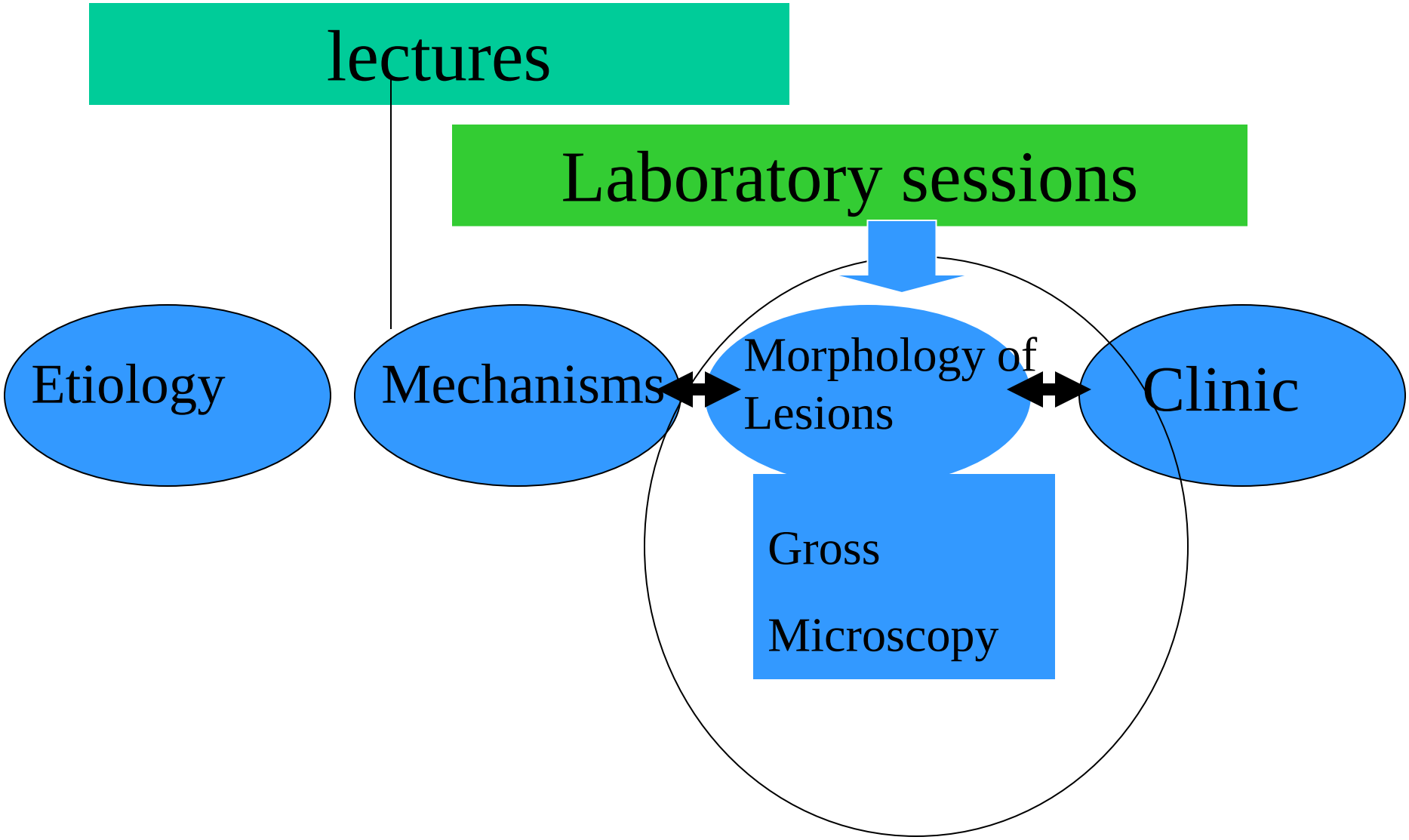
You will find:

-Steatosis as a **mechanism of disease** (p…)

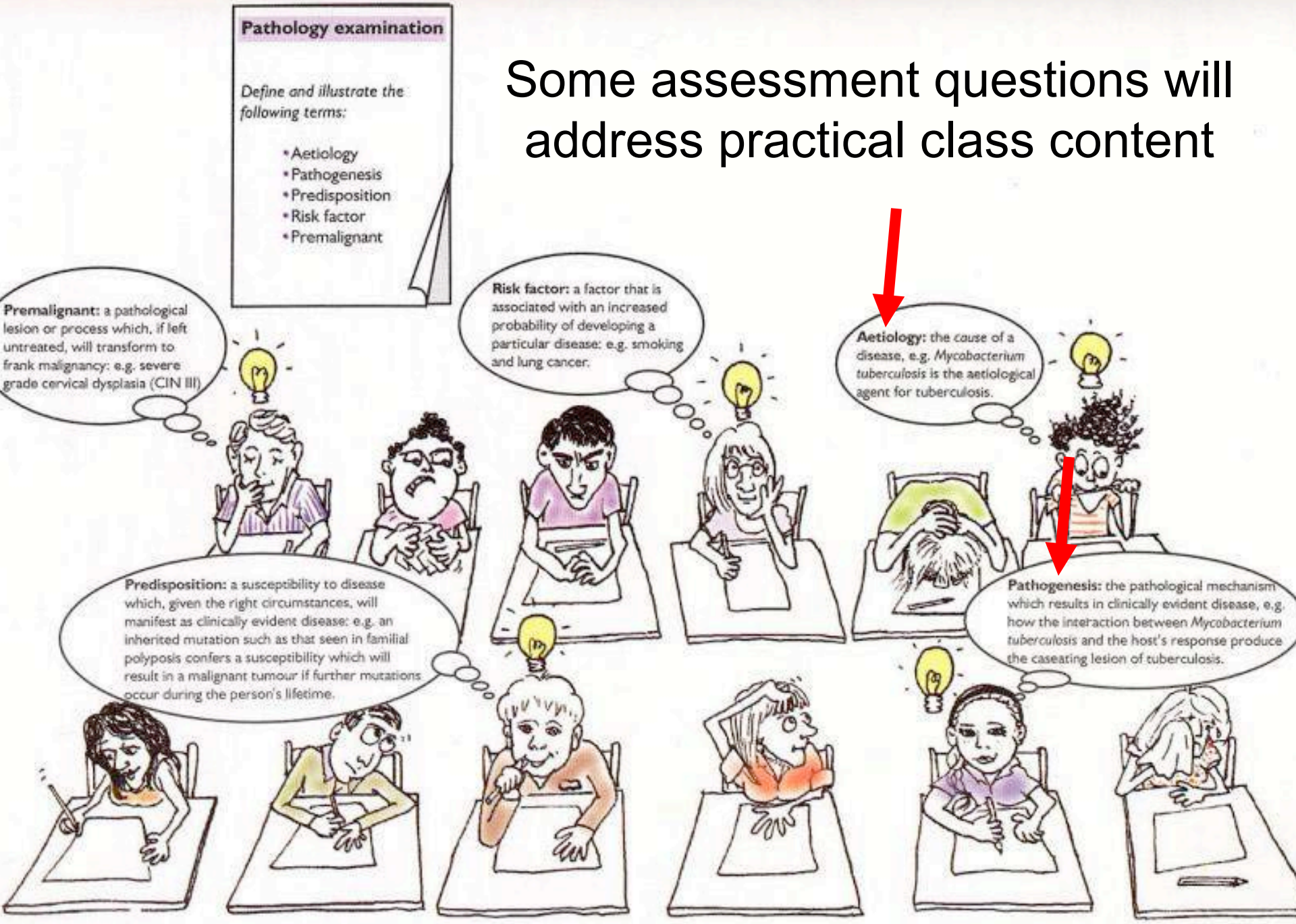
- steatosis in différent **organs** (p…)

Step 1:

Diseases
Pathology
The Robbins textbook
Pathology laboratory classes


lectures
Laboratory sessions
Etiology
Mechanisms
Morphology of Lesions
Clinic
Gross
Microscopy

Some assessment questions will address practical class content



Instructors are available for questions about step 1

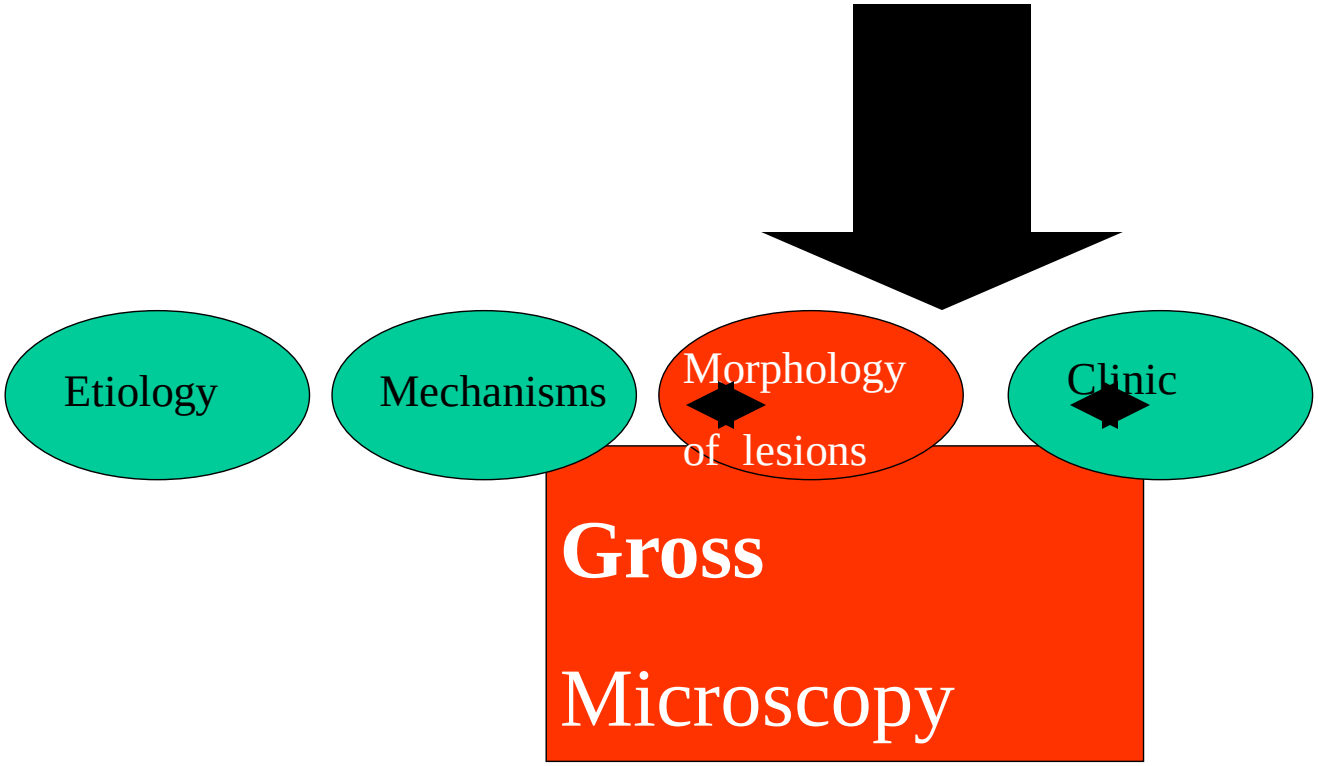
You can now start Step 2.

