

▶ 00:01:52:20



Experiment 08:10 / 05:03:20 >

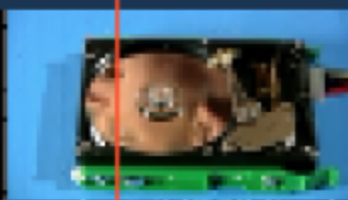
00:01:50:00

00:0

Ferromagnetic core



sc dur





Video Roles



Video Role

Titles

Titles

Video

Video

PICTURES

PICTURES

New Subrole

pictures subrole

PICTURES NOT TO GO

PICTURES NOT TO GO subrole

pictures not to go subrole2



Audio Roles



Audio Role

Dialogue

Effects

Music

Cancel

Apply

How...works

- Smart...tions
- All Video
- Audio Only
- Favorites
- Projects
- Stills

5-09-2019

Name

- Picture TH
- Picture TV
- Com és ur
- Screen Shi
- Screen Shi

1 of 24 selected, 10:00

Picture THREE

Picture THREE

Notes

Name	Picture THREE
Start	01:00:00:00
End	01:00:10:00
Duration	00:00:10:00
Reel	
Scene	
Take	
Camera Angle	
Camera Name	
Media Start	00:00:00:00

00:03:00:00 Extended Apply Custom Name

Index How a hard drive works Storyline 10:00 / 05:03:20

00:02:45:00 00:02:50:00 00:02:55:00 00:03:00:00 00:03:05:00 00:03:10:00 00:03:15:00 00:03:20:00 00:03

Slider

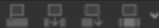
Picture THREE

Globesatoy

Com és un disc dur

Timeline with video clips of people at a table

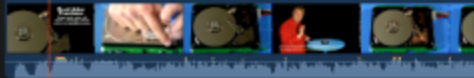




00:00:00:00 | 00:00:30:00 | 00:01:00:00 | 00:01:30:00 | 00:02:00:00 | 00:02:30:00 | 00:03:00:00 | 00:03:30:00 | 00:04:00:00 | 00:04:30:00



Com és un disc dur



Com és un disc dur



Atmosphere

Clouds





Video Roles

+ Video Role

Titles

Titles

Video

Video

PICTURES

PICTURES

New Subrole

pictures subrole

- PICTURES NOT TO GO

+ Subrole



HIDE

PICTURES NOT TO GO subrole

pictures not to go subrole2



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+ Audio Role

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Cancel

Apply

Camera Name

Media Start

00:00:00

00:03:00:00

Extended

App

How a har

New Compound Clip...

⌘G

Open Clip

⌘P

Change Duration...

⌘D

Rename Clip

Disable

V

Assign Audio Roles

▶

Assign Video Roles

▶

Expand Audio

⌘S

Expand Audio Components

⌘⌘S

Show Video Animation

⌘V

Show Audio Animation

⌘A

Lift from Storyline

⌘⌘↑

Reveal in Browser

⌘F

00:03:15:00

00:03:20:00

Picture THREE

Picture THREE

Picture THREE

Picture THREE

Globeasatoy



Titles

⌘⌘T

Video

⌘⌘V

PICTURES

PICTURES

New Subrole

✓ pictures subrole

PICTURES NOT TO GO

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Edit Roles...



▶ 00:01:52:20



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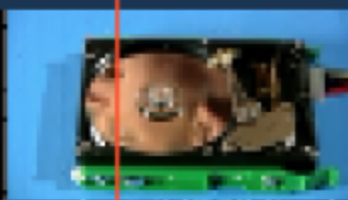
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Ferromagnetic core



sc dur



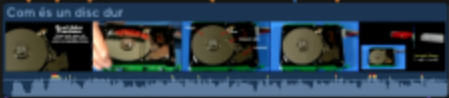
Index



How a hard drive works 05:03:20



00:00:00-00 | 00:00:30-00 | 00:01:00-00 | 00:01:30-00 | 00:02:00-00 | 00:02:30-00 | 00:03:00-00 | 00:03:30-00 | 00:04:00-00 | 00:04:30-00 | 00:05:00-00



Atmosfera

Clouds







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Titles

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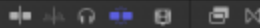
Slider

Picture THREE

Globesatoy

Com és un disc dur

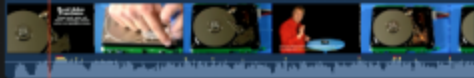
Timeline with video clips of a person in a red shirt at a table.



