

* Saving exhibits from the dumpster

Refurbishing on a shoestring budget

*Brought to you by the Department of Science Content and Design,
and the number π*

ONTARIO
SCIENCE
CENTRE



Is the shortest route
always the fastest?
WATCH THIS RACE!

**REGARDEZ CETTE
COURSE!**

Le chemin le plus court
est-il toujours
le plus rapide?



2.85 m / 2.85 m

3.10 m / 3.10 m

FINISH ARRIVEE

Both balls start at the same time.
Les deux balles partent en même temps.

Why does the ball travelling the LONG WAY arrive FIRST?
Celle sur le parcours LE PLUS LONG arrive EN PREMIER. Pourquoi?

Why does the ball travelling the LONG WAY arrive FIRST?
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ISAAC NEWTON...

Why does the ball travelling the LONG WAY arrive FIRST?
Celle sur le parcours LE PLUS LONG arrive EN PREMIER. Pourquoi?



The ball on the curved path has a greater acceleration as it moves along the curve. It arrives at the finish line first.
La balle sur le parcours courbé a une accélération plus grande en avançant. Elle arrive en premier à l'arrivée.

Both balls start at the same time.
Les deux balles partent en même temps.

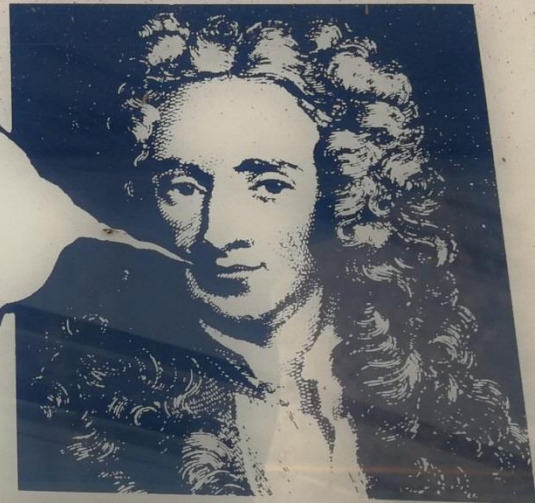
ISAAC NEWTON...

one of five 17th century mathematicians to find the fastest route between two points.

l'un des cinq mathématiciens du 17^e siècle qui trouvé le chemin le plus court entre deux points.

*I'd bet on the
CURVE Any Day!*

*Je parie que c'est
la courbe!*



The
C
res
ad



STRENGTH IS NOT ALWAYS THE ANSWER
Try lifting each weight the same distance

WHY IS THIS ONE THE EASIEST TO LIFT?

6
KILOS

6
KILOS

6
KILOS



RIPPLE TANK

In this tank, the vibrations set up
in the water in the tank. The walls
of the tank are lined with a material
that produces a steady, regular
vibration. The waves you see here are
ripples. They are produced by the
vibrations of the water in the tank.
The ripples are produced by the
vibrations of the water in the tank.



There is a disturbance of the water
in the tank. The disturbance of the
water in the tank produces the ripples
in the water. The ripples are
produced by the vibrations of the
water in the tank.



Turn handle



Come inside
and listen!
*Entrez et ouvrez
vos oreilles!*



**BERNOULLI
SAYS**
That if you blow some air
between the two spheres
by PRESSING the BUTTON...
The spheres come together
instead of moving apart.
WHY?

To move over the curved
surfaces, the air increases
its speed. Consequently the
pressure decreases between
the spheres. The surrounding
air pressure remains the
same and thus brings the two
spheres together.
This is a consequence of
Bernoulli's theorem.





Shadow Tunnel

Leave your shadow behind!
Step inside to find out how.

Why won't your shadow follow you out of the Shadow Tunnel?
The phenomenon of phosphorescence holds it back.

Here's how it works:

What's the difference between phosphorescence and fluorescence?

Le tunnel des ombres

Laissez votre ombre!
Entrez et voyez comment.

Pourquoi votre ombre ne vous suit-elle pas?
C'est parce que la phosphorescence la retient.

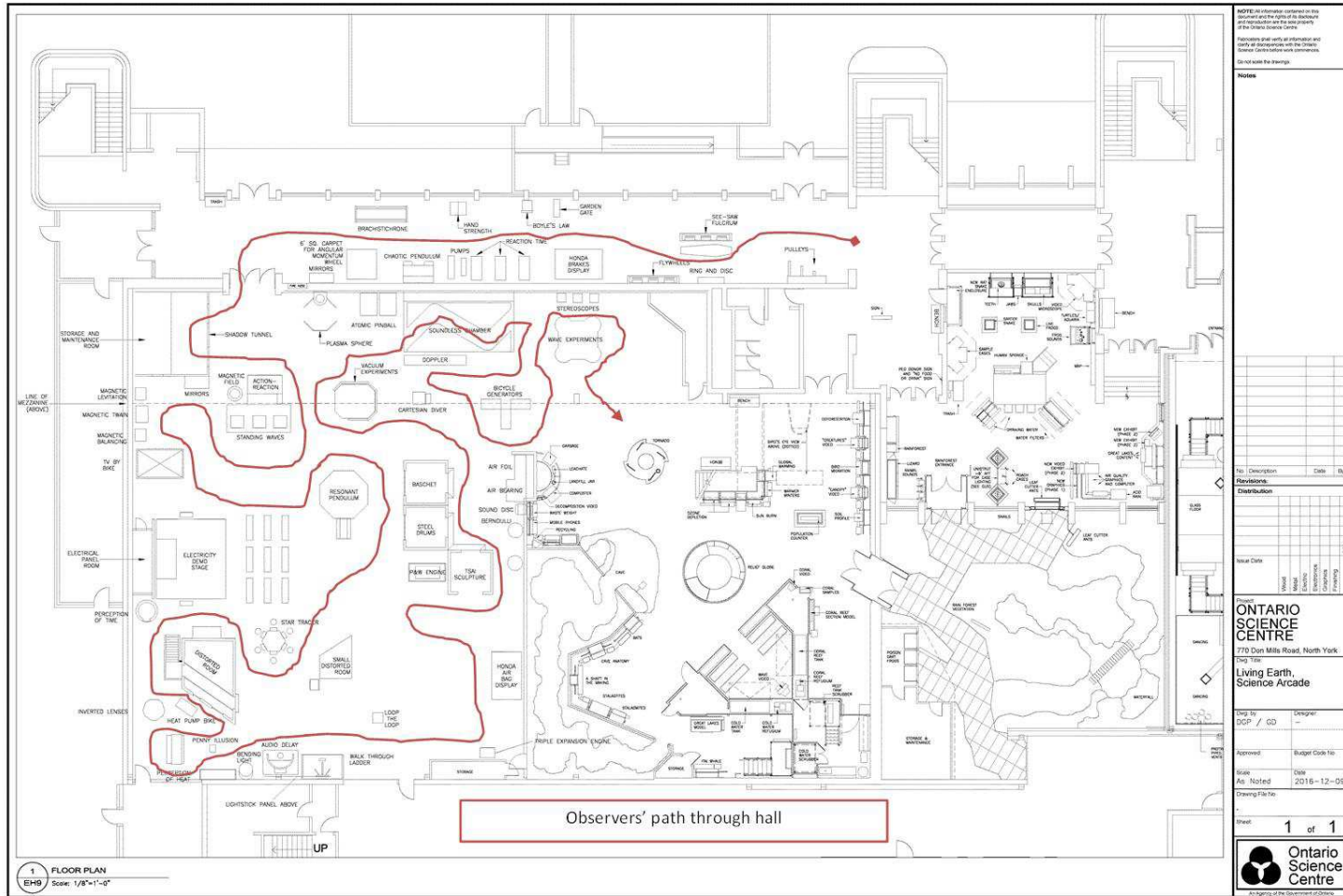
Voilà comment :

Quelle est la différence entre la phosphorescence et la fluorescence?





