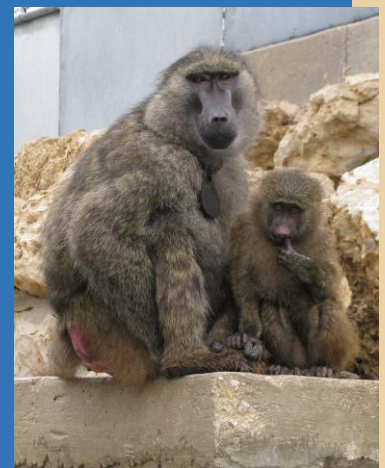




Enrichment Device Manual

**Texas Biomedical Research Institute
Southwest National Primate Research Center
Behavioral Services**



**TEXAS BIOMEDICAL
RESEARCH INSTITUTE**

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The following manual is a compilation of enrichment devices used at the Southwest National Primate Research Center. With 2500 nonhuman primates housed at this facility, it is cost-prohibitive to purchase all of the devices needed to meet our enrichment needs. We have found it easier and more cost-effective to build devices out of material that is available from most hardware stores. With a little creativity and some tools we have been able to successfully design, build, and implement a variety of devices.

The description of each device includes the objective, pros and cons, how to make it, materials and cost, how to use the device, and the species and housing type for which it is primarily used. Although these devices are designed for baboons, macaques, and chimpanzees, the primary species housed at this facility, they can be used for other species as well. Only a few methods of implementing the devices are given; there are numerous ways to implement each device, so be creative. The device designs in this manual may not work at all facilities so some modifications may be needed. This manual is a foundation to help you get started; your creativeness and the restrictions of your facility are the only limits to how far these devices can go. A blank copy of our enrichment data sheet and a sample of a filled out data sheet are also provided as suggestions for record keeping.

We are constantly designing and building new devices, as well as making changes to existing ones, so this manual will be updated from time to time to include what has been added or changed. We hope you find this manual helpful and useful when looking for enrichment ideas.

Non-Food **Devices**

Triangle and Ring Rattles



Photo courtesy of Bio-serv

Description: The devices consist of a stainless steel rod in the shape of a triangle or ring. Three washers run along the rod which the animals can manipulate and rattle to make noise. The rod runs through a chain that is connected to a snap hook which is used to connect the device to the outside of the cage.

Objective: These devices provide the animal with manipulable enrichment.

Housing type and Species: These devices can be used in all housing environments for all species.

Enrichment Category: Physical

Pros: The devices are made of stainless steel, making them very durable and easy to clean.

Cons: These enrichment devices must be purchased, because they are difficult to make. This requires purchasing new devices when existing devices are lost or broken.

Instructions to Make: These devices are purchased from an enrichment device company.

Materials and Cost:

To purchase-

1. \$8.50- \$8.75 each (Bio-serv)

Instructions to Use: Clip these devices to the outside of the cage where they are easily accessible by the animal. They can be left on the cage for 2-7 days. Optimally, these devices should be used in rotation with other devices to maintain novelty.

Mirror



Photos courtesy of Bio-serv

Description: This device is a sheet of stainless steel cut into a circle 6" in diameter. A hole is punched along the edge and a twist clip connects the mirror to a chain. The chain is attached to a snap hook at the other end that allows the device to be clipped to the outside of the cage.

Objective: The device provides the animal with manipulable and sensory enrichment.

Housing type and Species: This device can be used in all housing environments for all species.

Enrichment Category: Physical, Sensory

Pros: The device is made of stainless steel, making it very durable and easy to clean.

Cons: This device must be purchased and is relatively expensive. Although it is quite durable, it is not indestructible, and does eventually require replacement. Also, the device requires polishing to remove lime scale build-up so that the animals are able to see reflections.

Instructions to Make: This device is purchased from an enrichment device company

Materials and Cost:

To purchase-

1. \$14.00- \$14.75 each (Bio-serv)

Instructions to Use: The device is clipped on the outside of the cage where it is easily accessible by the animal. It can be left on for 2-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Kong on Chain



Photos courtesy of Bio-serv

Description: This device is made of a virtually indestructible type of rubber. It comes in many shapes, although the most commonly seen is the shape of three hollow balls fixed together. A chain with a snap hook is attached in the top center of the device to allow the device to be clipped to the outside of the cage.

Objective: The device provides the animal with manipulable enrichment.

Housing type and Species: This device can be used in all housing environments for all species.

Enrichment Category: Physical

Pros: The device is made of hard rubber, making it durable and easy to clean. The device can be used as a food or non-food enrichment device.

