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The World of Bees

Louise I. Lynch

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The World of Bees

curated by

Louise I. Lynch

University of Nebraska-Lincoln
Master of Science Degree Project

hosted by

The Hudson Highlands Nature Museum
Cornwall on Hudson, New York

September 2011

Table of Contents

Page	*Topic*
3	**Project Overview and Key Figures**
4	**Hosting Institution: The Hudson Highlands Nature Museum**
5	**The World of Bees: Project Goal**
6	**The World of Bees: Preliminary Exhibit Design Research**
7	**The World of Bees Photography**
8	**The World of Bees Carpentry**
9 – 11	**Eagle Scout Project**
12	**The World of Bees Design**
13	**The World of Bees Installation**
15 - 53	**Content Description and Interactive Components**
15 – 16	**Wall 1: The World of Bees**
17 – 19	**Wall 2: What is a Bee?**
20 – 27	**Wall 3: The Honey Makers**
28 – 34	**Wall 4: Bees are Builders**
35 – 40	**Wall 5: Bees are Pollinators**
41 – 44	**Wall 6: Wasps and Bees**
45 – 50	**Wall 7: Bees in Peril**
51 – 53	**Wall 8: Beckoning the Bees**
54 – 64	**Special Thanks: Donations, Loans and Discounts**
65 – 71	**Time Log**
72 – 76	**References**

Project Overview

The World of Bees is an interactive children's museum exhibit created to convey the diversity of bees, the significant role of bees in nature and to humans and the need for their conservation. It presents aspects of bee evolution, anatomy, species diversity, life history, ecology, agricultural significance, and pollination role. *The World of Bees* promotes preservation of bees through beekeeping, gardening and environmental stewardship.

Please visit the virtual tour of the exhibit at: http://vimeo.com/34493111 or http://www.loulabella.com

Project Commencement: 16 Feb 2010
Project Installation Completion: 24 Sep 2011
My Total Hours: 1489 hours
Total Estimated Man Hours: 1231 man hours

Financial Support

The Hudson Highlands Nature Museum obtained two grants to fund *The World of Bees*:

- Orange and Rockland Utilities Grant in the amount of $2,500.00
- Center for the Advancement of Apiculture Matching Grant in the amount of $1,500.00

Expense Budget Overview

Consulting Exhibit Designer: $1000.00
Muralist: $1000.00
Fiber Technician: $300.00
Observation Hive (incl. bees and glass): $708.00
Materials: $2060.76
Total Cost: $5068.76

Exhibit Crew

Louise I. Lynch, Exhibit Curator and Photographer
Pam Golben, Director, Wildlife Education Center
Garry Johnson, Head Carpenter
Kirsten Kucer, Consulting Exhibit Designer
Rick Price, Muralist
Danika I. Norey, Fiber Artist, Assistant to the Curator
Virginia I. Norey, Typographer
Daniel R. Lynch, Graphic Artist
Elaine Lynch, Graphic Artist
Tom Weissling, Graduate Advisor

Hosting Institution: The Hudson Highlands Nature Museum

The Hudson Highlands Nature Museum, founded in 1959, is hosting *The World of Bees* exhibit from September 2011 to August 2012. The mission and goals of the Hudson Highlands Nature Museum closely parallel those of *The World of Bees* project. With an outreach of more than 30,000 annual visitors, the Museum offered an excellent forum for education and outreach about bees. *The World of Bees* was installed in the Ogden Gallery located at the Museum's Wildlife Education Center.

Executive Director: Jacqueline L. Grant
Director, Wildlife Education Center: Pam Golben

"The mission of the Museum is to create responsible caretakers of our environment. Through quality educational programs for the public that focus on the unique ecology of the Hudson Highlands, the Museum promotes knowledge and appreciation of our natural world and the dynamic role of human interaction in its well-being."

Mailing and Email Addresses
Hudson Highlands Nature Museum
P.O. Box 451
Cornwall, New York 12518
http://www.hhnaturemuseum.org

Outdoor Discovery Center
120 Muser Drive
Cornwall, New York 12518
P: 845-534-5506

F: 845-534-4581
Wildlife Education Center
25 Boulevard
Cornwall on Hudson, New York, 12520

P: 845-534-7781

The World of Bees: Project Goal

The project goal was to create an interactive exhibit conveying the significant role of bees in nature and to humans and the need for bee conservation. The target audience is three to eight year olds, however the exhibit was designed to inspire and communicate with an adult audience as well.

This exhibit is the first of it's kind in size and content in this region. Honeybee and native bee populations in the United States have been significantly declining over the past six years. Bees play an extremely important role in nature and to humans: they are nature's primary pollinators and their pollination activity results in one-third of the foods we eat.

The gallery space was designed to guide and interact with visitors by introducing key bee-related topics. There are five take-home messages inherent to *The World of Bees*. Each is conveyed using various visual and interactive components.

1. Bees are familiar representatives of the insects, the dominant group of animals on Earth. Bees exhibit many characteristics of Class Insecta.
2. Bees are an ancient group of fascinating creatures with various life histories, behaviors, ecological roles, shapes, colors and sizes.
3. Bees are one of our most valuable insects. They are important and valuable to humans, responsible for pollinating many of our food crops and making products we rely on and use every day.
4. Honeybees and native bees are facing population declines due to known and unknown environmental factors, including Colony Collapse Disorder, habitat loss and pesticide use.
5. Bees are easy to keep on my own property or attract to my own garden and I can participate in their conservation.

The World of Bees: Preliminary Exhibit Design Research

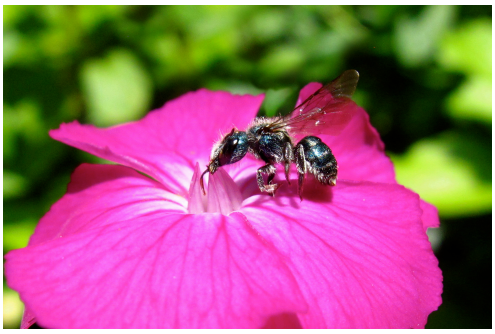
This project was my first attempt at designing and curating an exhibit. Thus significant time was spent studying exhibits at established institutes. I studied exhibit design aspects such as floor plan, wall layout, images, interactive components, and color schemes. Additionally, a significant amount of time was spent simply observing how visitors interacted with exhibits in order to gauge the typical attention span of varied ages and to determine what design components were engaged or unused by visitors. This greatly influenced my own design. I also relied heavily on the experience of Pam Golben, Director of the Wildlife Education Center. Pam has curated numerous exhibits at the Hudson Highlands Nature Museum and has a deep understanding of the Museum's audience and the feasibility of exhibit components.

The following institutions were visited for my preliminary exhibit design research:

- American Museum of Natural History, New York, New York
- Bernheim Arboretum, Clermont, Kentucky
- The Bruce Museum, Greenwich, Connecticut
- The Desert Museum, Tucson, Arizona
- Insectropolis, Toms River, New Jersey
- Louisville Science Center, Louisville, Kentucky
- The Maine Discovery Museum, Bangor, Maine
- Museum of Modern Art, New York, New York
- New York State Museum, Albany, New York
- Philadelphia Academy of Natural Sciences, Philadelphia, Pennsylvania
- Smithsonian Institute Insect Zoo and Butterfly Pavilion, Washington, D.C.
- Smithsonian Institute American Art Museum, Washington, D.C.
- Smithsonian Institute History Museum, Washington, D.C.

The World of Bees: Photography

In the interest of staying within the budget, principle photography was a key responsibility of mine. As an amateur photographer, this was certainly one of the most enjoyable parts of creating the exhibit. I used a Canon Powershot G10. In several cases, close up shots of live specimens were not available. I sought out informal training in Adobe Photoshop CS3 and created photos where possible. For example, a pinned mason bee specimen became an image of a bee visiting a flower with its glossa extended.

…became…


Photographs were printed, mounted on foam core and cut. I was greatly assisted in this task by Danika Norey. With a B.S. in Art History and significant experience in photograph mounting, she eagerly assisted and oversaw the preparation of exhibit photos.

In some cases, outside sources were required for photographs. A key contribution was made by Bjorn Rorslett (www. Naturfotograf.com), a professional nature photographer from Oslo, Norway. Mr. Rorslett donated images from his studies in experimental

infrared and ultraviolet photography of flowers. These images exposed visitors to the closest depiction we have available of a bee's eye view of the world.

The World of Bees: Carpentry

A significant amount of time was devoted to designing and building the exhibit's original components from scratch. I was lucky enough to have the volunteered services of a licensed carpenter, Mr. Garry Johnson. He oversaw all building related to the exhibit to ensure it's safety and durability. He provided me with significant training and volunteered the use of *many* of his tools, his workshop and provided temporary storage space for some exhibit components. As a beekeeper of 5 years, Garry came on board with a unique insight into bees. He assisted in installing the exhibit's observation hive and restoring a Langstroth hive. Additionally, he served as the consulting carpenter for the Eagle Scout project associated with the exhibit (detailed in subsequent section).

The following components were original constructions that were built, designed and enhanced specifically for this exhibit:

- Sweat bee life cycle pieces
- A child-sized *Agapostemon* bee
- A stabilized Langstroth hive
- Child-sized honey bee cells
- Three puzzles: honey bee, bumblebee and sweat bee
- A wall mounted bumblebee (*Bombus terrestris*)
- The bees eye view box
- Mason bee houses

Additionally, a chainsaw bear was conceived, designed and made specifically for *The World of Bees*. Bruce Bayard, of Chainsaw Bears in Newburgh, New York, donated this work as a personal contribution to the exhibit.

Eagle Scout Project

To encourage community involvement, our local Boy Scout Troop 206 was solicited to help build the child-sized honey bee cells envisioned for the exhibit. A proposal was written and supplied to the troop leaders (pictured below) and a Boy Scout, Eric Carnright, volunteered to take on the project under the direction of Mr. Garry Johnson, the exhibit's head carpenter. Eric supplied all materials required for building the hive cells. Garry supplied the tools and work space.

These hive cells were integrated into the exhibit by the stuffed animal creations and costumes by Ms. Danika Norey. Danika created child-sized a stuffed egg, larva and pupa to accompany the hive cells. Additionally, she made a child-sized stuffed flower with pollen balls and 4 striped bee costumes. Together, visiting children were given the opportunity to be a worker bee!

The World of Bees: Nature's Pollinators
September 2011

Louise I. Lynch
University of Nebraska-Lincoln
with the
Hudson Highlands Nature Museum

Exhibit Objective
Honeybee and native bee populations have significantly declined over the past 6 years in the United States. Bees play an extremely important role in nature and to humans: they are nature's primary pollinators and their pollination activity accounts for one-third of the foods eaten in the United States. This project will exhibit bee biology and diversity in New York as well as their importance to humans. This exhibit will promote an appreciation of bees, their role in our daily lives and will foster the conservation of bees by individuals.

Project Objective: Hive Cell
A large wooden hive cell will demonstrate where bees keep and rear their young, where metamorphosis (development) occurs and how honeycomb is constructed. This is an integral and interactive component of the exhibit.

Hive Cell Specs (see attached illustrations)
2 modular (separate), 6-sided wooden hive cells
Wood must be sanded and varnished in natural wood tone
Must be large enough for child to crawl through
    Dimensions and measurements provided
Design must be safe for young children
    No sharp edges- utilize beveled edges
    Sturdy enough to support child's weight
Carpenter or furniture maker should be consulted for structural integrity