Step 2

Gross & Microscopy

50 minutes

Step 2


Etiology
Mechanisms
Morphology of lesions
Clinic
Gross
Microscopy

Step 2
Gross Micro

You are expected to::

1 . **READ the next** 6 slides

2 . **Go to the tables near the windows**

3 . **Return to your tables and continue.**

You have:

2 clinical histories

- -Mr **Peter S.**
- -Mr **Paul H.**

4 gross spécimen

- No 1 : **normal liver, no lesion**
- No 2, 3 et 4 : **livers with lesion**

4 histological sections

- section *A* : **normal liver**
- sections **B and B'** : one liver, two sections
- section **C**: a liver with a lesion

A textbook: Robbins

Objectives for step 2: to

-**Observe**

- liver gross specimen
- liver tissue histological sections
- two liver diseases;

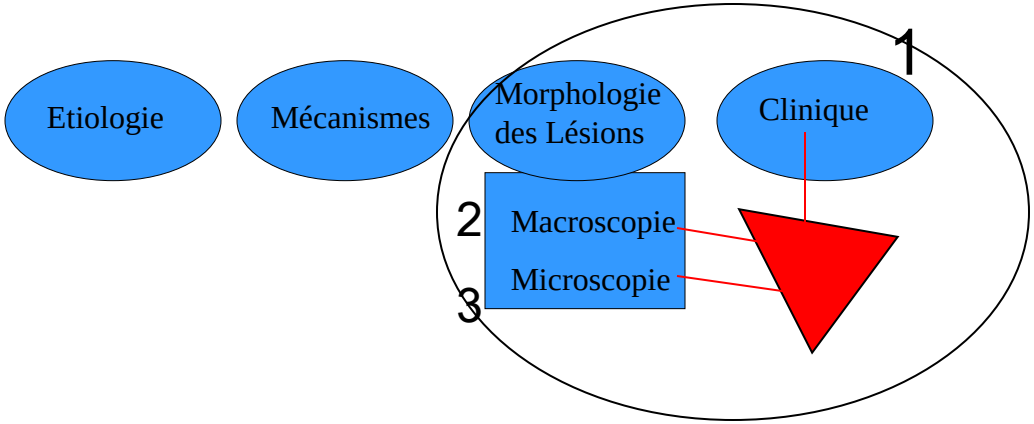
-**compare** normal and diseased liver;

-**describe** the gross and et microscopic **lesions** of liver parenchyma associated with the two diseases.

I could not correct this but the words are in French

You will have to

ASSOCIATE, RELATE



1- Each of two **clinical histories** and

2- one **gross** specimen : 2, 3, or 4

3- one tissue section : **B-B'** or **C**

2 clinical stories

Mr Peter S.

56-year-old, a real estate agent, shares his time between his job, his motor boat, and his friends. His big belly contrasts with thin arms and legs. He reports an important beer intake.

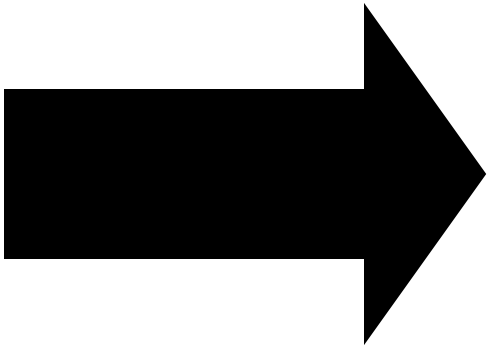
Mr Paul H.

48-year-old, bank employee, has a tan grey complexion. Recently, he felt tired and had vague abdominal pains. He lost a little weight, but feels as if his belly was enlarged. His doctor discovers diabetes.

Your task: to determine which of the livers you observe could be **Peter's**

(and which one could be **Paul's**)

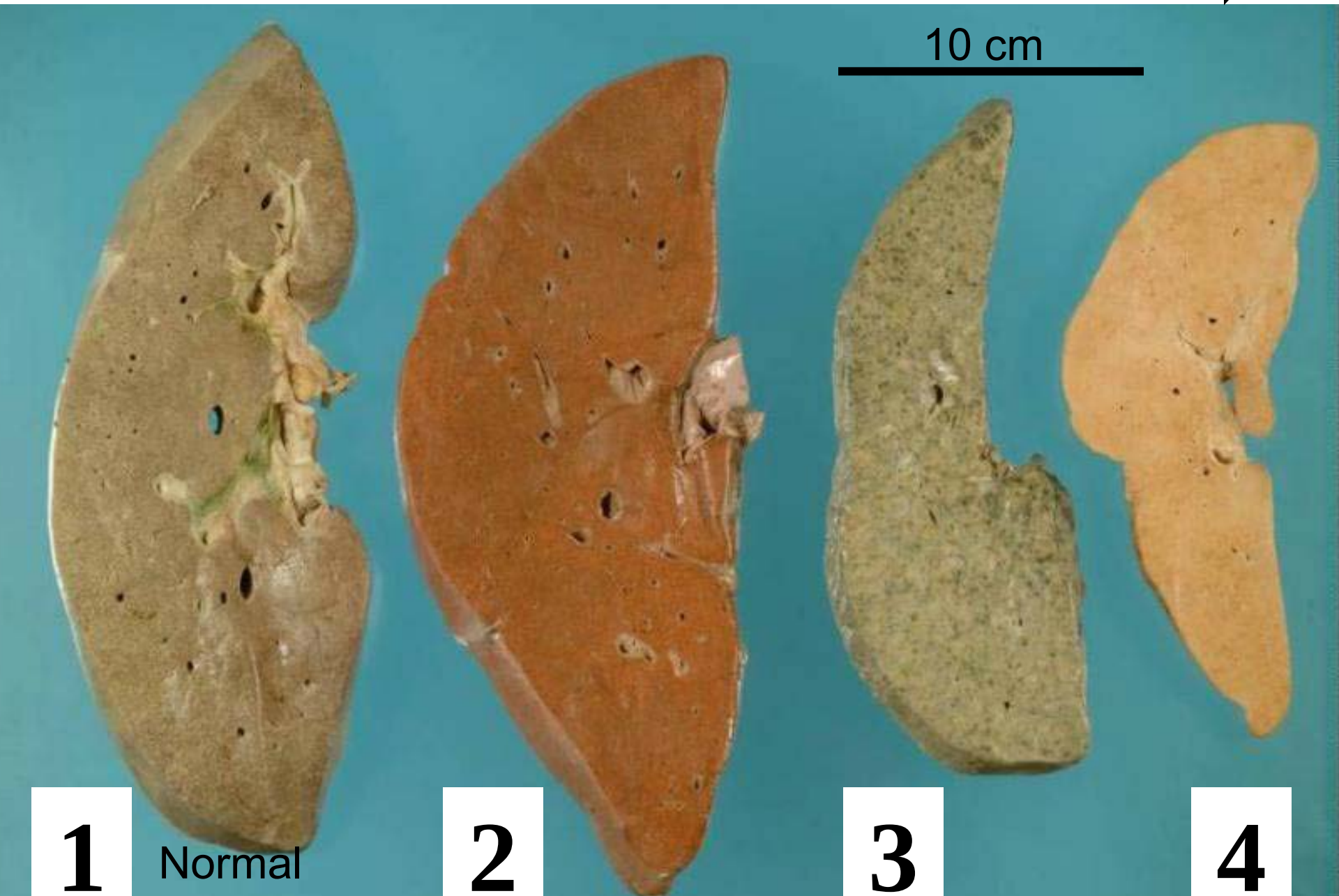
and **WHY**?



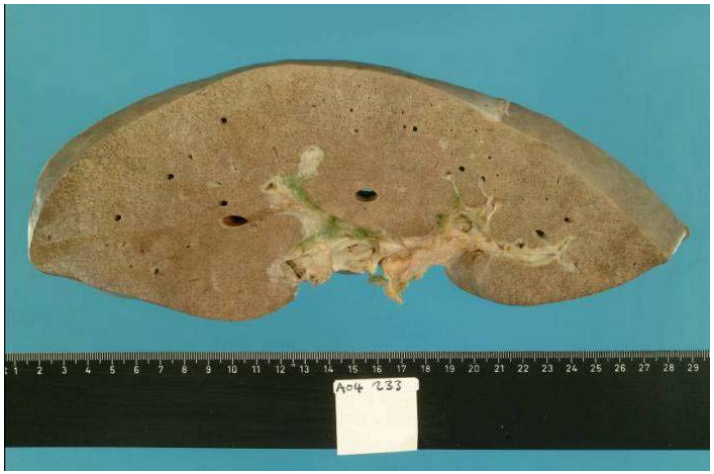
Now: stop with the computers and microscopes and go and observe the **gross specimens.**

*Pathologists study **gross** lesions on surgical specimens and on autopsy specimens*

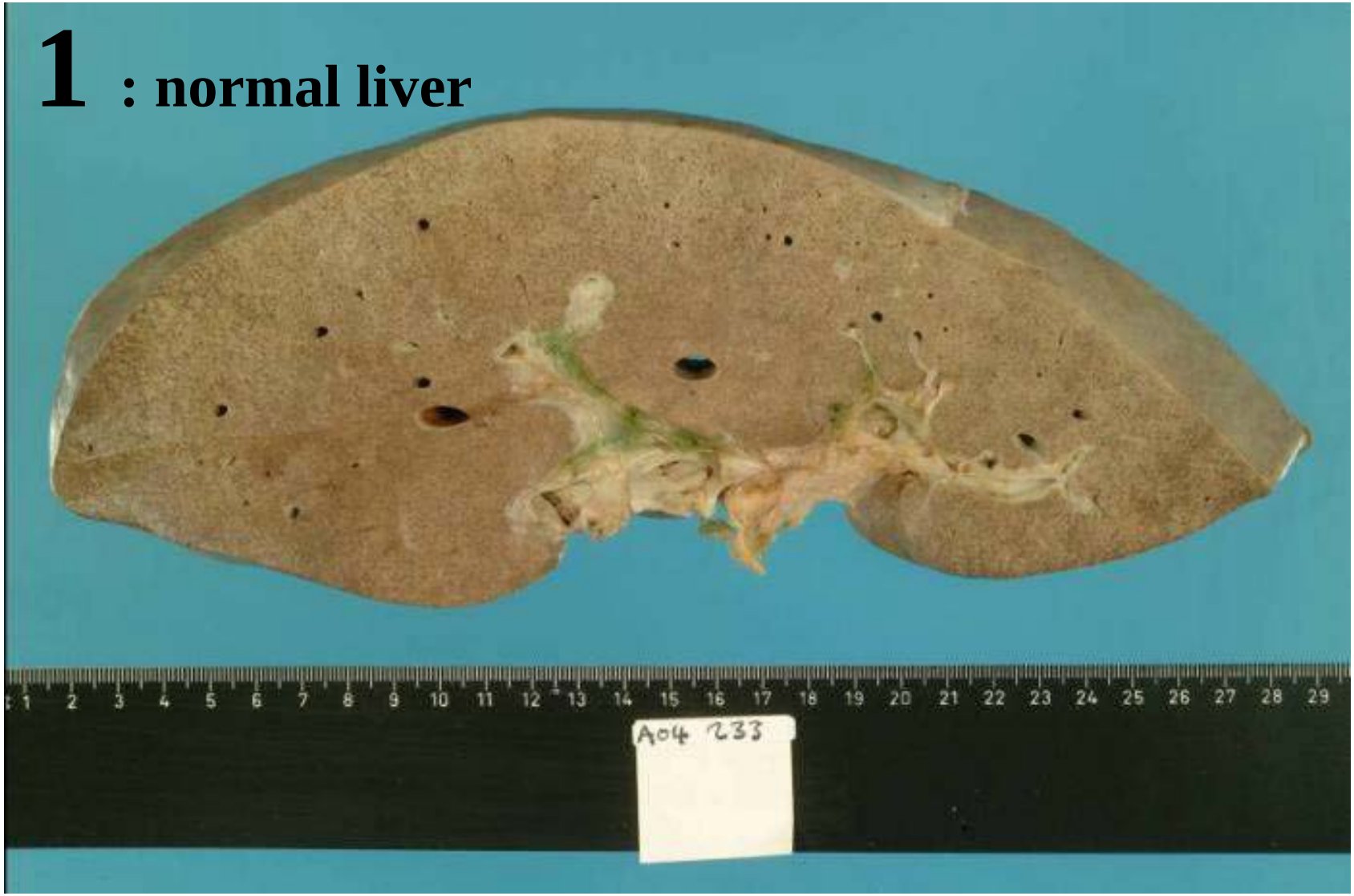
4 gross specimens



What we can observe :



- The **size** of the liver (of the section at least)
- *Its weight will be indicated.*
- Its **aspect** :
  - **color?**
  - homogeneous or heterogeneous (e.g.: nodules or no nodules) ?