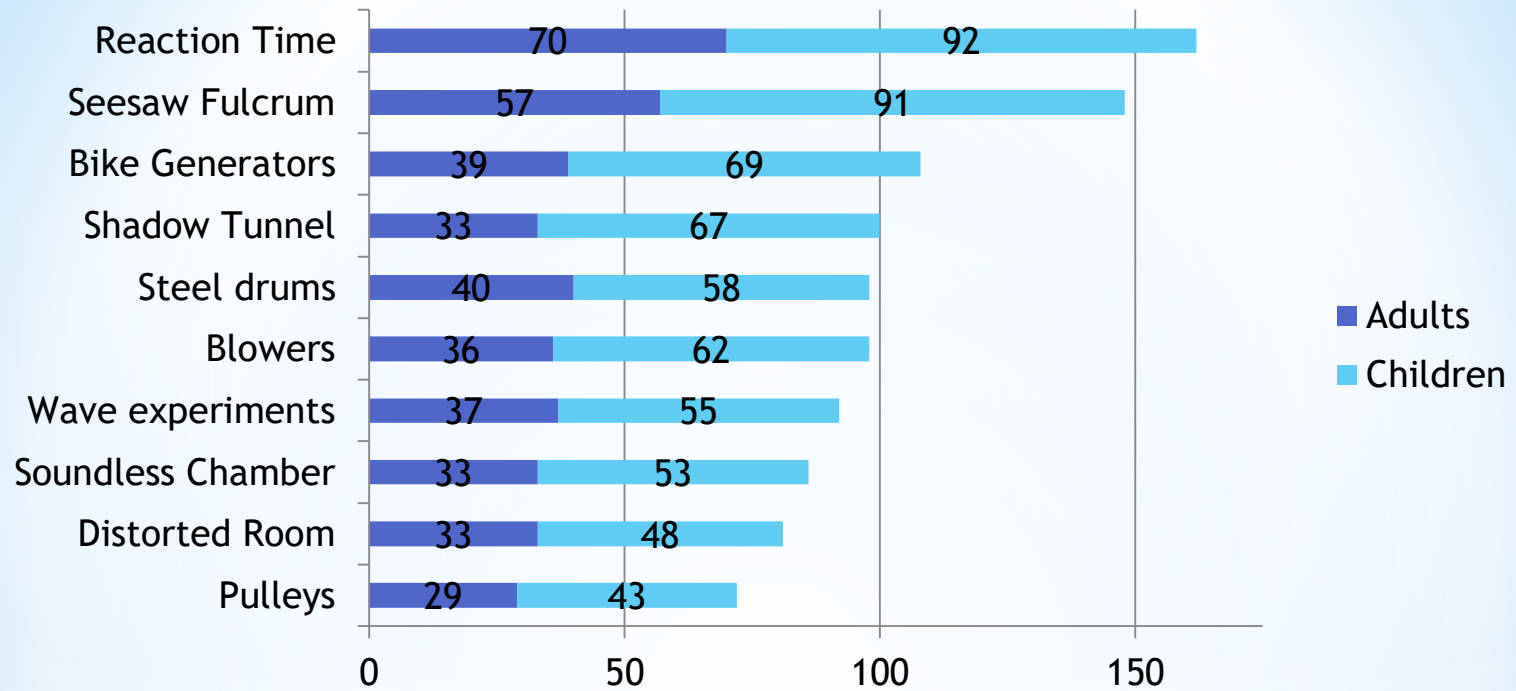




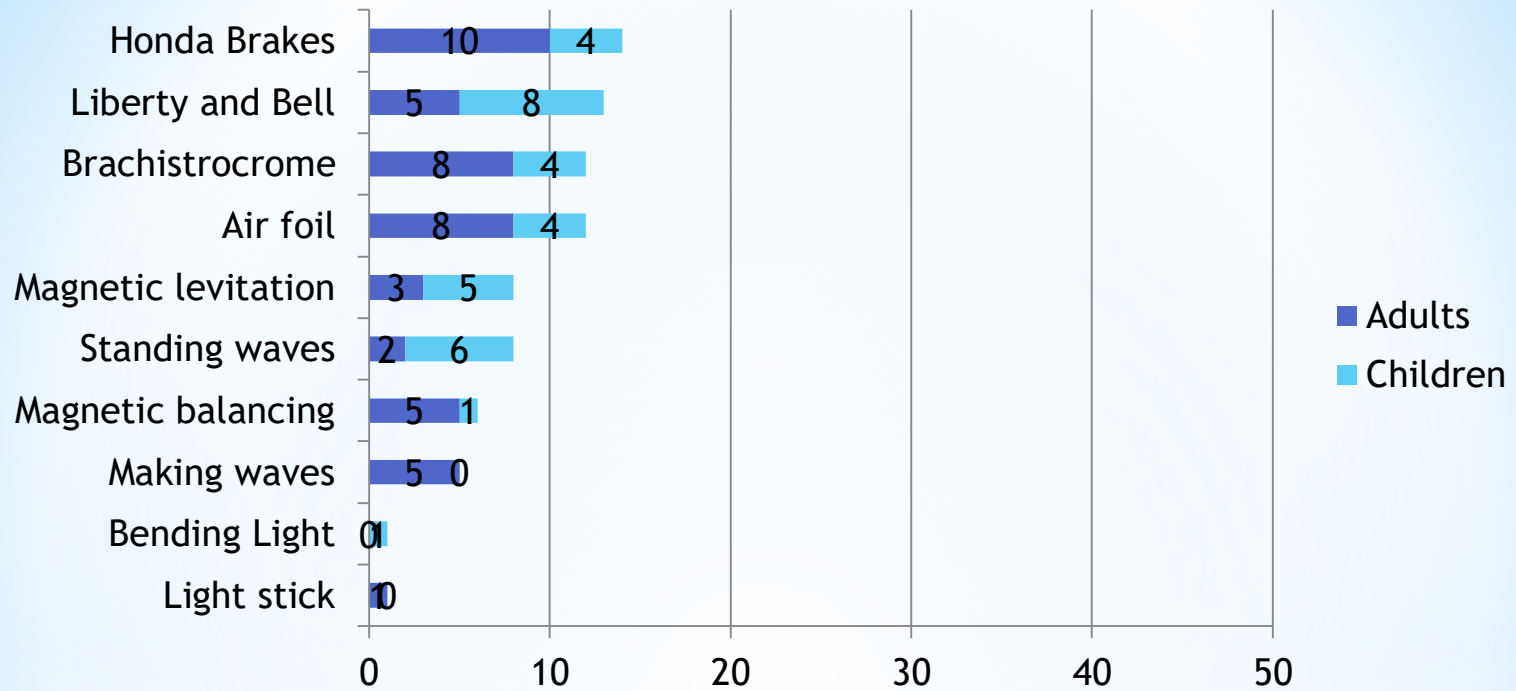
* Sweeps: snapshots of exhibit usage

• • •

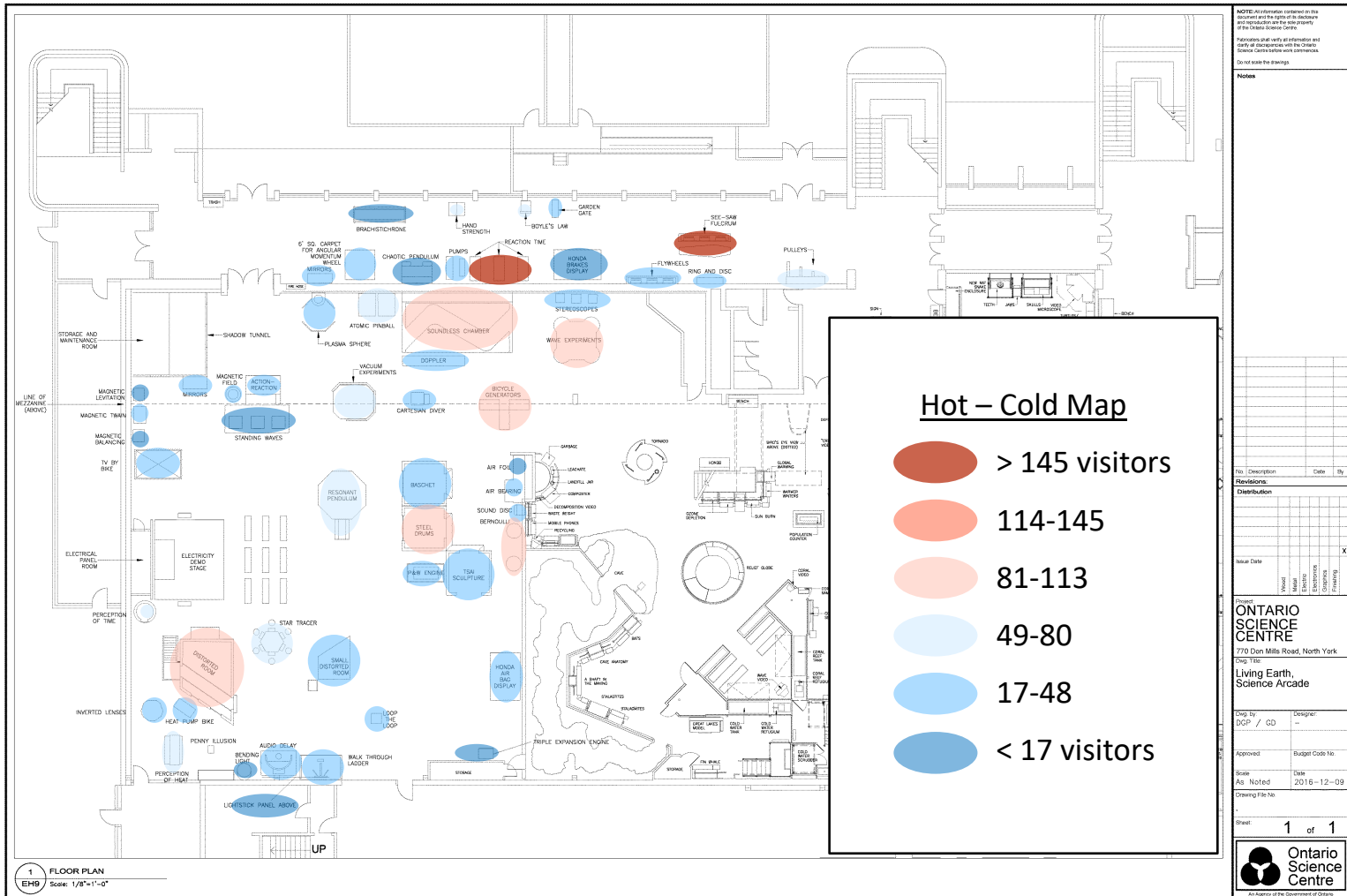
A total of 32 sweeps were made starting on 2016/12/28 through until 2017/01/10. During this time 2392 visitors were observed in the Science Arcade in direct interaction with one of the identified 57 exhibit clusters. A total of 1470 behaviours were identified, 97% of which fell into the 6 main expected categories selected for this study.