Cons: While chewing on the toy, the animals may ingest the material. Some sanitizing agents can break down material. (Enviro-B, etc.)

Instructions to Make:

1. Cut a length of 2/0 straight link coil chain 6-8 links long with the bolt cutters. Cut chain shorter if device is to be hung inside of cage. The shorter chain will help prevent injury.
2. Depending on size of Kong (4" for monkeys, 6" for chimpanzees) take a 5/16" or 3/8" washer and slide it down onto a 5/16"x 1" or 3/8"x 1 bolt respectively.
3. Insert the bolt into the base of the Kong toy and push it through the hole at the top.
4. With the threaded end now poking through the top of the Kong, slide the end link of chain down over the bolt. If using the 3/8" bolt for 6" Kong, expand link by squeezing in a vise.
5. Slide another 5/16" or 3/8" washer down onto the bolt over the chain.
6. Thread a 5/16" or 3/8" locking nut onto the bolt.

7. Attach a 6" extension to a ratchet followed by a 1/2" or 9/16" socket.
8. Insert the 1/2" or 9/16" socket into the base of the Kong and place it securely on the head of the bolt.
9. Holding the head of the bolt with the ratchet, use a 1/2" or 3/8" wrench to tighten the locking nut down securely.
10. Slide a snap hook into the end link of chain hanging from the bolt.
11. Secure snap hook to the chain squeezing in a vise.

Materials and Cost:*To purchase-*

1. Large 4" with chain: \$15.50-\$16.50 each (Bio-serv)
2. X-large 5" with chain: \$17.75-\$19.25 each (Bio-serv)

To make-

1. Kong: \$5.45- \$6.05 each (Bio-serv)
2. Chain: \$1.55/ft (Alamo Iron Works)
3. Snap hooks: \$2.27 each (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: Clip the device on the outside of the cage where it is easily accessible by the animal. It can be left on for 2-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

PVC on Chain



Description: This device consists of one to three pieces of PVC (usually a 45° or 90° elbow, a coupling, or a combination of the three.) A chain is run through the piece(s) of PVC and then connected to itself end to end by a snap hook.

Objective: The device provides the animal with manipulable enrichment.

Housing type and Species: This device can be used in all housing environments for all species.

Enrichment Category: Physical, (if used with treats occupational, nutritional)

Pros: The device is cheap and easy to make, as well as easy to clean. The device is primarily used as a non-food device. If desired, treats can be placed inside the pieces of PVC to make a food device.

Cons: Although this device can be used as a feeding device it does not encourage long bouts of foraging.

Instructions to Make:

1. Cut a piece of 2/0 straight link coil chain 6" long with bolt cutters. If device is to be hung on inside of cage do not make chain any longer. The shorter chain will help prevent injury.
2. Run the chain through 1-3 1" PVC fittings.
3. After chain is through all the pieces connect the two ends of the chain together with a snap hook.
4. Secure the snap hook by squeezing it in a vise.

Materials and Cost:*To make-*

1. PVC: \$.29-\$.55 each (Alamo Iron Works)
2. Chain: \$1.55/ft (Alamo Iron Works)
3. Snap hooks: \$2.27 each (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: Clip the device to the outside of the cage where the animal can easily access it. If used to deliver treats, the treat should be placed inside one of the pieces of PVC, so that it does not easily fall out but the animal is able to access it. This device can be left on for 2-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

PVC Rattle



Description: This device consists of two PVC slip caps with a 2-3" piece of PVC connecting them. A bolt runs through the device from slip cap to slip cap and has a chain and snap hook at one end to hang the device. Washer and nuts run along the bolt to generate noise.

Objective: The device provides the animal with manipulable enrichment.

Housing type and Species: This device can be used in all housing environments for all species.

Enrichment Category: Physical

Pros: The materials used to make this device are durable and cheap, as well as easy to clean. If the animal breaks the PVC, the nuts and washer will remain on the bolt so the animal will not be able to grab and possibly ingest them.

Cons: The device does not make much noise and is not reflective or shiny, so it does not present much sensory variation.

Instructions to Make:

1. Using a hacksaw, cut a piece of PVC pipe (any diameter is fine) to a length of 2-3".
2. Insert a 5/16" drill bit into a power drill and secure.
3. Drill a 5/16" hole in two slip caps of the appropriate diameter for the PVC pipe used.
4. Run a 5/16"x 5" bolt through a 5/16" flat washer. Run the bolt and washer through the hole in one of the caps.
5. Apply PVC primer to the first 1/2" of one end of the pipe as well as the inside the slip cap with the bolt through it. After the primer has dried apply PVC glue to the same areas. After glue has been applied slide the slip cap with the bolt through it onto the end of the pipe.
6. Place 3-5 washer and large nuts onto the bolt.
7. Using step 5. glue the remaining slip cap to the other end of the pipe so that the bolt protrudes through the hole drilled in step 3.