Contact Info
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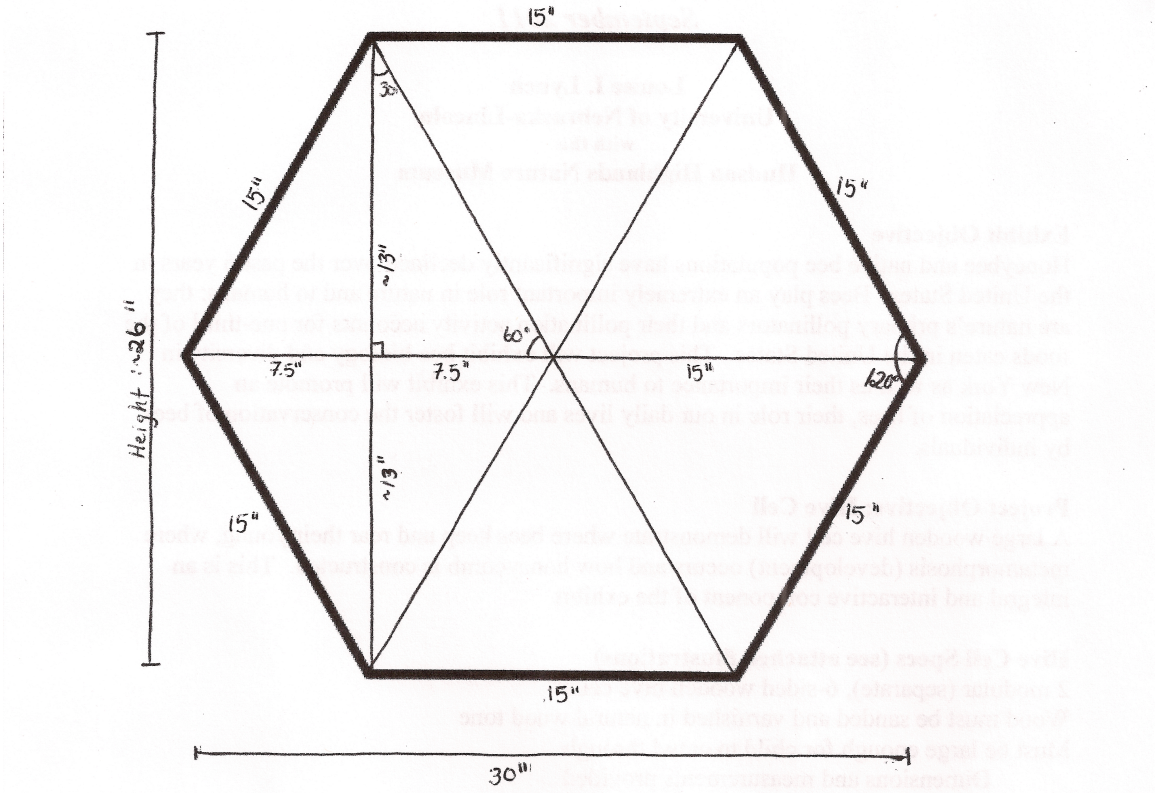
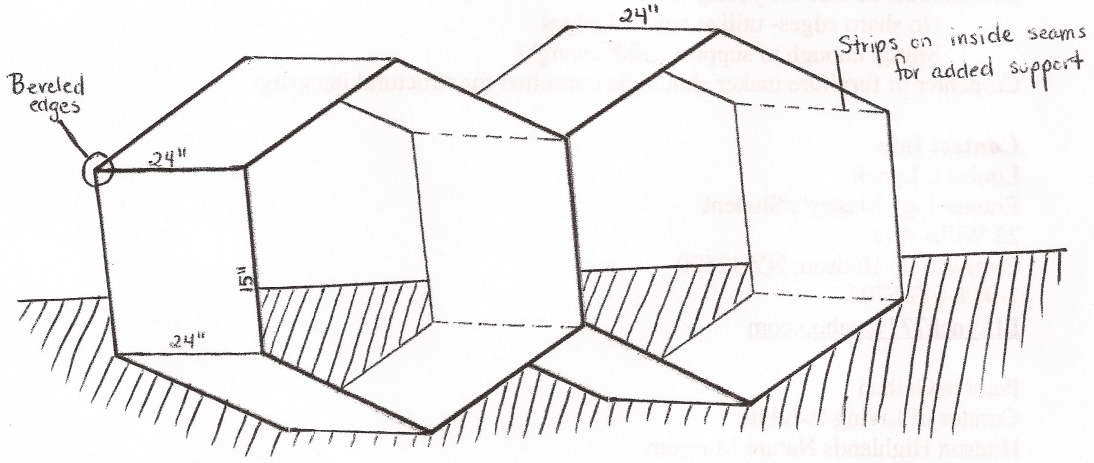




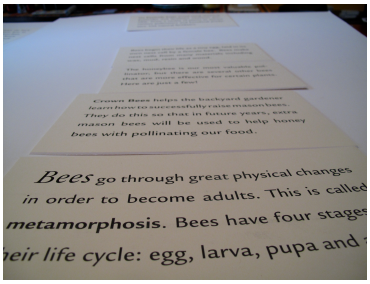
The World of Bees Design

A team of individuals came together to create the final design of *The World of Bees* exhibit.

Ms. Kirsten Kucer, a well-established exhibit designer, consulted throughout the initial conceptual layout and installation. She conceived and consulted on the color scheme, wall layout and text layout. She provided me with guidelines for planning and hanging an exhibit. Her personal portfolio is available here: http://local-artists.org/user/800

Mr. Rick Price, a well-established and creative local artist, provided his services as a muralist. After being provided with references, he quickly transformed many of the walls into active visual components of the exhibit. His personal website is available here: http://rickprice.net/

Ms.Virginia Norey volunteered her time as a typographer and designed all text plates in the exhibit. Additionally she purchased licensing rights for use of font types (CgCloister, ITC Legacy Serif and ITC Legacy Sans) from Random House, Inc. as her personal contribution to the exhibit. A paper color, texture and font shade (% gray) were chosen carefully to compliment the color scheme. All text panels were mounted on matte board and cut using a bevel-edged matte board cutter.



My most important design goals were to blow up the size of bees, envelope visitors with color and have a set up that encouraged touching. I wanted things to come off the walls where possible as well- to this end, I constructed as many ¾ inch mounted components for the walls such as the large *Agapostemon* bee and bee life cycle pieces.

Great care was taken to choose colors that complimented one another and colors that were bright. Kirsten developed a great color layout for the walls- a yellow band in the middle of the wall would provide the flow needed to carry visitors along the exhibit path. Even the brown color for the wall titles went through scrutiny in order to ensure a warm vibe in the exhibit room.

The World of Bees Installation

The installation process began by removing the previous exhibit, cleaning the walls, taping/covering wood frames and then covering the walls with two coats of primer. The color scheme of the previous exhibit was very dark, so care was taken to ensure proper coverage. Several volunteers, especially members of the Museum's board, volunteered their time to prepare the exhibit room for the new exhibit.

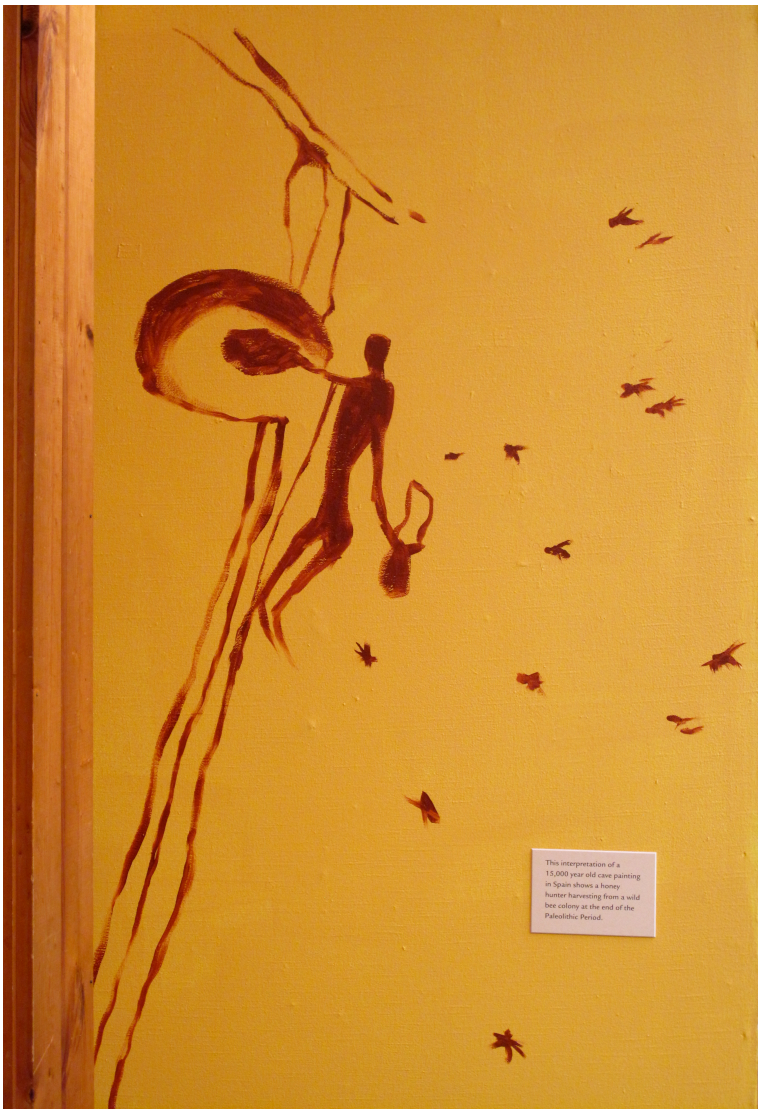
Entrance Wall: Cave Painting

The first visual component visitors are exposed to is a recreation of the famous honey hunting cave painting, a Paleolithic-age depiction preserved in a cave in Valencia, Spain. The exhibit muralist was provided with red paint closely matching the red pigment of the original work. Additionally, the muralist specifically painted using only his fingers in order to better represent the original artist.

The entrance wall includes the following:

- An informative text plate
- Enlarged mural of cave painting from Valencia, Spain

The following text plate and image are present on the entrance wall:
“This interpretation of a 15,000 year old cave painting in Spain shows a honey hunter harvesting from a wild bee colony at the end of the Paleolithic period.”



Wall 1: The World of Bees

As the starting point of the exhibit, “The World of Bees” wall introduces visitors to the history of bees on Earth. Bees have existed on Earth far longer than is commonly perceived. This wall was designed to visually connect bees to dinosaurs, animals that are synonymous with the prehistoric age. “The World of Bees” includes the following:

- informative text plates
- a Dominican amber specimen of a stingless bee, *Proplebeia dominica* (Apidae: Meliponini), dated at 17-25 million years old; donated by Doug Lundberg of Ambericawest. Doug provided magnified photographs taken with a microscope camera.
- Murals of a Triceratops, a magnolia-like tree and a pine tree dripping sap.

The following text plates and photos are presented on Wall 1:
“Bees have been around for at least 100 million years, since the age of dinosaurs! Evolving closely with flowering plants, bees today are the most important group of pollinators on the planet.”

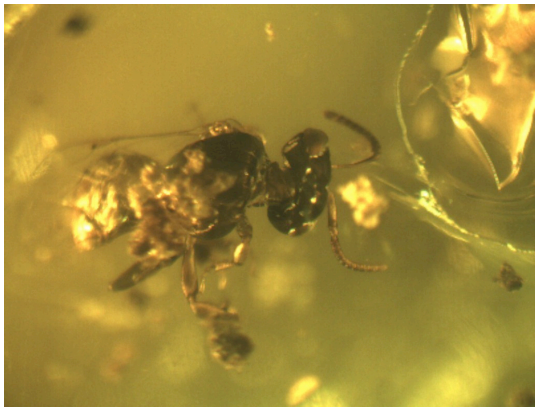


Photo by Doug Lundberg

“This tropical stingless bee was trapped in pine sap (now amber) 17-25 million years ago.”

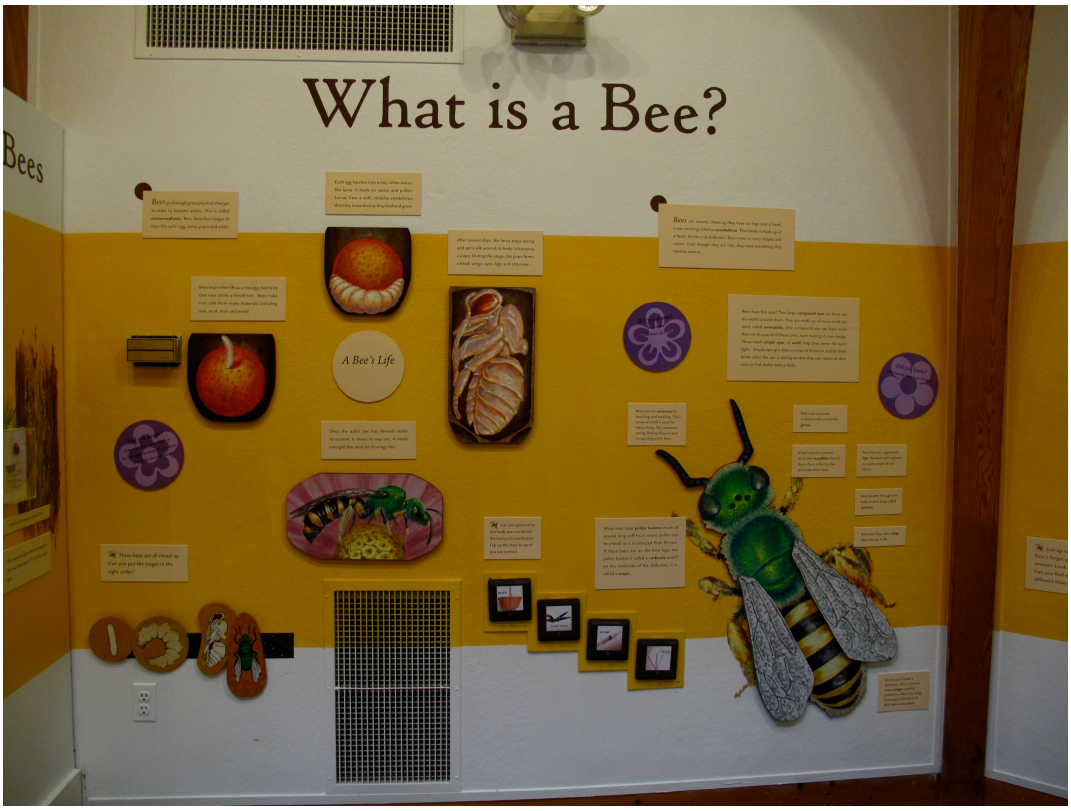
“Amber kindly donated by Amberica West.”

“Today, Earth is home to an estimated 20,000 bee species. More than 420 bee species live in New York State.”

Wall 2: What is a Bee?

The What is a Bee? wall introduces visitors to the biology, life cycle and anatomy off bees. It includes the following:

- Informative text plates
- Did You Know fact plates
- Relief murals of the life cycle stages of a sweat bee
- An interactive, magnetic game with life cycle pieces
- Interactive flip-up doors comparing bee body parts to tools
- A child-sized, relief mural of an *Agapostemon* bee.



The following text plates and photos are presented on wall 2:
"Bees go through great physical changes in order to become adults. This is called **metamorphosis**. Bees have four stages in their life cycle: egg, larva, pupa and adult."

Egg relief mural: "Bees begin their life as a tiny egg, laid in its own nest cell by a female bee. Bees make nest cells from many materials including wax, mud, resin and wood."