* **Most attended exhibits**

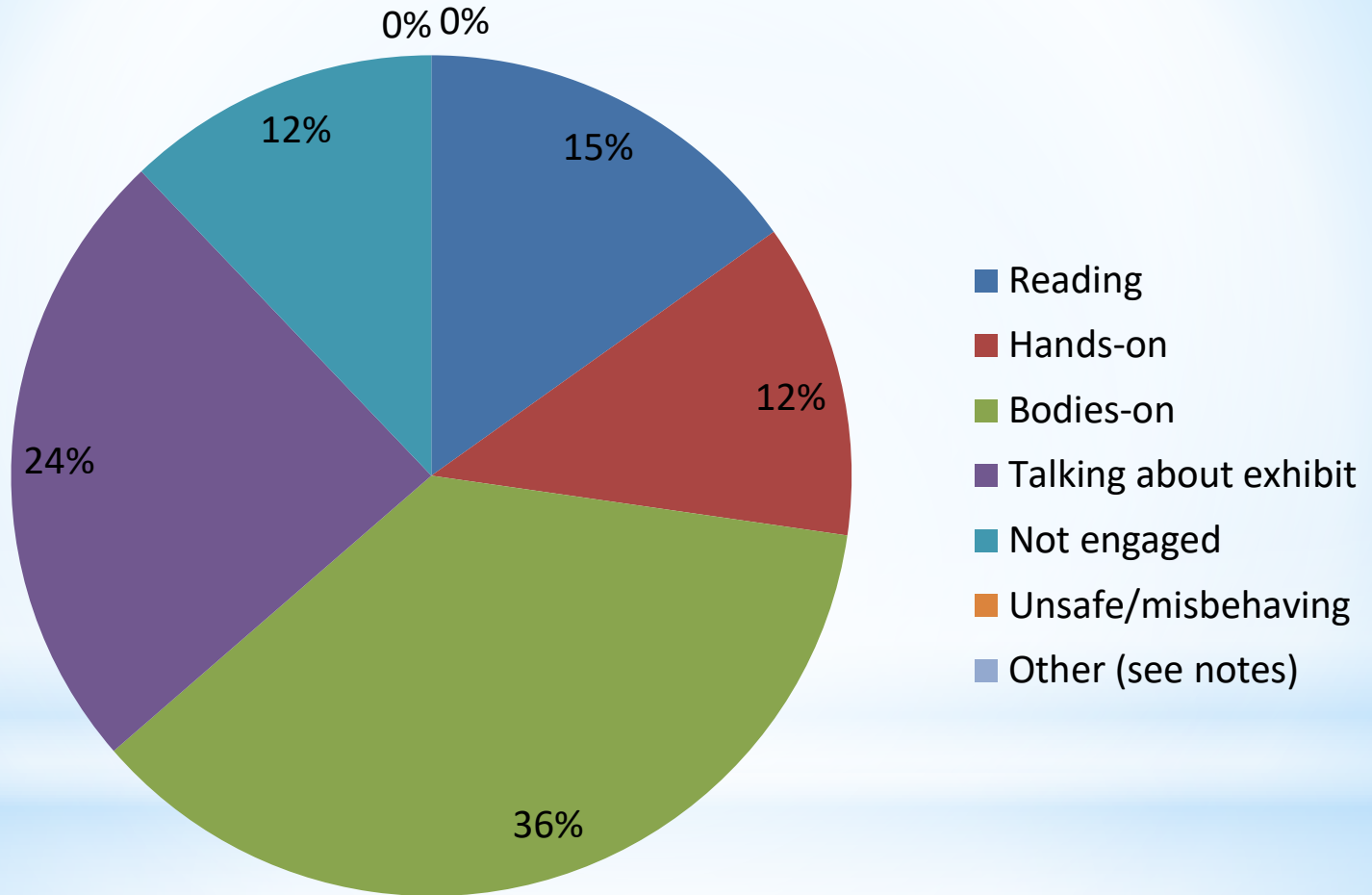


*Least attended exhibits

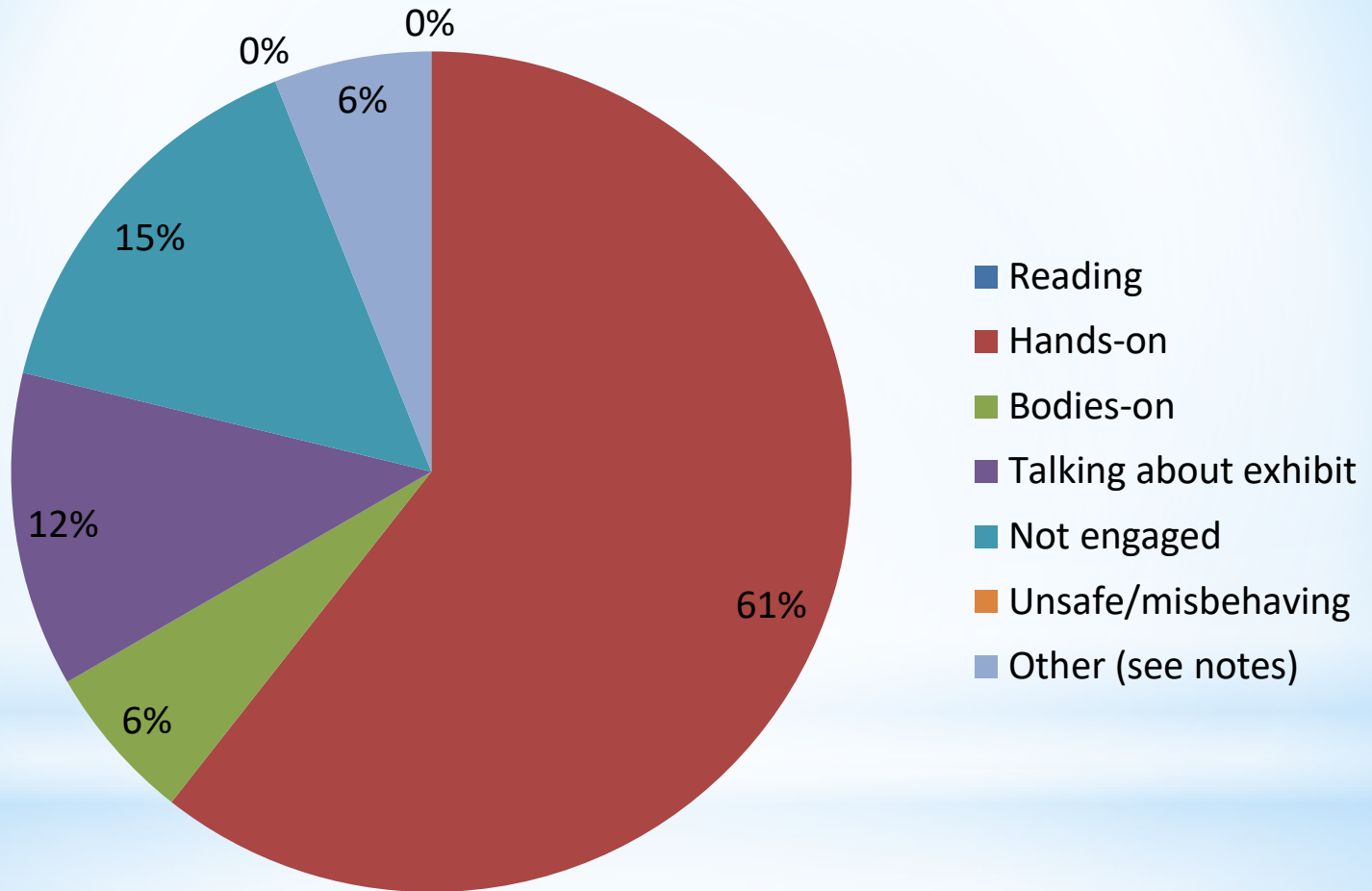


* Hot-Cold Map

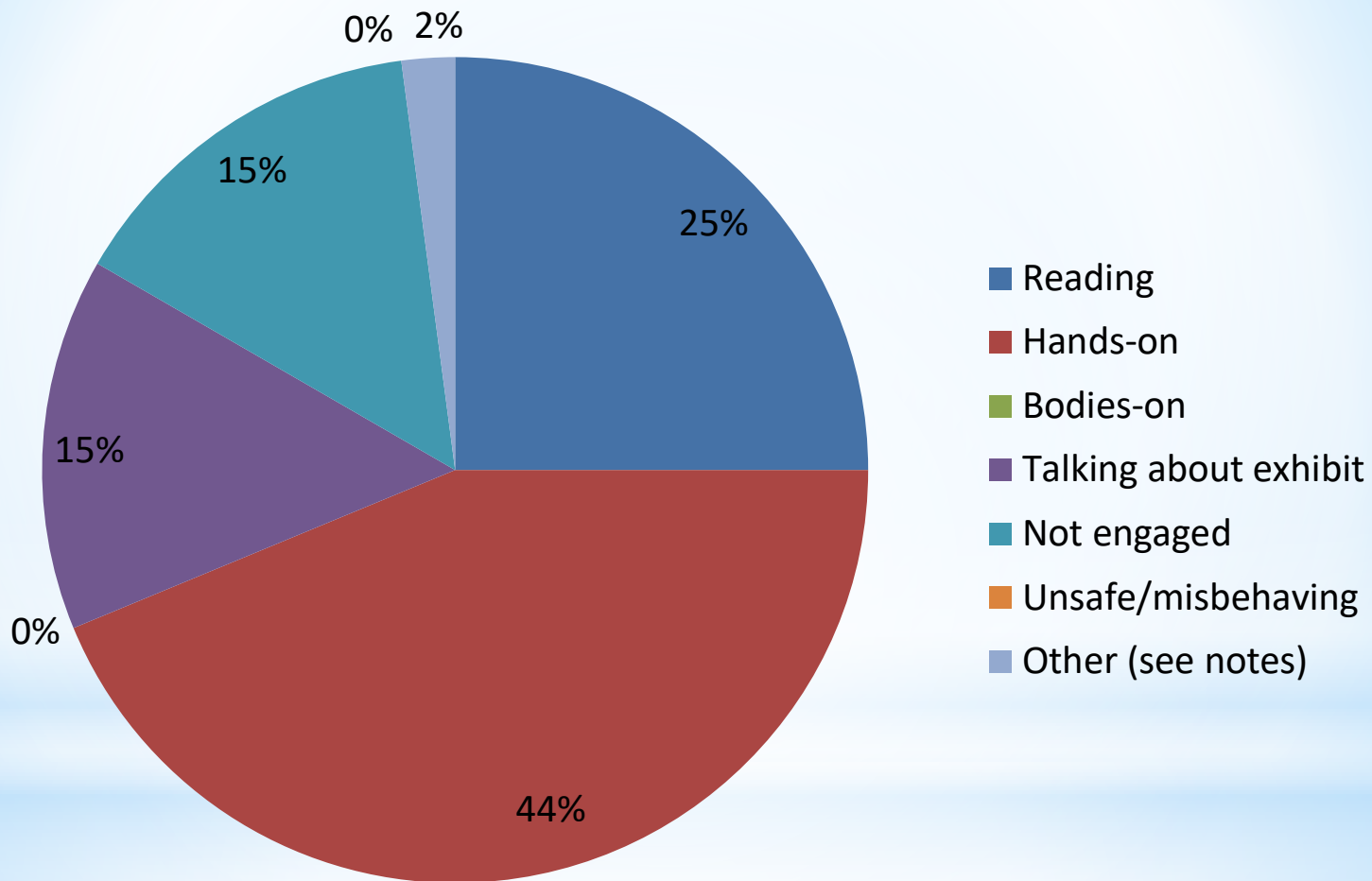
REACTION TIME