8. Using bolt cutters, cut a piece of 2/0 straight link coil chain 6-8 links long. Cut chain shorter if device is to be hung on inside of cage. The shorter chain will help prevent injury or death.
9. Slide the piece of chain onto bolt followed by a 5/16" flat washer. Thread a 5/16" lock nut onto the bolt.
10. Place a 1/2" socket onto a ratchet. Using the socket and ratchet and a 1/2" box end wrench tighten lock nut until secure.
11. Place a snap hook on the trailing end link of the chain.
12. Secure the snap hook to the chain by squeezing in a vise.

Materials and Cost:

To make-

1. PVC: Varies on size used
2. Chain: \$1.55/ft (Alamo Iron Works)
3. Bolt: \$15.98 per 100 (Alamo Iron Works)
4. Washers: \$2.39/lb (Alamo Iron Works)
5. Lock nut: \$6.95 per 100 (Alamo Iron Works)
6. Snap hook: \$2.27 each (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: To use this device simply hang on the cage where it is easily accessible by the animal. This device can be used for 1-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Toys on Chain



Description: This device is varying toys running along a chain. The chain is connected to itself end to end by a snap hook. Any type of toy can be used, but rubber, or Kong toys are suggested.

Objective: This device provides the animal with manipulable enrichment.

Housing type and Species: This device can be used in all housing environments for all species.

Enrichment Category: Physical, (if used with treats, occupational, nutritional)

Pros: This device offers variety to the animal. The device is also easy to clean. Depending on toys used, treats can be added to promote foraging behavior.

Cons: The chain tends to be longer for this device compared to others. The longer chain could cause injury if the device is hung inside, or the animal can get the device inside the cage.

Instructions to Make:

1. Using bolt cutter, cut a piece of 2/0 straight link coil chain to a length of two feet. Cut chain shorter if device is to be hung on inside of cage. The shorter chain will help prevent injury or death.
2. Run chain through selected toys.
3. Place both end links of the chain with a snap hook.
4. Secure snap hook to the chain by squeezing in a vise.

Materials and Cost:

To make-

1. Chain: \$1.55/ft (Alamo Iron Works)
2. Snap hook: \$2.27 each (Alamo Iron Works)
3. Toys: Varies

Total: \$10-\$12

Instructions to Use: Hang device on cage where it is easily accessible by the animal. This device can be used for 1-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Nylabone on Chain



Description: This device is a Nylabone toy with a chain and snap hook bolted to it to enable it to be hung on a cage.

Objective: This device provides the animal with manipulable enrichment.

Housing type and Species: This device can be used in all housing environments for all species.

Enrichment Category: Physical

Pros: This device is cheap and easy to make and clean.

Cons: Depending on cage type, animals can pull toys through the bars. If toys are pulled completely in, it can be difficult to remove.

Instructions to Make:

1. Acquire a Nylabone toy.
2. Insert a 5/16" drill bit into a power drill and secure.
3. Drill a 5/16" hole at one end of the Nylabone.
4. Using bolt cutters, cut a piece of 2/0 straight link coil chain 6-8 links long. Cut chain shorter if to be hung on inside of cage. The shorter chain will help prevent injury or death.
5. Run a 5/16" washer onto a 5/16" x 1 1/2" bolt.
6. Run bolt with washer through hole in the Nylabone.
7. Place one of the end links of the chain onto the bolt followed by a 5/16" washer.
8. Thread a 5/16" lock nut onto bolt.
9. Attach a 1/2" socket to a ratchet.
10. Place socket on the head of the bolt and a 1/2" wrench onto the lock nut and tighten until secure.
11. Place a snap hook into the trailing end link of chain.
12. Secure snap hook to chain by squeezing in a vise.

Materials and Cost:

To make-

1. Nylabones: \$2.69- \$5.28 each (Petedge)
2. Chain: \$1.55/ft (Alamo Iron Works)
3. Snap hook: \$2.27 each (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: Hang device on cage where it is easily accessible by the animal. This device can be used for 1-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Food Devices

Feeder Mix

Feeder mix is a staple food item used in conjunction with a lot of the food devices in this manual. This manual includes instructions on how we make our basic feeder mix, but your imagination is the limit, as long as it falls within the guidelines of your facility. We mix and store ours in a 33 gallon Rubbermaid container but you should mix and store yours according to the facility's guidelines and usage.