00:00:00:00 | 00:00:30:00 | 00:01:00:00 | 00:01:30:00 | 00:02:00:00 | 00:02:30:00 | 00:03:00:00 | 00:03:30:00 | 00:04:00:00 | 00:04:30:00



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Atmosphere

Clouds









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pictures subrole

- PICTURES NOT TO GO

+ Subrole



HIDE

PICTURES NOT TO GO subrole

pictures not to go subrole2



Audio Roles

+ Audio Role

Dialogue

Effects

Music

Cancel

Apply

Camera Name

Media Start

00:00:00

00:03:00:00

Extended

App

How a har

New Compound Clip...

⌘G

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⌘P

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⌘D

Rename Clip

Disable

V

Assign Audio Roles

▶

Assign Video Roles

▶

Expand Audio

⌘S

Expand Audio Components

⌘⇧S

Show Video Animation

⌘V

Show Audio Animation

⌘A

Lift from Storyline

⌘⇧↑

Reveal in Browser

⇧F

00:03:15:00

00:03:20:00

Picture THREE

Picture THREE

Picture THREE

Picture THREE

Globeasatoy



Titles

⌘⇧T

Video

⌘⇧V

PICTURES

PICTURES

New Subrole

✓ pictures subrole

PICTURES NOT TO GO

PICTURES NOT TO GO subrole

pictures not to go subrole2

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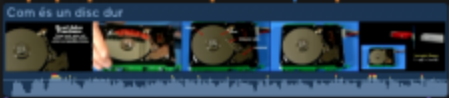
Index



How a hard drive works 05:03:20



00:00:00-00 | 00:00:30-00 | 00:01:00-00 | 00:01:30-00 | 00:02:00-00 | 00:02:30-00 | 00:03:00-00 | 00:03:30-00 | 00:04:00-00 | 00:04:30-00 | 00:05:00-00



Atmosfera

Clouds





# Hard drive Teardown

flying heads, voice coil  
motors, amazingly smooth  
surfaces & signal processing

series 3 | [engineerguy videos](#)

Supported in part by

THE CAMILLE  
& HENRY DREYFUS  
FOUNDATION, INC.