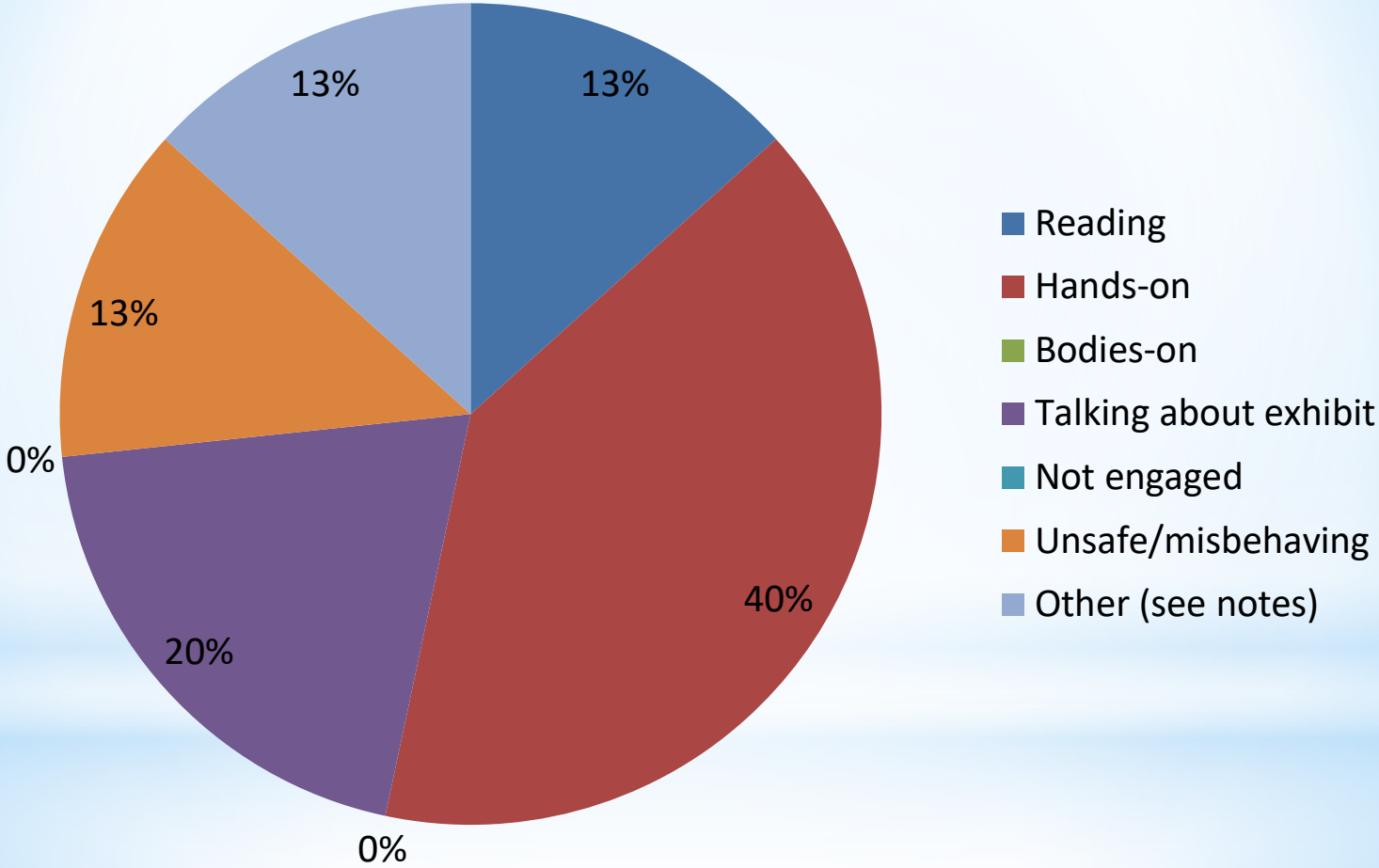
STEEL DRUMS



WAVE EXPERIMENTS

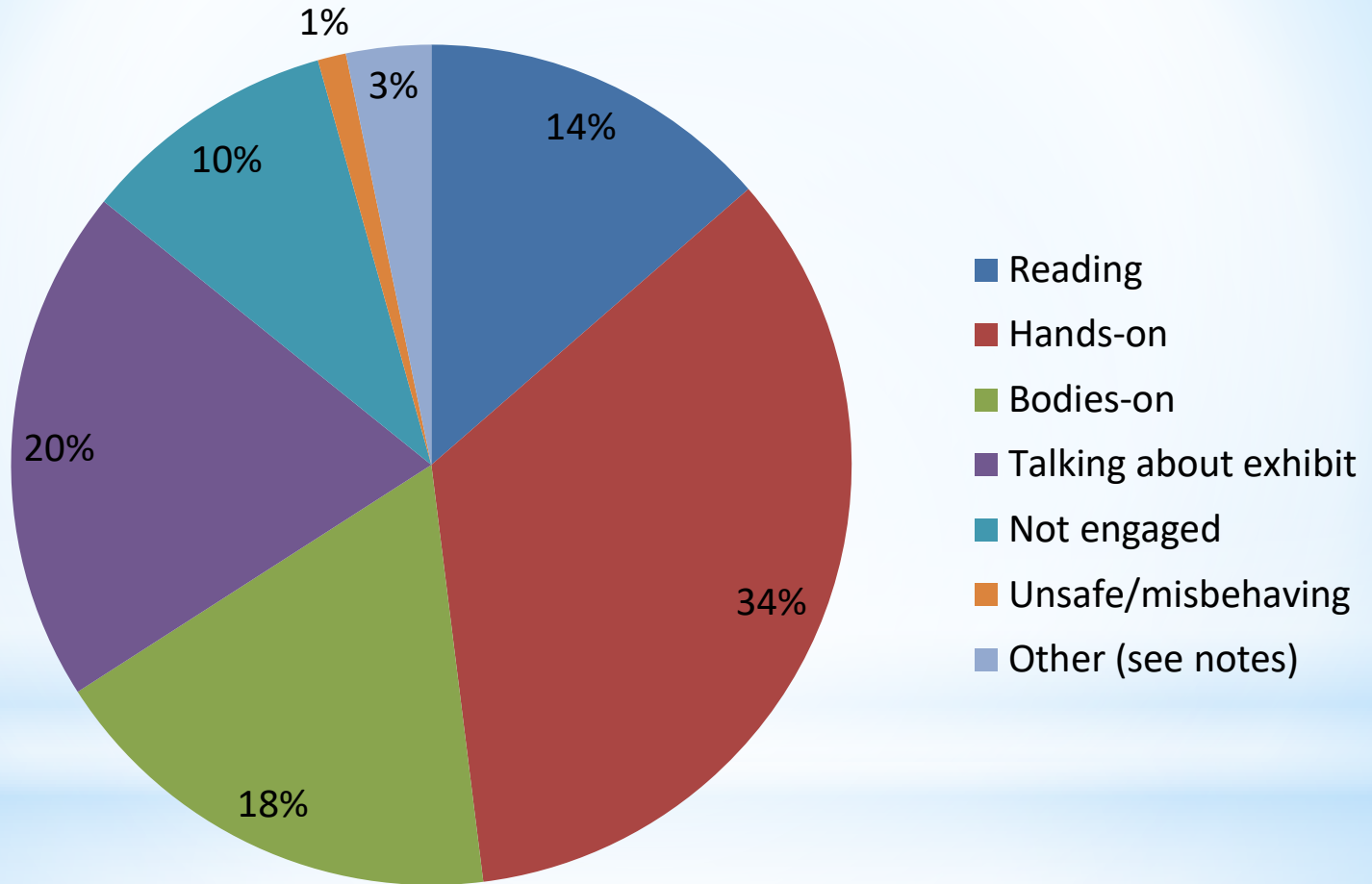


LIBERTY & BELL





OVERALL



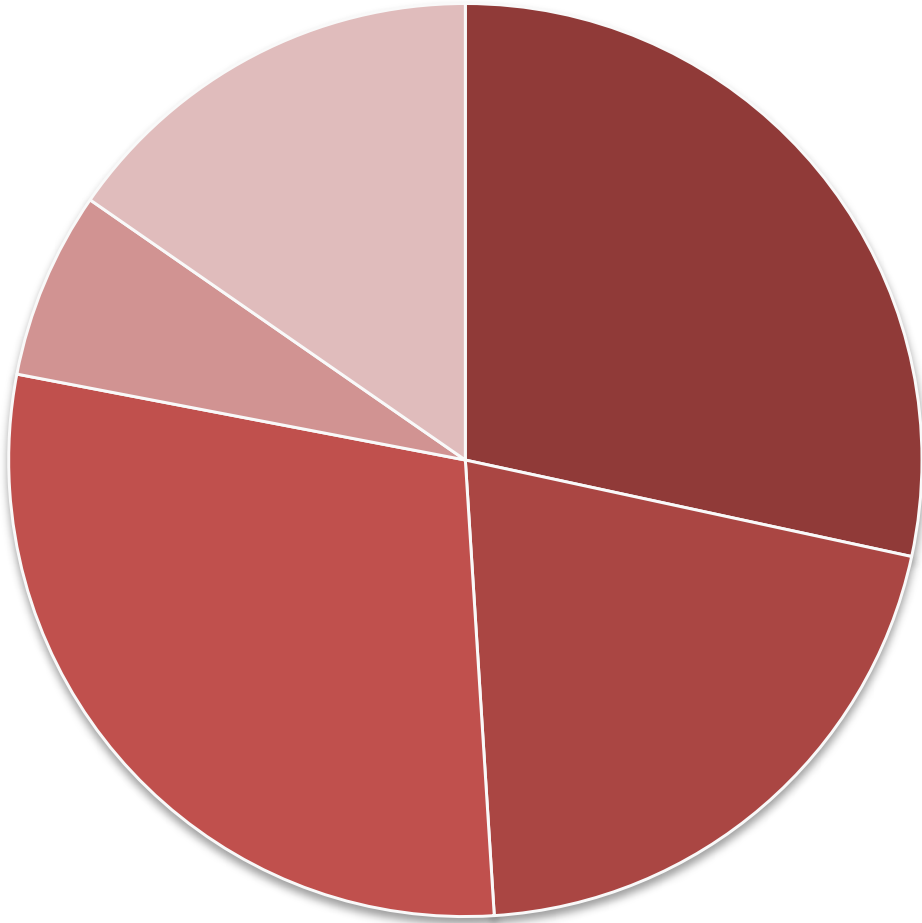
Use the response cards to ask your class.

What do you think are the best topics to use to add more exhibits to this room:

ELECTRICITY & MAGNETISM; EXPERIMENTS & SCIENTIFIC TOOLS; ATOMS & PARTICLES;
LIGHT, SOUND & WAVES or LEVERS, PULLEYS & GEARS?