Weight: 1650 g **size**:

Color:

Aspect **homogeneous or heterogeneous**:

Weight: 2500 g **size**:

Color:

Aspect **homogeneous or heterogeneous**:

Weight: 1200 g **size**:

Color:

Aspect **homogeneous or heterogeneous**:

4

Weight: 2200 g **size**:

Color:

Aspect **homogeneous or heterogeneous**:

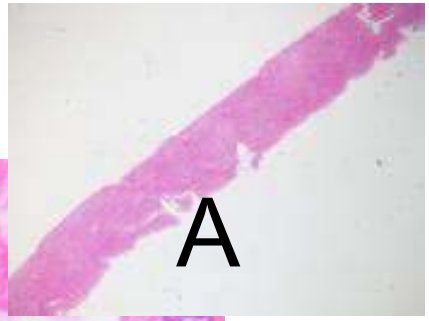
But …

What color are, for the naked eye :

- **bile** : ……..
- **fat** : ……..
- **Iron** (oxydated): ……..

microscopy

Information on the tissue sections that you are going to observe



A. Human liver biopsy

The H.E. stain: Hemalun Eosin

the *routine* stain in tissue pathology

nuclei	violet
cytoplasm	pink

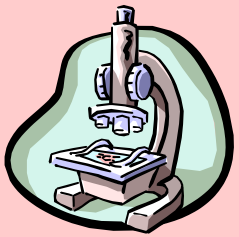
4 tissue sections

A few words about the technique

When a liver disease is suspected, the microsocpic examination of a piece of liver tissue is often a useful complement to clinical and serum data.

The lesions observed in the tissue will contribute to a final correct diagnosis.

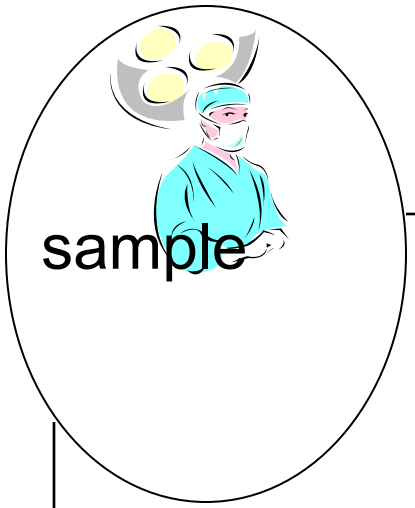
Do you know **the technical steps** needed to obtain an observable tissue section?



Fi…….

In…… **St**…

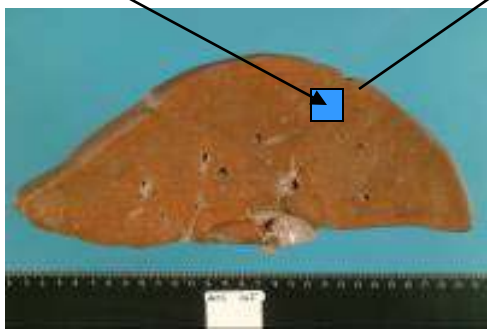
C……



Non invasive

Surgery or autopsy

sampling



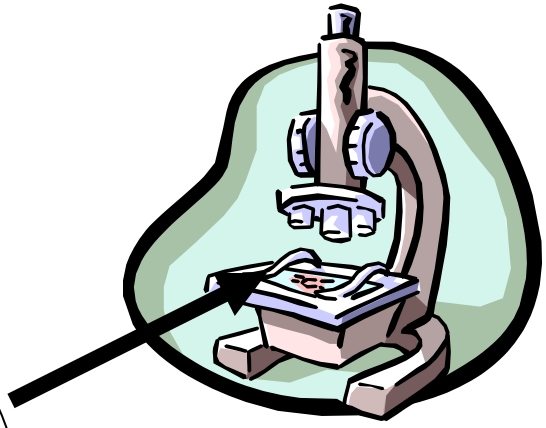
Technical steps:

Fixation

Inclusion: «block»

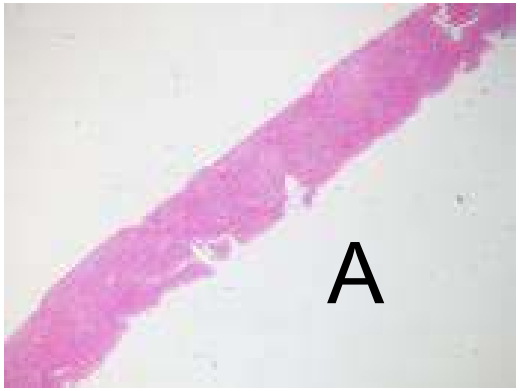
Cut

Stain



Tissue sections

Are stained and then mounted between two glass slides.



This liver sample was obtained through a trans-jugular biopsy.

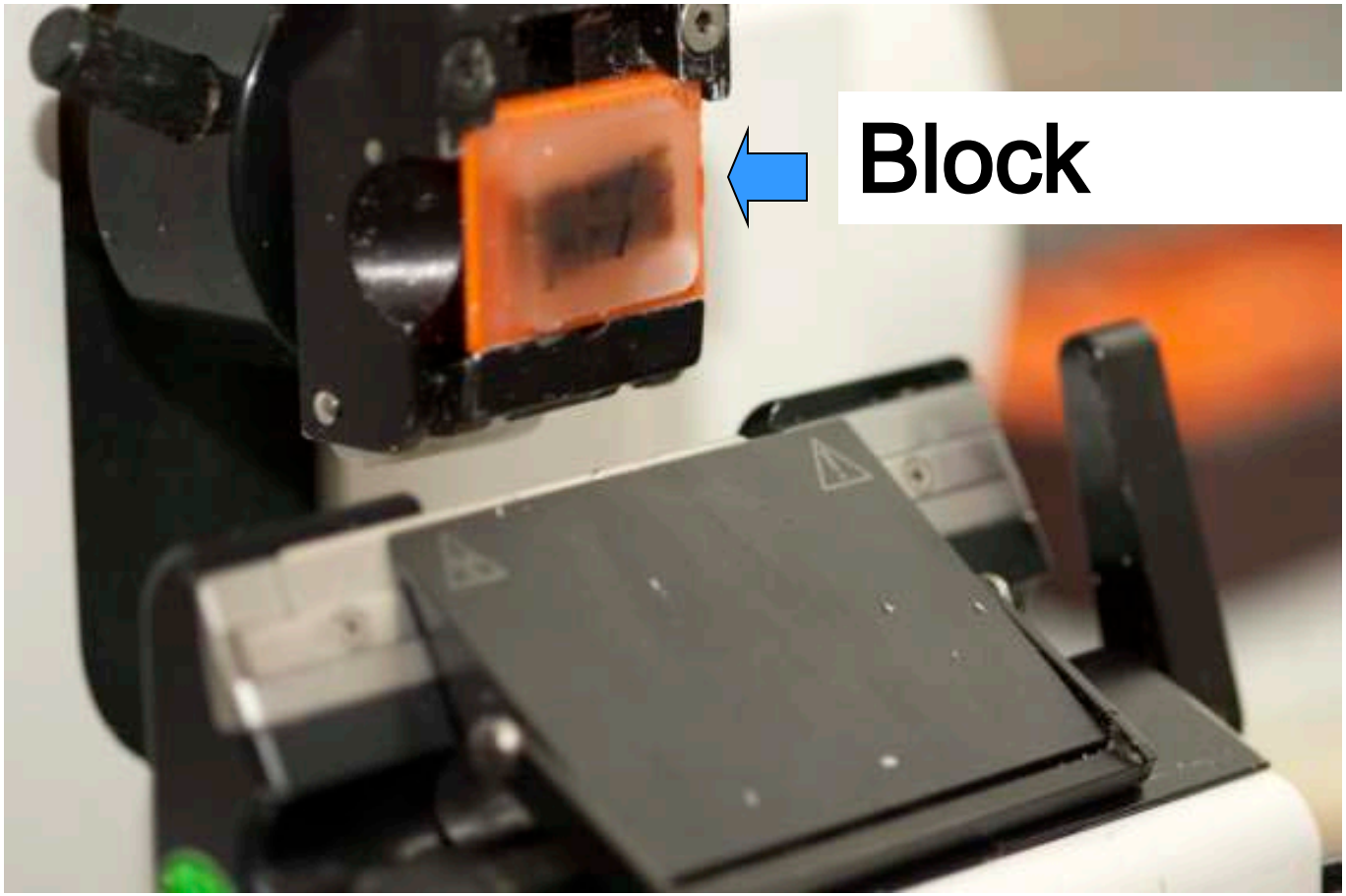
The sample is fixed in a buffered **formalin** solution for several hours and then embedded in **paraffin**, first liquid, hot, then solid (when it gets cold).

It can then be stored as a **block**, from which numerous 4-microns thick sections can be cut on a microtome.

