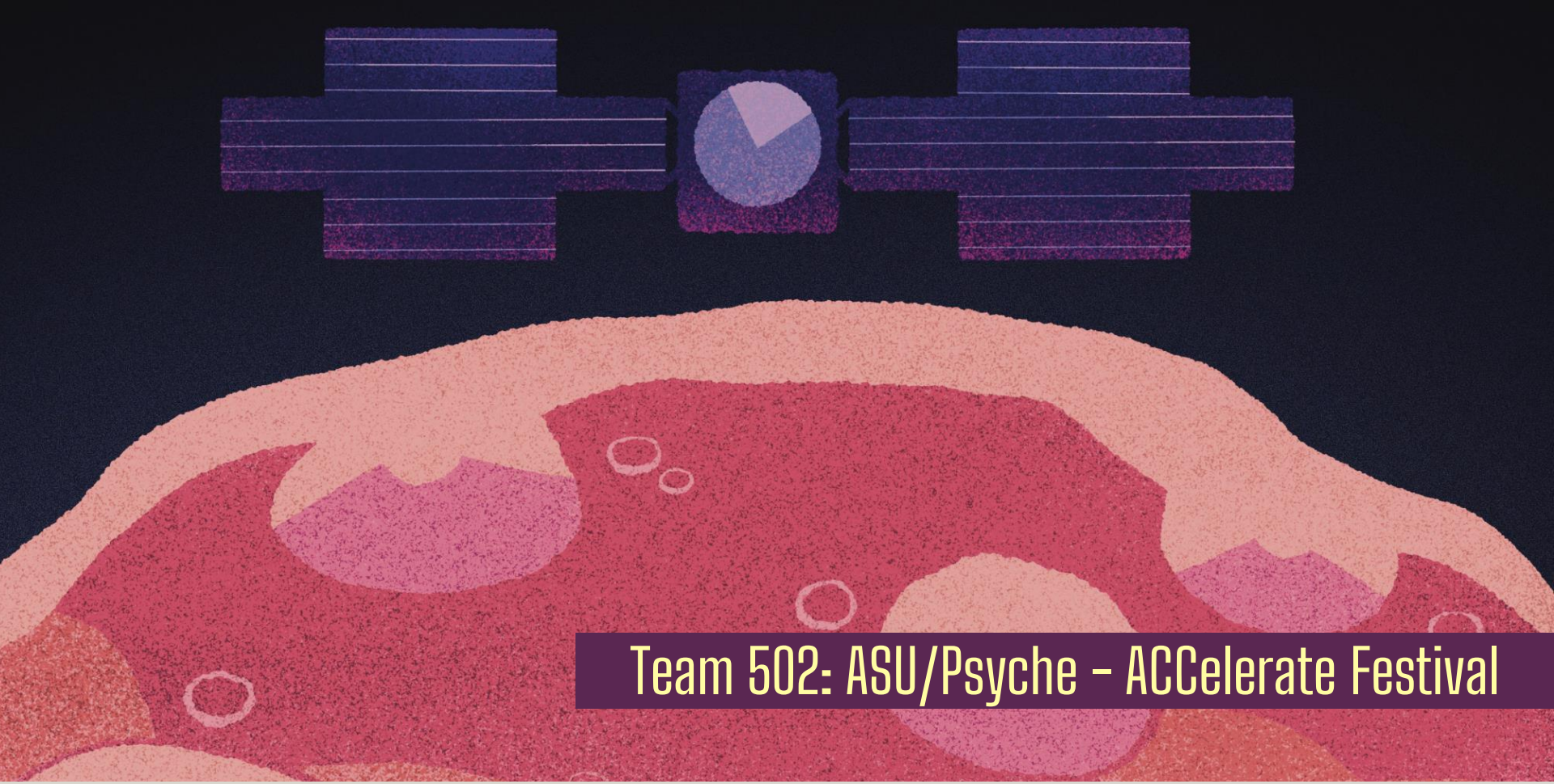
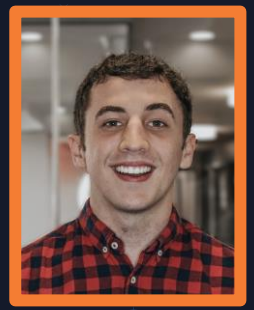


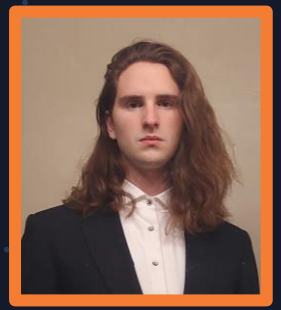
Team 502: ASU/Psyche - ACCelerate Festival

TEAM MEMBERS

Sara Bradley
Mechatronics
Engineer



Connor Bishop
Electrical
Engineer



Spencer Martin
Electrical
Engineer

Mariam Medina
Systems
Engineer

Garett
Southerland
Fluids Engineer

Kenneth Zhou
Mechanical
Engineer

Spencer Martin

SPONSOR AND ADVISOR

Sponsor

Cassie Bowman, Ph.D.
Associate Research Professor,
ASU

Academic Advisor

Shayne McConomy, Ph.D.
ME Teaching Faculty, FSU

Spencer Martin

SUMMARY OF VDR1

Objective

The objective of this project is to create interest in the Psyche Mission with an interactive exhibit.

Problem

The problem is ensuring a lasting interest in the Psyche Mission and Science, Technology, Engineering, Art, and Math (STEAM).

Spencer Martin

SUMMARY OF VDR1

Assumptions

- Power Source Access
- Eighth Grade Level Concepts
- Low-Cost Fabrication

Key Goals

- Interactive and Informative
- Affordable
- Durable

Markets

- Museums
- Planetariums
- Academia

Customer Needs

- User Interaction
- Stimulates User
- Runs Without a Wall Outlet
- Little Custom Parts
- Hide Parts not Meant to Touch

Spencer Martin

PSYCHE STORY

Psyche is an asteroid the size of Massachusetts!

The remains of a Planetesimal with an iron-nickel core that experienced many violent collisions.

Psyche is believed to be the core of that planet.

Spencer Martin

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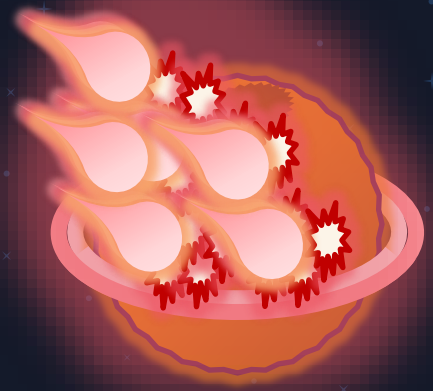

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Spencer Martin

PSYCHE STORY

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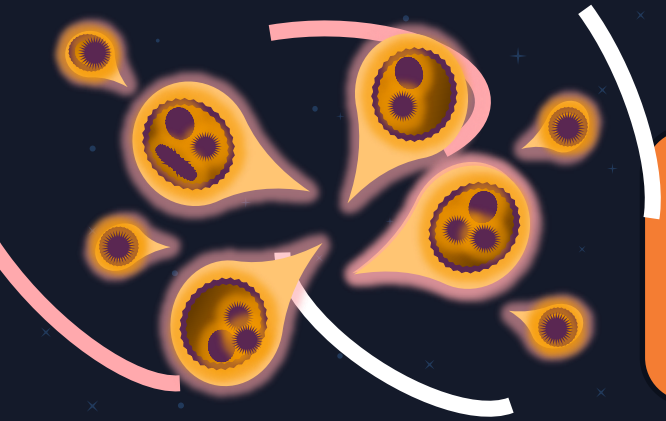

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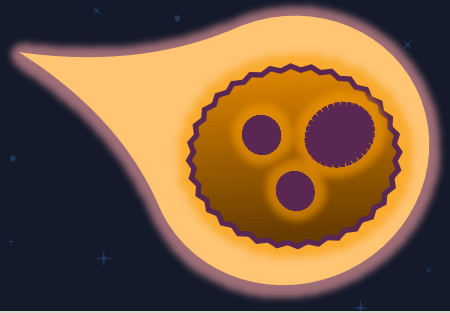

Spencer Martin

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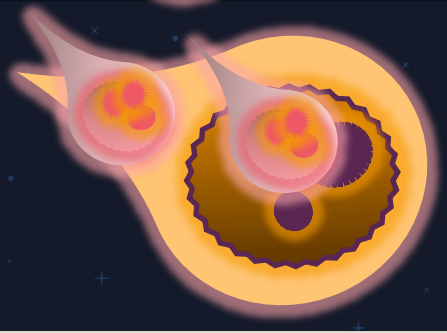