Larva relief mural: "Each egg hatches into a tiny, white worm-like larva. It feeds on nectar and pollen. Larvae have a soft, stretchy exoskeleton that they must shed as they feed and grow."

Pupa relief mural: "After several days, the larva stops eating and spins silk around its body. It becomes a pupa. During this stage, the pupa forms a head, wings, eyes, legs and antennae."

Adult bee relief mural: "Once the adult bee has formed inside its cocoon, it chews its way out. A newly emerged bee must let its wings dry."

"Did You Know? A bumblebee queen will sit on her eggs to keep them warm and help them grow."

Magnetic strip with wooden life cycle pieces: "These bees are all mixed up! Can you put the stages in the right order?"

Flip up doors: "Can you guess what bee body part works like the tools pictured below? Flip up the door to see if you are right!"

Proboscis, straw
Bee mandibles, garden sheers
Pollen basket, comb
Stinger, needle

"Bees are **insects**, meaning they have six legs and a hard, outer covering called an exoskeleton**.** Their body is made up of a head, thorax and abdomen. Bees come in many shapes and colors. Even though they are tiny, they have everything they need to survive."

Relief mural of *Agapostemon* female bee for anatomy:
"Bees use two **antennae** for touching and smelling. Their sense of smell is used for many things like communicating, finding flowers and recognizing other bees."

"Bees have five eyes! Two large **compound eyes** let them see the world around them. They are made up of many small eye units called **ommatidia**. One compound eye can

have more than six-thousand of these units, each making its own image. Three small simple eyes, or ocelli, help bees sense the sun's light. Simple eyes give bees a sense of direction and let them know when the sun is setting so that they can return to their nest or find shelter before dark."

"A bee's mouth contains tooth-like **mandibles** that let them chew, collect pollen and make their nests."

"Bees suck up nectar or honey with a straw-like **glossa**."

"Bees have six, segmented legs. Between each segment is a joint, much like an elbow."

"Did You Know? Bees taste with their six feet!"

"Bees have four, clear wings that they use to fly."

"Did You Know? It has been said that bumblebees should not be able to fly. However, they flap their wings in a figure-8 pattern, not up and down, giving their body enough lift for flight."

"Many bees have pollen baskets made of special long stiff hairs where pollen can be placed as it is collected from flowers. If these hairs are on the hind legs, the pollen basket is called a **corbicula** and if on the underside of the abdomen, it is called a **scopa**."

"Bees breathe through tiny holes in their body called **spiracles**."

"On the tip of a bee's abdomen, there may be a sharp **stinger** used for protection. Bees may sting if annoyed, harmed or if their nest is disturbed."

"Did you know? Only female bees have stingers."

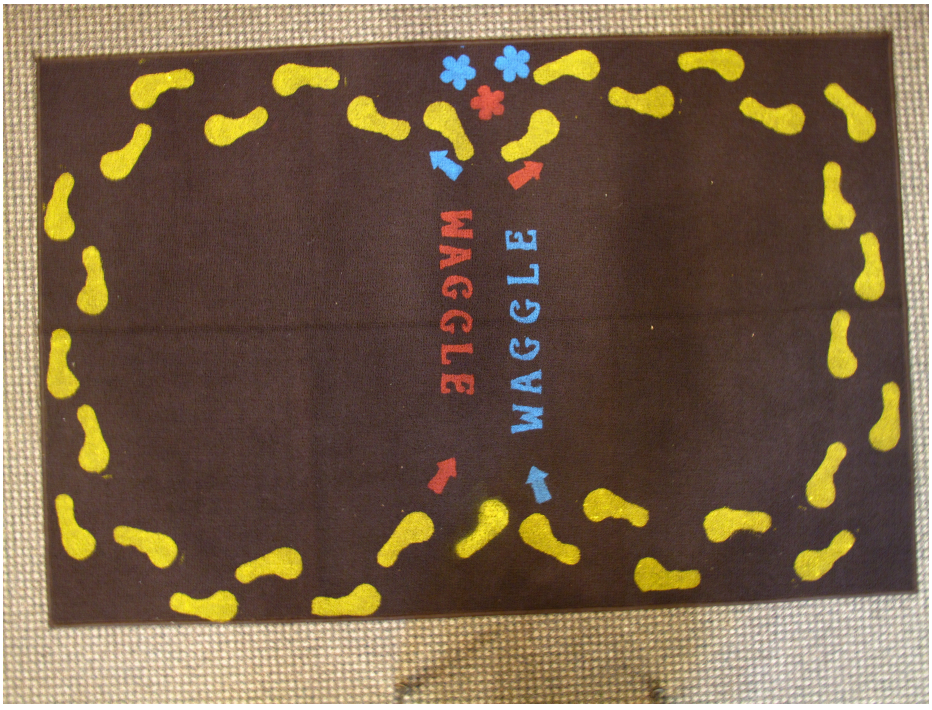
Wall 3: The Honey Makers

The Honey Makers wall introduces visitors to the biology and behavior of the honey bee and its significance to our agriculture and food supply. It includes the following components:

- Informative text plates
- Did You Know? Fact plates
- An observation hive and honey bee colony
- A labeled, Langstroth hive with movable frames for public inspection
- Child- and adult-sized beekeeping suits for public use
- Plush (stuffed) beekeeping tools
- A waggle dance rug
- Child-sized honey bee cells, bee costumes and stuffed bee egg, larva, pupa, pollen balls and flower.
- Beekeeping tools on display

smoker! Look inside your hive box.
Can you find which frame is
different than the others?
Look Inside!
The top cover keeps rains out
and encloses the hive.
The super holds frames with
extra honey.
The entrance is where bees
enter and exit.
It is watched by guard bees.
The landing platform gives bees
room to take off and
make landings.

The Queen
The entrance is where bees
enter and exit.
It is watched by guard bees.
The landing platform gives bees
room to take off and
make landings.


WAGGLE
WAGGLE

Paper or wood is burned in the smoker. Before entering a hive, many beekeepers "smoke" their hive with this tool to calm the bees down and distract them from the beekeepers presence.
A veiled hat keeps bees from stinging the beekeeper while they work in the hive.
The hive tool is used to pry open the hive and move frames.

The following text plates, photographs and interactive components are presented on this wall:
“Humankind has a long history with the honey bee, our most valuable insect. Its name, *Apis mellifera*, means “honey bearing.” Egyptians were the first to keep honey bees. Today, farmers rely on these pollinators to produce many fruits, nuts and vegetables. Honey bees are not native to North America. European colonists brought them to their new home in the 1600s. Today they are found throughout the planet.”

“Did You Know? The honey bee is only one of the 20,000 bee species found on Earth.”

Photo by L. Lynch

“Honey bees live in a colony, or **hive**, home to 60,000 or more bees that work together like a single organism. A lone honey bee cannot survive without its hive.”

“Did you know? There are several kinds of honey bee including Italian, Caucasian, Russian, Carniolan and African. They are all the same species, *Apis mellifera*.”

“Langstroth, the “Father of American Beekeeping,” found that honey bees do not like spaces in their hive wider than 3/8 of an inch, the distance just large enough for two bees to pass one another. His design is still used today and allows honey to be harvested without destroying the colony. Inside the hive, honey bees build 6-sided **cells** with wax. Together, these cells make **comb** where all hive activities occur from metamorphosis to honey production.”

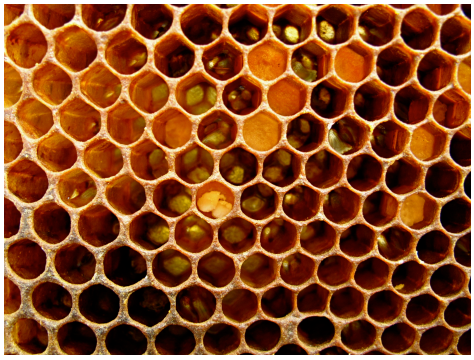


Photo by L. Lynch

"A person who keeps bees is called an **apiarist**, or simply, a beekeeper. Apiarists keep bees to pollinate plants and collect honey, pollen, and wax. Beekeepers often wear a protective suit, gloves and a special veiled hat to avoid getting stung. They use smoke to keep the bees calm."

Photo by L. Lynch

<u>Honey Bee Hive</u>: parts labeled on hive itself

"The **top cover** keeps the rain out and encloses the hive.
The **super** holds frames with extra honey.
The **frame** is where bees build comb, store honey and raise young.
The **hive box** is where the queen lives and lays eggs.
The **landing platform** gives bees room to take off or make a landing.
The **entrance** is where bees enter and exit. It is watched by guard bees.
The **stand** keeps the hive above ground, safe from moisture and some predators."

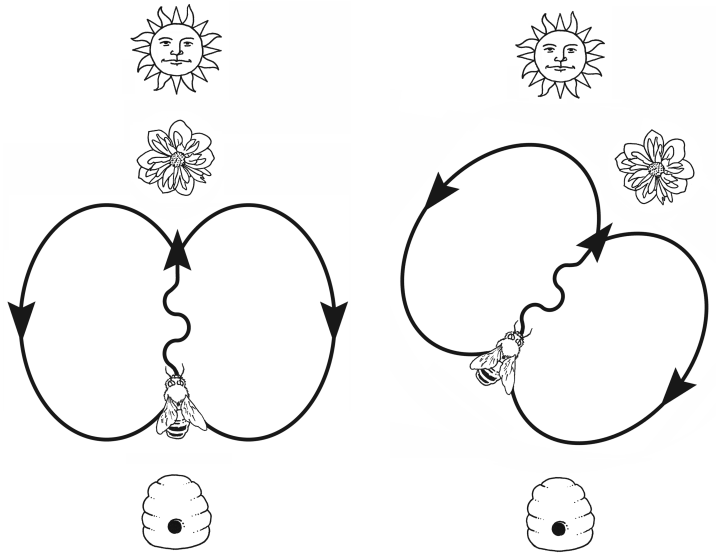
"Tools of the Trade
Suit up to check your bee hive. Don't forget your suit, gloves, hive tool and smoker!
Look inside your hive. Can you find which frame is different than the others?"

"Bees use a different language for communicating with one another, including scents and dancing! Bees use **pheromones**, or chemical odors, to identify one another, find the hive and get messages from the queen. Bees use **dances** to communicate the location of food."

“A guard bee gives off pheromones at the entrance to help returning worker bees smell their way to the hive entrance.”

“When a food source is near the hive, a bee dances in circle in the **round dance**. This lets other bees know that a food source will be found by circling around and away from the hive.”

“In the Waggle Dance, a bee communicates the location of a distant food source in relation to the sun. The slower the dance is, the farther away the food source. Because the inside of a hive is dark, dancing upwards tells other bees to fly towards the sun to find food and downwards means fly away from the sun. A bee that dances upwards and to the right is saying, “fly to the right of the sun.”



Original artwork by Dan Lynch

“Swarming is how a hive reproduces. Although swarms look scary, these bees have stomachs so full of honey that they are physically unable and uninterested in stinging. They are simply waiting for scouts to find a new home. If you see a swarm, contact your local beekeeping organization, so they can find a home for the colony!”

Observation Hive

“A honey bee hive can have 60,000 or more bees! Within this colony are three different **castes**, or groups, of bees, each with its own tasks.”

Queen Mural: “The queen is the largest and only egg-laying member of the hive. She directs many of the activities in her colony and lays 1,500 or more eggs a day! The queen starts out as an egg like the other bees but is fed more and sweeter food than other larvae.”

Photo by L. Lynch

“Can you spot the queen? Look for the largest bee being attended by other bees.”

<u>Worker Mural</u>: “Worker bees are all female and the most numerous in the hive. They carry out many duties including cleaning, guarding and building the hive, collecting food and feeding the queen and young larvae. Because they work so hard, workers may only live 14 days during the summer.”

“Can you spot the workers? They are the smaller busy bees caring for the many needs of the hive.”

Photo by L. Lynch

“Did you know? During her lifetime, a worker bee makes one teaspoon of honey.”

<u>Drone Mural</u>: “Drones are large male bees that make up a small part of the colony and do not help with hive maintenance. Drones mate with the queen so she can make new female workers. During the fall, drones are thrown out of the hive so they don’t eat up all the honey stored for the winter.”

Photo by L. Lynch

“Can you spot the drones? Look for their very large ‘wrap around’ eyes used to spot queens during mating flights.”

"Did you know? Male drones die after mating and female workers die after stinging."

Wall 4: Bees are Builders

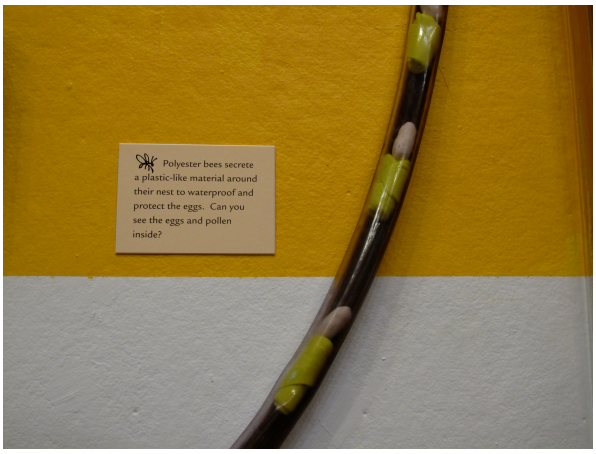
Bees are Builders introduces visitors to the diversity of bees by exhibiting key groups: mason bees, leafcutter bees, polyester bees, carpenter and pith bees, bumblebees and parasitic bees. The biology, nesting preferences and characteristic behaviors of these bees are presented. This wall includes the following components:

- Informative text plates
- Did You Know fact plates
- A live mason bee nest donated by Crown Bees
- A large, touchable leafcutter bee nest model
- A large, bumblebee nest model
- A large, clay model of a sweat bee nest
- A large, polyester bee nest model
- Pinned specimens of leafcutter, mason, parasitic, sweat and bumble bees donated by Amanda Dillon, Albany Pine Bush Reserve; or on loan by the American Natural History Museum.
- Three puzzles; a honey bee, bumblebee and sweat bee

Parts of a Leafcutter Bee Nest

Mason bee nest kindly donated by Crown Bees.
This nest has live, developing bees inside! Here's a peek inside.
Pollen
Larva
Mud cell wall

Look inside this bumblebee nest model. A bumblebee queen makes a new nest each year. It has orange pollen balls with developing larvae inside. Can you see the nectar in the nectar pots?


