**AMNH Brain Exhibit Section 2.1 Welcome to the Brain—v23**

**Design Concept, Floor Plan, Video Projection:**

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**BRAIN MODEL Lighting Colors:**

**Structure/Lighting Type:**
1) **Brain Stem** / LED color WHITE
2) **Cerebellum** / LED color BLUE
3) **Limbic System** / LED color PINK
4) **Basal Ganglia** / LED color ORANGE
5a) **Motor Cortex**/UV dye color: RED
5b) **Prefrontal Cortex**/ UV dye color: VIOLET
5c) **Auditory Cortex**/ UV dye color: GREEN
5d) **Visual Cortex**/ UV dye color: YELLOW
5e) **Cortex remaining areas**/ UV dye color: BLUE

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**Program Description:**

“Welcome to the Brain” is an object-theater program that allows visitors to take a virtual “tour” of their brain while following along with a high school student, Lea, as she auditions for entrance to the prestigious dance program at the Juilliard School. Through Lea's dance audition story visitors learn the basics of brain anatomy and the key role that the brain plays in controlling senses, emotions, thinking, memory and decision-making—all major themes...
of the Brain exhibit. “Welcome to the Brain” introduces key terms and topics of the Brain exhibit while elegantly weaving together: video, music, sound effects, and, most spectacularly, a large model of the brain with internal lighting. Projected on stretched fabric that architecturally defines the theater space, the video portion has a minimal, iconic look that helps focus visitor’s attention to the large brain model. Regions in the brain model light up as relevant parts of the story arise. At the end of each nine-minute program, a 30-second video countdown allows time for another seating of visitors.

**Activity Description:**

- Visitors enter a ~26’ wide theater space and find a seat on one of several benches facing a semi-circular mesh scrim.
- A ten-minute program unfolds that incorporates sound effects, a video screen with captions, and, most spectacularly, a large model of the brain with internal lighting.
- The full brain model is angled at a ¾ view; favoring the LEFT HEMISPHERE.
- Regions in the brain model will light up as relevant parts of the story arise.
- The brain model is viewed through a large, round perforation in a 13’ wide piece of stretched fabric that also serves as a video projection screen.
- The video projection provides the story narration, footage, animation, sound effects and captioning.
- Captions will be placed near the top of the video projection area so as not to block the view of the brain model.
- At the end of each nine-minute program, a 30-second video countdown allows time for another seating of visitors.
[INTRODUCTION]

Welcome to the human brain—an exquisitely complex organ that allows us to perceive the world, and respond to everything we encounter.

With so much to take in, how does the brain focus and make sense of what’s happening?

Can emotions control the brain?

Where does the brain store a memory?

Follow along with high school senior Lea as she auditions for the prestigious dance program at the Juilliard School in New York City.

Through Lea’s audition, we will explore the amazing human brain.

[NEURONS]

Lea’s brain contains about 100 billion neurons—specialized cells that send and receive electrical and chemical signals.

Through complex neural networks, a single neuron may set off thousands of connections across her brain.

Down to the tips of her toes—Lea’s brain communicates with her entire body by way of neurons that make up her central nervous system.

[BRAIN REGIONS—quick overview]

Lea’s brain integrates everything she does.

But at the same time her brain has specialized regions that work somewhat independently.

The brain stem connects the brain to the spinal cord and on to the rest of the body.

Vital functions such as breathing and heartbeat are regulated by the brain stem.
Looking like a mini-brain at the back of the brain is the cerebellum, which plays a big part in coordinating movement and balance.

Deep in the center of the brain are highly interconnected structures called the limbic system that triggers emotions and processes memories.

The basal ganglia stores how to do step-by-step activities such as tying your shoes.

The cortex is the wrinkly, outer surface of the brain. The creases and folds of the cortex provide lots and lots of extra room to pack in millions of neurons.

This tight network of cortex neurons allows us to think, talk, plan ahead and direct our actions.

[BRAIN HEMISPHERES]

Notice how the outer portion of the cortex is neatly separated into two hemispheres.