Spencer Martin

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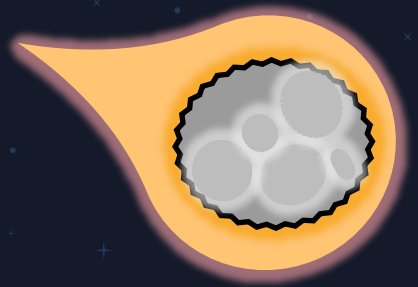


Spencer Martin

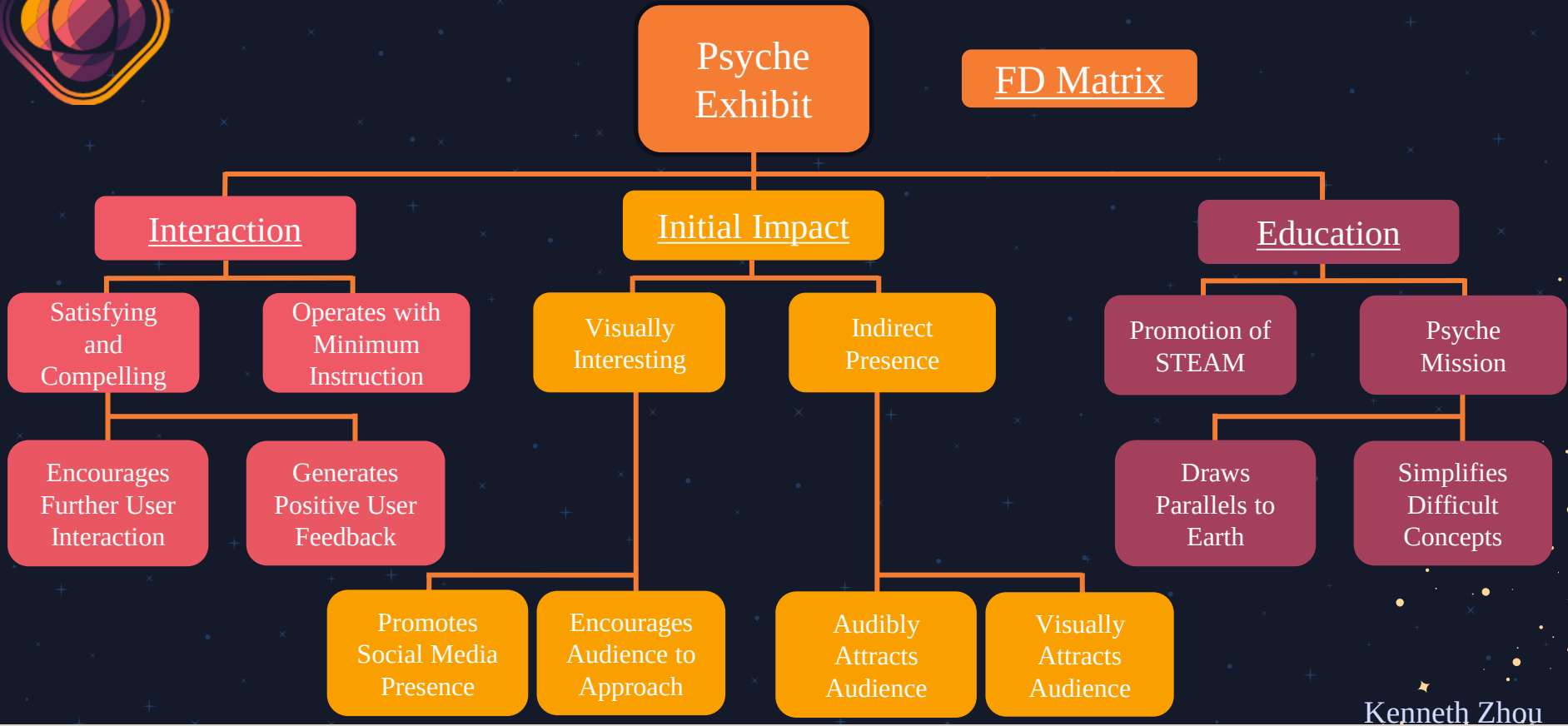
ABOUT THE MISSION

Present

Launch a spacecraft to travel to Psyche to further study

Spencer Martin

FUNCTIONAL DECOMPOSITION



Kenneth Zhou

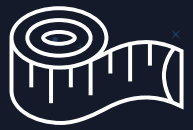
VDR1 TO VDR2

We are creating an accessible museum exhibit to spark interest in Psyche

Must meet multiple targets to complete the project objective and satisfy the targeted market

Kenneth Zhou

CRITICAL TARGETS



Below 3400 Square Feet

One STEAM Related Concept

Maximum of $1000

50% of Information should relate Psyche & Earth

Kenneth Zhou

TARGETS AND METRICS

Function	Method of Measurement	Target
Operates with Minimum Instruction	Using a stopwatch to time how long it takes for an intended interaction	< 1 Minute
Encourages User Interaction	Using a stopwatch to time user interactions	≥1 Minute
Generates Positive User Feedback	Using a survey to ask users how they felt about each interaction	1 Response per Interaction
Encourages Audience to Approach	Using a survey to ask users what interactive features were first noticed	2 Identifiable Features
Simplify Difficult Concepts	Use a quiz to measure user understanding of concepts	Above 50 Percent Score

TARGETS AND METRICS

Function	Method of Measurement	Target
Operates with Minimum Instruction	Using a stopwatch to time how long it takes for an intended interaction	< 1 Minute
Encourages User Interaction	Using a stopwatch to time user interactions 	≥1 Minute

Kenneth Zhou

TARGETS AND METRICS

Function	Method of Measurement	Target
Operates with Minimum Instruction	Using a stopwatch to time how long it takes for an intended interaction	< 1 Minute
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Simplify Difficult Concepts	Use a quiz to measure user understanding of concepts	Above 50 Percent Score

TARGETS AND METRICS

Generates Positive User Feedback	Using a survey to ask users how they felt about each interaction	1 Response per Interaction
Encourages Audience to Approach	Using a survey to ask users what interactive features were first noticed	2 Identifiable Features
Simplify Difficult Concepts	Use a quiz to measure user understanding of concepts	Above 50 Percent Score

Kenneth Zhou

CONCEPT GENERATION

Individual Brainstorming

- Diverse Solutions
- Interesting Topics

Group Brainstorming

- Share Findings
- Favorite Ideas
- Combining Ideas
- Anti-Problem and Crap Shoot