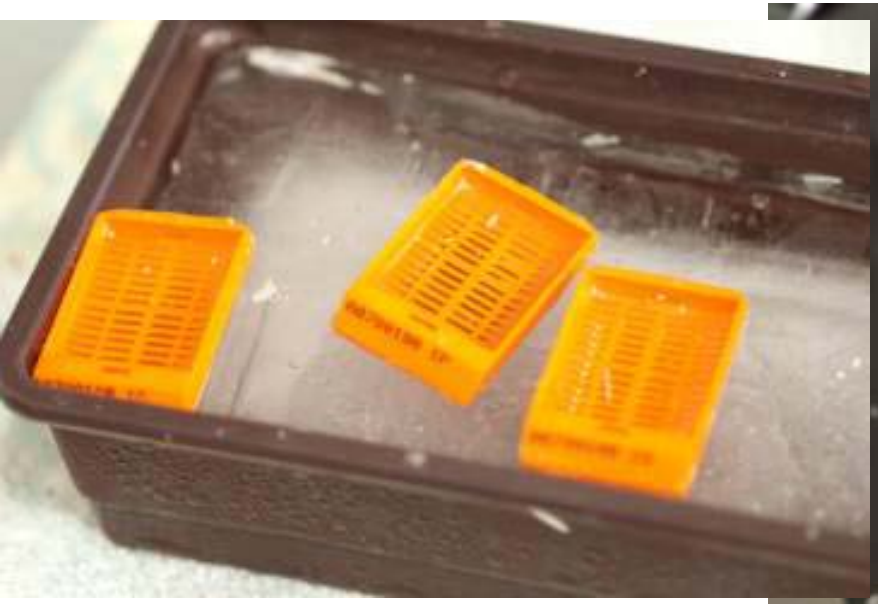
These sections are then stained in various solutions.

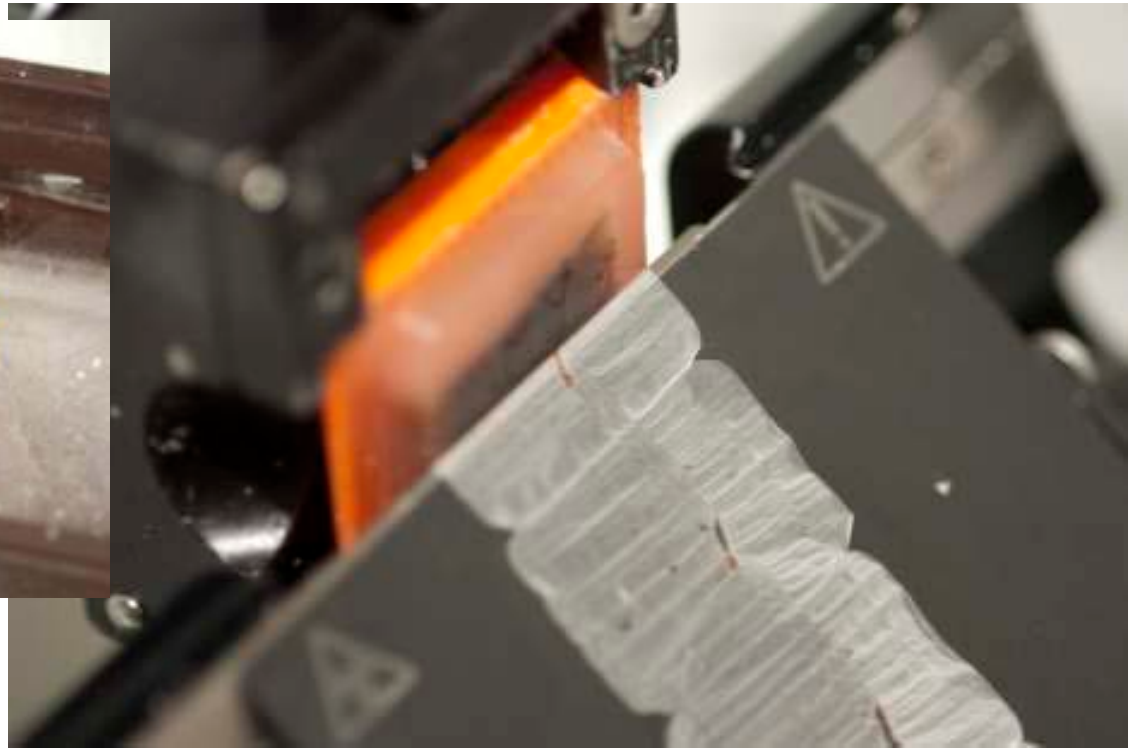
Fixation, Inclusion, cut and stain: these steps require 3 to 48 hours.

photos : Gilles Weber CEMCAV CHUV Lausanne



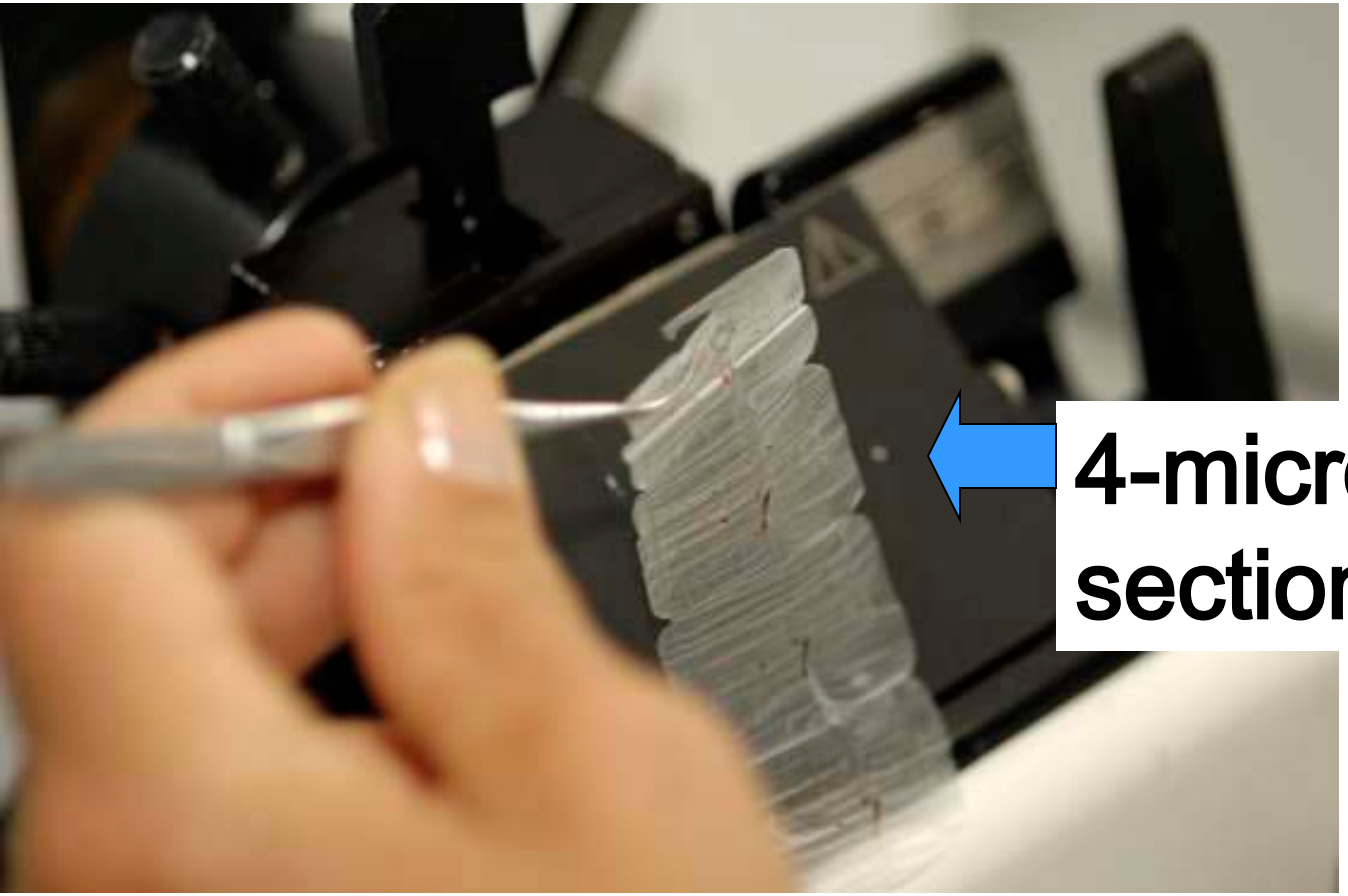
After fixation in Formalin, and then dehydration in alcohol, a small piece of tissue is embedded in paraffin (liquid, that then solidifies)





The block is cut using a **microtome** into 4-microns sections.

The block is cut, using a **microtome,** into 4-microns sections.



4-microns thick sections

This work is done by professionals, laboratory technicians.

The sections are laid onto glass slides

They are stained in different solutions.

They are stained in different solutions.

Eventually, the pathologist looks at the sections

Under a microscope.

This is what you will do now!

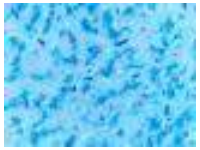
Information on the tissue sections

B B'. Human liver; surgical specimen

(the patient underwent a liver transplantation)

one liver is studied with **2 different stains**!

H.E. & **Prussian blue** : B'



B': The **iron** stains in **blue** after a chemical reaction done on the tissue section

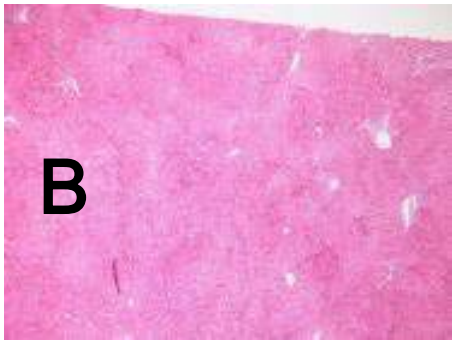
(this is a *histochemical* technique like many other « special stains » used by pathologists to characterize substances like iron, mucins, … in tissue sections).

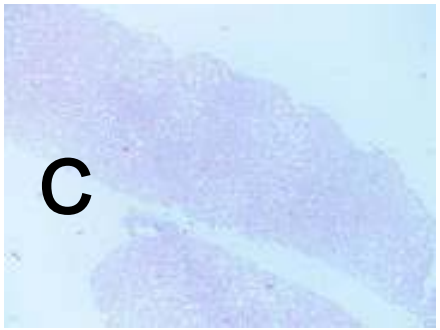
C. Human liver, trucut biopsy;

H. E. stain.

Pathologists work with different types of samples :

- *bio*psies
  - non invasive (no surgery)
  - surgical
- *Autopsies*





Your sections A B C :

How were they obtained?

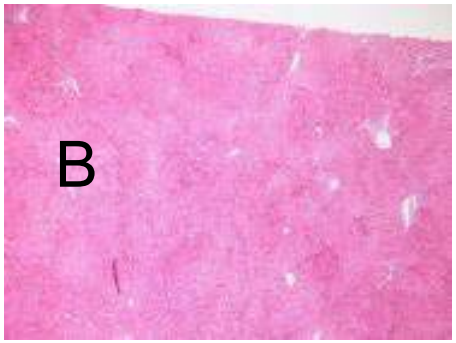
. A: biopsy? Surgery? Autopsy?

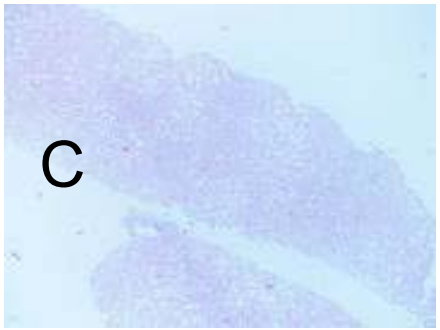
. B: biopsy? Surgery? Autopsy?