The left hemisphere controls the right side of the body, and the right hemisphere controls the left side of the body.

Thankfully, a thick band of nerve fibers connects the left and right hemispheres.

Otherwise, the left hand literally would not know what the right hand was doing!

[VISUAL CORTEX]

As Lea walks into the dance studio, what she perceives shifts with every step.

How does her brain sort out what she takes in?

Light enters Lea’s eyes and hits the retinas where specialized neurons then turn them into electrical signals.

Signals travel along the optic nerves to the visual cortex, a region at the back of the brain, here colored yellow.

Lea’s visual cortex encodes the signal streams as color, shape, motion and more – and integrates the information so that Lea “sees.”

[AUDITORY CORTEX]

Similarly, Lea hears with her auditory cortex — here colored green.
Sound waves enter her ears and are converted into neural impulses. The auditory cortex interprets the neural input as speech, music or just plain noise.

[MOTOR CORTEX]
As Lea moves, her motor cortex – the central red strip – sends messages out to her muscles.

For every part that moves—legs, fingers, lips—there’s a corresponding area of Lea’s motor cortex that controls those movements.

[AWESOME processing power]
Millisecond by millisecond Lea’s brain takes in constantly changing inputs from all her senses.
At the same time, her brain continually sends new outputs or instructions to her body.
It’s this awesome processing power that allows us to experience our environment as an integrated whole.

[LIMBIC SYSTEM]
Hearing her audition number, Lea is suddenly very nervous.
She feels that her whole life as a dancer depends on this audition.
Lea’s amygdala – a part of her limbic system – has triggered specific areas in her brainstem that then sends a signal to her heart to beat faster and for her skin to sweat.

[BRAIN STEM]
The brain stem controls things you don’t normally think about, like your heartbeat or breathing.
But right now, Lea is thinking about her breathing.
Lea’s dance instructor has taught her to consciously slow down her breath in order to relax her nerves and focus on her performance.

[PREFRONTAL CORTEX]
Intentionally, Lea’s prefrontal cortex – here colored violet – sends a “slow down” signal to her brain stem.

The prefrontal cortex – the area just behind the forehead – thinks about and directs many other brain functions.

This may be the reason why humans, compared to all other animals, have an infinite capacity to imagine, solve problems and create.

[MENTAL REHEARSAL]

In the moments before auditioning, Lea imagines her dance solo, making sure that she “nails” even the most difficult moves in her mind’s eye.

Areas in her basal ganglia, cerebellum and motor cortex are now firing away as she imagines her solo.

Look at how Lea’s brain appears now and compare it to how it will look when she actually performs the solo.

Will it look the same? Let’s see.

Because Lea has practiced her solo many, many times, her motor cortex – the outer red strip – cerebellum and basal ganglia work together to seamlessly coordinate her movements.

[BASAL GANGLIA]

Remember how you learned to tie your shoes? At first it was difficult, then it became easy.

That’s because after practicing many times, a procedural memory for how to tie your shoes was stored in your basal ganglia.

Now you don’t have to think about how to tie your shoes – you just do it.

[EMOTION & MEMORY]

She’s done it! This has been her best solo performance ever!

Because she’s so happy with her performance, Lea will remember it for a long, long time.

Lea’s hippocampus, a part of her limbic system, will let this memory go into long-term storage in those areas of her brain that were active when she performed her solo.
Practicing any skill over and over again creates more efficient neural pathways and stronger memories that lead to better performance. Just ask LEA, who did get into the Juilliard School.

[Segue to FUTURE with AMBIENTS SOUNDs from a Juilliard dance class; we hear NARRATION over these dance class SOUNDs]

   Good morning, dancers. We’re ready to warm up ....

[CONCLUSION]

As a toddler you learned to walk. Your brain laid down neural pathways that connected regions in your brain that hold together your knowledge of walking.

From walking you moved on to running, even dancing.

Everything you do changes your brain.

Explore the most beautiful, exquisitely complex part of you.