Kenneth Zhou

EXISTING DESIGNS

Above and Beyond

Gateway Science Museum

Kenneth Zhou

MEDIUM FIDELITY CONCEPTS

Psyche live data feed

Satellite point of view comparison demo

Projected Psyche

Draw on Psyche's surface

Psyche Plinko

Kenneth Zhou

HIGH FIDELITY CONCEPTS

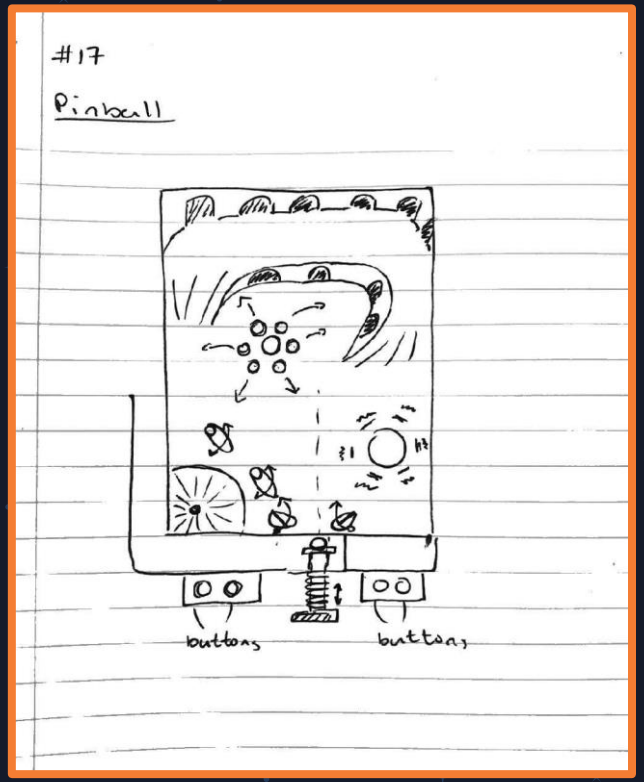
Pinball

Disco ball + DDR Pad

IR Pointer Game + Satellite Controls

Kenneth Zhou

PSYCHE PINBALL

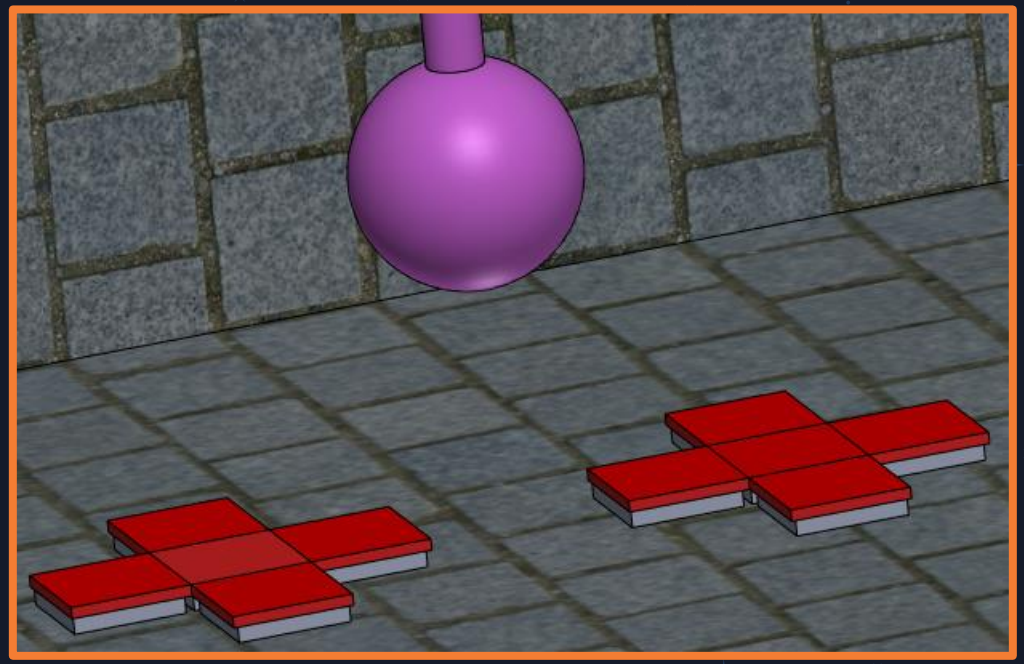


Key Features

- Pinball with a Psyche theme
- Possibility of multiple machines
- Has a planet that “breaks apart” to reveal Psyche

Kenneth Zhou

DISCO BALL + DDR PAD



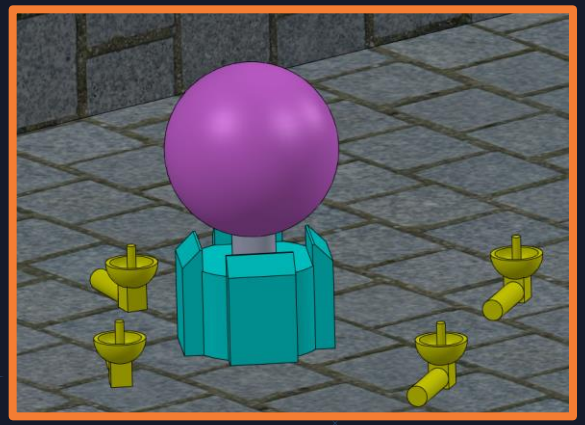
Key Features

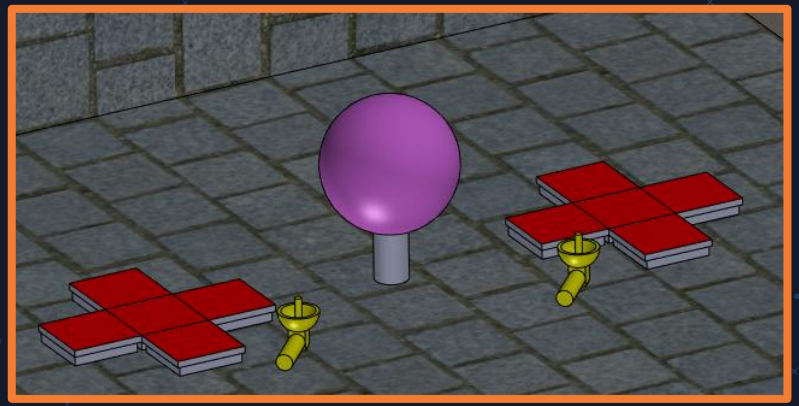
Two dance pads that match the satellite's solar panels

Plays noises and lights up when stepped on

Kenneth Zhou

IR POINTER GAME + SATELLITE CONTROLS





Key Features

IR pointers to trigger targets

Would have lights and sounds

Screens to display information about Psyche

Kenneth Zhou

CONCEPT SELECTION

Connor Bishop

BINARY PAIRWISE COMPARISON

User Interaction	Stimulates Senses	Independent Power Source
Durability	Average Exhibit Size	Easily Repairable
	No Custom Parts	

Connor Bishop

HOUSE OF QUALITY

Top 6 Engineering Characteristics

Assembly Time

Durability

Positive User Feedback

Encourages Interaction

Visually Attractive

Cost to Replicate

Connor Bishop

PUGH CHARTS

IR Pointer Game + Satellite Controls	Psyche Plinko	Psyche Live Data Feed	Disco Ball + DDR Pad
Pinball	Projected Psyche	Size Comparison Exhibit	Draw on Psyche's surface

Connor Bishop

PUGH CHARTS

IR Pointer Game + Satellite Controls

Pinball

Disco Ball + DDR Pad

Connor Bishop

PUGH CHARTS

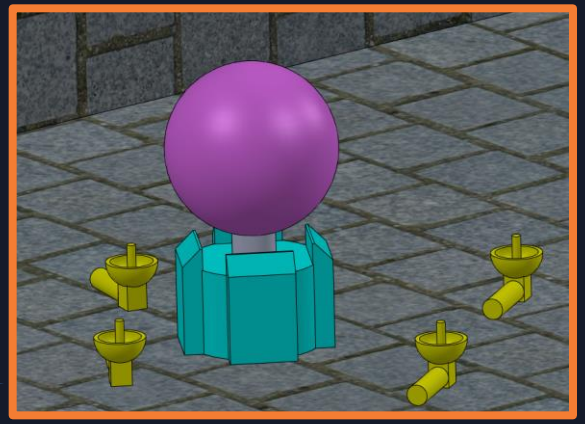
Pinball

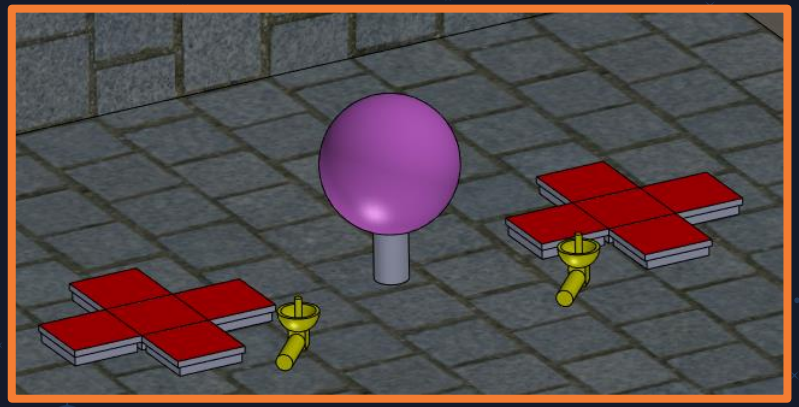
IR Pointer Game + Satellite Controls

Disco Ball + DDR Pad

Connor Bishop

FINAL CONCEPT





IR Pointer Game + Satellite Controls

Connor Bishop

FUTURE WORK

Connor Bishop

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"Access smithsonian," *Access Smithsonian | Access Smithsonian*. [Online]. Available: https://access.si.edu/. [Accessed: 06-Oct-2022].

E. Asphaug, J. F. Bell, C. J. Bierson, B. G. Bills, W. F. Bottke, S. W. Courville, S. D. Dibb, I. Jun, D. J. Lawrence, S. Marchi, T. J. McCoy, J. M. G. Merayo, R. Oran, J. G. O'Rourke, R. S. Park, P. N. Peplowski, T. H. Prettyman, C. A. Raymond, B. P. Weiss, M. A. Wieczorek, and M. T. Zuber, "Distinguishing the origin of asteroid (16) psyche - space science reviews," *SpringerLink*, 12-Apr-2022. [Online]. Available: https://link.springer.com/article/10.1007/s11214-022-00880-9. [Accessed: 06-Oct-2022].

SUMMARY

After using concept selection tools, we were able to determine that our final concept is the IR pointer game with satellite controls.