.C: biopsy? Surgery? Autopsy?

answer

- Different types of samples :
  - *bio*psies
    - non invasive (no surgery) 1
    - surgical 2
  - *Autopsies* 3





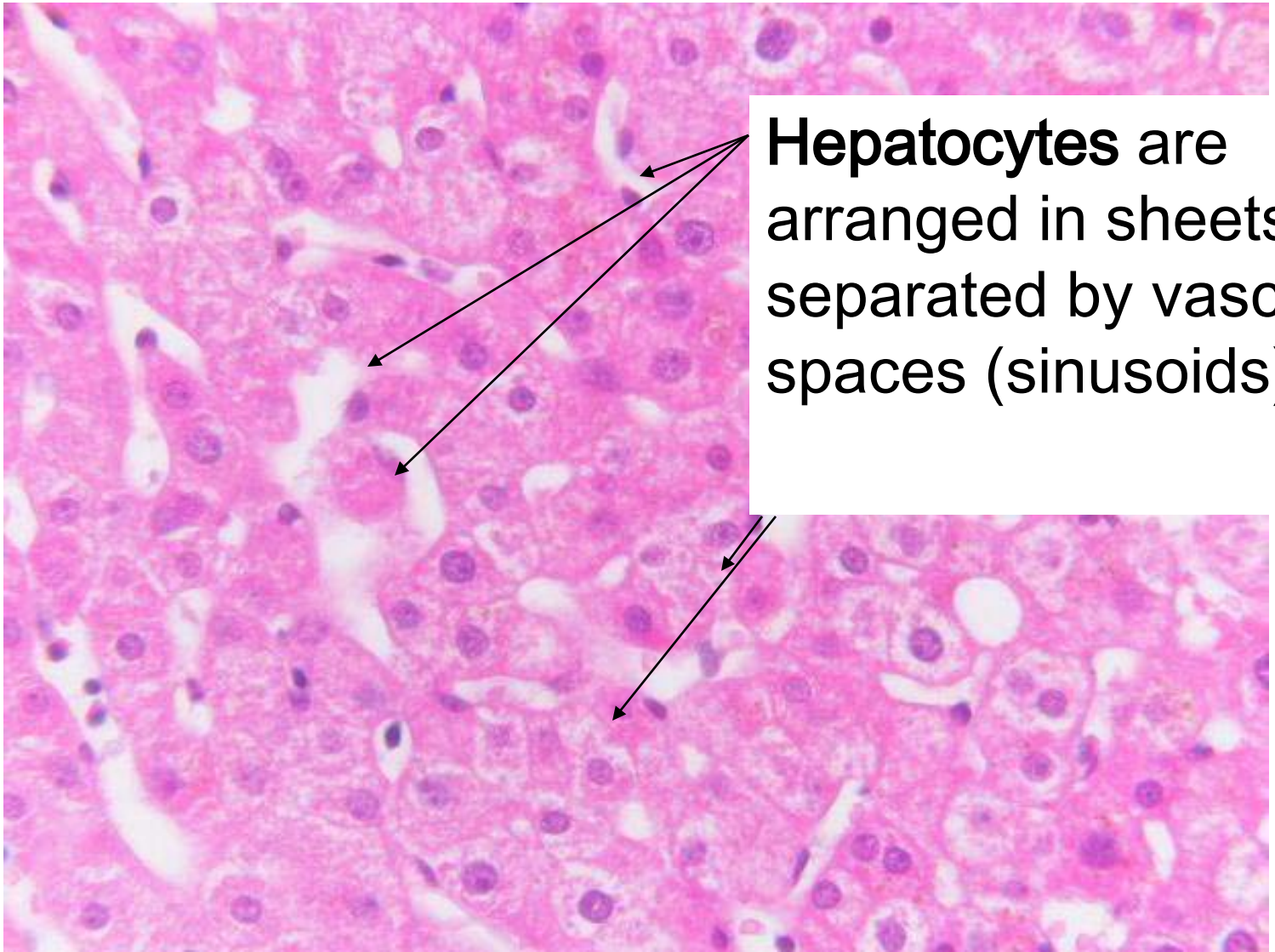
Your sections A B C : How were they obtained?

.A : **1: non invasive biopsy**

. B: **2 or 3: surgery or autopsy**

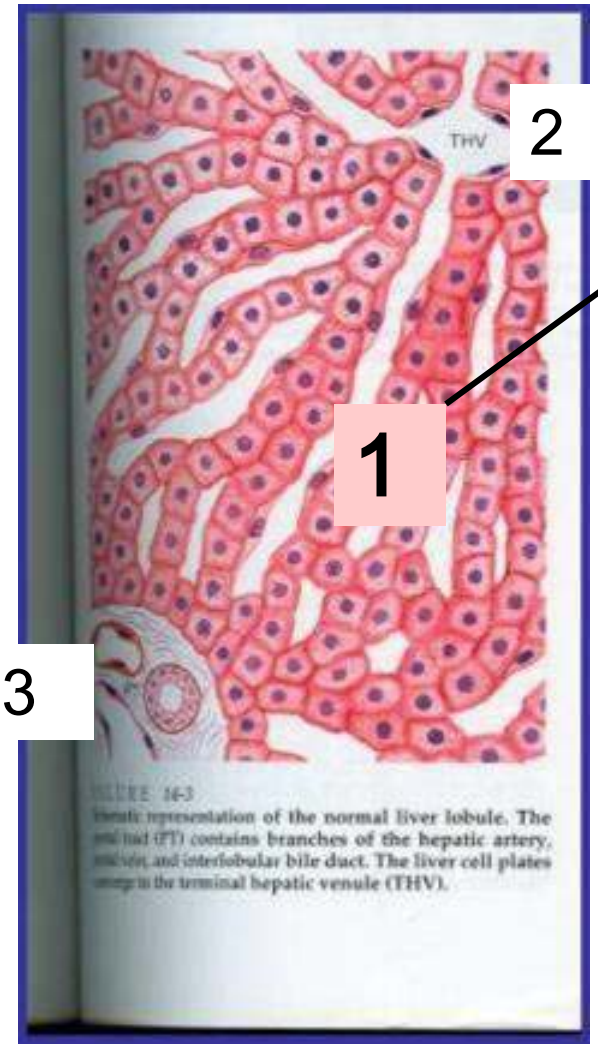
. C: **1: non invasive biopsy**

To day we focus on the morphology of **hepatocytes**, in the **normal and diseased liver**.



Hepatocytes are arranged in sheets separated by vascular spaces (sinusoids).