Polyester bees secrete a plastic-like material around their nest to waterproof and protect the eggs. Can you see the eggs and pollen inside?

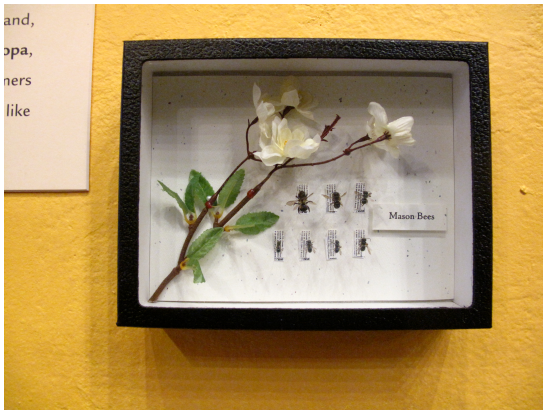
Look closely! How many little rooms, or egg chambers, can you count in this sweat bee nest casting?

Bumblebee Queens
Bumblebees

Sweat Bees

Carpenter Bees
Pith Bees

Leafcutter Bees


and,
ppa,
ners
like
Mason Bees

Sweat Bees
Leafcutter

Bumble Bee
Honey Bee
Sweat Bee

The following text plates and photo are presented on this wall:
"New York State is home to more than 400 bee species! Most of our bees are **solitary**. A single female bee makes her own nest and cares for her own young. Some bees are **social**, living in a colony with two or more female bees that share the responsibility of raising young. Other bees are **parasitic** and lay their eggs in the nests of other bees and let another bee do all the work."

"**Sweat bees** can vary in color, from brilliant metallic green to dusky black. As their name implies, some are attracted to the salt in human sweat! Sweat bees can be solitary or social with an egg-laying queen and a few workers. Sweat bees are ground-nesters. Females tunnel into loose soils or use abandoned beetle tunnels in rotting wood. They visit a wide variety of flowers including crops, such as sunflowers and watermelon."

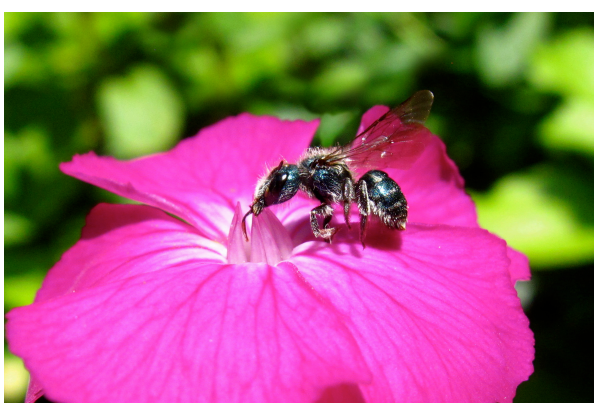
Photos by L. Lynch

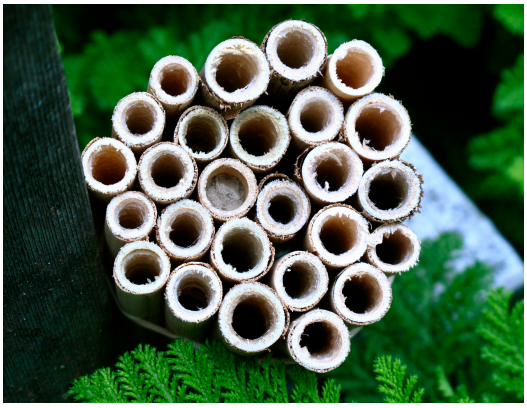
Clay, sweat bee nest model: "Here is a replica of a sweat bee nest in which an egg-laying queen lives with a few workers."

"Leafcutter bees are solitary and often build nests in natural or artificial cavities, from abandoned beetle tunnels to hollow plant reeds. Female bees have large mouthparts for cutting circular pieces of leaves or petals, which surround each egg in its cell. Leafcutter bees visit a wide variety of flowers and store pollen in a special basket under their abdomen called a scopa. The alfalfa leafcutter bee has been introduced to pollinate alfalfa, an important livestock food."

Photo by L. Lynch

"**Mason bees** are solitary bees that vary in color from dull black to metallic green, blue, and even purple. Mason bees are named for the walls they build between eggs in their nest. Females use a variety of materials including mud, pebbles, sand, chewed leaves and flower petals. They hold pollen in a **scopa**, an area with stiff hairs on their underside. Orchard farmers use them for early spring fruit trees like apples, and crops like blueberries and alfalfa."





Photos by L. Lynch

"Can you find the reed that has a mason bee nest in it? Look for the mud plug."

"Mason bee nest kindly donated by Crown Bees."

"Carpenter bees are large bees named for the nests they burrow into solid wood. They look like large bumblebees but have a shiny, black abdomen Carpenter bees are solitary and females bore tunnels as long as 12 inches into solid wood. Eggs are laid with a sticky mass of pollen for food. Males can be territorial and although they appear to be aggressive, male carpenter bees are harmless and cannot sting. Some carpenter bees are much smaller, often metallic blue or green, and make nests in softer plant stems."

Photos by L. Lynch

"Parasitic bees, also called cuckoo bees, do not build nests. These wasp-like bees are not hairy like other bees and do not need to collect pollen for their young. They lay and abandon their eggs in another bee's nest. When cuckoo bee larvae hatch, they kill the larvae of the host bee and eat its food."

Photo by L. Lynch

"Mining bees make up most of New York State's bee species. They are named for the excavations they build in soil. Although solitary, females may share a nest entrance. Mining bees are most numerous in the spring and are important pollinators of spring flowers."

Photo by L. Lynch

Polyester bee nest out of vinyl tubing: "Polyester bees secrete a plastic-like material around their nest to waterproof and protect the eggs inside."

"Bumblebees are familiar furry bees that range in color from black and yellow to orange and white. Some bumblebees have very long tongues that are better at reaching nectar in very long flowers, like clover. Bumblebees are social, living in a hive with a queen, workers and males. They do not make honey, rather they store nectar in pots. Bumblebees work long hours and are even seen collecting pollen and nectar on rainy days!"

Photo by L. Lynch

Bumblebee nest replica: "Look inside! In a bumblebee nest, nectar is stored in wax pots. Eggs are laid on pollen balls where larvae will later feed and grow."

Vials with preserved bees: "Take a closer look at these different types of bees. How many colors can you find?"

Three 4-6 piece puzzles: "Put the puzzles together. What type of bee is it?"

Wall 5: Bees are Pollinators

Bees are Pollinators introduces visitors to the hugely significant role that bees play in pollinating many of Earth's flowering plants and many of our crop plants. It includes the following components:

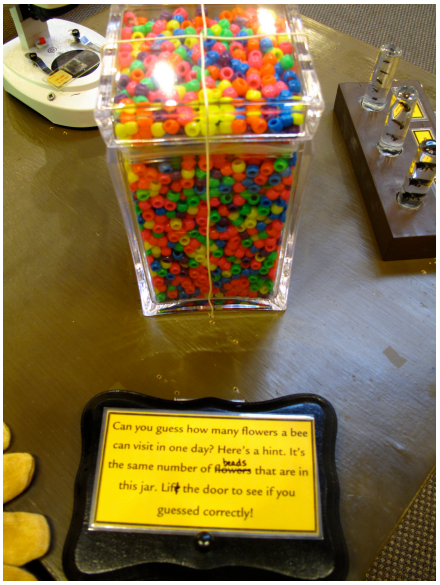
- Informative text plates
- Did You Know fact plates
- Color photographs
- Artificial foods suspended foods suspended form ceiling representing plants pollinated by bees
- Child-sized flower mural
- Child-sized stuffed, wall mounted bumblebee
- Interactive pollen activity attached to flower mural
- Pinned specimens of squash bees
- Bee products display case
- "How Honey is Made" display case
- Pollination Picnic Activity including table and artificial foods
- A Bees Eye View box
- "Sounds of Summer" sound board

Bees are Pollinators

Pollen from another flower has to travel to the stigma, down the pistil and to the ovary. As the ovary grows larger, it will become fruit. Help the pollen reach its destination.

Humans' Eye View
Bees' Eye View

Can you match the flower with its ultraviolet pattern? Check the key below to see if you are correct!



The following text plates and photos are presented on this wall:
"Pollination is the passing of pollen grains in and between plants. Bees often repeatedly visit the same flower species, ensuring pollen is dropped in the right place. Most of earth's plants need to be pollinated by animals in order to bear seeds, nuts, fruits and vegetables. Without bees many foods, like those above, would be out of our reach."

"Did You Know? Alfalfa is an inexpensive, bee-pollinated food source commonly used to feed livestock, keeping dairy and meat products affordable."

Wall Mounted Bumblebee: "Bees are great pollinators because they are covered with statically charged fur and vibrate as they collect nectar. Pollen sticks to them and gets dropped off at other flowers. This bumblebee has been fashioned after *Bombus terricola*, a once common species that is now rarely found in New York, if at all."

Photo by L. Lynch

Painted flower relief: "Pollen from another flower has to travel to the stigma, down the pistil and to the ovary. As the ovary grows larger, it will become fruit. Help the pollen reach its destination."

Guessing Game: Jar filled with flower beads on pedestal: "Can you guess how many flowers a bee can visit in one day? Here's a hint. It's the same number of flowers that are in this jar. Lift the door to see if you guessed right!"
Answer: "A bee can visit up to 3000 flowers in one day."

"Honey is a favorite of many people. Do you know how it is made?"

How Honey is Made Display Box:
Artificial apple blossoms: "Honey bees collect nectar from flowers and carry it back to their hive in a special honey stomach. The flower source will determine the honey's flavor."
Wax comb with nectar in it and bees on it: "The nectar mixes with enzymes in the bee's honey stomach. It is stored in a wax comb where water begins to evaporate."
Honey comb: "Once water has evaporated, the nectar becomes honey. Bees cap it with wax to save it for later use."

"Did you know? Bee venom stimulates the immune system and is used in acupuncture and treatment of arthritis and MS."

"The honeybee is our most valuable pollinator, but there are several other bees that are more effective for certain plants. Here are just a few!"

"B**umblebees** are native pollinators of plants such as tomatoes, blueberries, cranberries and peppers. They perform buzz pollination in which flight muscles are vibrated while visiting flowers. These vibrations get pollen all over the plant, resulting in larger fruits. Some bumblebee species are raised in captivity for use in greenhouses."

"Squash Bees specialize in pollinating plants like cucumbers, watermelons, pumpkins, squashes and gourds. These bees begin working before sunrise and males may rest inside the large flowers. One species, *Peponapis pruinosa*, is found across the United States wherever its favorite plant are found."

Photo by L. Lynch

"Mason Bees are important pollinators of several orchard fruits such as apples, cherries and plums. The **Blue Orchard Mason Bee** readily nests in reed or wooden nests and is increasingly kept by farmers. Other mason bee species are important pollinators of blackberries and blueberries."

Photo by Tom Murray

“The Alfalfa Leafcutter Bee is originally from Europe, but is an important alternative to honeybees for alfalfa pollination. Alfalfa makes an affordable feed for many farm animals. Not many bees are willing to pollinate this flower which has a lock mechanism that hits an entering bee in the head. But Alfalfa leafcutter bees do not mind!”

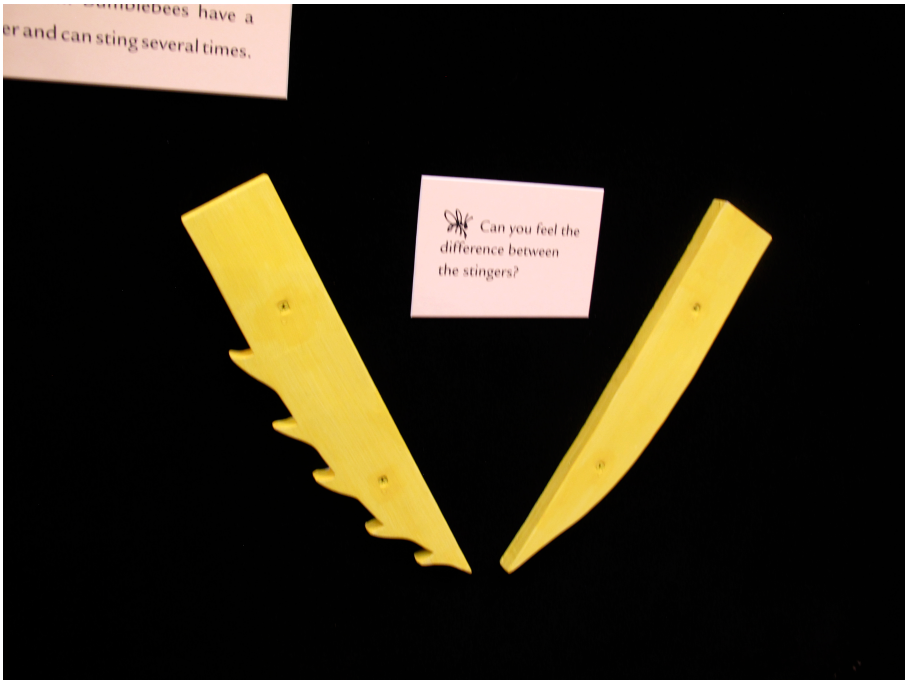
Pollination Picnic: “Did you know that one third of the food we eat comes from pollination by insects, most importantly bees? Make a meal for your picnic with the foods provided. Put unused foods back in the basket. Now use this key to determine what foods you would have without bees.
X Pollinated by bees: remove this food from your picnic!
O Not pollinated by bees: keep this food in your picnic.
$ Affordable because of bee-pollinated plants. Will be more expensive without bees.”