# Bill Hammack

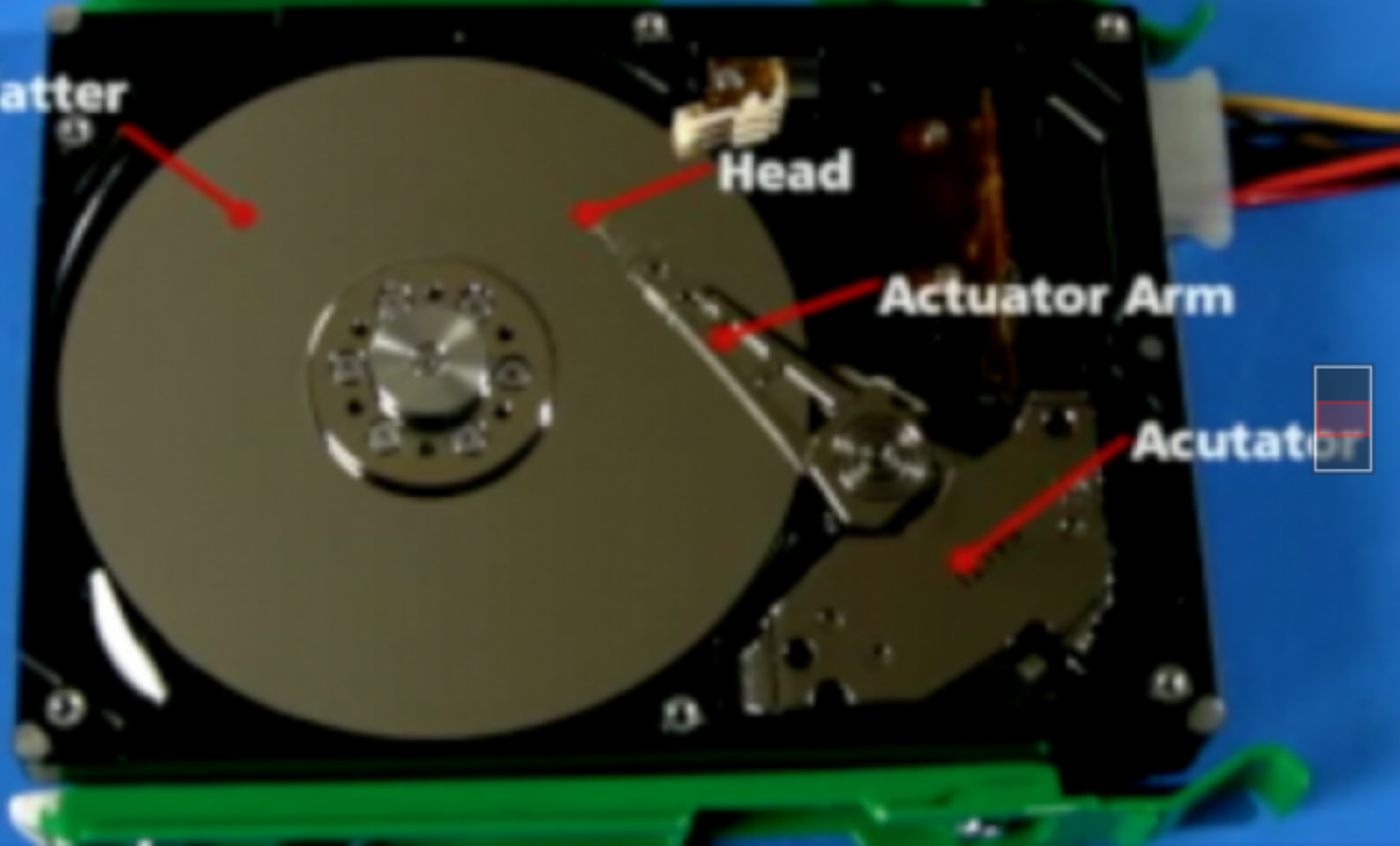
Department of Chemical  
& Biomolecular Engineering  
University of Illinois - Urbana