Slides 53-57 : histology of the liver

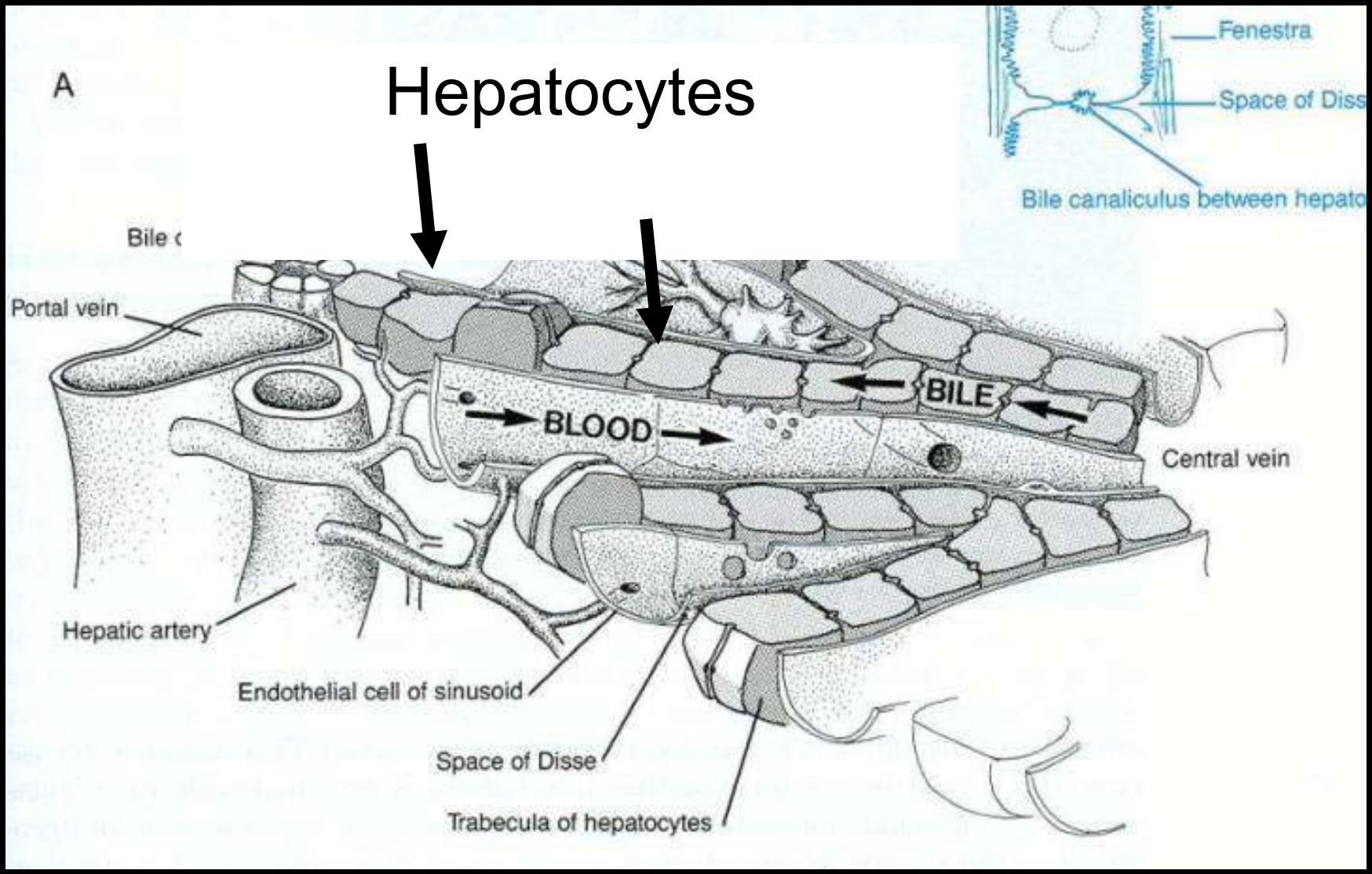


1 HEPATOCYTES

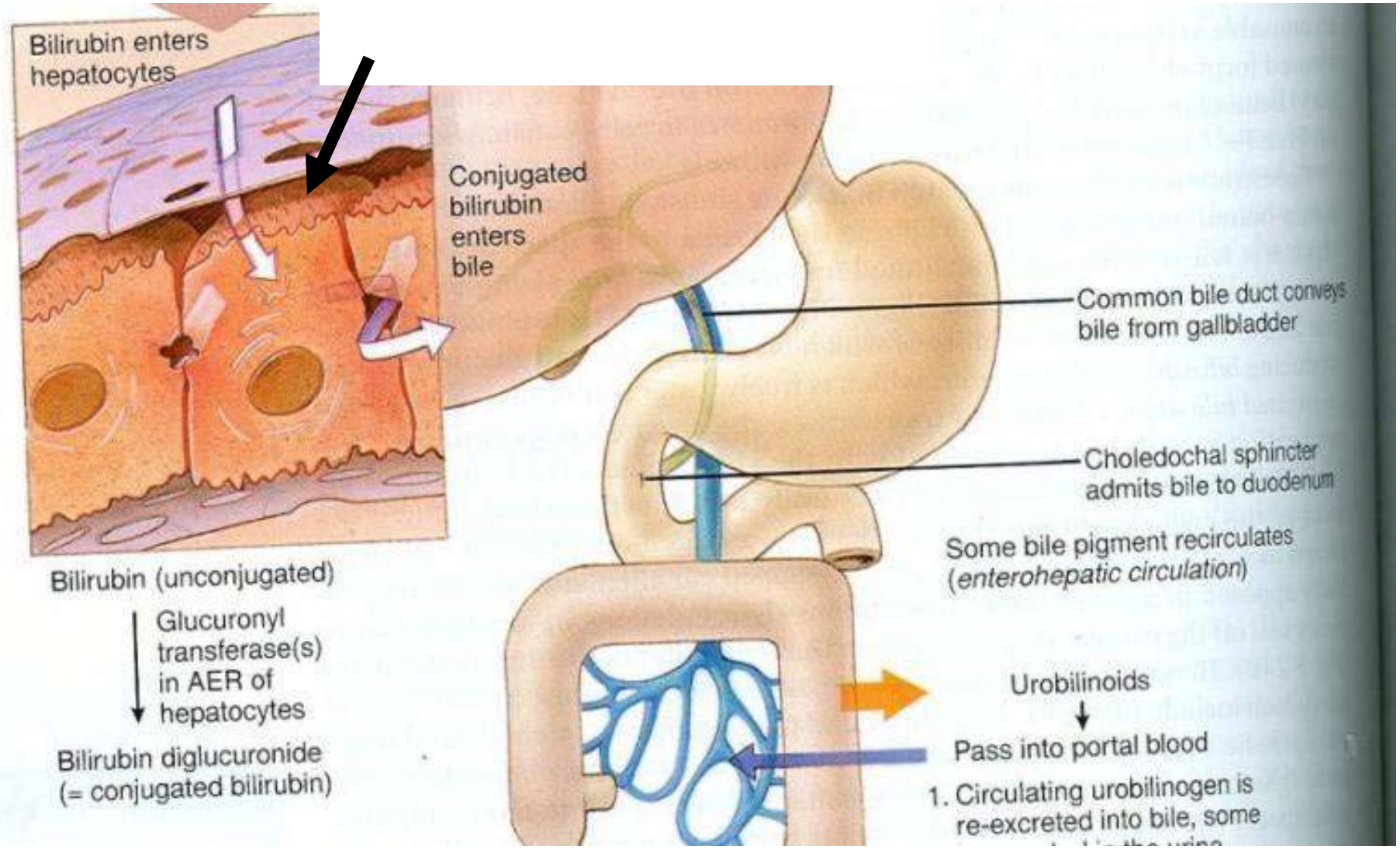
2 CENTRAL VEIN

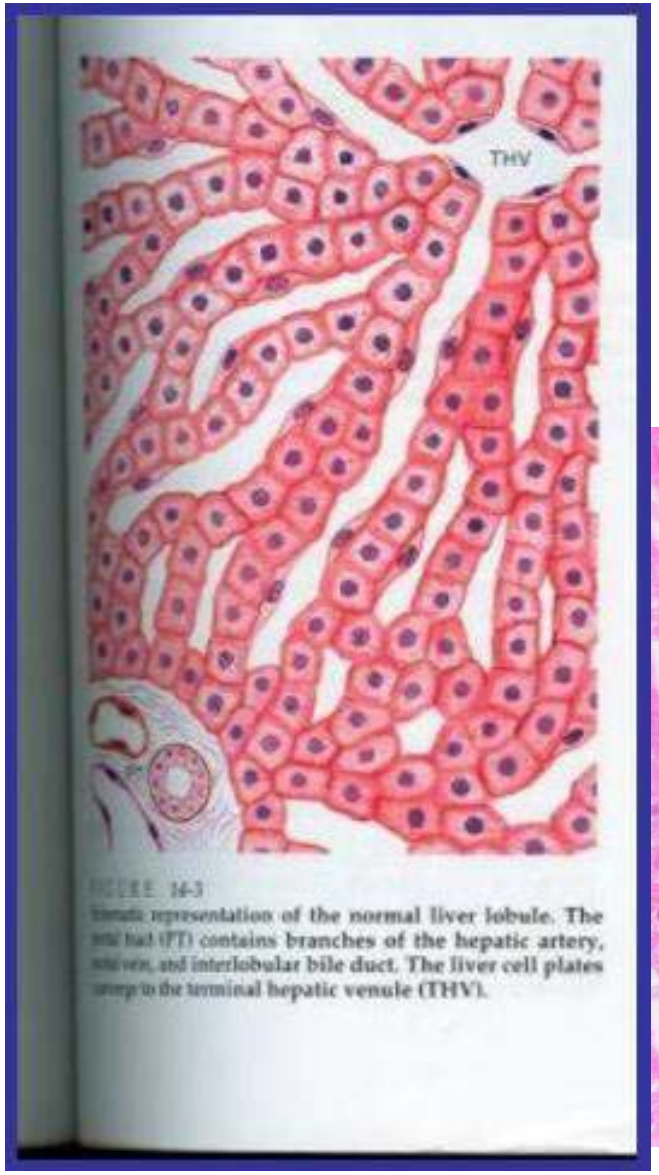
3 PORTAL space

with 3 elements : **artery, vein, and biliary duct.**


A
Hepatocytes
Fenestra
Space of Diss
Bile canaliculus between hepato
Bile
Portal vein
BILE
BLOOD
Central vein
Hepatic artery
Endothelial cell of sinusoid
Space of Disse
Trabecula of hepatocytes

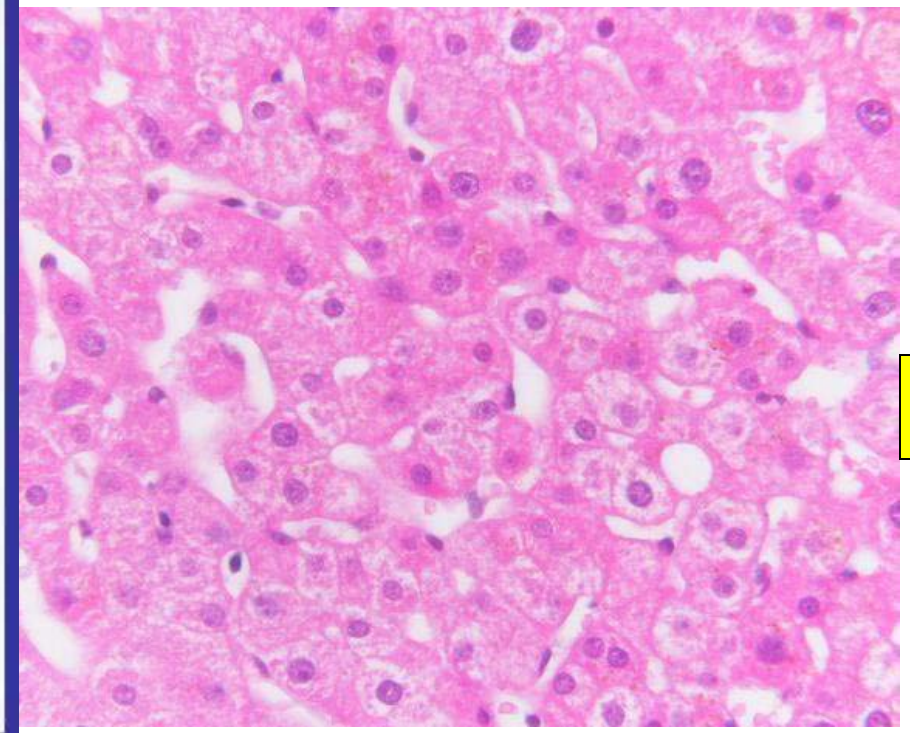
Hépatocytes





16-3
matic representation of the normal liver lobule. The
al triad (PT) contains branches of the hepatic artery,
al vein, and interlobular bile duct. The liver cell plates
verge to the terminal hepatic venule (THV).

Your section 1A



Information on the tissue sections that ou are going to observe

A. Human liver biopsy

The H.E. stain: Hemalun Eosin

the *routine* stain in tissue pathology

nuclei	violet
cytoplasm	pink

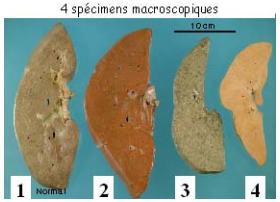
Your turn …

Examine sections A, B et B’, C

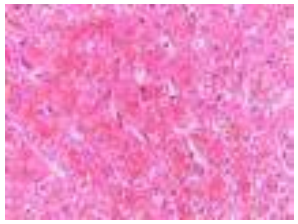
Section A: observe and insert images of hepatocytes:

What color is normal liver at gross examination?

Which gross specimen?

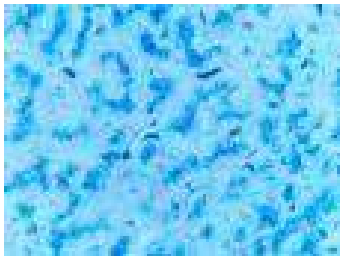


Section B: observe and insert images of



hepatocytes:

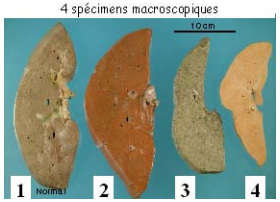
Section B': observe and insert images of



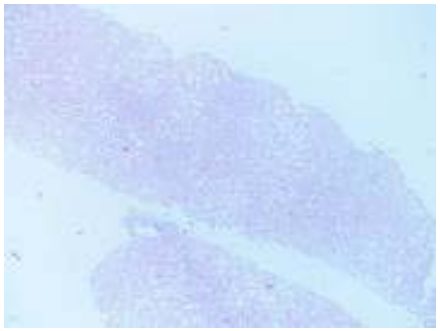
hepatocytes:

What color is normal liver at gross examination?

Which gross specimen?



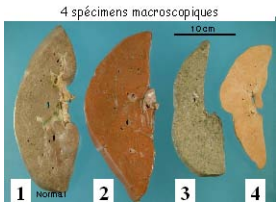
Section C: observe and insert images of



hepatocytes:

What color is normal liver at gross examination?

Which gross specimen?