Instructions to Make: (Always wear exam gloves when preparing food)

1. Pour 2 large bags of Cheerios, Honey Nut Cheerios, Granola w/raisins, and Chex cereal into a 33 gallon Rubbermaid container.
2. Pour 2 large scoops of sunflower seeds and pigeon seed into the container.
3. Thoroughly mix items with scoop or hands.
4. Repeat steps 1-3 until container is full.
5. Whenever making a new batch pour remainder of old mix into a separate container. After filling container pour old mix on top to enable it to be used first.

Cup Feeder (Small and Large)



Description: The device consists of four to five PVC slip caps, all facing the same way (1" caps for small and 2" caps for large), that run along a 3/8"x 12" bolt. The slip caps are filled with food items such as feeder mix, fruit, etc. A chain and snap hook is attached to the top of the bolt to enable the device to be hung onto the cage. Large washers can be inserted (optional) between each cap to divide the slip caps and act as covers making the food inside the cups more difficult to obtain.

Objective: This device provides occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and object manipulation.

Housing type and Species: The small version of this device can be used for macaque species and young baboons (infants or juveniles), while the larger version can be used for adult baboons and chimpanzees.

Enrichment Category: Physical, occupational, nutritional

Pros: These devices are easy to make, prepare, and clean. These devices provide occupational and nutritional enrichment for the animal, thereby encouraging lengthy bouts of foraging behavior.

Cons: Due to the device's simplicity, it is used best by the animal as a novelty item. When an animal is exposed to the device too often or for a lengthy period of time, it will become proficient at manipulating the device to retrieve forage. Future exposure to the device will not be as enriching for the animal as it loses its novelty and challenge.

Instructions to Make: (washers optional)

1. Insert a 3/8" bit into the drill press and tighten using the chuck key.
2. Drill a 3/8" hole through the center of the bottom of four to five 1" PVC (small version) or 2" PVC (large version) slip caps.
3. String each of the cups down onto the 3/8" x 12" hex head bolt.
4. Screw a standard 3/8" nut down to the point where the thread ends on the bolt.

5. Cut a length of 2/0 straight link coil chain 6-8 links long with the bolt cutters.
6. Using a vise, squeeze the end link until it opens just enough to allow the 3/8" bolt to pass through.
7. Slide a 3/8" washer down onto the nut that was previously screwed onto the bolt.
8. Slide the expanded link of chain down onto the bolt.
9. Slide another 3/8" washer down over the chain.
10. Thread a 3/8" lock nut down onto the assembled piece.
11. Attach a 9/16" socket to a ratchet.
12. Using the socket to hold the head of the bolt, tighten the nut down using a 9/16" wrench.
13. With the nuts secured, slide a snap hook into the end link of chain hanging from the bolt.
14. Secure the snap hook to the chain by squeezing in the vise.

Materials and Cost:

To make-

1. PVC caps: \$0.55 each (small) and 1.77 each (large) (Alamo Iron Works)
2. Bolt: \$0.90 each (Ace Bolt and Screw)
3. Lock nuts: \$5.39 per 100 (Alamo Iron Works)
4. Flat washers: \$4.24/lb (Alamo Iron Works)
5. Snap hook: \$2.27 each (Alamo Iron Works)
6. Chain: \$1.55/ft (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: Fill the cups with feeder mix (see Feeder Mix) or similar food item. Clip the device to the outside of the cage where it is easily accessible by the animal. The items used can be frozen to increase time used and make food more challenging to extract. This device can be left on the cage for 2-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Banana Feeder (Small and Large)



Description: The device consists of a 10” long piece of PVC pipe (1” diameter for small and 2” diameter for large). Bananas or other produce are placed into the pipe. A chain with snap hooks is bolted to each end of the pipe to hang the device on the cage. Four to five holes are drilled into the pipe (3/4” for small and 1” for large). They are used by the animal to dig out food.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and object manipulation. When the food is frozen, this device also serves as a type of sensory enrichment.

Housing type and Species: The small version of this device can be used for macaque and baboon species, while the larger version can be used for chimpanzees.

Enrichment Category: Physical, occupational, nutritional, sensory (if frozen)

Pros: These devices are easy to make, prepare, and clean.

Cons: If left up for too long these devices can become unsanitary. The holes on the device must also be big enough so that the animals cannot get their fingers stuck in the device. These devices require a long narrow brush to clean the insides thoroughly.