Connor Bishop

ADDITIONAL SLIDES

PUT EXTRA STUFF IN THE SLIDES AFTER THIS

PSYCHE STORY

How did Psyche get there?
There are three theories, but one leading formation of Psyche:
Psyche believe to be part of a differentiated body, meaning it is what remains of a once larger planet, and experienced iron volcanism.

Current mission?
Psyche is the only metallic core-like body we have discovered and can teach us a lot. The mission is to study using a spacecraft also named *Psyche.*

Future of the mission?
The most recent major update on the Psyche mission was in Feb 2020 when NASA awarded SpaceX the $117 million contract launch *Psyche*. *Psyche* is scheduled to launch no earlier than 2024.

Our role
Our objective is to raise awareness and interest in Psyche and to get the public excited about the future of the mission.

Presenter Name

PSYCHE STORY

Figure 1

What is Psyche?

A large asteroid the size of Massachusetts!

The leading hypothesis of the formation:

The remains of a Planetesimal with an iron-nickel core that experienced many violent collisions.

Presenter Name

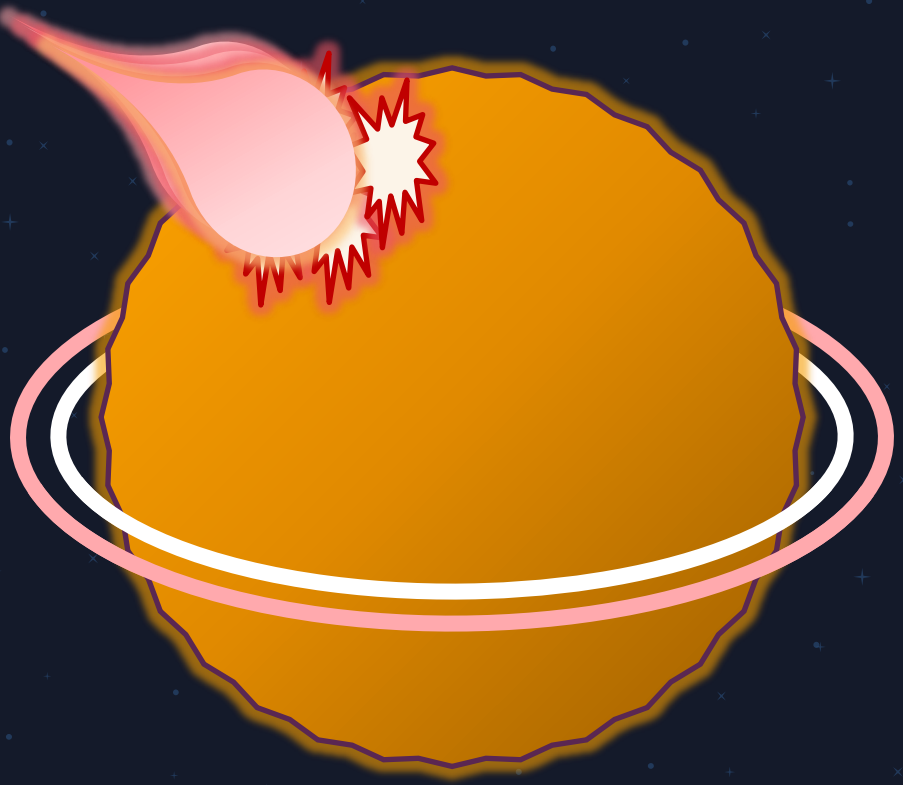
PSYCHE STORY

Presenter Name

PSYCHE STORY

Presenter Name

PSYCHE STORY



Presenter Name

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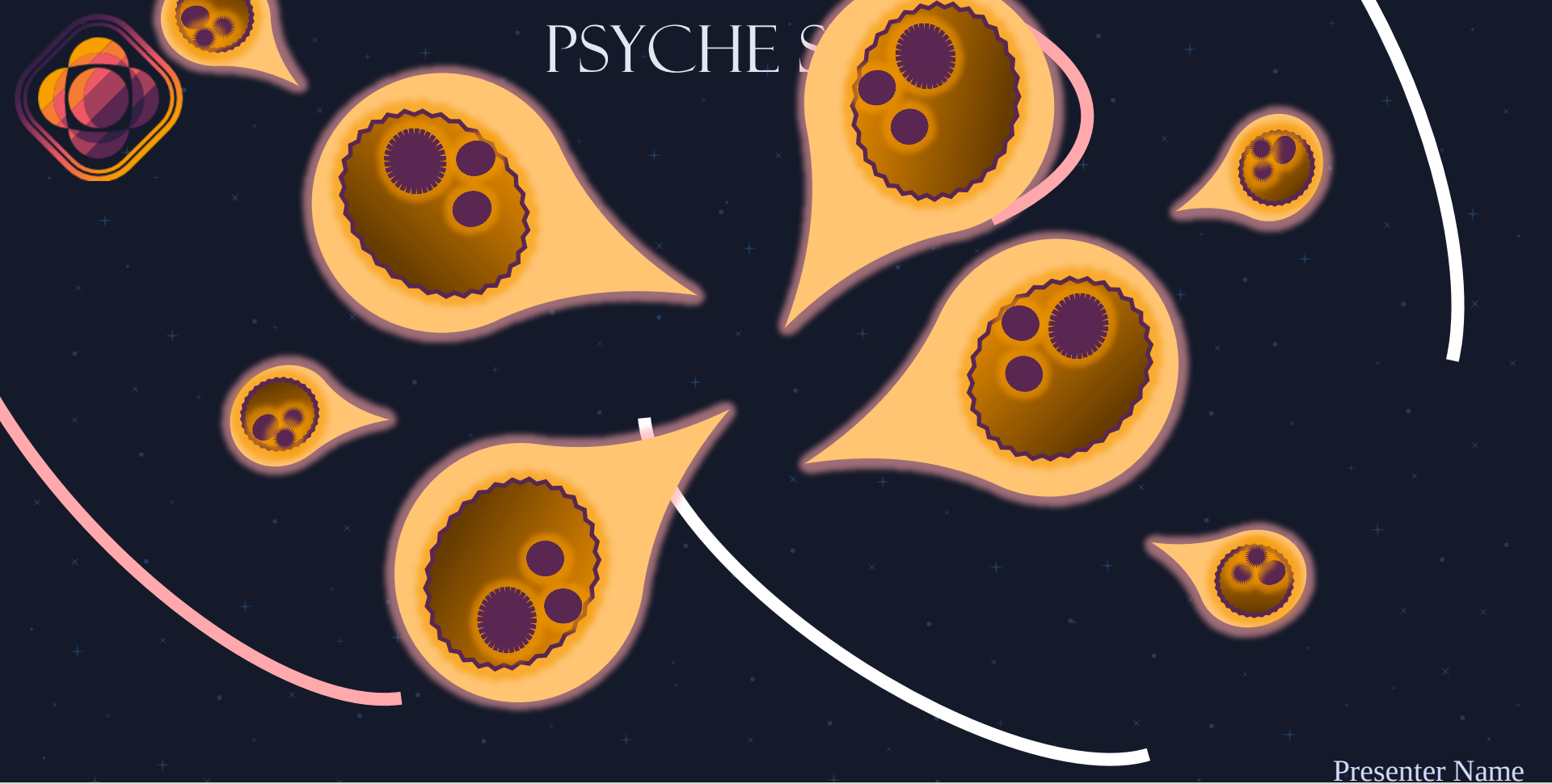


Presenter Name

PSYCHE STORY

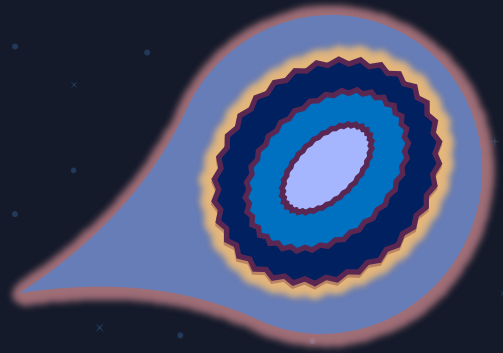
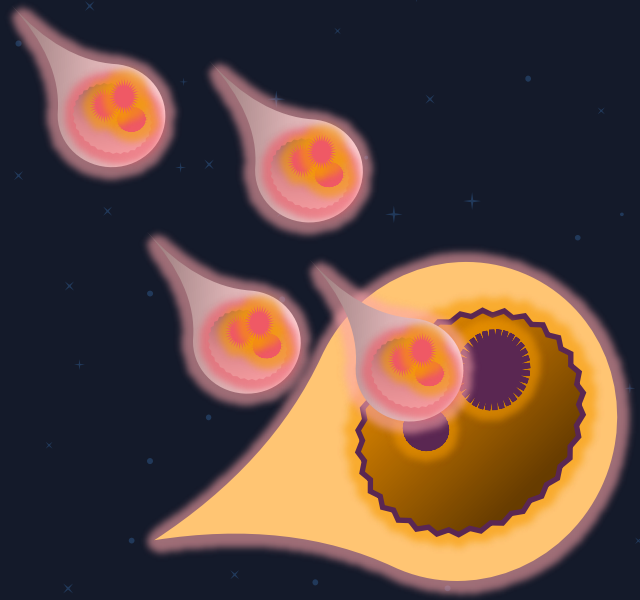