Now, you can:

-either : go to slides 63 and 64

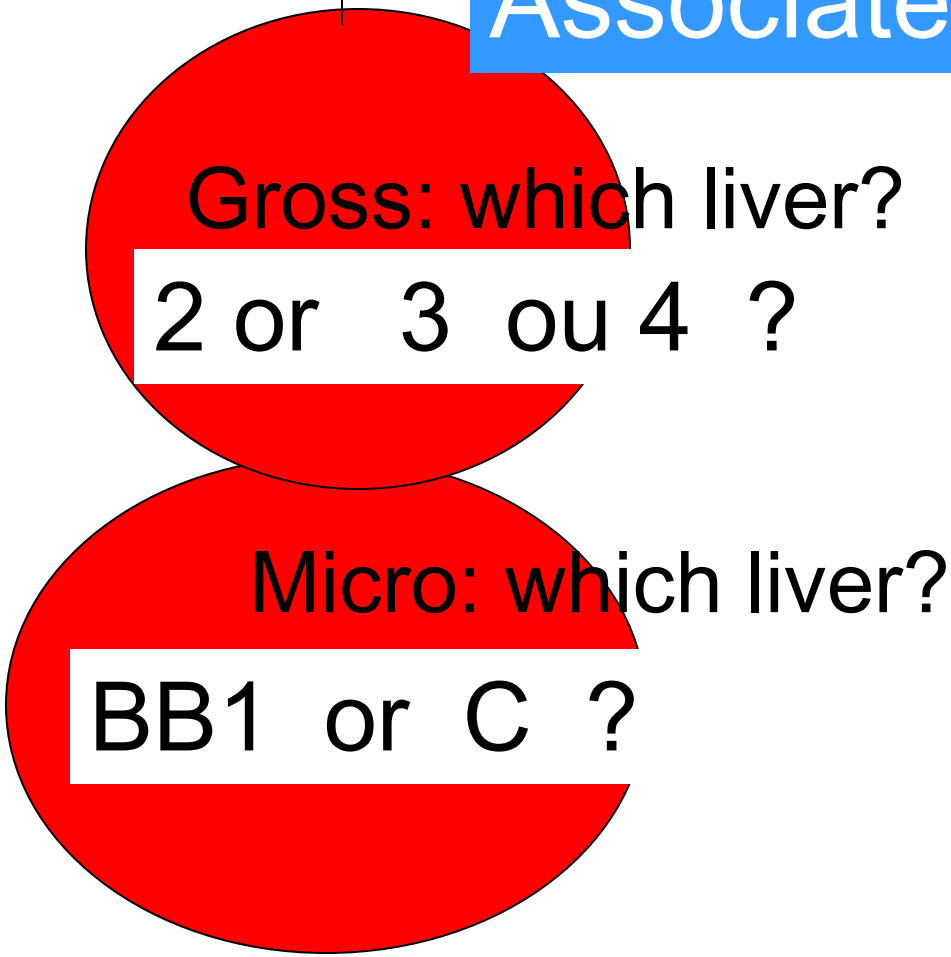
-or: go first to next step (step 3 : slides 66 to 70)

As you prefer

56-year-old, ~~a~~ real estate agent, shares his time between his job, his motor boat, and his friends. His big belly contrasts with thin arms and legs. He reports an important beer intake.

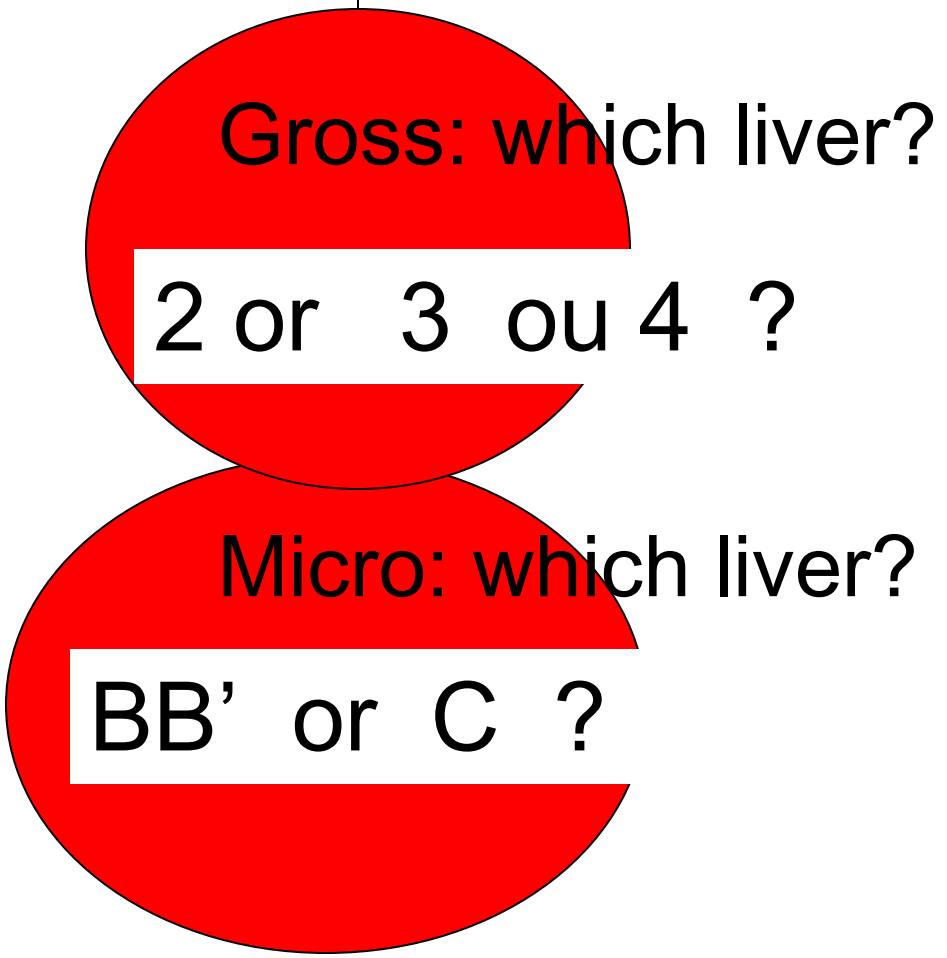
Mr Peter S.

Associate!



Mr Paul H.

48-year-old, bank employee, has a tan grey complexion. Recently, he felt tired and had vague abdominal pains. He lost a little weight, but feels as if his belly was enlarged. His doctor discovers diabetes.



You have observed gross and microsocpic lesions associated with **two diseases** in two patients.

What is **the pathogenesis** of these diseases ?

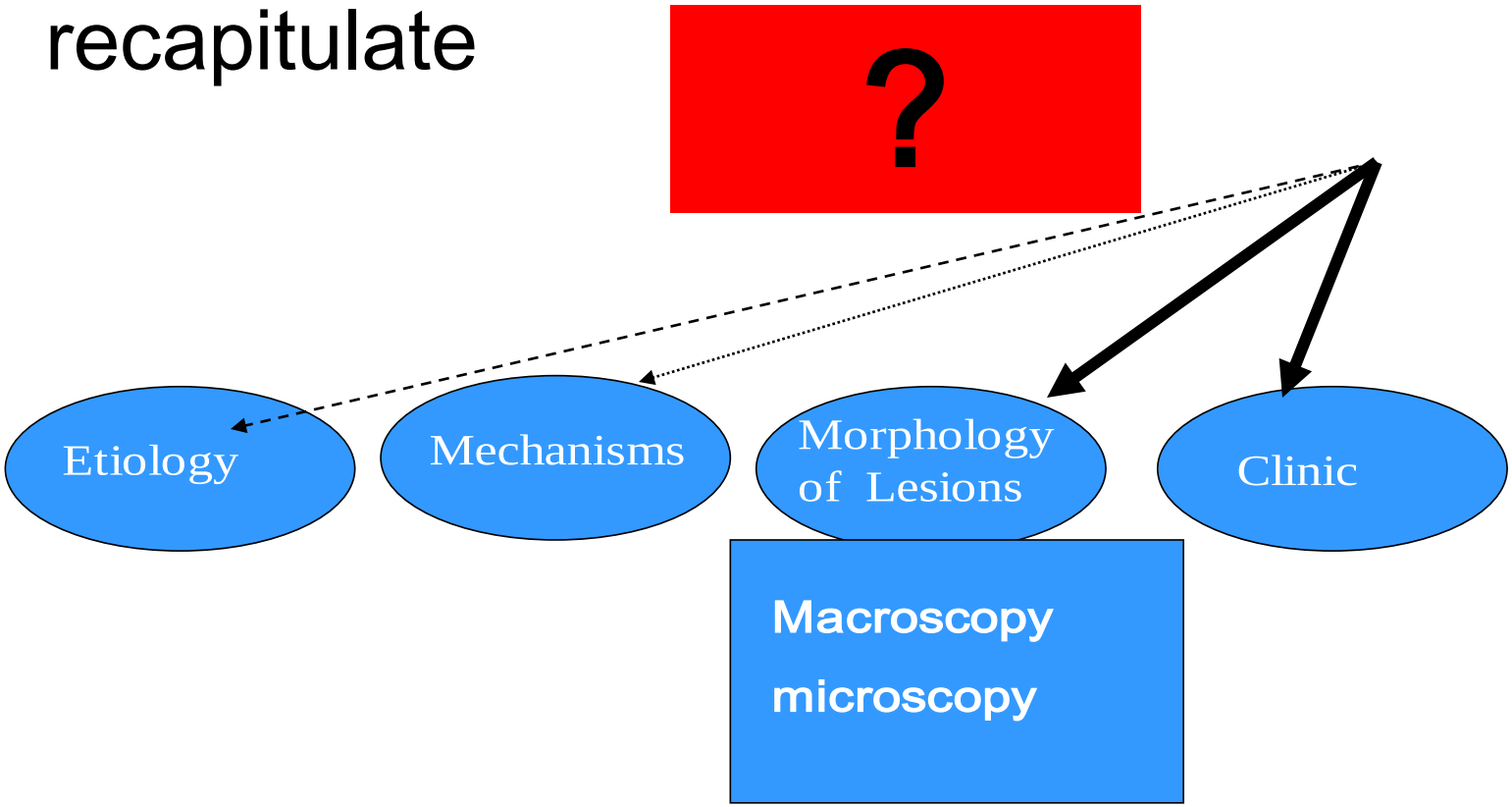
Their causes, mechanisms?

That is what you will define during **step 3**

Using the Robbins textbook.