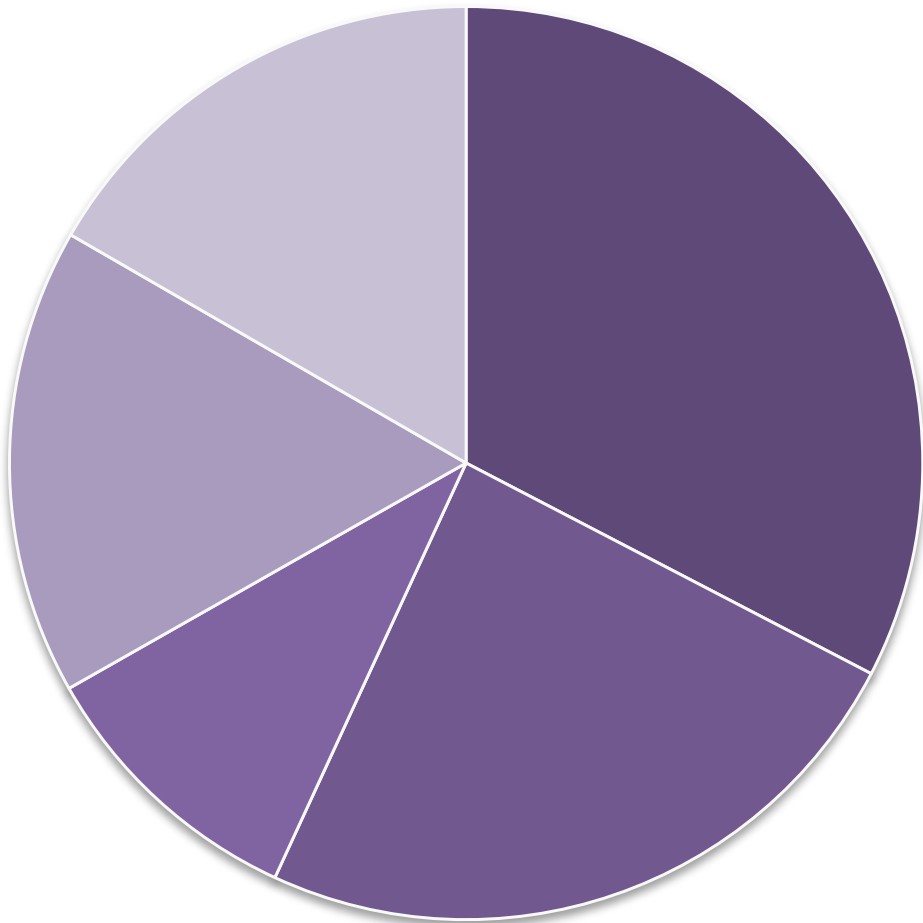


What type of activities do you think are the best activities to add to this group of exhibits?

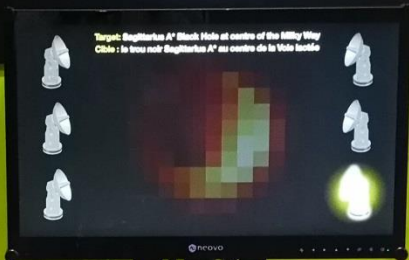
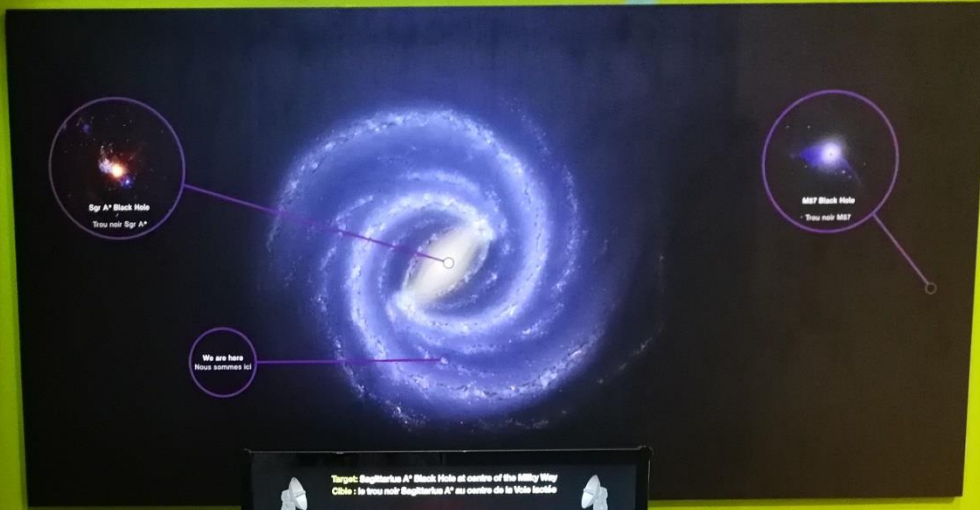


- Playful
- bodies-on
- high tech
- group activity
- quiet

What do you think are the best topics to use to add more exhibits to this room?



- ELECTRICITY & MAGNETISM
- EXPERIMENTS & SCIENTIFIC TOOLS
- ATOMS & PARTICLES
- LIGHT, SOUND & WAVES
- LEVERS, PULLEYS & GEARS



An interactive table with a blue top and black base. On the table are several white satellite dish models of varying sizes, some mounted on stands. In the center of the table is a black panel with white text. The text is organized into two columns: 'Can you picture a black hole?' and 'Imaginez un trou noir?'. Below these are sections for 'Sagittarius A* Black Hole' and 'Le trou noir Sagittarius A*', and 'M87 Black Hole' and 'Le trou noir M87'. A small white rectangular object is placed on the table between the two columns of text.

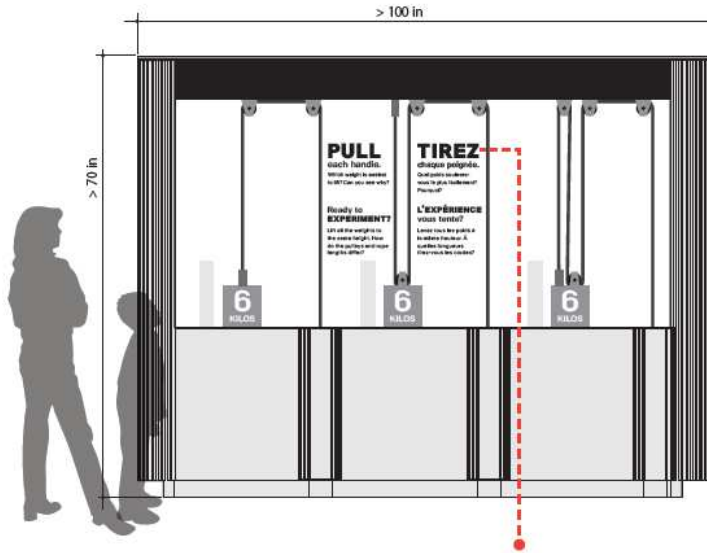
So that participants unveil for themselves the **Fun** and **Joy** in science while exploring and experimenting with the fundamental ideas of:

- Atoms and Particles
- Electricity and Magnetism
- Light, Sound and Waves
- Levers, pulleys and gears
- Experiments and scientific tools,

this hall will inspire:

the ***Curiosity*** to question and wonder; the ***Courage*** to try and play;
the ***Confidence*** to interpret and conclude; and the ***Comfort*** to share and listen.





In situations where there are physical barriers such as pulley ropes, the **French text defines the maximum type size for the Action Words** in both French and English (since French words tend to be longer.)

In instances where the exhibits feature large format canvases (especially those with physical barriers to reading) it's important to optimize the typographic design to create visual hierarchy.

Clearly articulated typographic hierarchy attracts people to the exhibit from far away, and also breaks content into digestible portions when viewing from up close for people of all ages.

SAMPLE TYPOGRAPHIC BREAKDOWN

Visual Hierarchy LEVEL 1

PULL
each handle.

Action word typeset in Neogram Black, upper case.

Remaining action sentence, typeset in Neogram Bold, lower case.

Visual Hierarchy LEVEL 3

Which weight is easiest to lift? Can you see why?

Visual Hierarchy LEVEL 2

Ready to
EXPERIMENT?

Tight line-spacing used to keep sentence as cohesive graphic unit.

Slightly looser line-spacing used to separate text block from next sequence of hierarchy.

Visual Hierarchy LEVEL 3

Lift all the weights to the same height. How do the pulleys and rope lengths differ?

Avoid widows/orphans (single-word lines) whenever possible. However, width constraints combined with font size requirements might make them necessary sometimes.



50

Press the button and watch what happens.