Figure 3: inside of the rocky layer as it cools

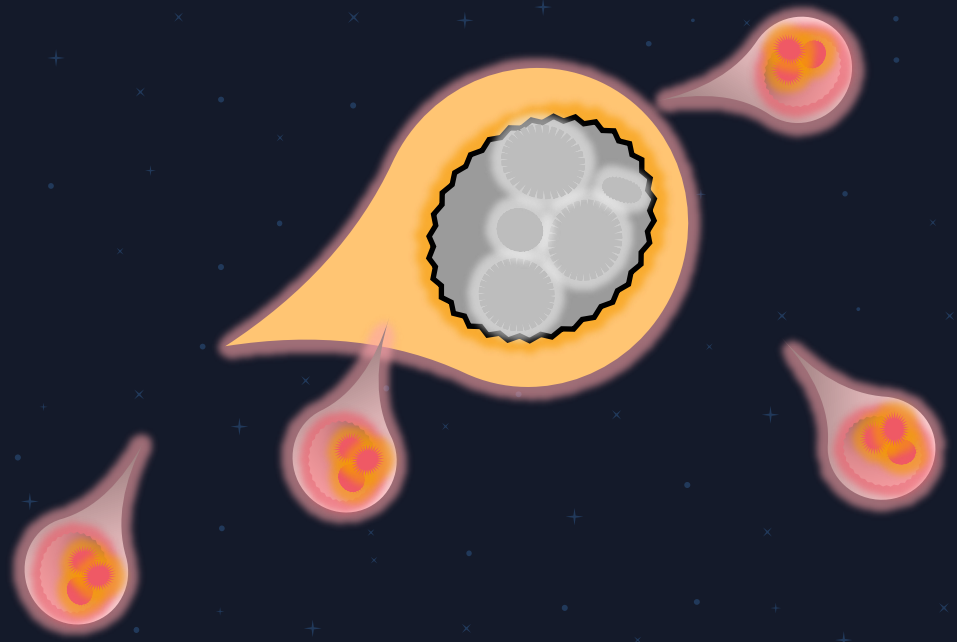
Presenter Name

PSYCHE STORY



Presenter Name

PSYCHE STORY



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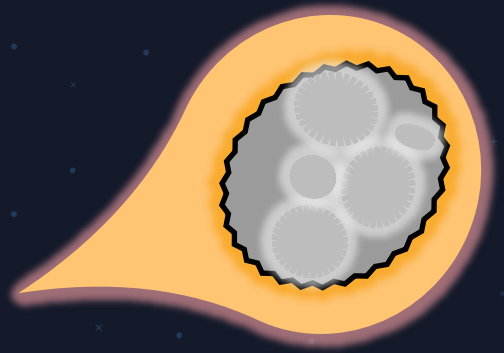
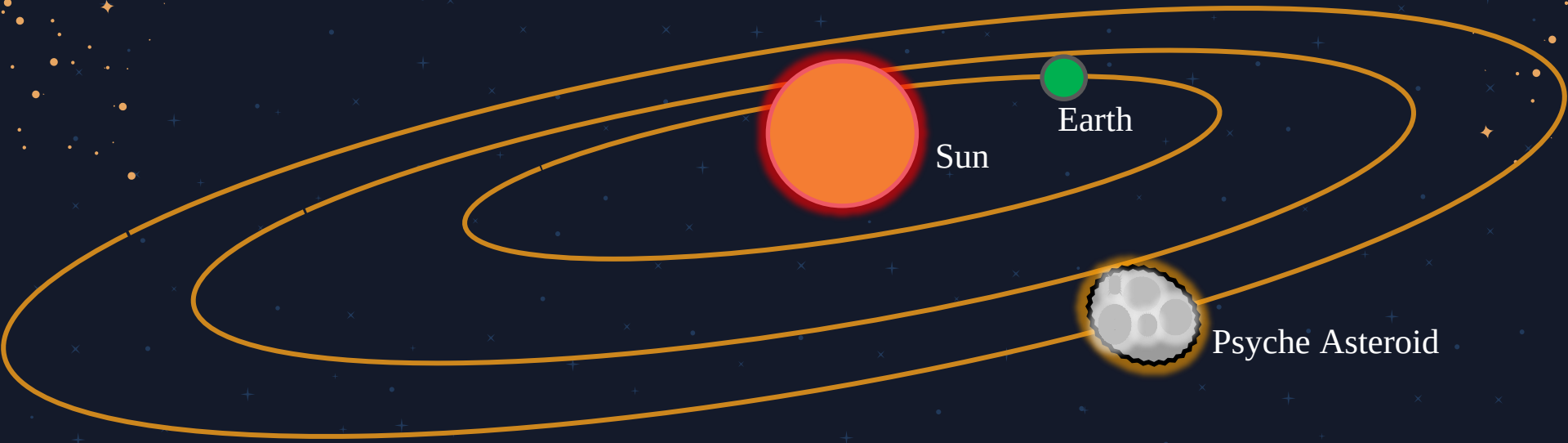


A Metal World?

By observing Psyche from a distance, it is currently believed that Psyche is made of mostly metal because it gives off many reflections.