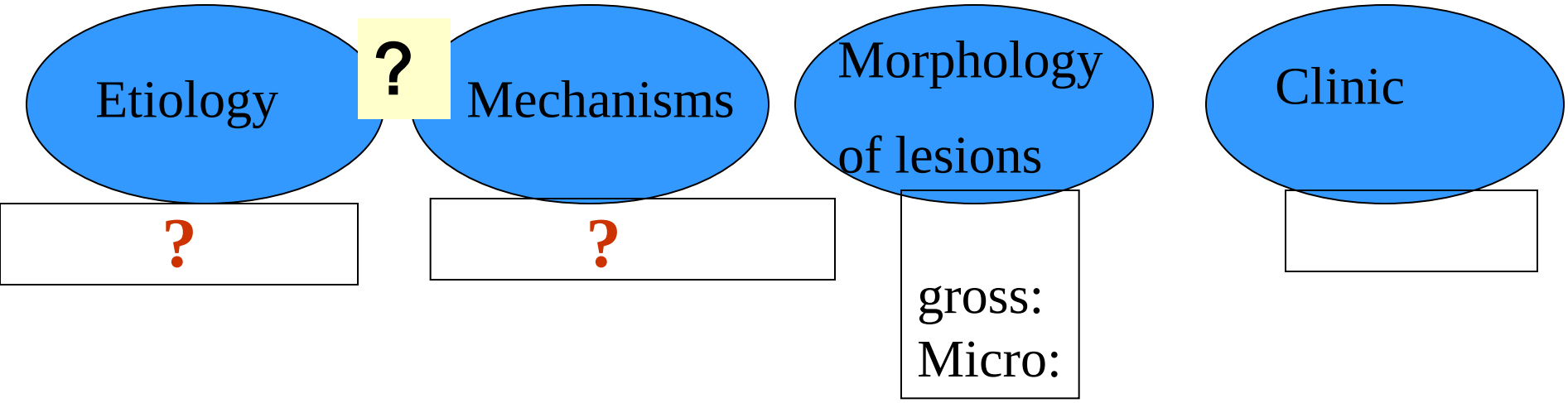
Step 3

Let's recapitulate



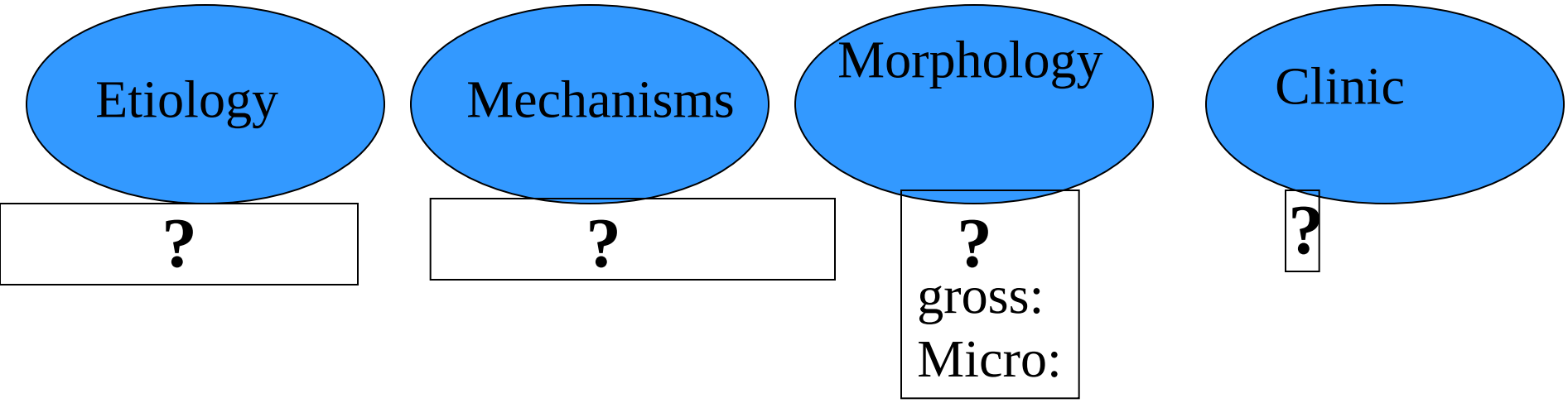
One example of disease: **hemochromatosis**

Use the Robbins to fill the boxes



(Robbins *index*: hemochromatosis)

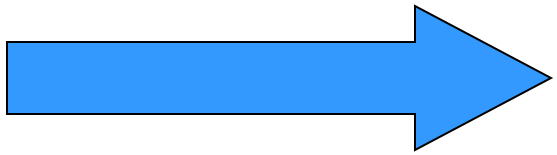
Another lesion: steatosis



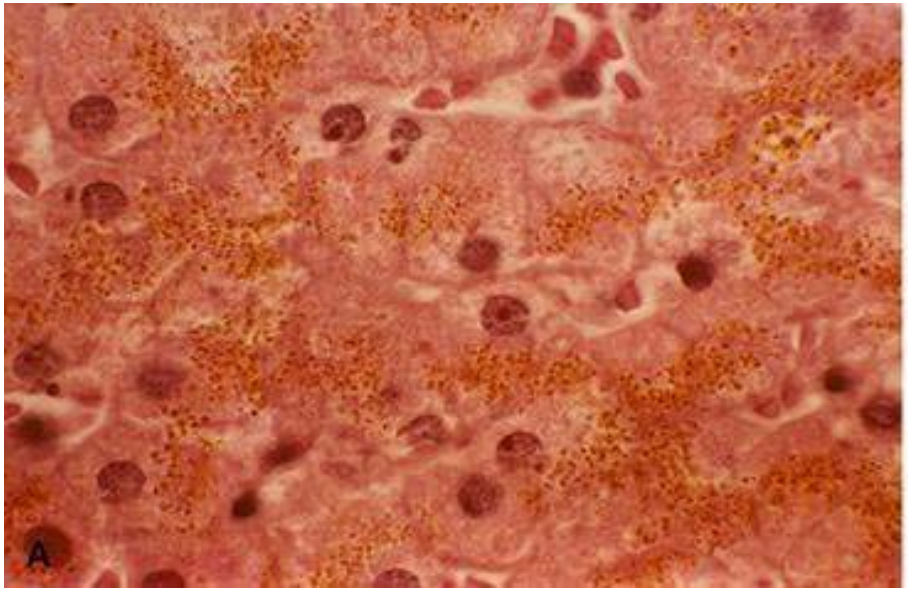
Robbins index : « steatosis » « fatty change » « fatty liver »

Step 4 :

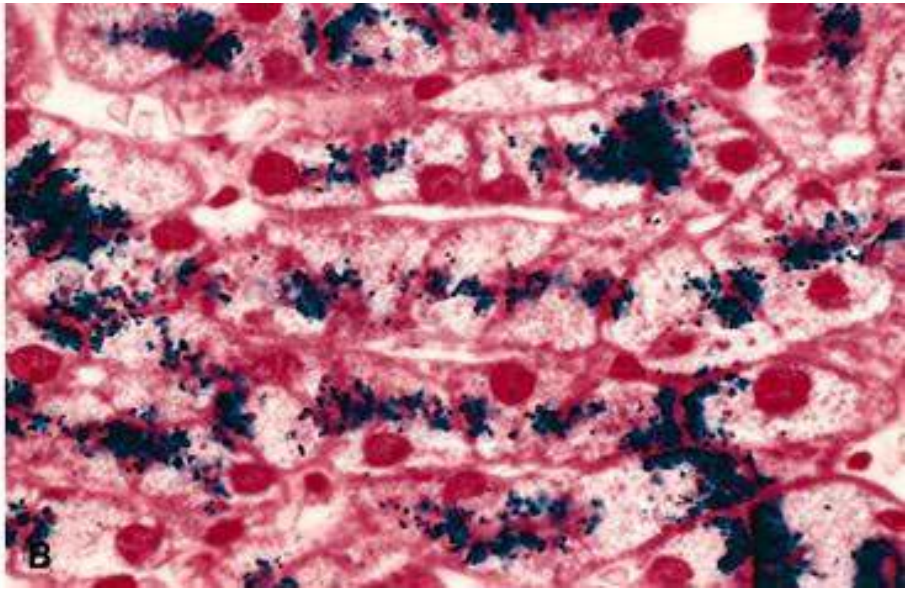
a quiz



A



B



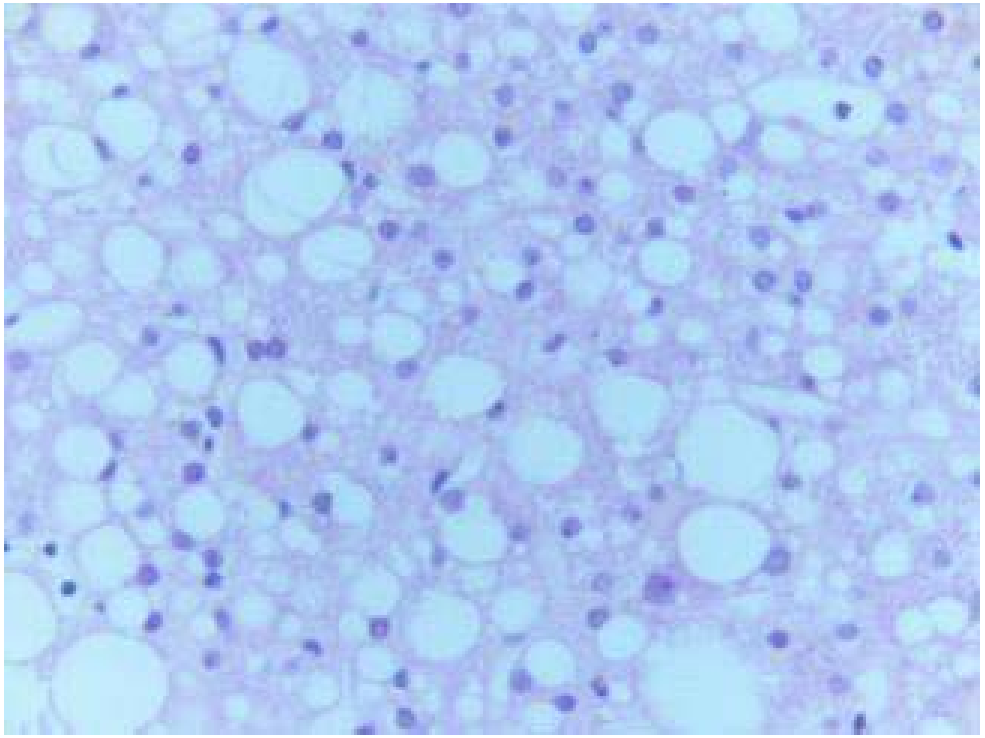
These microscopic images illustrate liver overload.

Picture B is a …….. Stain.

The brown (in A) and blue (in B) **deposit is ……..**

This is :

- an inherited disease?
- an acquired disease?



Liver steatosis

Which **substance** accumulates in the cytoplasm of these hepatocytes ?

- cholesterol
- triglycerides

In the two diseases that you have studied, the liver is enlarged (size and weight are increased).

Is this :

- Hyperplasia ?
- Hypertrophy ?

Besides the liver, in which organs or tissues can these lesions be observed :

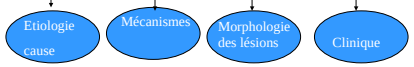
- **An iron overload:**
- -…..
- -…..
- -…..

- ***fatty changes***
- -……

The End for today! you now know how to

Pathos maladie *Logos* : étude

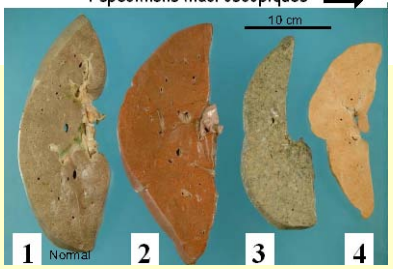
L'étude des maladies comprend ces 4 aspects:



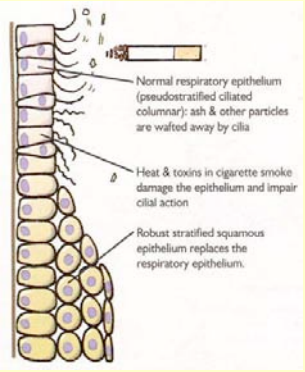
Robbins 6è Edition pages 1-2

7è Edition page 4

4 spécimens macroscopiques



- Define pathology
- Observe a gross specimen
- Explain how a tissue section is obtained
- Compare a normal and diseased tissue
- Find information in Robbins relativ the observed lesions.



Robbins

- Les pages Contents (Xiii et XiV après la préface)

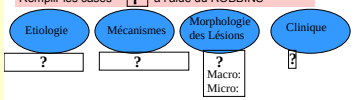
vous indiquent que le livre comporte **deux parties**:

. La pathologie **générale :** p xiii

. La pathologie **par organes :** p xiv-xv

Un exemple de maladie : **l'hémochromatose**

Remplir les cases ? à l'aide du ROBBINS



Prenez le **Robbins** pages .. (*index*: hemochromatosis)

À la fin!