Instructions to Make:

1. Cut a piece of PVC pipe 10” long with a hack saw (1” diameter for small and 2” diameter for large).
2. Cut 2 lengths of 2/0 straight link coil chain 6-8 links long with the bolt cutters.
3. Using the vise, squeeze the end links of both pieces of chain until they open just enough to allow a 3/8” bolt to pass through. Set the chain aside.
4. Insert a 3/8” drill bit into the drill press and secure using the chuck key. A hand held drill can be used by first securing the pipe in a vise before drilling.
5. One and a half inches from one end of the PVC pipe, drill a hole straight through, so that the drill bit comes out the other side. A 3/8” bolt of appropriate length should now be able to pass all the way through the PVC pipe, straight through the holes.

6. Repeat this step at the other end of the PVC pipe. Make sure that the set of holes run the same way as the set that was previously drilled.
7. Remove the 3/8" bit and replace it with a Unibit.
8. Using the Unibit, drill four holes randomly along the PVC pipe. (3/4" diameter for small and 1" diameter for large)
9. Place 3/8" bolts of appropriate length through the holes on both ends. After bolts are through the pipe slide 3/8" washers onto them.
10. Using the links expanded in the vise slide each one onto a bolt, followed by another 3/8" washer.
11. Thread a 3/8" lock nut onto each bolt.
12. Attach a 9/16" socket to a ratchet.
13. Using a 9/16" wrench to hold the head of the bolt, tighten the nut down using the 9/16" socket.
14. With the nuts secure, slide a snap hook into the trailing end of chain hanging from each bolt.
15. Secure the snap hook by squeezing it in the vise.

Materials and Cost:*To make-*

1. PVC: \$4.90 per 20 ft (Alamo Iron Works)
2. Bolts: \$8.09 per 100 (Alamo Iron Works)
3. Lock nuts: \$5.39 per 100 (Alamo Iron Works)
4. Flat washers: \$4.24/lb (Alamo Iron Works)
5. Snap hook: \$2.27 each (Alamo Iron Works)
6. Chain: \$1.55/ft (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: To prepare the device for use, slide a banana (or other produce) into the pipe through one end. Two bananas may be used in the large version. After the banana(s) is (are) in, place in the freezer until banana is completely frozen. Freezing items is optional but does make device more challenging as well as providing sensory enrichment. When banana is frozen, remove from freezer and clip both chains on the cage in a place easily accessible by the animal so that the feeder itself is hanging horizontally with holes facing the animal. This device can be left on the cage for 1-2 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Puzzle Feeder



Description: The device consists of three 12" long pieces of 1" diameter PVC. Peanuts or other large foods are placed in the pipes. These pipes are bolted together using a 5/16"X 8" bolt on both ends. There are pieces of chain at each end of the bolt (four pieces total). There are 1/2" inch holes drilled 1" apart along the three pipes with a 1" long by 3/4" hole drilled on the edge of one outer pipe and on the face of the other outer pipe.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and object manipulation.

Housing type and Species: The device can be used for macaque and baboon species.

Enrichment Category: Physical, occupational, nutritional

Pros: The device is more complex to solve than other feeders, so it will make the animal work harder and longer to extract food. This extra work will keep the animal occupied longer, encouraging a higher frequency of normal behavior. This device is also relatively easy to clean.

Cons: The best way to use the device is to fill it with peanuts or other large objects. Grain such as pigeon seed is too small and falls out. This is both wasteful and requires little effort from the animal to obtain food. Also, this device is large and bulky and requires large amounts of room for storage, transportation, and cleaning, if using a dishwasher.

Instructions to Make:

1. Cut three pieces of 2" PVC pipe 12" long.
2. Cut six pieces of 1/2" PVC 1" long.
3. Cut four pieces of trade size 4, twist link chain 6-8" long.
4. Insert a 5/16" drill bit into a power drill and secure. Using the drill, drill a hole completely through the three pieces of pipe at both ends. When sat next to each other the holes on all three pipes should line up.
5. Run a 5/16"x 7" bolt through a 5/16" flat washer and the end link on one of the pieces of chain.

6. Insert the bolt into the first hole at one end of a pipe. Now place one of the pieces of 1/2" pipe on the end of the bolt and then push bolt through the next hole.
7. Repeat steps 5 & 6 for the two remaining pipes.
8. When the bolt is through all three pipes, run another piece of chain on the bolt through an end link. After that, thread on a 5/16" flat washer. Finally, thread a 5/16" lock nut onto the end of the bolt.
9. Attach a 1/2" socket to a ratchet.
10. Place a 1/2" wrench on the head of the bolt. Using the 1/2" socket, tighten the lock nut down until secure.
11. Repeat steps 5-10 for the holes on the other end of the pipes.
12. Finally, using the end link of the four chains run the hook end of snap hooks through the chain.
13. Secure the snap hooks by squeezing in a vise.
14. Using a 1/2" bit and a power drill, drill 6, 1/4" holes on the same side of all three pipes so that there is an inch space in between them and a 1/2" space from the last hole to the end of the pipe.
15. On one of the out side pipes take a 1/4" router bit and router out the last hole on one end to make an oval 1/4" wide by 1/2" long.
16. On the other outer pipe at the opposite end of where the last oval was made make another 1/4" by 1/2" oval on the side of the pipe.