**Platter**

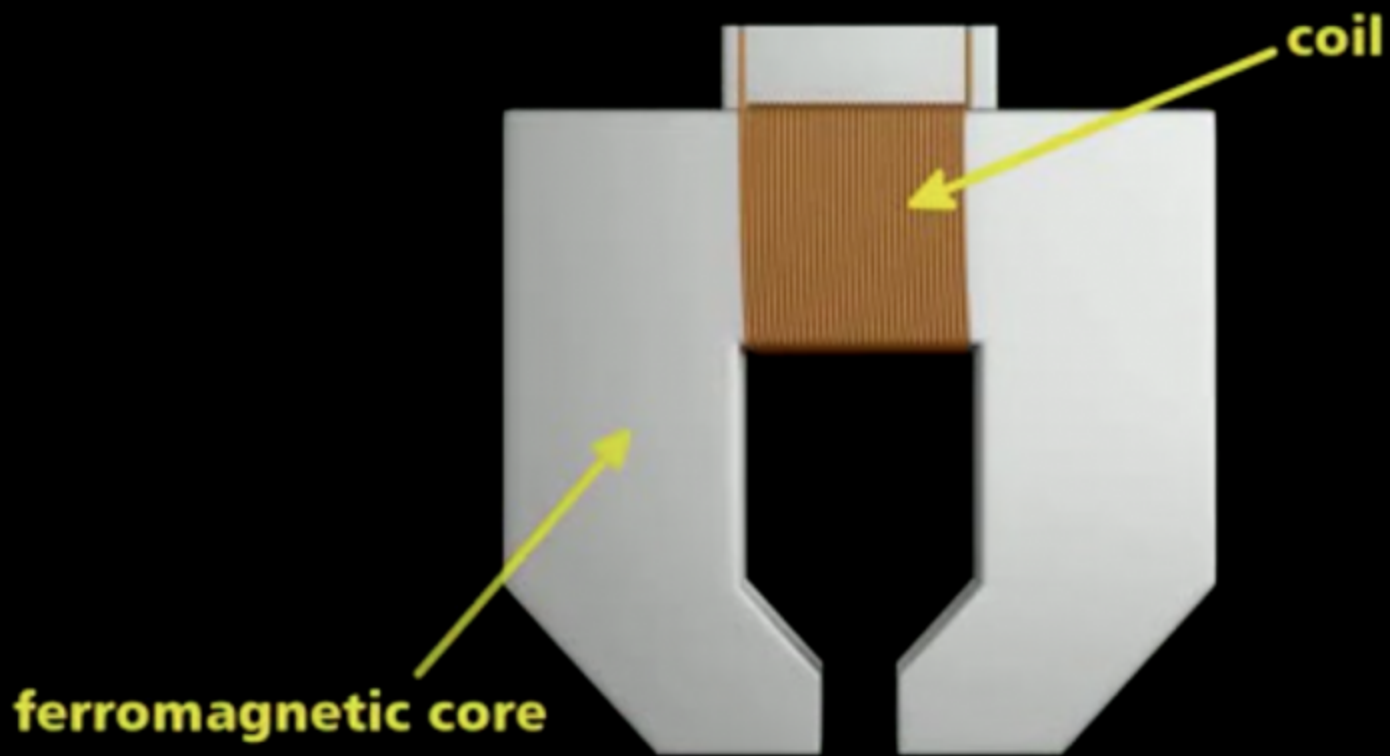
**Head**

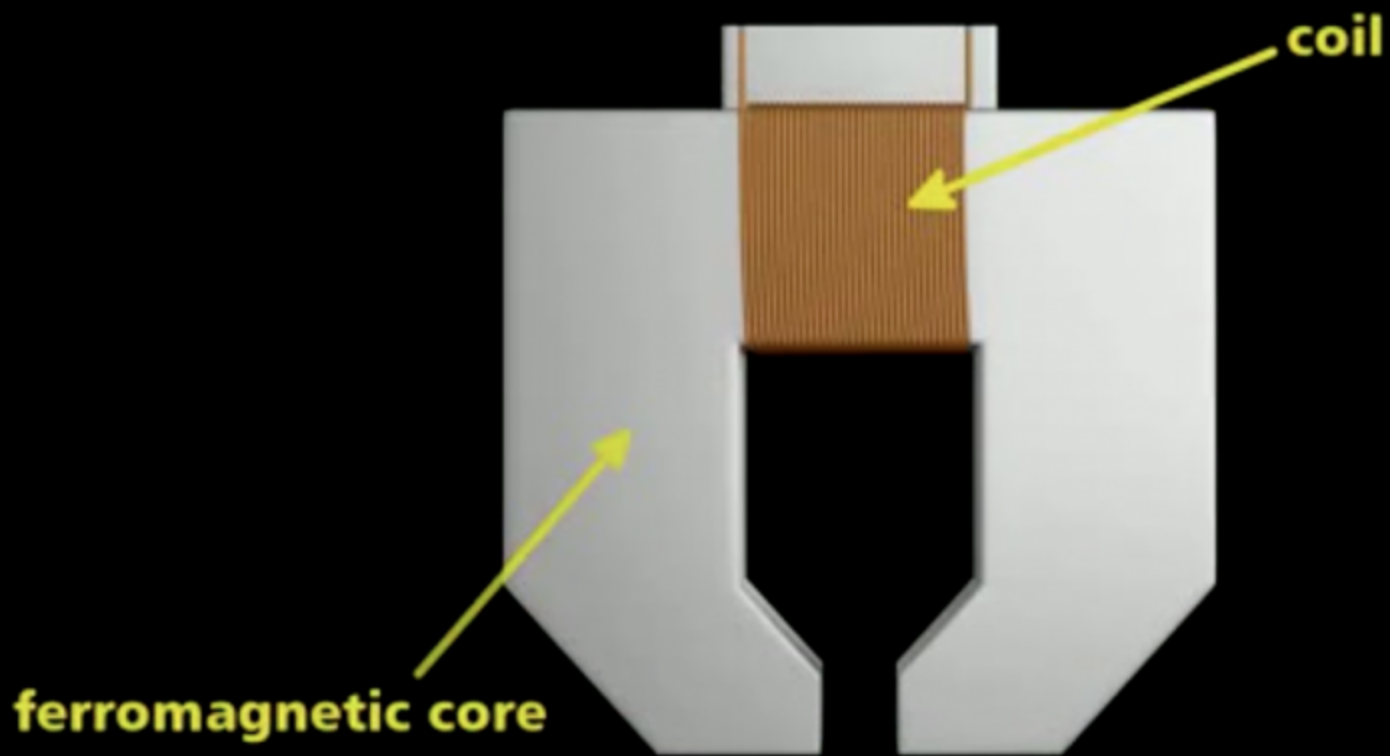
**Actuator Arm**

**Actuator**











**Faraday's Law** The EMF (electromotive force) generated is