Presenter Name

WHERE IS PSYCHE



Presenter Name

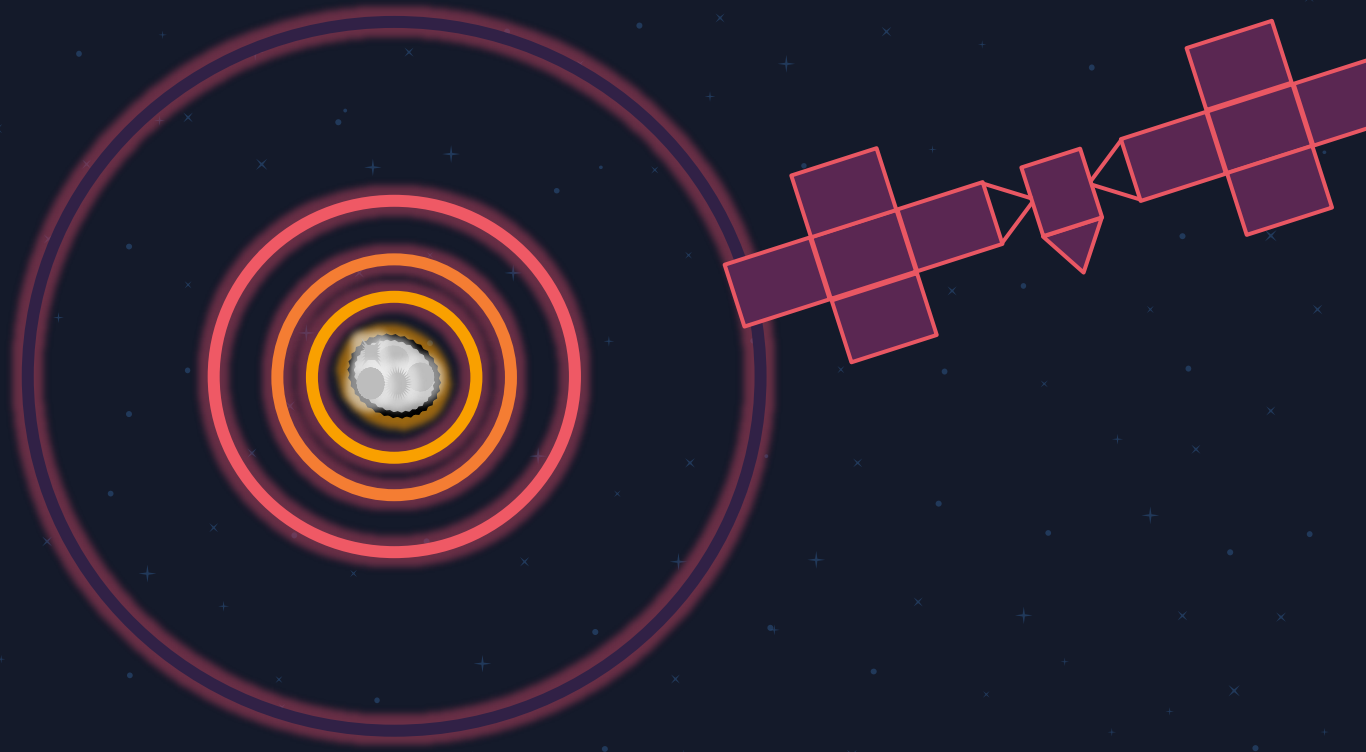
ABOUT THE MISSION

Present

Launch a spacecraft to travel to Psyche to further study

Presenter Name

REACHING PSYCHE

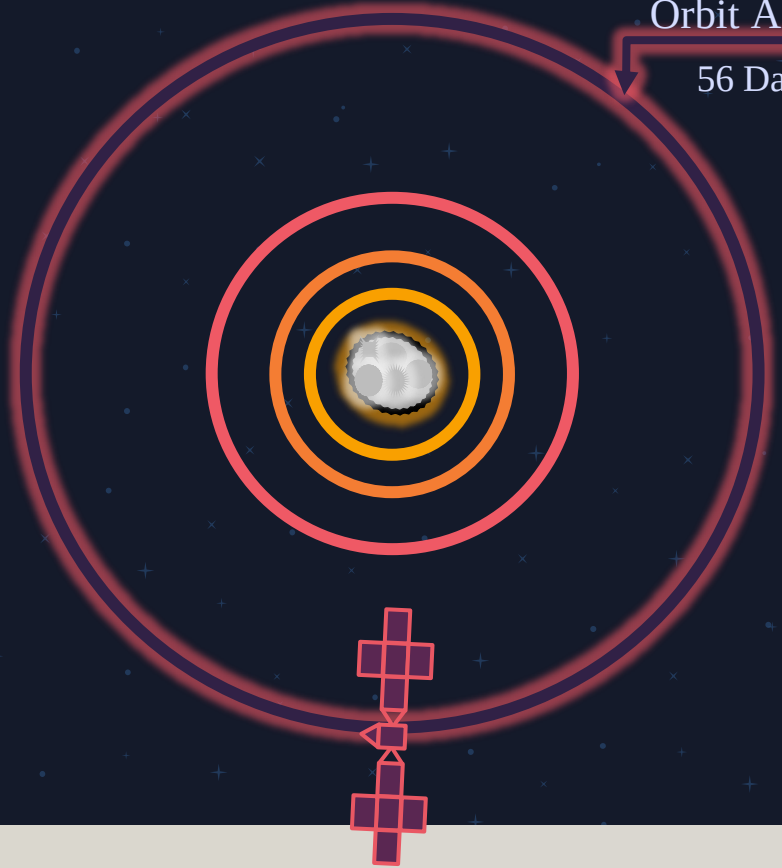


Presenter Name

REACHING PSYCHE

Orbit A: Characterization

56 Days (41 Orbits)



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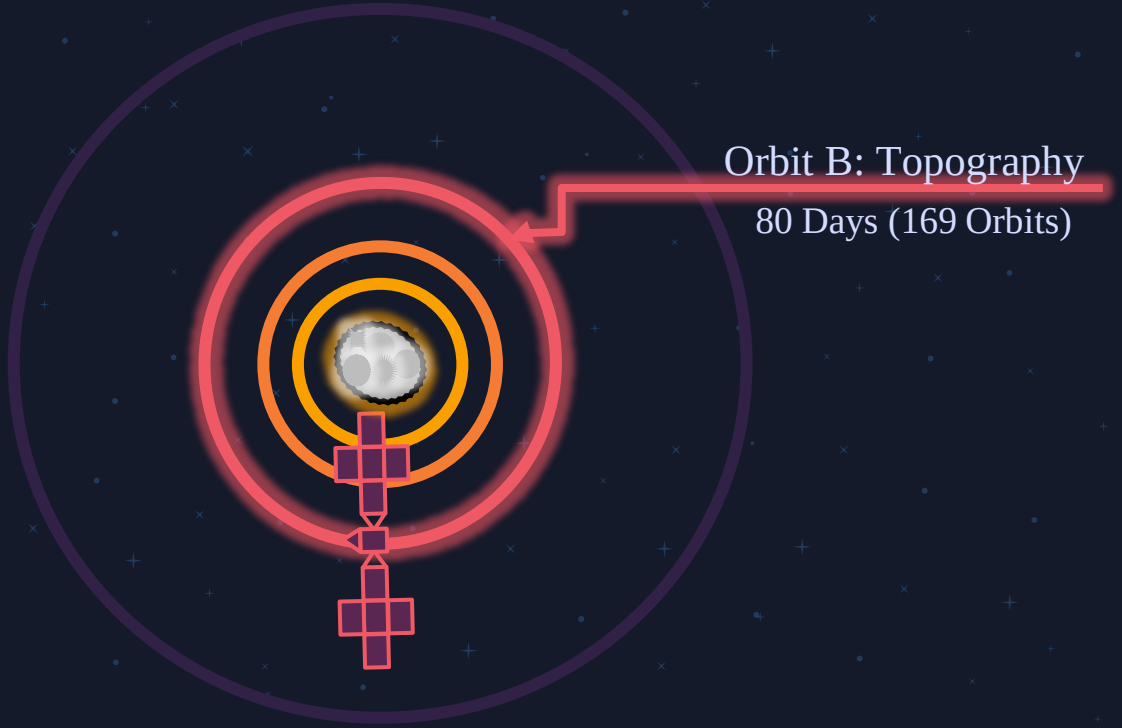

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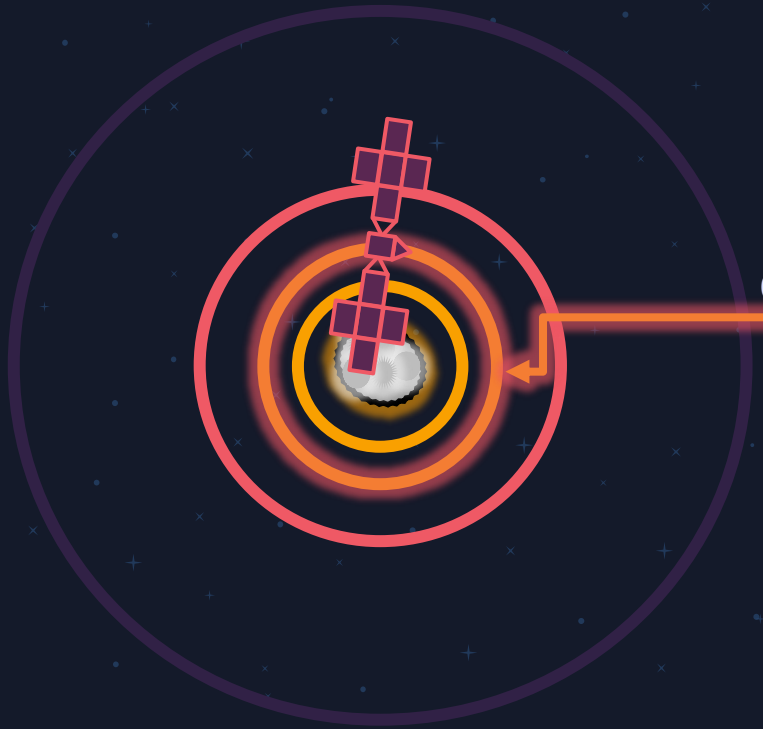
REACHING PSYCHE

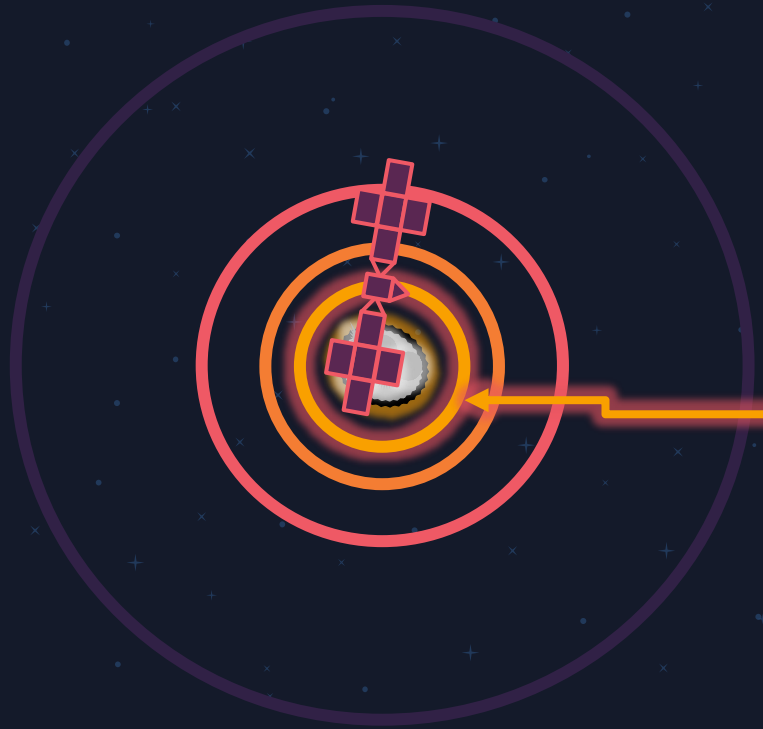


Orbit C: Gravity Science

100 Days (362 Orbits)

Presenter Name

REACHING PSYCHE



Orbit D: Elemental Mapping

100 Days (684 Orbits)

Presenter Name

PRELIMINARY RESEARCH

Accessible Exhibition Design

Museum Visitor Experience

Previous ACCelerate Submissions

Presenter Name

ACCESIBLE EXHIBITION DESIGN

Mount small items no higher than 40 in (1015 mm) above the floor

Include closed captioning for audio aspects and alternative text for visual aspects of the design