Materials and Cost:

To make-

1. PVC: 2"-\$30.29 per 20 ft (Alamo Iron Works)
2. PVC: 1/2"-\$7.76 per 20 ft (Alamo Iron Works)
3. Bolts: \$21.39 per 50 (Alamo Iron Works)
4. Chain: \$1.55/ft (Alamo Iron Works)
5. Flat washers: \$4.24/lb (Alamo Iron Works)
6. Lock nuts: \$5.39 per 100 (Alamo Iron Works)
7. Snap hooks: \$2.27 each (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: This device is best used with larger food items such as peanuts so that the items do not fall out if the animal shakes the device. Small seeds and other foods may spill out, diminishing the opportunity for the animal to work the puzzle. Small food items also create a mess. Fill the device with the desired food item by using the oval hole cut at the ends of the outer pipes. After the device is filled, hang it on the cage using the four chains so that the oval on the side of the outer pipe is over the feed hopper and the string of holes along the front are facing the animal. This device can be left on the cage for 2-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Three Ring Feeder



Description: The device consists of a 1 1/2" PVC pipe with a slip cap on one end and a screw cap on the other end with three 1 1/4" long pieces of 2" PVC running along it. Four holes along the pipe allow the animal to access the food. Chains with snap hooks at each end enable the device to be hung on the cage.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and object manipulation.

Housing type and Species: This device can be used for macaque and baboon species.

Enrichment Category: Physical, occupational, nutritional

Pros: The device is inexpensive to make, as well as durable and easy to prepare and clean.

Cons: The one end of the device can be unscrewed and removed by the animal. The device can be wasteful and messy if the animal turns it upside down or removes the cap.

Instructions to Make:

1. Using a hacksaw, cut a piece of 1 1/2" PVC 9" long.
2. Using a hacksaw, cut three pieces of 2" PVC 1 1/4" long.
3. Using a 5/16" drill bit and a power drill, drill a 5/16" hole through the middle of a 1 1/2" slip cap. Next drill a 5/16" hole through the middle of a 1 1/2" male PVC plug.
4. Using bolt cutters, cut two pieces of 2/0 straight link coil chain 6-8 links long.
5. Run a 5/16" X 1 1/2" bolt through a 5/16" flat washer then through the end link of one of the of the pieces of chain.
6. Place the bolt through the hole and place a 5/16" flat washer on it the thread a 5/16" lock nut onto the bolt.
7. Put a 1/2" socket on a ratchet and place on the bolt head.
8. Put a 1/2" wrench on the lock nut and tighten until nut is secure.
9. Repeat steps 4-7 for the male PVC plug.

10. Apply PVC primer to the first 1/2" of one end of the pipe as well as the inside of the 1 1/2" slip cap. After primer dries repeat the step with the glue. After glue is applied slide the 1 1/2" slip cap onto the end of pipe.
11. Using a Unibit and a power drill, drill four 1/2" holes starting 1" from the slip cap at a distance of 1 1/2" apart.
12. Slide the three pieces of 2" PVC onto the pipe.
13. Using step 10 glue the 1 1/2" female threaded cap to the other end. Then screw the male PVC plug into the cap.
14. Place a snap hook in the trailing end link of each chain.
15. Secure each snap hook to chain by squeezing in a vise.

Materials and Cost:*To Make-*

1. PVC: 1 1/2"- \$4.90 per 20 ft (Alamo Iron Works)
2. PVC: 2"- \$18.68 per 20 ft (Alamo Iron Works)
3. Slip caps: \$1.77 each (Alamo Iron Works)
4. PVC fitting & plug: \$4.00 each (Alamo Iron Works)
5. Bolts: \$5.99 per 100 (Alamo Iron Works)
6. Flat washers: \$4.24/lb (Alamo Iron Works)
7. Lock nut: \$5.39 per 100 (Alamo Iron Works)
8. Chain: \$1.55/ft (Alamo Iron Works)
9. Snap hooks: \$2.27 each (Alamo Iron Works)