“Did You Know? The yellow jacket, which is a wasp and **not** a bee, is often attracted to picnics and backyard barbecues. In fact, wasps eat bees!”

Wall 6: Wasps and Bees

Wasps and Bees introduces visitors to the differences between wasps and bees. It includes the following components:

- Informative text plates
- Did You Know fact plates
- Color photographs
- Pinned specimens of wasps and bees
- Large, touchable models of wasp and honey bee stingers
- A honey bee nest display



The following text plates and photos are presented on this wall:
"Wasps and bees both belong to the order Hymenoptera. Despite this relationship, they differ in many ways and bees often look to steer clear of these predators. Common wasps include yellow jackets, paper wasps and mud dauber wasps."

Photo by L. Lynch

"Wasps, like this ichneumon, are often thinner and much less hairy than bees."

Photo by L. Lynch

“Bees have furry bodies, ideal for picking up and dropping off pollen.”

Photo by L. Lynch

“Wasps are predators, parasites or scavengers. **Predators** eat other insects, including bees. **Parasites**, like the pompilid wasp above, paralyze and lay eggs on or in other animals, such as spiders. **Scavengers**, like the infamous yellow jacket, will feed on fruits, sugary foods and drinks.”

Photo by L. Lynch

“Bees survive on a diet of pollen and nectar obtained from flowering plants.”

Photo by L. Lynch

“Wasps are beneficial to humans. They are useful in controlling pests that feed on our crops. Many wasps are important decomposers.”

Photo by L. Lynch

"Bees are beneficial to humans. Their pollination activities are vital to our agriculture, the survival of many flowering plants and the production of honey and wax."

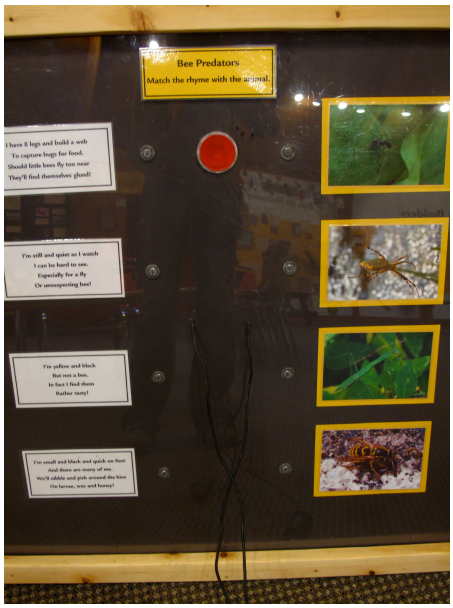
"Wasps have a smooth stinger and can sting several times. Honey bees have a barbed stinger that is wrenched out after a sting, causing their death. Bumblebees have a smooth stinger and can sting several times."

Wooden stingers: "Can you feel the difference between the stingers?"

Wall 7: Bees in Peril

The Bees in Peril wall introduces visitors to the many issues that both native and non-native bee populations are facing. It includes the following components:

- Informative text plates
- Did You Know fact plates
- Color photographs
- A "Bee Predators" matching light board
- Child-sized chainsaw bear donated by Bruce Bayard
- A "Match the predator with the rhyme" light board



The following text plates and photos are presented on this wall:
“Bees are currently facing challenges that are natural and manmade, native and introduced, known and unknown. The honey bee and many native bees have seen extreme population declines, even extinction. Bees are considered keystone species,

because many living organisms, including humans, rely on them for survival. Bee declines or extinction will have a profound effect on all living things."

"A **predator** is an animal that eats other animals. Bees have many predators to contend with.

- Bears will destroy a honey bee hive in search of protein-rich larvae and pupae.
- Yellow jackets hunt for bees and feed them to their young back at their nest.
- Mice, skunks and raccoons will feed on honey comb, larvae, pupae and adults.
- Some spiders build webs strong enough to capture bees.
- Beewolves are predatory flies that mimic bumblebees. They will stake out a honey bee hive and feed on worker bees."

"Chainsaw bear kindly donated by Chainsaw Bears, Newburgh, NY."

Photos by L. Lynch

"Did You Know? When a bear attacks a hive, it is searching for the protein-rich brood."

Photo by L. Lynch

"A **pesticide** is a chemical or other substance used to kill pests that are unwanted or cause damage to property. Many pesticides work on insects that damage food crops. As insects, bees are easily poisoned and killed when visiting crops."

"A **parasite** lives in or on another organism, called a host. Parasites can cause sickness or death in the host."

Photo by L. Lynch

"Varroa mites are small, red parasites that suck the blood of bees much like a tick. They can cause death or malformed wings in adult bees. Can you find the small, red varroa mite in this picture?"

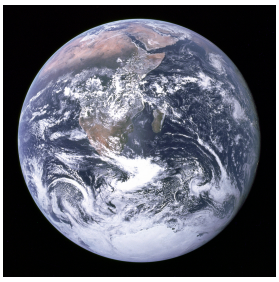
Photo by L. Lynch

"**Bumblebee declines** in the United States have been severe and some species may already be extinct. A fungal disease entered the country with bumblebees imported from Europe and is likely responsible for these declines. Bumblebees are important pollinators of greenhouse tomatoes, clovers, and other fruits and flowers."

"**Habitat** is the natural home of a living organism and bees often need different types of habitat. They need a place to find food, to nest and to hibernate through the winter. Nesting habitat alone is of no use to a bee, if it has nowhere to find food. **Habitat loss** is the destruction of any of these habitats due to construction, agriculture or development."

Photo by L. Lynch

"A **monoculture** is the planting of only one crop on a farm. Without diversity, bees are limited to only one food source in season, or possibly no source at all. Furthermore, treating crops with pesticide to increase yield may poison and kill bees."



Public Domain Photo

"**Climate change** is the increase in number and intensity of storm events on the planet. Warming temperatures and harsher storms may abruptly alter habitat and change when and where food sources grow, making survival more difficult for bees."

Photo by L. Lynch

"**Colony Collapse Disorder (CCD)** is the sudden disappearance of all or most worker bees in a honey bee colony. Scientists believe that CCD is the result of stress caused by a combination of pesticide poisoning, habitat loss, parasites, disease, and poor nutrition. The increasing failure of commercial honey bee hives will make it difficult to meet growing global food demands."

"**Bias** in our culture is to define any flying, stinging insect as a bee. Fear of and unfamiliarity with bees presents a challenge to protecting our pollinators."

"**The Africanized honey bee** is a hybrid. Bred in Brazil as part of a project to create a bee that could produce honey in hot climates, it escaped before research was completed and has since spread northward into the United States. Fear and reactive measures have led to bans on backyard beekeeping, further challenging honey bee populations. The unfortunate reality is that these bees exhibit heightened colony defense and more frequent swarming. Research continues and has seen promising results in their management."

"*Before handling them, I was curious and nervous, but not fearful. These bees are hybrids of the African and European counterparts. They have a role to fulfill in pollination just like other bees. In general, all people are afraid of stinging insects. But some cultures have a longer tradition of honey consumption and are more understanding of honey bees and their role in agriculture. Fear of the Africanized honey bee is sometimes justified. It is an organism that demands respect. But using a label like "killer bee" tends to get a rise out of our collective psyche and fear sells. Few people understand why they are here, how they got here and how they are spreading around. This is where the beekeeping and agricultural communities need to step in, striving to provide education about these bees."*

-Justin Stevens, Executive Vice President of Betterbee, Inc. has worked with Africanized honey bees in Africa and Central America.

Wall 8: Beckoning the Bees

The Beckoning the Bees wall introduces visitors to the many ways that they can get involved in bee conservation. It includes the following components:

- Informative text plates
- Did You Know fact plates
- Color photographs
- Original water colors by Katherine Johnson
- A Little Tikes Garden Cart

The following text plates and photos are presented on this wall:
"**Bees** need our help! You can help support and attract them on your own, with friends and family or as a community. There are many ways to provide habitat and food sources that support local bees already in your area."

Photo by L. Lynch

"**Become an Apiarist!** You can keep bees, too! Contact your local beekeeping organization, search the internet and visit your local library to learn more about how to keep honey bees, bumblebees, mason bees and others."

"**Make a nest!** Making nest sites for native bees is an easy and fun way to help our bees. You can purchase one or make your own."

"Every spring, bumblebee queens can be seen searching for a warm, dry cavity in which to build a nest. You can build a nest out of wood or simply a coffee can."

"These bamboo nests mimic the natural cavities and abandoned beetle tunnels used by leafcutter and mason bees."

"**Did You Know?** Leafcutter, mason and sweat bees are docile and seldom sting. They collect pieces of leaves, petals, or soil to surround their eggs when they lay them."

"Experiment with nest materials. Try plastic and paper straws to see which straws the bees prefer."

Wooden Nest: "Drill holes of varying diameters to a depth of 5 or more inches to provide for a variety of cavity nesters. Bees come in different sizes and need holes of different sizes."

"Nest box kindly loaned by Bees Louise!"

"Nest box kindly donated by Crown Bees."

"Crown Bees helps the backyard gardener learn how to successfully raise mason bees. They do this so that in future years, extra mason bees will be used to help honey bees with pollinating our food."

"**Go Pesticide Free**! Avoid using chemical pesticides and fertilizers when ever possible. Grow a variety of plants to attract various pollinators and beneficial predators. Use natural fertilizers."

"**Make a Bee Garden!** You don't have to keep bees to help them. Just plant flowers! Include flowering plants that will blossom throughout the warmer months. Visit your local nursery, search the internet or contact your local beekeeper's association for more bee-friendly flowers."

"Bee gardens can be an individual or community effort."

"**Did You Know?** Native plants are more attractive to native bees than exotic plants because they have coevolved with our native bee species."

Kate's watercolors (4-12+ paintings)

"All watercolors kindly loaned by Katherine Johnson."

"**Did You Know?** Nearly all flowering plants rely on insects for survival so your garden benefits from a healthy bee population."

"**Make an Herb Garden!** Planting herbs like oregano, mint, rosemary, basil, lavender and purple coneflower, will help bees and add to your kitchen."

"Leave the Weeds! A great way to support local bees is to leave areas with weeds, twigs, dead wood, and even bare soil. This provides much needed natural nesting sites for many different kinds of social, ground-nesting and tunnel-nesting bees. It's not a weed; it's a wild flower!"

Special Thanks: Donations, Loans and Discounts

Numerous individuals donated in various ways from time, materials, and assistance, to advice, discounts and loans. Below is a list of those individuals that contributed to the exhibit.

Dr. John Ascher
American Museum of Natural History
Central Park West at 79th Street

New York, New York 10024-5192
Time spent: 4 hours
Description: prepared, packaged and mailed preserved specimens, offered information resources.

Mr. Jason Balletta, President and CEO
BeeAlive, Inc.
PO Box 1006
Valley Cottage, New York 10989
Time spent: 1 hr
Description: $250 donation towards C.A.A. matching grant

Bob Bamberger
60 Union Avenue
New Windsor, New York 12553
Time spent: 30+ hours
Description: installed observation hive, assembled wooden hive cells for "The Honey Makers" wall, helped with building of native bee houses, offered carpentry assistance all throughout the exhibit development period, and offered use of tools.

Bruce Bayard, Chainsaw Bears
5360 Route 9W
Newburgh, New York 12550
Time spent: 20 hours
Description: designed, built and donated a chainsaw bear holding a skep (~350?)

Eric Carnright, Eagle Scout
51 Duncan Avenue
Cornwall on Hudson, New York 12520
Time spent: 35 hours
Description: Built three wooden hive cells for Eagle Scout project, with Garry's assistance.

Susan and Hank Christensen
Time spent: 1 hr
Description: $100 donation towards C.A.A. matching grant

Dwayne Clark, Dwayne's Glassworks
8 Bridge Street #A
Florida, New York 10921
Time spent: 1 hour
Description: Donated 8" x 24" piece of plexiglass for honey bee model in exhibit room tree (approx. $110 value)

Amanda Dillon

Albany Pine Bush Preserve
195 New Karner Road
Albany, New York 12205
Time spent: 6 hours
Description: Donated bee specimens collected from Albany Pine Bush Preserve used for bee vials, offered assistance in identification of specimens.

Mr. Rodney Dow
Center for the Advancement of Apiculture
PO Box 140
27 Cutler Lane
Garrison, New York 10524
Time spent: 12 hours
Description: Offered matching grant through Center for the Advancement of Apiculture in the amount of $1500. Provided advice on observation hive and beekeeping.

Sam Droege
USGS Patuxtent Wildlife Research Center
BARC_EAST, Building 308, Room 124
10300 Baltimore Avenue
Beltsville, Maryland 20705
Time spent: 1 hour
Description: offered assistance in identification of some bee specimens, taught USGS Bee Identification Course, assisted in spreading the word about exhibit's opening.