Construct the top of a case no higher than 36 in (915 mm) above the ground

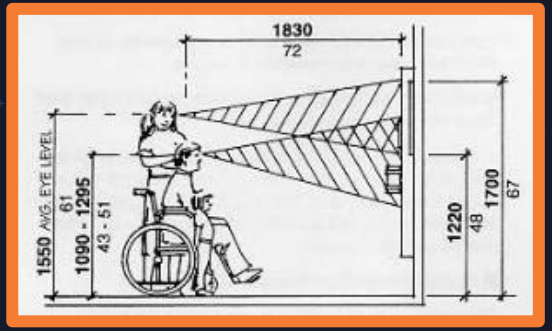


Figure 6 : Wall mounting

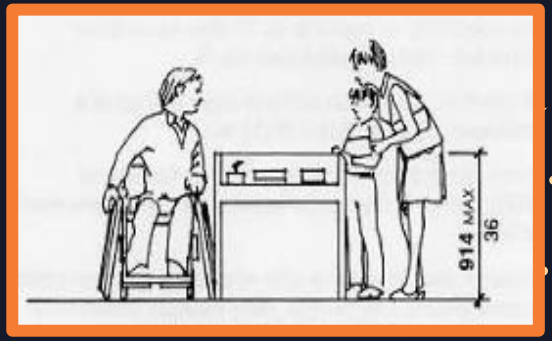


Figure 7: Table display

Presenter Name

MUSEUM VISITOR EXPERIENCE

On average, families spend 1.6 minutes on an individual exhibit and non-families spend 1.1 minutes.

Mean Time per Exhibit

	Family	Nonfamily	Average
Weekday	1.9[a]	0.9[a]	1.4
Weekend	1.3	1.2	1.3
Average	1.6	1.1	1.4

Note. All times are in minutes. Values are averaged over both exhibitions.
[a]These values are statistically different from one another.

Figure 8: Time spent at each interactive exhibit

Presenter Name

CURRENT RESEARCH

Survey on Target Audience

Social Media Interaction

Presenter Name

ASSUMPTIONS

- Power Source Access
- Eighth Grade Level Concepts
- Low-Cost Fabrication

Presenter Name

KEY GOALS

Interactive and Informative

Affordable

Durable

Presenter Name

MARKETS

Museums

Planetarium

Academia

Presenter Name

CUSTOMER NEEDS

The product has the ability to have a user interact with it.

The product has the ability to simulate the user's senses.

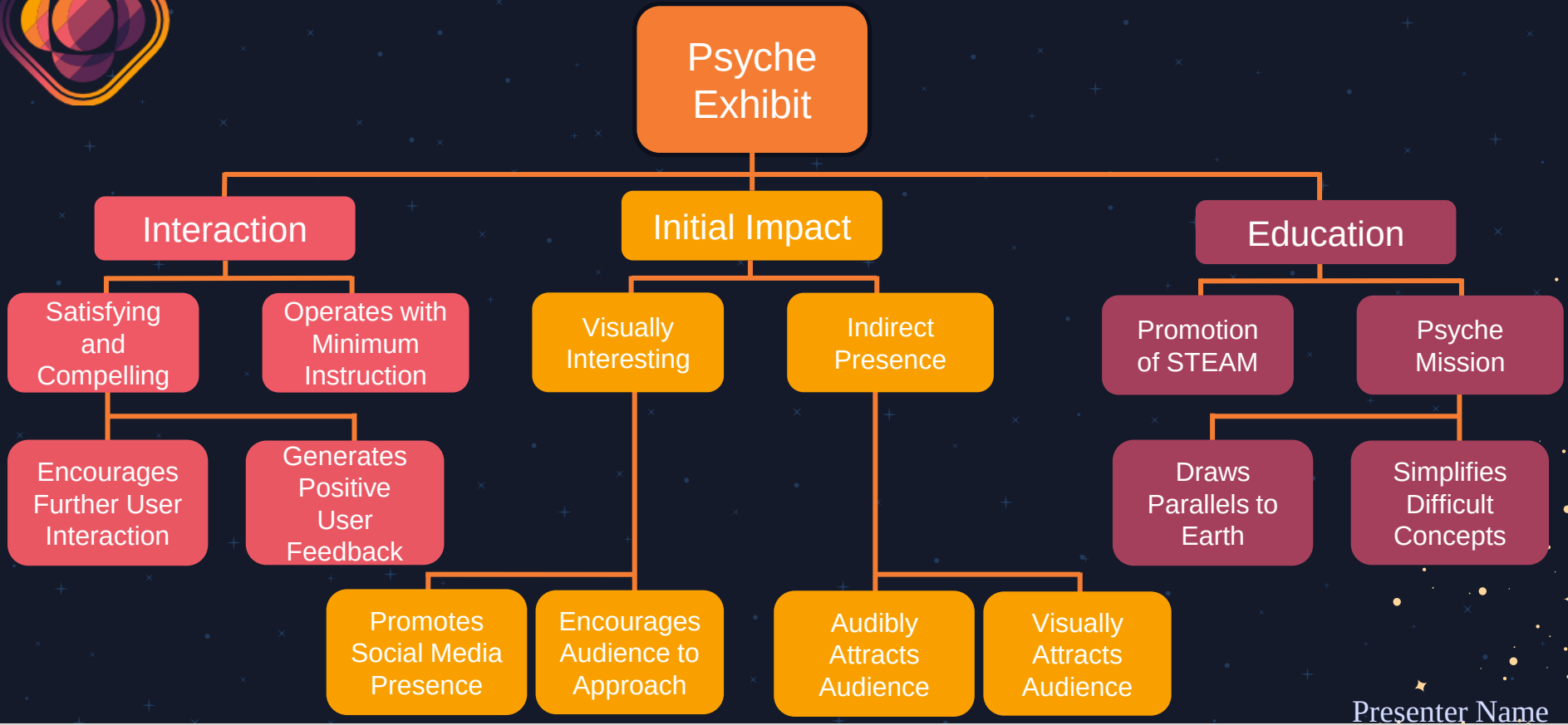
The product has the ability to run without a wall outlet if one is not availble.

The product should use little to no custom parts outside of parts that are 3D printable

The product has the ability to hide components that are not meant for the user to touch.