proportional to the rate of change of the magnetic flux



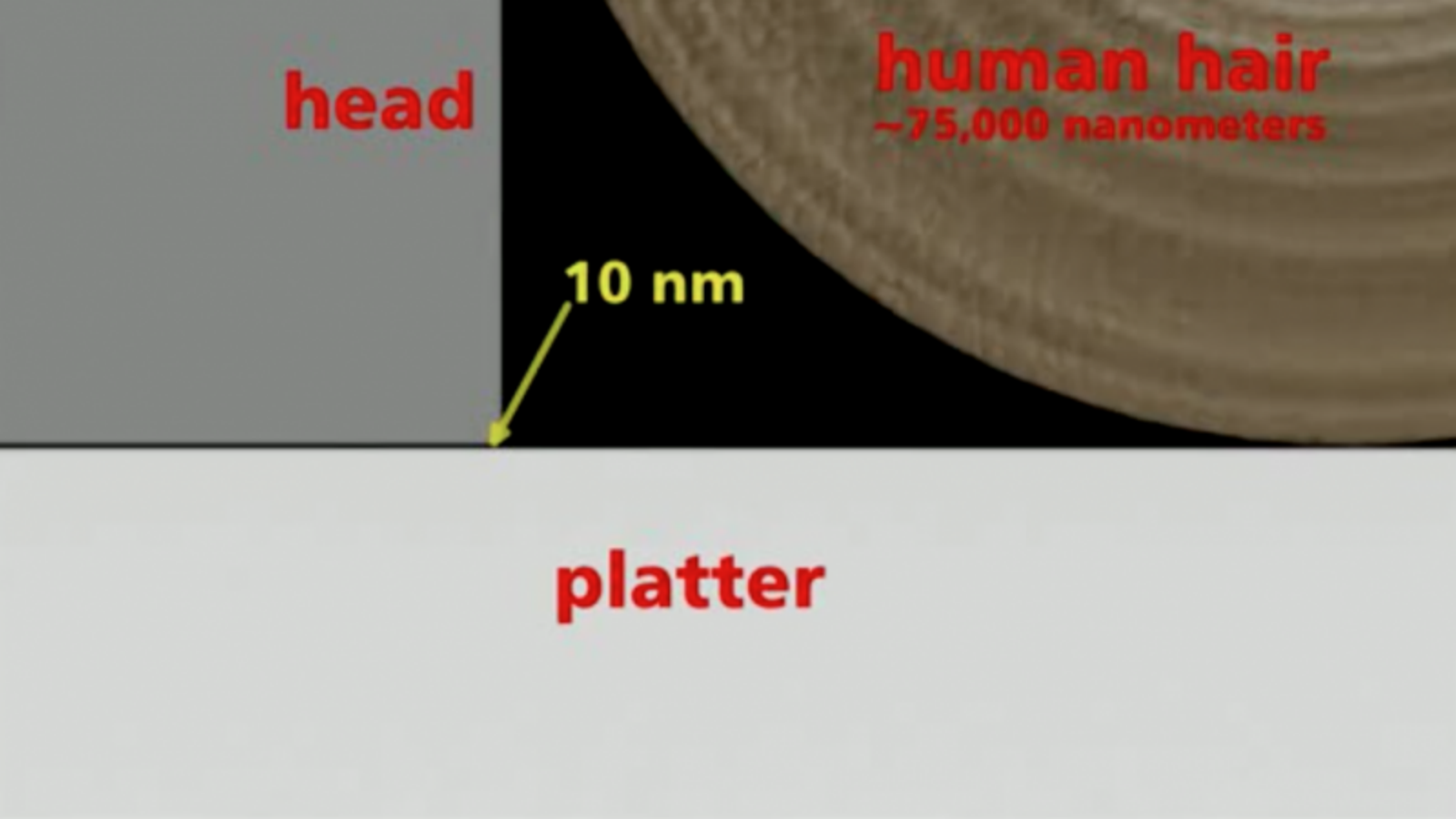
**Faraday's Law** The EMF (electromotive force) generated is proportional to the rate of change of the magnetic flux