Total: Less than \$12

Instructions to Use: This device is simple to prepare. Unscrew the plug on the one end of the feeder. Fill with food items such as Feeder mix, grain, applesauce, etc. After the device is full screw the plug back on. You can freeze the device or simply hang at room temperature. Hang the device horizontally where it is easily accessible by the animal. The device can be left on the cage for 2-3 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Pump Feeder



Description: The device consists of an 8" long piece of 1 1/2" PVC pipe with a slip cap on one end and a screw cap on the other. A polycarbonate rod runs through a hole drilled in the screw cap. Notches cut into the rod pick up the food, and a washer screwed to one end of the rod keeps the rod from being pulled out of the pipe. Soft foods such as applesauce, pudding, etc. are poured into the pipe and the cap is replaced. A chain and snap hook is connected at one end of the device with a hose clamp to allow the device to be hung on the cage.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging object manipulation.

Housing type and Species: This device can be used for macaque and baboon species.

Enrichment Category: Physical, occupational, nutritional

Pros: The device is easy to prepare and clean. The device dispenses small amounts of food so it keeps the animal busy for a lengthy time.

Cons: The polycarbonate rod is durable but can be broken. If the rod breaks and does not fall through the cage floor, it cannot be retrieved easily.

Instructions to Make:

1. Using a hacksaw cut a piece of 1 1/2" PVC pipe to a length of 9".
2. Apply PVC primer to the first 1/2" of pipe on one end as well as the inside of a 1 1/2" slip cap.
3. After the primer has dried apply PVC glue to the same areas. Immediately following the application of the glue slide the slip cap onto the pipe.
4. Using steps 2 and 3, glue a 1 1/2" fitting with female threads to the other end of the pipe.
5. Attach a 1/2" drill bit to the cordless drill.
6. Drill a 1/2" hole through the square part of a 1 1/2" plug with male threads.

7. Using a hacksaw, cut a piece of 1/2" polycarbonate rod to a length of approximately 12".
8. Drill a pilot hole at one end of the rod.
9. Place a #10 lock washer around the pilot hole.
10. Apply a dab of glue to the threads of a 10-24 x 3/4" screw, and screw it through the washer and into the pilot hole at the base of the rod.
11. Drill small notches randomly along the rod.
12. Set rod inside of pipe, and slide plug down over the rod. Hand-tighten the plug into the fitting.
13. Cut a piece of 2/0 straight link coil chain 6-8 links long.
14. Open a 2" hose clamp completely, and run the flat end through one of the end links of chain.
15. Place the hose clamp around the pipe next to the slip cap to where the two ends of the hose clamp meet.
16. Tighten the hose clamp down using an appropriate screwdriver or drill head.
17. Insert the end of a snap hook into the trailing end link of the chain.
18. Secure snap hook to chain using a vise.

Materials and Cost:

To make-

1. PVC: \$4.90 per 20 ft (Alamo Iron Works)
2. Slip Cap: \$1.77 each (Alamo Iron Works)
3. PVC fitting and plug: \$4.00 (Alamo Iron Works)
4. 10-24 x 3/4" screw: \$0.83 per pack (Lowe's)
5. #10 split lock washer: \$0.85 per pack (Lowe's)
6. Polycarbonate rod: \$0.75/ft (Regal Plastics)
7. Screw and washer: \$1.00 (Alamo Iron Works)
8. Chain: \$1.55/ft (Alamo Iron Works)
9. Snap hook: \$2.27 each (Alamo Iron Works)

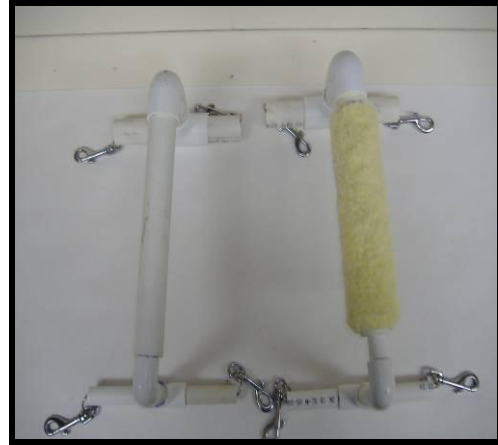
Total: Less than \$12

Instructions to Use: To use this device unscrew the cleanout cap and remove the rod. Fill the device with the desired food (pudding, applesauce, etc.). Place the rod back inside the device. Slide the cap over the rod and tighten until secure. Hang device so that it is accessible by the animal. This device can be used for 1-2 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Paint Roller



Version 1



Version 2

Description: The device consists of a piece of 1" PVC cut to 9". A piece of chain with a snap hook on each end runs through the pipe. Food is applied to this device in the same manner as the grooming board. When the device is attached to the cage the paint roller cannot come off. Another version (as seen in picture on right) is designed to keep the paint roller away from the cage, for use with destructive animals.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging, grooming, and object manipulation.