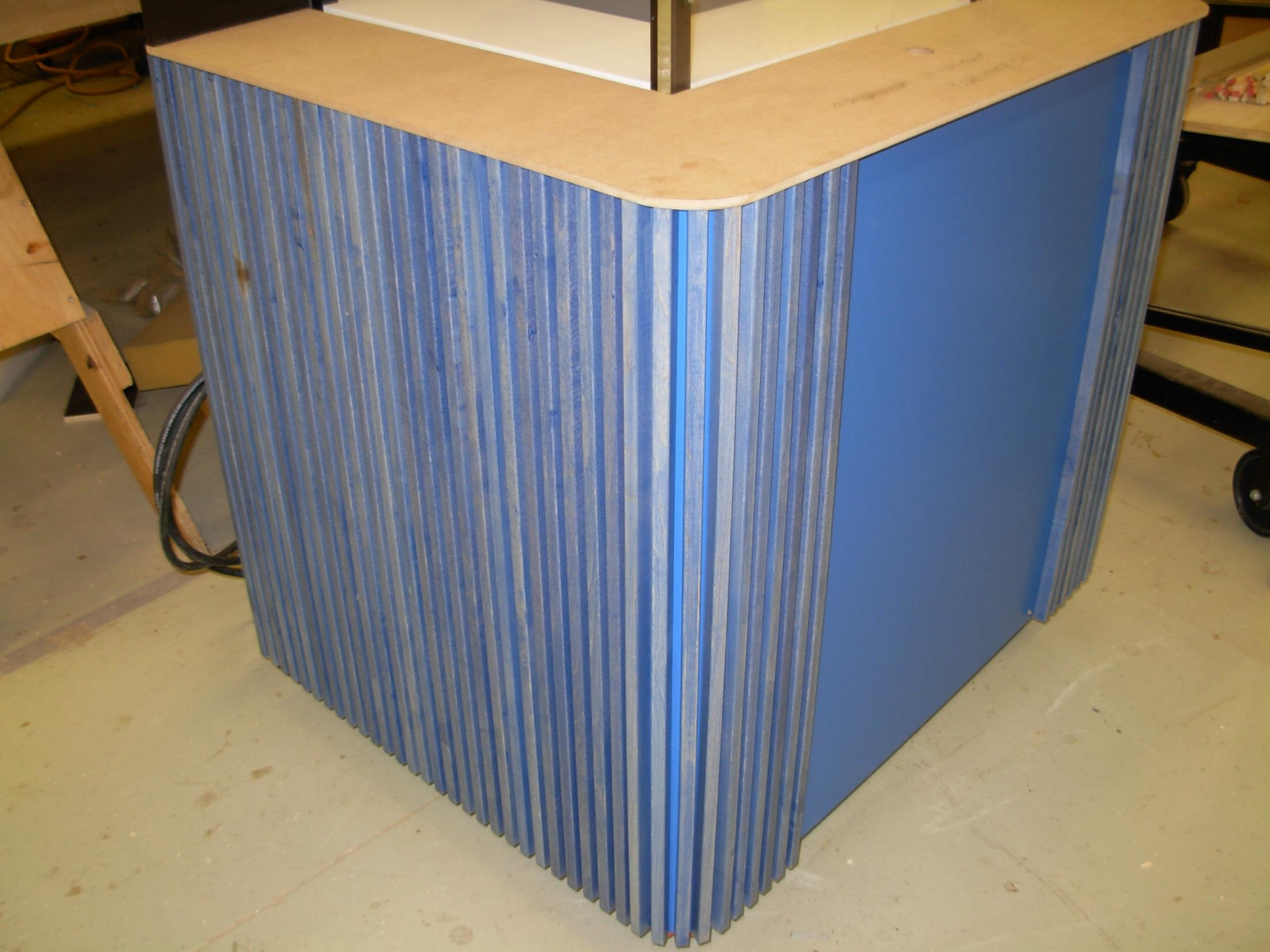
Ready to experiment? When you push the button, the magnet will attract the coil, and the coil will move up and stop.

What's magnetizing the copper wire and why? Pushing the button will set up a current in the wire.

Approve us to break it together.

The experiment is simple! Approach us to see the experiment in action. We will be happy to show you the experiment in action.

Do I need a special tool? No, we have everything you need.





STORAGE AND MAINTENANCE ROOM

Shadow Tunnel

Plasma Sphere

Atomic Pinball

Mag. Lev

Mag. Twain

Mag. Balancing

Spin to Infin
Screen

FUTURE TLE EXHIBITS

Angular Momentum Wheel

Bicycle Generators

Collider

Magnetic Field

When is a Mirror?

Bending Light

Signpost

Entry

Flywheels

Pulleys

Chaotic Pendulum

Vacuum Experiments

Air Foil

Air Bearing

Ring vs Disc

Levers

See-Saw Fulcrum

Resonant Pendulum

Sound Disc

Boyle's Law

ELECTRICAL PANEL ROOM

EHT

Steel Drums

Baschet

Soundless Chamber

Bernoulli

Stretch Mirror

Audio Delay

TSAI Sculpture

Standing Waves

Star Tracer

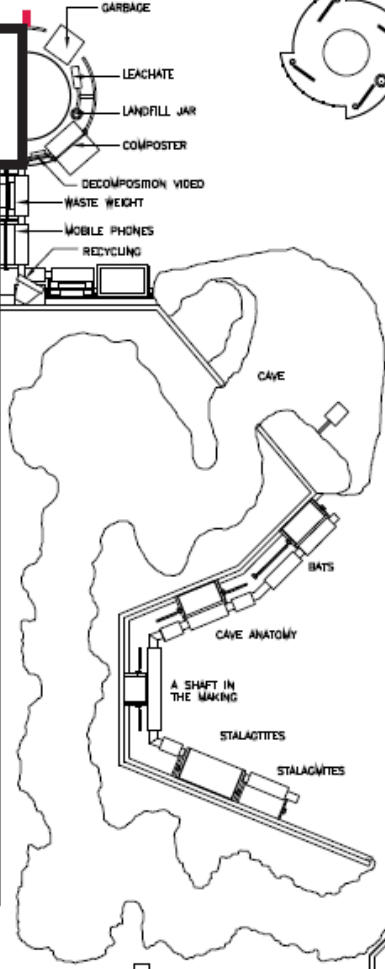
Distorted Room

Inverted Lenses

Wave Experiments

Stereoscopes

STORAGE





STRENGTH IS NOT ALWAYS THE ANSWER
Try lifting each weight the same distance

WHY IS THIS ONE THE EASIEST TO LIFT?

6
KILOS

6
KILOS

6
KILOS

PULL

each handle.

Which weight is easiest to lift? Can you see why?

Ready to EXPERIMENT?

Lift all the weights to the same height. How do the pulleys and rope lengths differ?

TIREZ

chaque poignée.

Quel poids soulevez-vous le plus facilement? Pourquoi?

L'EXPÉRIENCE vous tente?

Levez tous les poids à la même hauteur. À quelles longueurs tirez-vous les cordes?



SPIN

chaque roue.

Lequel tourne le plus facilement? Pourquoi?

Lequel tourne le plus vite? Pourquoi?

Lequel tourne le plus longtemps? Pourquoi?

Lequel tourne le plus longtemps? Pourquoi?

Lequel tourne le plus longtemps? Pourquoi?

Lequel tourne le plus longtemps? Pourquoi?

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Lequel tourne le plus longtemps? Pourquoi?

Lequel tourne le plus longtemps? Pourquoi?

EMERGENCY
EXIT

TEST

the levers.

How do they differ?

Ready to EXPERIMENT?

Which lever takes the most effort to lift?
Which lever takes the least effort to lift?
Which weight moves the farthest?
Which handle moves the farthest?
How does this relate to where each
pivot point (fulcrum) is positioned?



TEST

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How do they differ?

Ready to EXPERIMENT?

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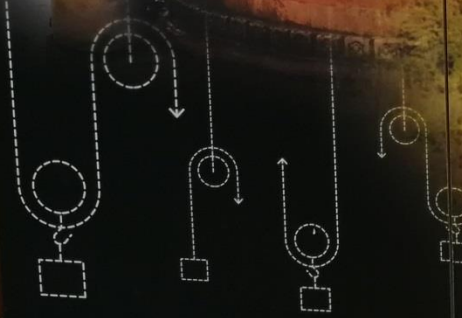
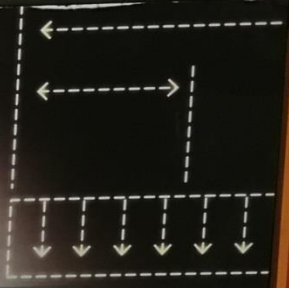
ESSAYEZ

les leviers.

Quelles sont les différences?

L'EXPÉRIENCE vous tente?

- Quel levier exige le plus d'effort?
- Le moins d'effort?
- Quel poids se déplace le plus?
- Quel bras se déplace le plus?
- Comment la position du pivot change-t-elle la situation?



Turn the handle!

What do you see?

Ready to experiment?
What's creating the waves? Look at the pattern at the bottom. What's making the light on the hand?

Turn the handle at a steady rate.
How fast do the waves pattern travel?
What happens if you turn the handle faster/slower?

How to read the ripples

The number of waves across (width) or height (vertical) passing a certain point over one full turn is the frequency. The distance between two adjacent crests or troughs is called the wavelength. How many waves pass a certain point over one second?

Tournez la manivelle!