**head**

**human hair**  
~75,000 nanometers

**10 nm**

**platter**

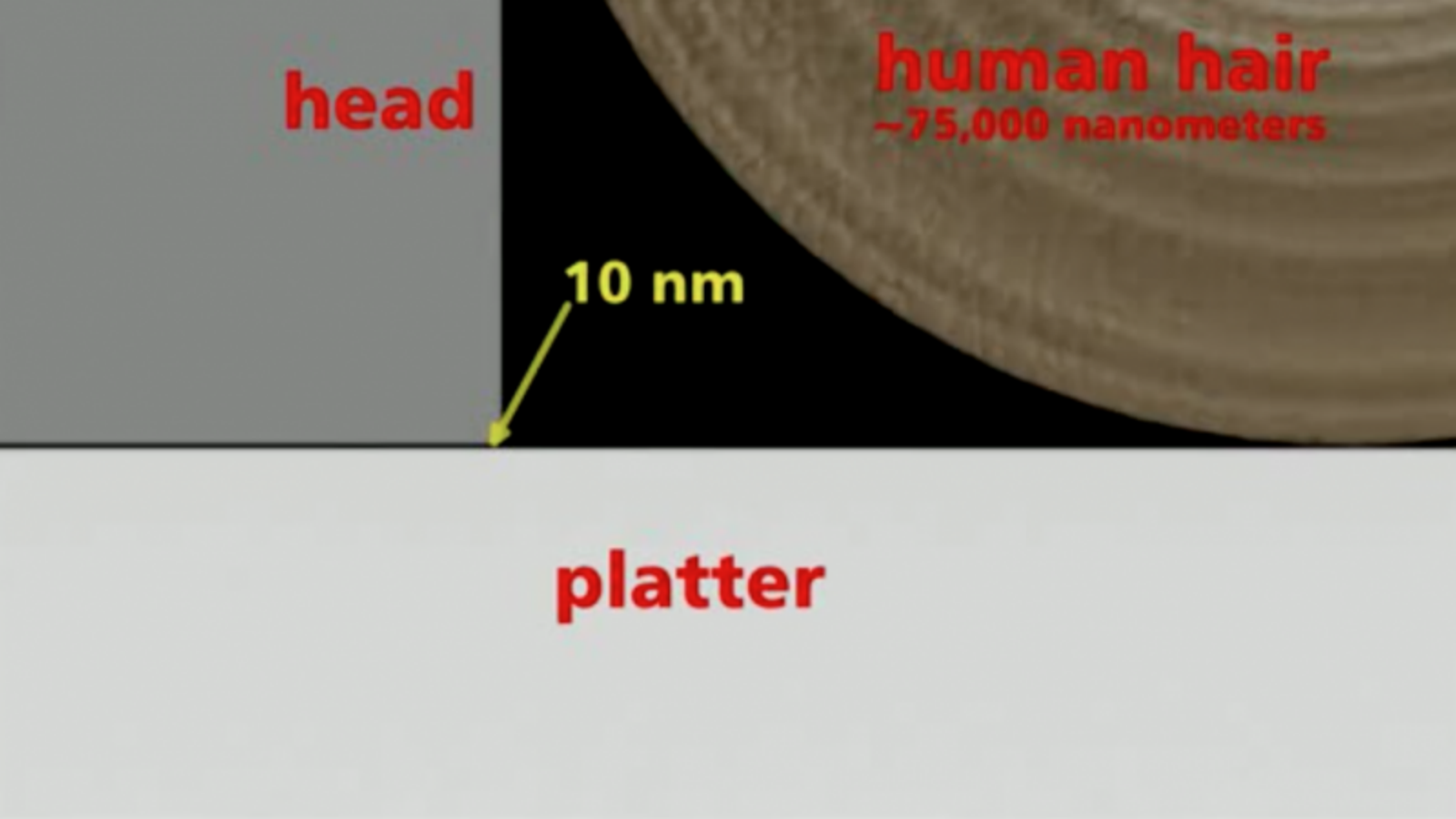


**head**

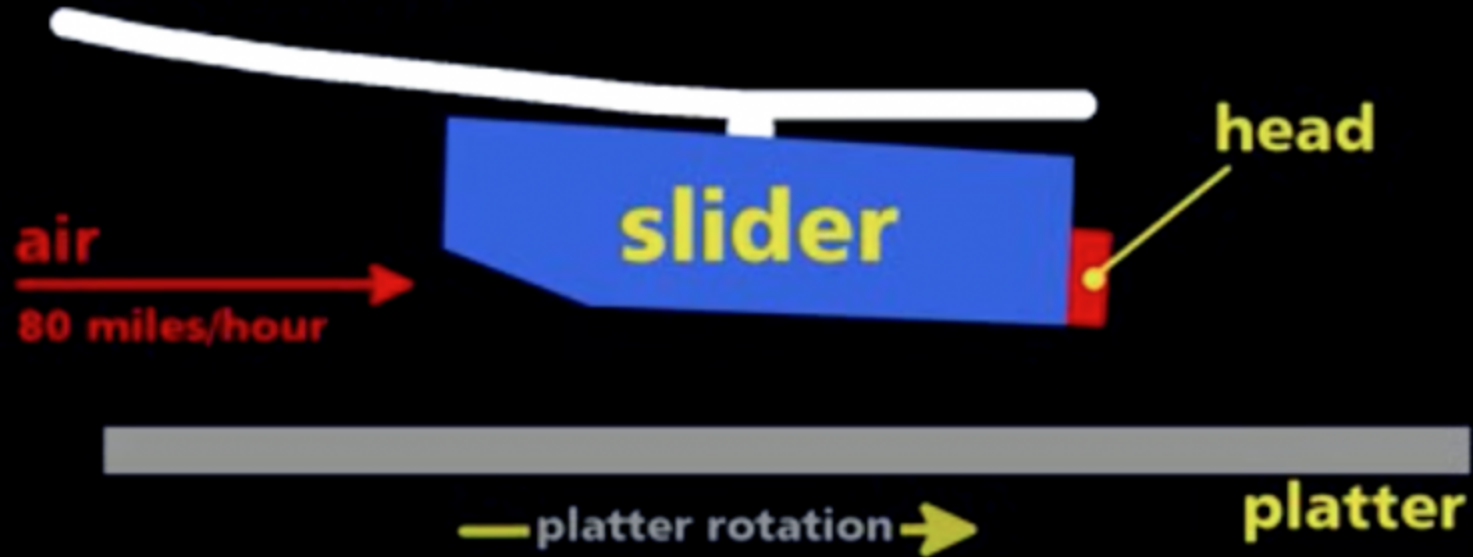
**human hair**  
~75,000 nanometers

**10 nm**

**platter**



**Suspension**



**head**

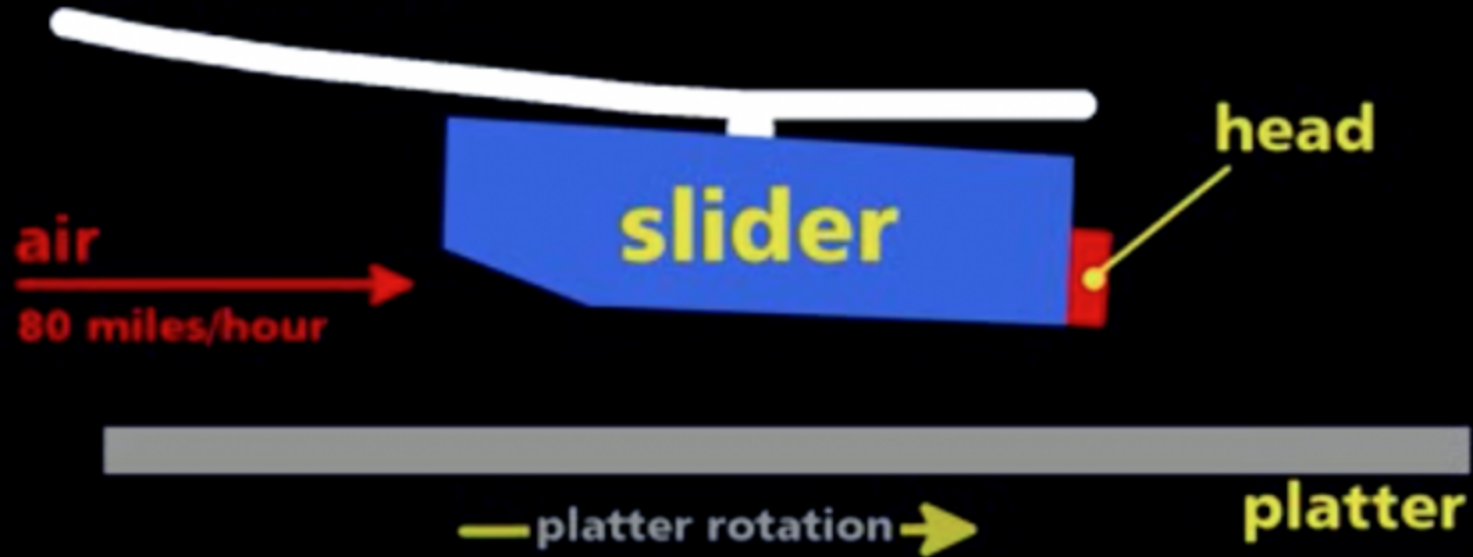
**slider**

**air**  
80 miles/hour

**platter rotation**

**platter**

**Suspension**



**head**

**slider**

**air**  
80 miles/hour

**platter rotation**

**platter**



## Carbon Overcoat

tough layer with lubricant  
to reduce wear