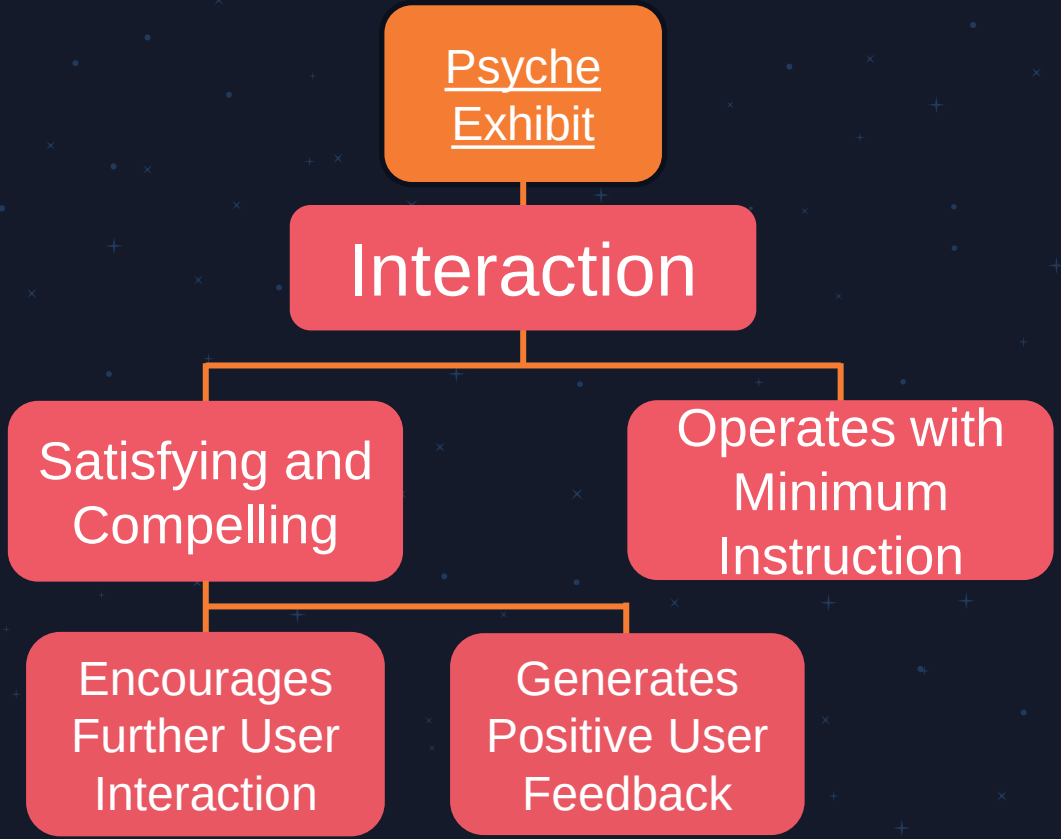
Presenter Name

FUNCTIONAL DECOMPOSITION



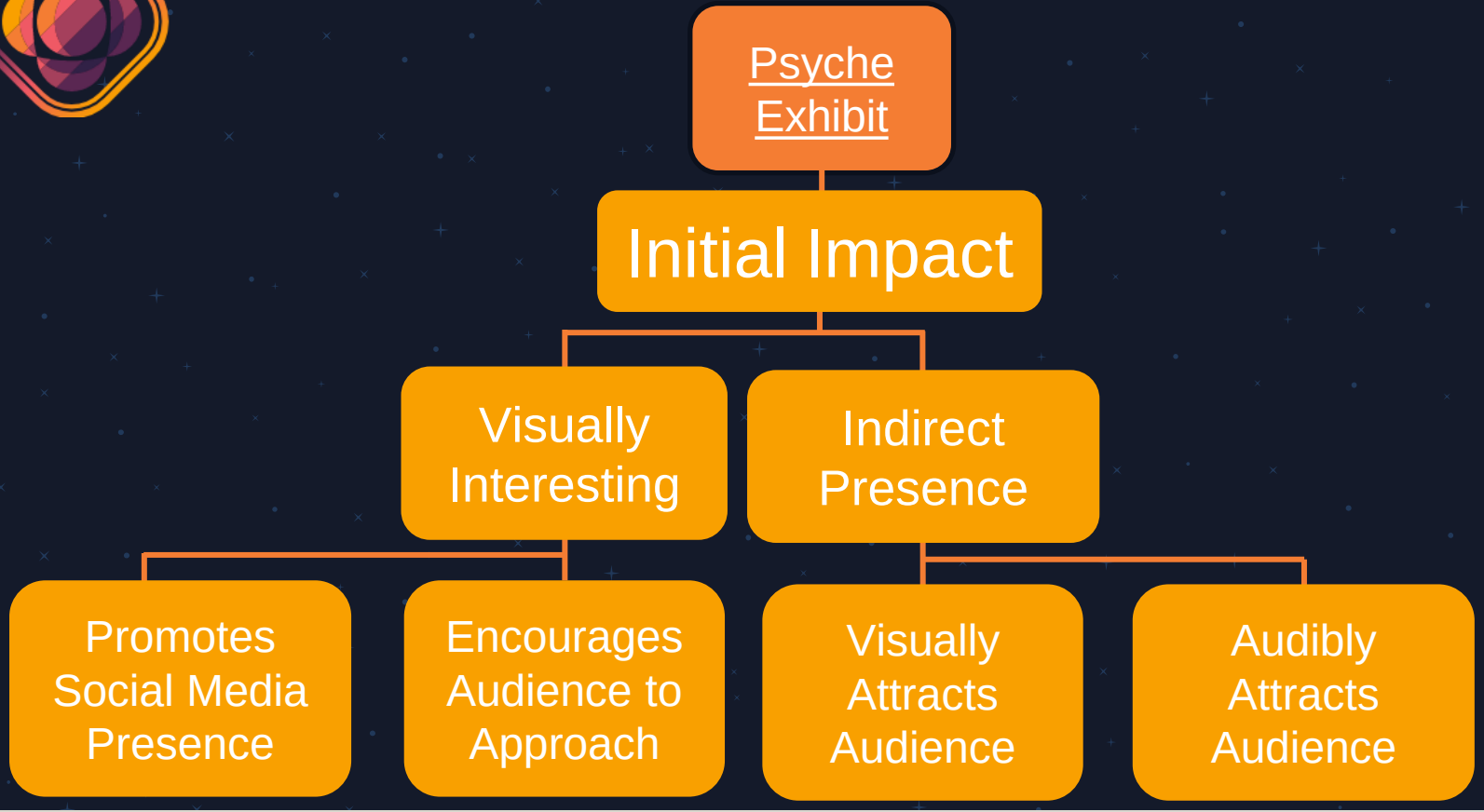
Presenter Name

FUNCTIONAL DECOMPOSITION



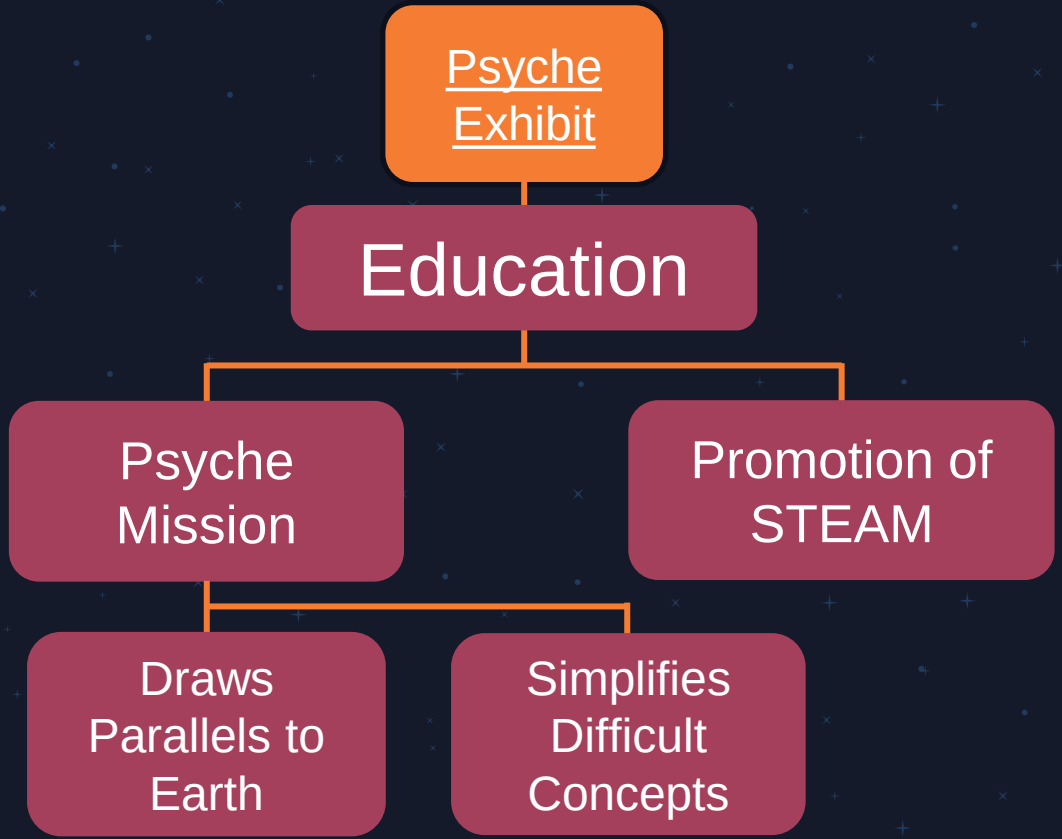
Presenter Name

FUNCTIONAL DECOMPOSITION



Presenter Name

FUNCTIONAL DECOMPOSITION



Presenter Name

FD MATRIX

Psyche Exhibit

Minor Functions	System Functions		
	Interaction	Initial Impact	Education
Visually Interesting	●		
Operates w/Minimum Instruction	●		
Satisfying and Compelling	●	●	
Indirect Presence		●	
Promotion of STEAM	●		●
Psyche Mission			●

Presenter Name