Eric Eaton
4470 E. Pikes Peak Ave #143
Colorado Springs, Colorado 80916
Time spent: 0.5 hours
Description: Identified pompilid wasp photo for use on "Wasps and Bees" wall.

Dr. Marion D. Ellis
University of Nebraska
Department of Entomology
210 Entomology Hall
Lincoln, Nebraska 68583-0816
Time spent: 2 hours
Description: Provided guidance for "Pollination Picnic" activity and exhibit development

Nathan Erwin, Insect Zoo Manager
National Museum of Natural History
10th Street and Constitution Ave NW
MRC 158 PO Box 37012

Washington D.C. 20013-7012
Time spent: 2 hours
Description: Gave advice on maintaining observation hive and development of exhibit

Louise, Chris and Ken Fall
BioQuip
2321 Gladwick Street
Rancho Dominguez, California 90220
Time spent: 3 hours
Description: Provided 40% discount on merchandise and reimbursed shipping and handling for: microscopes, insect nets, glass vials, display cases.

Roberta Glatz
524 Copeland Hill Road
Feura Bush, New York 12967
Time spent: 5 hours
Description: Collected and shipped Squash bee specimens (*Pepinosa pruinosa*), copied and mailed information on squash bees

Victor H. Gonzalez Betancourt
Division of Entomology, Natural History Museum
1501 Crestline Drive- Suite 140
University of Kansas
Lawrence, Kansas 66045
Time spent: 2 hours
Description: Posted prominent advertisement for *World of Bees* on his personal website, http://apoidea.lifedesks.org/

Carl Hausknecht, Branch Manager
Dadant & Sons, Inc.
PO Box 267
Waverly, New York 14892
Time spent: 2 hours
Description: Donated honey bee info cards, soap and candle molds, frames for observation hive.
David Hudson
Crown Bees
14313 NE 177th Court
Woodinville, Washington 98072
Time spent: 5 hours
Description: Donated bee houses and live mason bee nest (~$100), reviewed text for "Bees are Builders", provided advice and info about mason bees

Katherine Johnson
462 Eighth Avenue, Apt. A
Fort Knox, Kentucky 40121
Time spent: 30 hours
Description: Loaned wildflower watercolors made specifically for the exhibit

Garry Johnson
114 Willow Avenue
Cornwall, New York 12518
Time spent: ~150 hours
Description: Oversaw all carpentry building: installed observation hive and live bees, oversaw Eagle Scout project, bumblebee wall mount, built frames for wildflower watercolors, helped with building native bee houses, met with Bruce Bayard, etc.

The Kelly Family
12 Andrews Street
Cornwall on Hudson, New York 12520
Time spent: 3 hours
Description: assisted with measurements for wooden hive cells

Kirsten Kucer
24 Fowler Street
Beacon, New York 12508
Time spent: 20 hours
Description: Consulted on wall layout and exhibit design.

Mr. and Mrs. Kurdwanowski
PO Box 701
Cornwall, New York 12518
Time spent: 3 hours
Description: Donated books, information, photographs, etc. about honey bees.

Doug Lunderberg
Ambericawest
15270 Pleasant View Drive
Colorado Springs, Colorado 80921
Time spent: 1 hour
Description: Donated bee amber specimen (~$50)

Daniel R. Lynch
15 Gadiri Drive
Highland Falls, New York 10930
Time spent: 35 hours

Description: Designed wall titles, magnetic life cycle pieces, puzzles, and waggle dance illustrations.

Elaine Lynch
15 Gadiri Drive
Highland Falls, New York 10930
Time spent: 50 hours
Description: painted puzzles, helped paint yellow wall stripe, painted wall titles, designed and suspended foods from “Bees are Pollinators” wall, helped paint several interactive components.

Diane and Robert Lynch
23 Willis Avenue
Cornwall on Hudson, New York 12520
Time spent: 60 hours
Description: Helped clean room for opening, steam-cleaned carpets, helped paint walls, helped hang all text and photographs on walls.

Bonnie Mangiaracina
Time spent: 12 hours
Description: Helped paint walls, helped clean carpets.

George Muser
Time spent: 15 hours
Description: Helped prime and paint walls.

Danika I. Norey
25 Academy Avenue
Cornwall on Hudson, New York 12520
Time spent: 105 hours
Description: Made life cycle stuffed animals, bee costumes, pollen balls, stuffed wall mounted bumblebee, pollen balls & larvae for leafcutter and polyester bee nest, consultant for crafts and installation, assisted with wall layout, oversaw and assisted with text and photograph mounting, cutting and matting. Made 3-tiered bee cake for opening event.

Virginia I. Norey
25 Academy Avenue
Cornwall on Hudson, New York 12520
Time spent: 50 hours
Description: Designed all text and layout, purchased and donated licensing rights for exhibit fonts from Random House (~$90)

Mr. James P. O'Brien
161 Old Middletown Road
Pearl River, New York 10965
Time spent: 0.5 hours
Description: Donated $25 towards C.A.A. matching grant

Peter O'Brien
7 Highway Avenue
Congers, New York 10920
Time spent: 201.5 hours
Description: Assisted in initial museum exhibit study (traveling), assisted with observation hive bee pick up, helped sand many of the wooden cut outs, helped make and paint wooden cutouts for Rick's murals, helped paint walls, helped with installation and cleaning, helped hang text and photographs, painted sound board, donated time to record and edit video of *The World of Bees* exhibit for the Virtual Tour, posted video to advertise exhibit's opening.

Rick Price
59 Beacon Street
Beacon, New York 12508
Time spent: 30 hours
Description: Painted murals on walls 1, 2, 3, 7 and 8, painted 2 bee murals on gallery sign.

Nancy Proyect and Bill Webber
Time spent: 1 hour
Description: Donated $250 towards C.A.A. matching grant

Bjorn Rorslett
Time spent: 1 hour
Description: Allowed free use of UV photographs of flowers

Dr. Jerome Rozen
American Museum of Natural History
Central Park West at 79th Street
New York, New York 10024-5192
Time spent: 4 hours
Description: Gave advice on developing exhibit, loaned bee specimens for use on "Bees are Builders" wall.

Sally Ryan
Time spent: 6 hours
Description: Helped prime and paint walls.

William Schuster
129 Continental Road
Cornwall, New York 12518
Time spent: 0.5 hours
Description: Allowed Black Rock Forest bee specimens to be utilized in exhibit

Douglas S. Spaulding
110 Mill Street
Cornwall, New York 12518
Time spent: 2 hours
Description: Donated wood used to make some of the native bee houses

Margaret, Justin and Erica Stevens
Betterbee, Inc.
8 Meader Road
Greenwich, New York 12834
Time spent: 5 hours
Description: Donated beekeeping materials for "The Honey Makers" wall; children's bee suit, 2 hive tools, and smoker (~$115 value).

Dr. Lucy Swift
Time spent: 5 hours
Description: Helped prime and paint walls; donated $500 towards C.A.A. matching grant.

Christopher R. Tripoli
Executive Director
Downing Park Planning Committee
PO Box 306
Newburgh, New York 12551
Time spent: 5 hours
Description: Donated wax comb for tree honey bee model, provided info on honey bee keeping

Animal Hughes
Care of Christopher R. Tripoli
Downing Park Planning Committee
PO Box 306
Newburgh, New York 12551
Time spent: 5 hours
Description: Donated wax comb for tree honey bee model, provided info on honey bee keeping.

Greg Vallas
165 Spruce Street
Bloomfield, New Jersey 07003
Time spent: 2 hours
Description: Donated adult beekeeping suit.

Ray Zablocki
Time spent: ~24 hours
Description: Volunteered time to film footage for World of Bees Virtual Tour, color correction and audio balancing to be done in future.

Opening Donations
Donna
Hudson Street Café
237 Hudson Street
Cornwall on Hudson, New York 12520
Description: Donated hors d'oeuvres for opening.
Time spent: 10 hours (estimated), value unknown

Peter
Painters' Tavern
266 Hudson Street
Cornwall on Hudson, New York 12520
Description: donated liquor for opening, value unknown
Time spent: 1 hour

Jim
The Trestle
2 Idlewild Avenue
Cornwall on Hudson, New York 12520
Time spent: 1 hour
Description: donated wine for opening, value unknown.

Museum
Bob Engel
Hudson Highlands Nature Museum
PO Box 451
Cornwall, New York 12518
Time spent: 10 hours
Description: Helped move sturgeon, boat, etc. and helped prep room for installation.

Jim Farkas
Hudson Highlands Nature Museum

25 Boulevard
Cornwall on Hudson, New York 12520
Time spent: 5 hours
Description: Installed sounds into sound board.

Pam Golben, Curator of Living Exhibits
Hudson Highlands Nature Museum
25 Boulevard
Cornwall on Hudson, New York 12520
Time spent: 150+ hours
Description: Oversaw and guided me in all aspects of the exhibit.

Carl Heitmuller
Hudson Highlands Nature Museum
PO Box 451
Cornwall, New York 12518
Time spent: 12 hours
Description: Helped with wooden hive cell assembly, did wiring and set up for pedestals, oversaw Eagle Scout project.

Jessica Lickun
Hudson Highlands Nature Museum
PO Box 451
Cornwall, New York 12518
Time spent: 25+ hours
Description: organized and assisted in advertising exhibit opening.

Michelle Mindicino
Hudson Highlands Nature Museum
25 Boulevard
Cornwall on Hudson, New York 12520
Time spent: 5 + hours
Description: Set up gift shop for opening.

Asher Pacht
Hudson Highlands Nature Museum
PO Box 451
Cornwall, New York 12518
Time spent: 8+ hours
Description: Assisted in preparing for opening and served alcohol during event.

Mr. David N. Redden and members of the Board
Hudson Highlands Nature Museum

PO Box 451
Cornwall, New York 12518
Time spent: 5+ hours
Description: Assisted in raising money and advertising for exhibit.

The Rivera Family
Hudson Highlands Nature Museum
PO Box 451
Cornwall, New York 12518
Time spent: 5+ hours
Description: assisted in cleaning and preparing building for opening

Vicky Rubino
Hudson Highlands Nature Museum
PO Box 451
Cornwall, New York 12518
Time spent: 5+ hours
Description: helped prep crafts for opening weekend.

Sasha Boucher
9 Spruce Street
Cornwall on Hudson, New York 12520
Time spent: 15+ hours
Description: assisted in cleaning and preparing building for opening, worked during opening for food and wine serving, worked during opening weekend

Heidi Boucher
9 Spruce Street
Cornwall on Hudson, New York 12520
Time spent: 5+ hours
Description: donated 3 wildflower bouquets for opening (value unknown, but they were beautiful!!)

Judy Onufer
Hudson Highlands Nature Museum
PO Box 451
Cornwall, New York 12518
Time spent: 5+ hours
Description: assisted in cleaning and preparing building for opening

Amanda Merritt
140 South Main Street
Florida, New York 10921
Time spent: 5+ hours
Description: volunteered with kids crafts on opening weekend.

Time Log

Below are the scanned images of my time log, detailing my hours and activities from the beginning of the project to the very end…

(1)

World of Bees: Time Log
Louise I. Lynch

University of Nebraska-Lincoln
Hudson Highlands Nature Museum

Date	Time	Hours	Description of work
16 Feb 2010		2 hrs	Lit search @ library
2 Mar 2010		5 hrs	Bruce Museum, Greenwich, CT w/ Peter
4 Mar 2010	8AM - 5PM	8 hrs	Insectropolis, Toms River, NJ w/ Peter
7 Mar 2010		1 hr	Emails + phone conversations w/ Dr. Marion Ellis, UNL
1 Apr		5 hrs	Museum of Modern Art, New York, NY w/ Peter
9 Apr		1 hr	Meeting w/ Jackie + Pam: project approval
4 May		1 hr	Research + title composition
5 May		5 hrs	Proposal composition + research
7 May		5 hrs	" "
11 May		3 hrs	" "
12 May		3 hrs	The Maine Discovery Museum, Bangor, ME
15 May		5 hrs	Proposal composition + ~~title comp~~ research
16 May		5 hrs	" "
25 May		5 hrs	" "
27 May		3 hrs	" "
10 Jun		1.5 hrs	Meeting w/ Pam: budget
11 Jun		2 hrs	Materials list
13 Jun		2 hrs	" "
18 Jun		3 hrs	Budget composition (price checks)
20 Jun		2 hrs	" "
2 Jul		—	Proposal approved by UNL
16 Jul		2 hrs	Kurdwanowskis: 1st visit w/ Pam
17 Jul		2 hrs	Beekeeping Program @ HHNM
21 Jul	10-12:15	2 hrs	Meeting w/ Kirsten + Pam @ Alexis Diner
30 Jul		.25 hrs	The Desert Museum, Tucson, AZ
7 Aug		6 hrs	Puzzled: design + emails to Dan + Elaine
9 Aug	1PM-8PM	7 hrs	American Museum of Natural History
14 Aug	9AM-4PM	7 hrs	Bug Fest Pollinators exhibit Philly Academy of Nat. Sciences, PA.
15 Aug		3 hrs	Online search for grant sources
20 Aug		1.5 hrs	Louisville Science Center, KY
25 Aug	8AM-4PM	8 hrs	Insectropolis, Toms River, NJ w/ Pam + Kirsten
14 Sept		7 hrs	Research flowers + emails to Kate
22 Sep		2 hrs	Bumblebee hive research
26 Sep		3.5 hrs	Meet Garry Johnson: photos, hives info
27 Sep		4 hrs	Organized bee photos collected thus far
29 Sep		5 hrs	Supplies from Walmart + meeting w/ Danika
2 Oct		4 hrs	Proposal write up for Boy Scouts
4 Oct		1.5 hr	Board Meeting @ Boy Scouts, Methodist Church
18 Oct		1 hr	Eagle Scout correspondence + web search for guidelines
19 Oct		1.5 hrs	Flower portrait research
24 Oct		3 hrs	Meeting w/ Garry Johnson + Eric Cartwright
27 Oct	12PM-3:30	3.5 hrs	Sanding down bee boxes @ Gerrys Go through tools
21 Oct		2 hrs	Pick up bee suit (donation) in Bloomfield, NJ
May - Oct		5 hrs	Numerous meetings/phone calls/emails w/ Pam regarding exhibit.
		149.5 hrs	