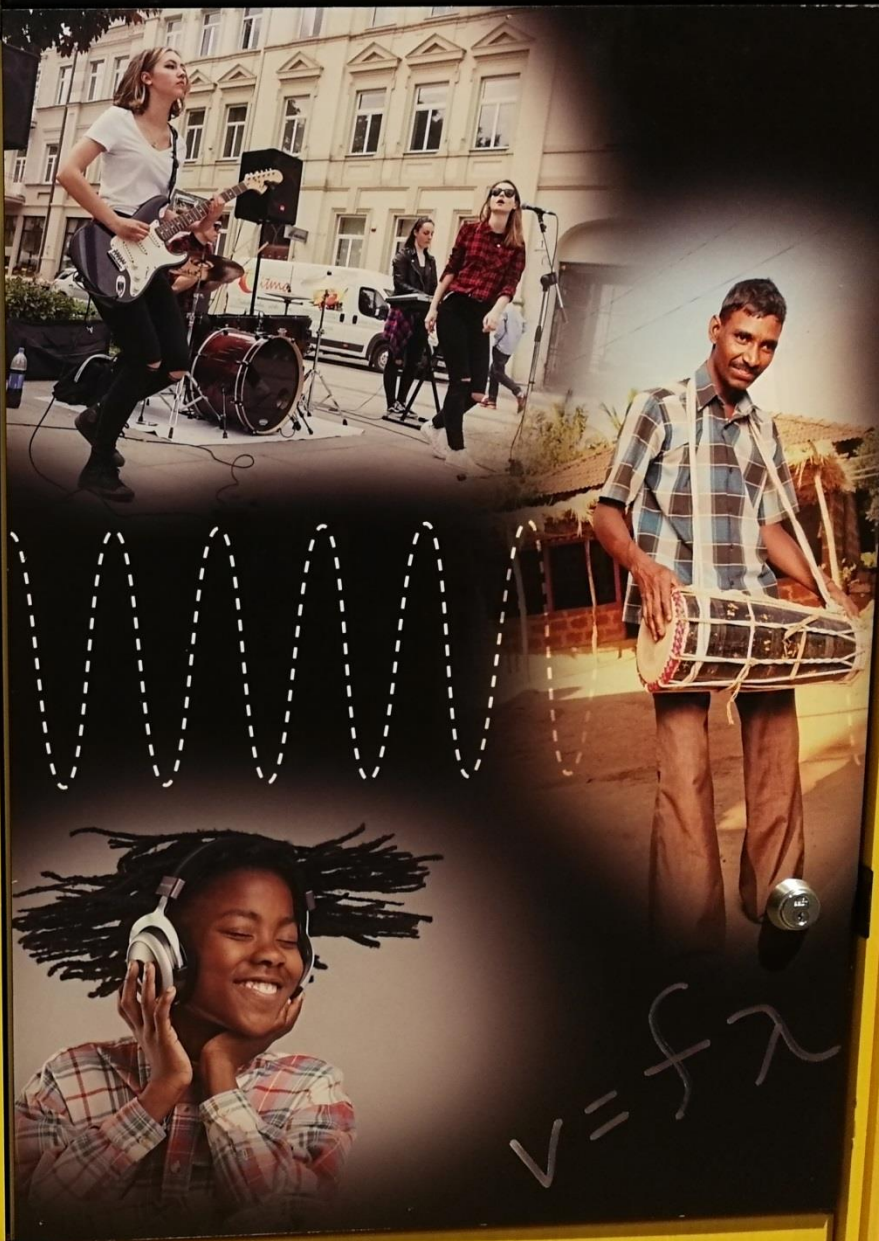
Que voyez-vous?

L'expérience vous tente?
Comment se forment les vagues d'en haut? Regardez tout en bas. Quelle est la trace du bras à l'écran ou à l'éclairage?

Tournez! Le rythme régulier. Les ondes circulent-elles vite? Et si vous tournez plus vite? Plus lentement?

Lire entre les lignes

Le nombre de crêtes et de creux des vagues et le bas de l'écran qui traversent un certain point donné par unité de temps s'appelle la fréquence. La distance entre deux crêtes ou deux creux est le même que la longueur d'onde. La fréquence multipliée par la longueur d'onde donne la vitesse.



Sponging up sound

Why do we need it?
Can you find objects that absorb or reflect sound?
How does it work?
Sponge
acoustique

Pourquoi une éponge acoustique?
 Comment ça marche?

Il y a-t-il des formes particulières à privilégier dans la conception d'une éponge acoustique?



Come inside
and listen!
*Entrez et ouvrez
vos oreilles!*



Listen to the sounds
around you.
What do you hear?

Excavate sand to find
artifacts.
What do you find?

Ready to excavate?
Scrape away sand and
look for things to identify.

Excavation tool to find
artifacts.
What do you find?

Excavation tool to find
artifacts.
What do you find?



**Listen to the sounds
around you.**

What do you hear?

Ready to experiment?

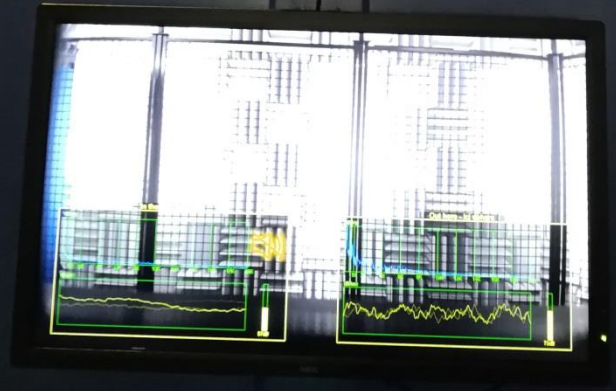
Explore inside. Listen. Look.
Where and why is it quietest?

**Écoutez tout le bruit
autour.**

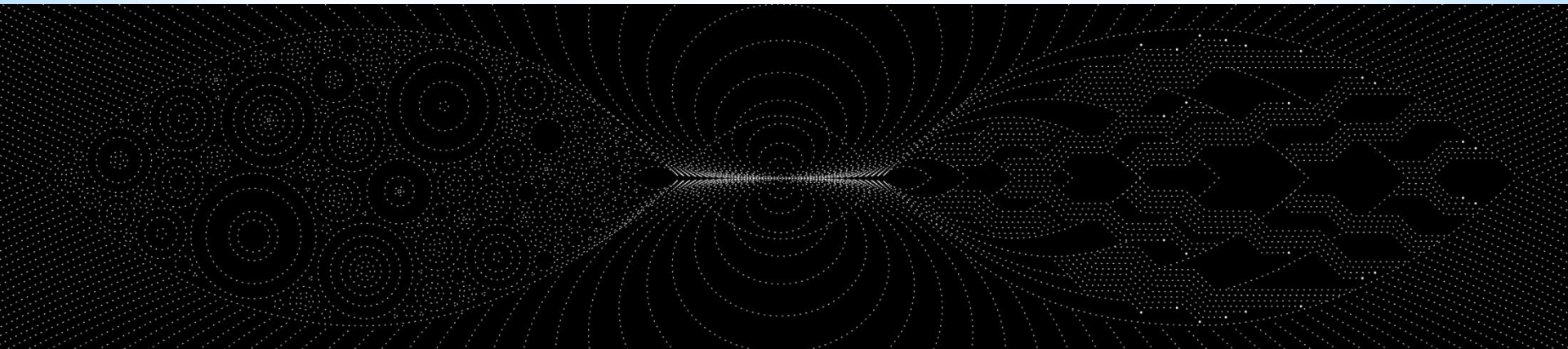
Vous entendez?

L'expérience vous tente?

Entrez explorer. Écoutez. Regardez.
Où se trouve le plus de silence?











Launch the ball. What way does it bounce?
Ready in equipment?
How do you explain what you have seen?

Faites partir la bille. Dans quel sens rebondit-elle?
L'équipement est-il prêt?
Comment expliquer ce que vous avez vu?

1. Place the ball on the launch point.
2. Press the launch button.
3. Observe the path of the ball.
4. Record the path on the grid.

1. Placez la bille sur le point de lancement.
2. Appuyez sur le bouton de lancement.
3. Observez la trajectoire de la bille.
4. Enregistrez la trajectoire sur la grille.

Launch the ball. What way does it bounce?
Ready in equipment?
How do you explain what you have seen?

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Informational text on the top surface of the red block, including a warning symbol and several lines of text.

Small screen on the front face of the red block.

Informational text on the top surface of the yellow block, including a warning symbol and several lines of text.

Small screen on the front face of the yellow block.







* Thank you for time
and attention

Any questions?

*Brought to you by the Department of Science Content and Design,
and the number π*

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SCIENCE
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