## Magnetic Layer

## Chromium

## Aluminium

low density, rigid,  
& low cost

## Cobalt with platinum & nickel

Sputtered onto chromium, which provides  
grained surface that is replicated in magnetic  
layer, which helps reduce signal noise

# Platter

The diagram illustrates the layered structure of a hard drive platter. It consists of four overlapping circular layers, each with a central hole. From left to right, the layers are: a brownish-yellow Carbon Overcoat, a teal Magnetic Layer, a purple Chromium layer, and a light blue Aluminium layer. The layers are shown in a perspective view, overlapping to show their relative positions. A red arrow points from the text 'Cobalt with platinum & nickel' to the Magnetic Layer.

## Carbon Overcoat

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## Magnetic Layer

## Chromium

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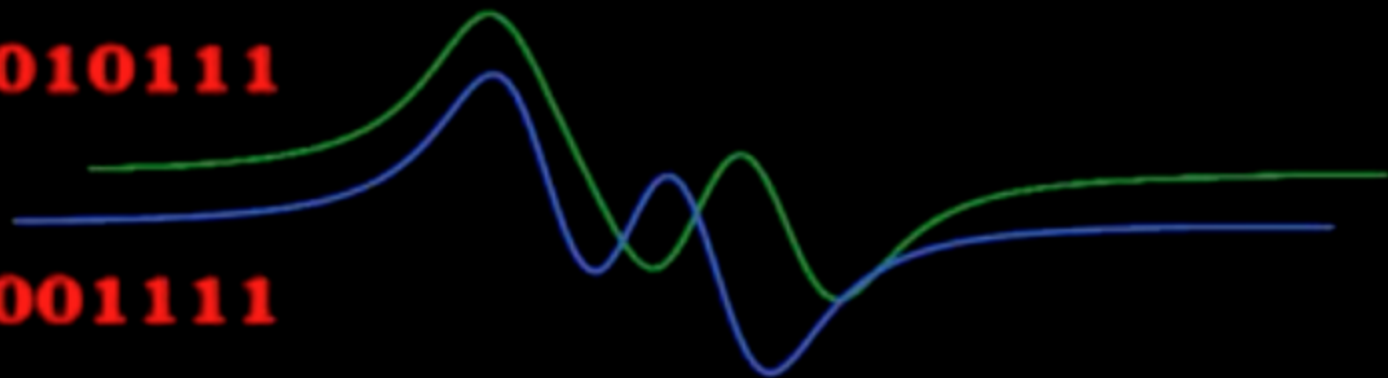
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# Partial Response Maximum Likelihood

**010111**

**001111**



# Partial Response Maximum Likelihood

**010111**

**001111**