(2)

World of Bees: Time Log
Louise I. Lynch

University of Nebraska-Lincoln
Hudson Highlands Nature Museum

	Date	Time	Hours	Description of work
	10/28/10	2:15-5:00	2:45	Reading/writing for last wall "Beckoning the Bees"
	10/30/10	12PM-3:30	3.5 hrs	Sanding down bee boxes @ Garners → almost done!!
	31 Oct 2010	1:15-1:45	0.5 hr	Carl, Eagle Scout issue; processing + paperwork order, called Sparanza
	1 Nov 2010	3-4:30	1.5 hrs	Sanding bee box @ Garrys
		7:30-8:30	1 hr	Meeting w/ Troop 206: Received Eric's plans; he was 35 minutes late
	2 Nov 2010		1.5hrs	Reviewed Eric's project, dropped to Carl, phone calls w/ Carl
			1.5 hrs	Sanding down frames @ Mr. Johnson's
	3 Nov 2010		1. hr	Conversations/calls w/ Eric Carnright, Mrs. Carnright + Carl
	4 Nov 2010		1 hr	Paperwork + records to Carl + Pam; direction emailed to Eric
	6 Nov 2010		1 hr	CCD (Colony Collapse Disorder) + Honeybee History Reading
	8 Nov 2010	11-1 PM	2 hrs	Bernheim Arboretum, Fort Knox, KY
		On flights + layovers	4.5 hrs	Reading: A Spring Without Bees
	12 Nov 2010	2-4:30	2.5 hrs	Primed beehive @ Johnson's → paint Sunday or Monday
	14 Nov 2010		2.5 hrs	1st coat of paint on beehive
	15 Nov 2010	11-12:15	1.25 hrs	2nd coat of paint → set!
		5PM-10:15PM	5.25 hrs	- need to freeze boxes this winter + find frames
				Ulster County Beekeepers Association meeting, Rosendale NY
				★ excellent meeting, lots of people who might be able to help
				★ Beacon Bee → Sell products @ exhibit?
	19 Nov 2010		1 hr	Collecting dead bees @ Johnsons; Puzzle plans, phone calls
	20 Nov 2010		~~3 hrs~~ 2 hrs	Phone calls w/ Eric Carnright, Garry Johnson about tomorrow
				Gathering materials for puzzles → I have paint
	21 Nov 2010	9:30AM-4:30	7 hrs	Constructed bee hive cells (3) and Bees Eye View box
				Began native bee boxes w/ red cedar
	22 Nov 2010	6-7PM	1 hr	Walmart - supplies for pollination picnic + bee stuffed animals
	26 Nov	10-5	7hrs	Bee hive cells + wall mount @ Johnsons
	27 Nov		1 hr	Collected dead bees (~45) @ Mr. Johnsons / prep for tomorrow
		8:30-4:00	7.5 hrs	Beehive Cells, measurements @ museum, Home Depot + Radio Shack supplies
		5:30-6:30	1 hr	Pinned specimens → inventory gathered
		10:00-11:30	1.5 hrs	Bee diversity research
				★ Magic School Bus Book!!!
215.75	28 Nov 2010	1:00-5:00	4 hrs	Wall mounted bee cut out, native bee boxes, hive cells (2 hrs)
	29 Nov 2010	10PM-12AM	2 hrs	Bee Diversity Wall panels
	4 Dec 2010	11AM-6PM	7 hrs	Hive Cells, Bee wall mount, life cycle
	10 Dec 2010	4-4:30	.5 hrs	Emails/letter to J. Ascher (AMNH) + correspondence
	11 Dec 2010	12-7PM	7 hrs	Painting Hive Cells/Home Depot run: primer, paint, plexiglass
	12 Dec 2010	11AM-8PM	9 hrs	Painting hive cells/Reading + research
	13 Dec 2010	1PM-4PM	3 hrs	"Pre fabbing" hive cells + moving to my house (garage)
	14 Dec 2010	9:30PM-12AM	2.5 hrs	Reading/Research: Bee diversity; Prep for tomorrow
	15 Dec	9:30AM-5pm	7.5 hrs	Garnerville: Life Cycle pieces cut out
	21 Dec	10:30PM-12AM	1.5 hrs	Wall outlining (Basics)
	23 Dec	10:30AM-3	4.5 hrs	Meeting with Pam/Reading + research @ home
	27 Dec 2010	3PM-5	2 hrs	Reading + Photos: Wall II
	5 Jan 2011	10:30AM-1	2.5 hrs	Reading: Wall II
		2PM-3:15	1.25 hrs	Reading: Wall II
	~~6 Jan 2011~~	5:30-5:00	1.5 hrs	Pollination Picnic supplies from Throwaway Market, Walden NY
	6 Jan 2011	3:30-7:00pm	3.5 hrs	Typing: Wall II
	10 Jan 2011	9:30AM-2:00PM	4.5 hrs	Wall II, McHenry letter, emails, photo credits, donor letters
		Page TOT	126 hrs	
	Current	TOTAL	275.5hrs	

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World of Bees: Time Log
Louise I. Lynch

University of Nebraska-Lincoln
Hudson Highlands Nature Museum

Date 2011	Time	Hours	Description of work
13 Jan	2:30PM-3:30	0.5	Emailed ambencawest.com, Wall 2 text
	6:30PM-12AM	5.5hrs	
14 Jan	8:30-12:30AM	2.0hrs	Wall 3 text
25 Jan	12:30PM-3:30	3.0 hrs	Meeting w/ Pam
26 Jan	6PM-7PM	1 hr	McHenry Grant budget
27 Jan	9AM-11AM	2 hrs	McHenry Grant budget
28 Jan	2PM-4PM	2hrs	McHenry Grant Letter
	1AM-3AM	2hrs	Donation letter/~~contacts~~
29 Jan	10AM-12AM	2 hrs	letter to Dr. Rozen, (AMNH)/Dadant letter revisions/McHenry letter
3 Feb	12-1:30PM	1.5hrs	Donation letters to Bruce Bayard (chainsaw bear), Dadant + Scenic Technologies
		1 hr	Eric + Scott Master Final choice on hive cells
10 Feb		2 hrs	Bumblebee research - on Line
11 Feb	11:45am-2pm	2hr 15min	Native bee research - on-Line, Thank you to Zac Lehman
12 Feb	2:30pm-4	1.5hr	Wall text
13 Feb		1.5hr	Wall text
15 Feb	10AM-7:30	9.5 hrs	Chainsaw Bear visit/Nest box designt/Mr. Johnson meeting
	8:30PM-11PM	2.5 hrs	Wall text/sketches
16 Feb	12PM-3:15PM	3.25 hrs	Wall text/sketches
17 Feb	11:30AM-~~3:30~~PM	4hrs	Wall text/sketches
	4PM-8PM	4 hrs	Walmart/Fabric.com/Meeting w/Danika/Wall text
18 Feb	9:30AM-3PM	5.5 hrs	Meeting w/ Pam/Wall text/Bumblebee Research
19 Feb	12PM-7PM	7 hrs	Meeting w/ Pam + Kirsten (4-6)/Bumblebee research
24 Feb	12PM-8PM	8 hrs	Bee house designt, Garnerville, Meeting w/ Mr. Johnson
1 Mar	11AM-9PM	10 hrs	Meeting w/ Dr Rozen @ AMNH
7 Mar	6PM-9PM	3hrs	Attempted to get to UCBA Meeting, Rosendale - road closed 2mi out of Rosendale!!
11 Mar	12PM-5PM	5 hrs	NJMCA meeting - How to get public involved with science
15 Mar	7AM-9PM	2 hrs	Meeting w/ Mr. Johnson/Bumblebee research
16 Mar	2PM-3PM	1 hr	Meeting w/ Pam
17 Mar	9AM-10AM	1 hr	Stopped @ Beckerle lumber for wood source → for native bee houses Joseph Kleinberg
" "	1PM-4PM	3 hrs	Met w/ Dave Spalding (Pt 32, Cornwall): wood source for native bee houses
18 Mar	4PM-8PM	4 hrs	Drive to Hilton Hdrrisburg for ESA Meeting - Eastern Branch
20 Mar	8AM-~~2~~2PM	6hrs	Pollinators + Pesticides session (centering around CCD + HB mortality)
" "	1PM-3PM	2 hrs	Drive to College Park outside D.C. for meeting w/ Nathan Erwinn, Smithsonian
" "	4PM-5PM	1 hr	Notes to Kate regarding paintings
21 Mar	11AM-5PM	6 hrs	Smithsonian American Art + History Museums - interactive exhibit studies
22 Mar	11AM-4PM	5hrs	Meeting w/ Nathan Erwin, Smithsonian Manager/Insect Zoo + Butterfly Pavilion visit/observ.
" "	" "	" "	Emails to Sam Droege, Nathan + Pete
23 Mar		7 hrs	Drive home from DC
25 Mar	12-5PM	5 hrs	Emails to Pam, Kirsten, Gary, AMNH, Meeting w/ Danika
26 Mar	9AM-4PM	7hrs	Calls/emails/Meeting w/ Kirsten, Danika + Barry (x2) meeting - really good :)
29 Mar	10AM-12:30	2.5 hrs	Betterbee Donation letter, Email to Ascher (bee loan)
			Discussed observ hive w/ Pam; researched Barberra Bees
2 April	8AM-8PM	12 hrs	Meeting w/ Betterbee owners (Justin Stevens + Erica, CEO) - donation successful!
			Albany State Museum - pick of ant colo next aluminum easel.
5 April	9:15AM-12:15	3 hrs	Emails to Justin Stevens (Betterbee), Pam, Bjorn → photo permission granted
	5:30-9:30	4 hrs	Bee house building, Garnerville
7 April	6:00AM-6:00PM	12 hrs	Northeast Natural History Conference - bee sessions/Drive to Albany
8 April	7:00AM-9:00PM	14 hrs	" " /Drive to Cornwall/Meeting Prep
9 April	8:00AM-9:30PM	1.5hrs	HHNM Board Meeting
	Page TOT	195.5	
Current	TOTAL	470.5	

(4)

World of Bees: Time Log
Louise I. Lynch

University of Nebraska-Lincoln
Hudson Highlands Nature Museum

	Date	Time	Hours	Description of work
	10 April		6 hrs	Drive to Martinsburg, WV for Bee ID Course
	11-15 April		70 hrs	USGS Bee Course @ NCTC, Shepardstown, West Virginia
	~~16-19th~~			Honeybee immunity/CCD reading
	20 April		1 hr	Emails
	23 April		2.5 hrs	Meeting + prep @ Boulevard w/ Pam + Garry for observation prep
	28 April		4 hrs	Lowe's, observation hive materials runs
	29 April		6 hrs	Garnerville → finished bee boxes!! (6 total)
	30 April		3 hrs	GAGA festival → advertising exhibit
	1 May		10 hrs	GAGA festival → advertising exhibit
	3 May	11AM-2:30	3.5 hrs	Observation hive prep @ Boulevard
	5 May	4PM-7PM	3 hrs	Garnerville, observation hive prep
Fri	6 May	4:00PM-8PM	4 hrs	MOHH Observation Hive Installation w/ Garry + Bob
Sat	7 May	6AM-9PM	15 hrs	Drive to Dadant (Waverly NY) to pick up bees; Meeting w/ Branch Manager about donations, Hiring of bees into observation @ MOHH w/ Garry,
	Tue 10 May	8:30AM-11AM	2.5 hrs	Check observation hive, remove cork from queen's cage
	Wed 11 May		2 hrs	Honeybee/Squash bee reading, letter to Bio Quip for donations
	Thur 12 May		3hrs	" " " Measurements of bee exhibit walls
	Fri 13 May		2hrs	Honeybee/Squash bee reading Honeybee training prep
Tue	17 May		3 hrs	Honey Bee Training Prep
	Wed 18 May	7AM-2PM	7 hrs	Honey Bee Training prep and session (11:30-1:30PM)
	Thu 19 May	9AM-5PM	8 hrs	Exhibit wall boards + evolution of bees.
	Fri 20 May	7AM-9AM	2 hrs	Puzzles → photos to Dan + Elaine
	[redacted]	1PM-4PM	3 hrs	" " emails re: Bio Quip
	Sun 22 May	~~7AM~~ 9PM-12AM	3 hrs	Wall layout, emails to Bio Quip + Pam
	Tue 24 May	9AM-5PM	8 hrs	Conv. w/ Pam; emails to Pam, reading, writing, wall layout
	Sun 5 Jun		5 hrs	Writing/Wall design/emails/scaling on walls
	Mon 6 Jun		3 hrs	" "
	Tue 7 Jun		6 hrs	" "
	Wed 8 Jun		6 hrs	" "
	Thu 9 Jun		8 hrs	" "
	Fri 10 Jun		5 hrs	" "
	Sat 11 Jun		6 hrs	Met w/ Emily Waterfield, emails, writing
	Sun 12 Jun		6 hrs	Writing/wall design/emails → Bees from Amanda Dillon
	Mon 13 Jun		6 hrs	Writing/wall design/emails
	Tue 14 Jun		8 hrs	Met w/ Dan + Elaine, photos, bee collection, writing, emails, Pam comm
	Wed 15 Jun	9AM-9PM	12 hrs	Collected specimens, photographs, Writing, Mapping walls Meting w/ Pam + Kirsten
	Thu 16 Jun	11AM-9PM	10 hrs	Garnerville: BUILDING, Emails, phone calls, Potluck
	Fri 17 Jun	5PM-9PM	4 hrs	Queen of the Sun, met w/ Animal, emails
	Mon 20 Jun	3PM-9PM	6 hrs	Size check @ museum, checked obs. hive, emails, HS real attempts
	Wed 22 Jun	9AM-9PM	12 hrs	HS vials - attempted!! Met w/ Cioci about text; Watch Q of Bees again - Notes
	Sat 25 Jun	2PM-10PM	8 hrs	Met Animal night before, text, emails
	Sun 26 Jun		8.5hrs	text, emails
	Mon 27 Jun		6 hrs	
	Tue 28 Jun		12 hrs	
	Wed 29 Jun		4 hrs	
	Thu 30 Jun	8AM-3AM	16 hrs	Text, emails, photos
	Fri 1 Jul	9AM-12AM	15 hrs	Meetings: Christopoli 10AM; Jessica + Susan 11AM, Rodney Dow 2PM
				text, emails, photographs - library, garden,
		Page TOT	340.5	
	Current	TOTAL	811	

World of Bees: Time Log
Louise I. Lynch

University of Nebraska-Lincoln
Hudson Highlands Nature Museum

(5)

Date 2011	Time	Hours	Description of work
Sat 2 Jul	12AM-2AM	2hrs	Text edit/photo editing, wall 3 + wall 5
Sun 3 Jul	9:30 AM-2:30	4 hrs	
Tue 5 Jul	12PM-10PM	10 hrs	Meeting w/ Pam, Revisions/writing wall 7, Sound board, Danika meeting, emails, Lang Elliot call
Wed 6 Jul	N/A	1.5hrs	Wall 7 editing, Justin Stevens interview, emailed to him for approval
Thu 7 Jul	8:30AM-1AM	15.5 hrs	Wall 7 text, photos, Edited to completion w/ MOM!! Photos Ptb, Chester, & home
Fri 8 Jul	9:30AM-10PM	12.5 hrs	Font + Text formatting w/ Cioci / Wall layout w/ Danika
Sat 9 Jul		5 hrs	Wall text, Sound Board, emails to Jim, Pam, Kirsten
Tue 12 Jul	3:30PM-1AM	9.5 hrs	Wall layout w/ Danika → almost done!!
Wed 13 Jul	8:30 AM-6PM	10.5hrs	Wall layout, emails
Mon 8 Aug	10AM-5:30PM	7.5hrs	June Burgess, Pam phone conversation, Rick/Kirsten scheduling + emails, Lang Elliot, Gary, Danika,
			Printed test run of photos @ Office Supply in Newburgh
Tue 9 Aug	9AM-9PM	12 hrs	Printed all photos (most of), meeting w/ Pam, emails, emails,
			meeting w/ Danika, meeting/phone w/ Cioci
Wed 10 Aug	9AM-5PM	8hrs	Scheduling w/ Pam, Lang Elliot email, Dan + Elaine email, Picked up supplies
			@ Michael's, meeting w/ Gary → steel work shop
Thu 11 Aug	9AM-5PM	8 hrs	Bee Alive donation letter, Bulletin review, meet w/ Bob Bamberger + Gary,
			Photo Layout, prep for printing, Meeting w/ Pam, Text review w/ Cioci
Fri 12 Aug	8:30AM-7PM	10.5hrs	Michael's supply run, Lowe's supply run, email checked metal store, muralist references
Sat 13 Aug	9AM-3PM	6 hrs	Garnerville → sweat bee cutout
Sun 14 Aug	5PM-1 AM	8 hrs	Text review, Muralist references, report
Mon 15 Aug	9AM-3AM	18 hrs	Roberta Gatz phone + mail, Budget + receipts, text review, edits + additions to
			Cioci, mounting photos w/ Danika, photo review + editing + prep for
			drop off to Office Depot tomorrow, NCBs in the world photos, 9/24
			reception list to mom, Master To Do List, Pedestal configurations,
			"Find these behaviors" poster.
Tue 16 Aug	9AM-2PM	17 hrs	Emails, supply run for Danika (Bumblebee wall mount), Mounted + printed photos
Wed 17 Aug	11PM-1AM	2 hrs	Powerpoint poster for soundboard, Muralist's report
Thu 18 Aug		5 hrs	Printed edited photos, took new ones, Muralist's report
Fri 19 Aug	12PM-5PM	5 hrs	Picked up picnic table, checked paint, matte board gluing + cutting
Sat 20 Aug	2PM-3 AM	13hrs	Matte board gluing and cutting, emails, Bee Hive Poster, Muralist report
Sun 21 Aug	11AM-11PM	12 hrs	Matte board cutting, taping @ museum, started removing titles, wall dusting, Muralist report
Mon 22 Aug	8:30 AM-5	8.5 hrs	Painting!! First coat of primer Volunteers! George Nester
	6PM-3AM	9 hrs	Finished Rick's doc → pdf Bonnie
Tue 23 Aug	8AM-9AM	13 hrs	Painting (2nd coat), painted tree, touch ups, (6) Dr. Swift
Wed 24 Aug	8:30 AM-9PM	12.5hrs	1ST base coat, touch ups Farmers Market Loaves, Sally CVS, Gary
			6 bottle down sound board, laser level PAINT + MRE Pam meeting
Thu 25 Aug	8AM-10PM	14 hrs	Tracing + leveling yellow line, painting yellow, painting sound board, leveling
			wall titles (7ft.), tracing and painting, carpet cleaned, tape removal (no tape)
			Present: Mom, Peter, Dan, Elaine, + Danika
Fri 26 Aug	10:30AM-11:30PM	13hrs	Moved hive cells, Garnerville work, cleared gallery for bday parties, supply run to
			Michael's (Mat board, glue, paint) + Lowe's (spray paint, wire) Elaine painted 11AM-4PM
274hrs Sat 27 Aug		1.5 hrs	Addresses compiled + sent to Jessica, Jackie + Pam
[redacted]			Bee Honey Products Box laid out, gathering materials/How Honey Is Made box started
	Page TOTAL	274hrs	
	TOTAL	1,085 HOURS	

World of Bees: Time Log
Louise I. Lynch

University of Nebraska-Lincoln
Hudson Highlands Nature Museum

Date	Time	Hours	Description of work
Sun 28 Aug 2011	12-4:30PM	4.5 hrs	Email reminder to Rick + Kirsten / To Do List / Started laying out honey products + How Honey is Made / Meeting prep / Notes + emails to Pam
Mon 29 Aug	8 AM-10PM	14 hrs	Edited 3x5 text, Supply runs to Michaels (sound board doors + pegs), Lowe's (PVC pipe + razor for photomounting) + Walmart (stuffing for Danika + rug), search for plastic picnic basket; Meeting w/ Rick, Pam + Kirsten (~4 hrs), Sound board poster editing / Pinned + chose specimens for display cases / Added invitations
Tue 30 Aug	10AM-11 PM	13 hrs	Painted + sanded sound board doors + base board (need to redo...again). Dropped off Danika's bumblebee. Looks great! Meeting @ museum w/ Pam - pencil. Meeting w/ Danika → discussed costume wings + materials needed. Picked up, dismantled + started painting light board, prime gallery sign, tried coloring Bees eye view flowers w/ permanent marker, researched nest for clay model / basting / Text doc to Cioci for revision
Wed 31 Aug	9AM-8PM	11 hrs	Painted gallery sign (2 coats yellow), Sanded light board frame + oiled (Tung) Another coat of paint on sound board doors + light board, Stripped yellow on sound board, Picked up bees eye view box, meeting w/ Garry, Got paint from museum
Thu 1 Sep	9AM-11 PM	14 hrs	Sound board, light board, flip up doors, Hakers, Supply run to Michaels, Lowes (beehive paint
Fri 2 Sep	10AM-11PM	13 hrs	Sound board, bees eye view box, new flip up doors, picnic table, supply runs to Walmart + Lowes, Pinned specimen review box layout + research, Honey box + bee supply box, Poster layout boards edited
Sat 3 Sep	9AM-2PM	5hrs	Painting bee hive, flip up doors, picnic table, bees eye view
Sun 4 Sep	9-10:30AM	1.5hrs	Painting bee hive, bees eye view, Moved supplies to museum. Several runs!
	1PM-11 PM	10hrs	Met Rick @ museum, Meeting w/ Danika + Garry, life cycle activity Hay
Mon 5 Sep	9AM-3PM	6 hrs	Painting @ museum w/ Dan + Elaine + Rick, Final review of text for final printing, wall layout, emails
Tue 6 Sep	9AM-9:30PM	12.5hrs	Photo + text prep, Phone meeting w/ Cioci, Printing + pick up @ Office Depot Materials runs to Michaels + Home Depot, mounting + cutting text + photos w/ Danika prep for tomorrow's meeting, gallery clean up
Wed 7 Sep	7:30AM-9:30 PM	14 hrs	Photos to Danika (WOB in works, bee egg), Printed DYKs on white paper @ home, Budget review, **Wall Layout w/ Kirsten** + Pam, Worked on How Honey is Made + Bee products boxes, DYK factoids
Thu 8 Sep	9:30AM-9PM	11.5 hrs	Email to Cioci re: DYKs, invitation check w/ FDU, Special Thanks poster Budget review, Contact w/ Bruce Bayard - bear's done!, Article to Walter Kelley Co. Light board, Soundboard, Flip up doors, etc.
Sat 10 Sep	9AM-10 PM	13 hrs	Hung the walls w/ mom + Pam!! Wrote to Garry, Rick + Jessica Stopped @ Painters, spoke w/ Pete → wine
Sun 11 Sep	9AM-9PM	12 hrs	Images for flip up doors, Emails, painting (flip up doors), layout for walls 6 + 8, put bee boxes together, CLEAN UP, Meeting w/ Cioci
Mon 12 Sep	6:30AM-9:30 PM	15 hrs	Picnic table, Thank you poster edits + to Jackie, Stained + trimmed legs of picnic table, text edits w/ Cioci
Tue 13 Sep	8AM-9:30PM	13.5hrs	Pick up from Office Depot. Photo + text matting + cutting, picnic table coated w/ felt / fabric, Soundboard photos, Light board text, Wall 6, 8 + 1 layout, mounted wall 1, Meeting w/ Cioci → DYKs set, shelves painted, life cycle pieces sealed, magnets, attached, Wall 1 mounted, Puzzles sealed, Large Hive cells assembled!! Reprinted text mounted. Pam, Dan + Elaine helped today! Bob + Carl helped w/ hive cell assembly. Message from Pete (Painter's) - had vodka bottle, working on wine
	Page TOT	183.5	
	TOT	1268.5	hrs

(7)

World of Bees: Time Log
Louise I. Lynch

University of Nebraska-Lincoln
Hudson Highlands Nature Museum

Date 2011	Time	Hours	Description of work
Wed 14 Sep	10AM-3 AM	17 hrs	Wall hanging painting, mounting, layout, text/photo mounting + cutting, fruit + food suspension, budget, wood cutting, display boxes done, lumber/specimens, Pete helped ALL day, photos for slipup door Wall 3
Thu 15 Sep	9AM-12AM	15 hrs	Installation / last minute interactive building, RSVP list, work@home
Fri 16 Sep	9AM-10PM	13 hrs	Installation, final building for interactives, RSVP list, work@home
Sun 18 Sep	9AM-9PM	12 hrs	
Mon 19 Sep	10AM-6PM	8 hrs	Installation, interactive building, supply runs
Tue 20 Sep	6AM-10PM	16 hrs	Installation, interactive building, supply runs
Wed 21 Sep	7AM-11PM	16 hrs	Installation + building. RSVPs!! Vacuuming
Thu 22 Sep	7AM-10PM	15 hrs	Installation, building interactives, supply runs, DVKs, hanging
Fri 23 Sep	7AM-12AM	17 hrs	Building + installation, Vacuuming, Cleaning
Sat 24 Sep	9AM-12PM	3 hrs	Cutting out puzzles
	Page TOT	132 hrs	
GRAND	TOTAL	1400.5	hrs
			Final report, ~~exhibit~~ : 8 hours
			Exhibit videorecording : 12 hours (3 people)
			Video editing + completion
Mon 7 Nov	9AM-9PM	12 hrs	Wrote WOBs script. Sent to Pete + Ray for perusal.
Fri 11 Nov	8PM-10PM	2 hrs	Me + Pete reviewed script for tomorrow's filming
Sat 12 Nov	8:30AM-8PM	11.5 hrs	Me, Pete + Ray filming
Sun 1 Jan	11AM-2AM	15 hrs	Importing + lining up scenes → Pete did this. Started composing
Mon 2 Jan	12PM-12AM	12 hrs	Pete + I editing
Tue 3 Jan	9AM-8 PM	11 hrs	Completed editing, completed song, 3 hr rendering, mail email for virtual tour link
1 Jan-8 Jan		25 hrs	Final report
GRAND	TOTAL	1489 hrs	Peter+Ray man hours for filming : 87 man hours

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