Housing type and Species: This device can be used for macaque and baboon species.

Enrichment Category: Physical, occupational, nutritional, sensory

Pros: This device is simple to prepare and clean. It helps redirect grooming behavior that may otherwise result in overgrooming.

Cons: If left up for an extended period of time, the animal can strip the material from the paint roller. After the material is removed the paint roller must be discarded and replaced. Parts of the paint roller can be ingested.

Instructions to Make:

(Version 1)

1. Using a hacksaw, cut a piece of 1" PVC to a length of 9"
2. Using bolt cutters, cut a piece of chain approximately 18 links long.
3. Run the chain through the piece of PVC.
4. Attach snap hooks to each end link of the chain.
5. Secure the snap hooks to the chain by squeezing in a vise.
6. Slide paint roller over pipe.

(Version 2)

1. Using a hacksaw, cut four pieces of 1/2" diameter PVC pipe, cut three of the pieces to a length of 2" and the remaining piece to a length of 8".
2. Using a hacksaw, cut four pieces of 1" diameter PVC pipe, cut three of the pieces to a length of 2" and the remaining piece to a length of 9".
3. Apply PVC primer to the first 1/2" of one end of each of the short 1/2" diameter pipes. Also apply primer to the inside of each hole on a 1/2" "T" fitting.
4. After primer has dried apply glue to the same areas and insert a pipe into each hole.
5. Apply PVC primer to the other end of the pipe that is perpendicular to the others, as well as one end of the 8" piece of pipe. Also apply primer to the inside of each hole on a 1/2" 90° fitting.
6. After primer has dried apply glue to the same areas. Place the 90° fitting onto the 1" PVC pipe so that the other opening on the fitting is perpendicular to the "T" fitting. Now place the end of 8" piece into the opening.
7. Repeat steps 3-6 for the 1" diameter pieces using 1" fittings.
8. Insert a 5/16" drill into a power drill and secure.
9. On the bottom of the four short pieces of pipe drill a 5/16" hole.
10. Individually place four snap hooks onto four key rings.
11. Secure snap hook to key ring by squeezing in a vise.
12. Thread a key ring with a snap hook through each hole.

Materials and Cost:

To make-(version 1)

1. PVC: \$14.44 per 20 ft (Alamo Iron Works)
2. Chain: \$1.55/ft (Alamo Iron Works)
3. Paint roller: \$5.00 package of 4 (Wal-Mart)
4. Snap hooks: \$2.27 each (Alamo Iron Works)

Total: Less than \$10

To make-(version 2)

1. PVC: 1" \$14.44 per 20 ft (Alamo Iron Works)
2. PVC: 1/2" \$7.76 per 20 ft (Alamo Iron Works)
3. PVC: 1/2" 90° elbow \$0.29 each (Alamo Iron Works)
4. PVC: 1/2" "T" \$0.25 (Alamo Iron Works)
5. PVC: 1" 90° elbow \$0.41 (Alamo Iron Works)
6. PVC: 1" "T" \$0.54 (Alamo Iron Works)
7. Key rings: \$0.00
8. Paint rollers: \$5.00 package of 4 (Wal-Mart)
9. Snap hooks: \$2.27 each (Alamo Iron Works)

Instructions to Use: (Version 1) Cover the paint roller in honey, peanut butter, or similar sticky food. Next, cover the paint roller with feeder mix, cereal, or similar food and place in freezer. After the paint roller is completely frozen slide onto the pipe so that the chain is sticking out on both ends. Hang the device on the cage horizontally where the animal can access it easily by using both snap hooks. This device should not be left on the cage for longer than a day. Optimally, this device should be used in rotation with other devices to maintain novelty.

Instructions to Use: (Version 2) Cover paint roller in honey, peanut butter, or similar sticky food. Next, cover paint roller with feeder mix, cereal, or similar food and place in freezer. After the paint roller is completely frozen slide over the long piece of 1" pipe. Slide the long piece of 1/2" pipe into the long piece of 1" pipe. Hang device on cage vertically or horizontally by using the four snap hooks where the animal can access it easily. This device can be used for 1-2 days depending on food used. Optimally, this device should be used in rotation with other device to maintain novelty.

Foraging Board



Photos courtesy of Bio-serv

Description: Different designs are available but the most common is a flat piece of stainless steel sheet metal with a 1/2"- 3/4" raised lip on all sides and a piece of Astroturf bolted to it. It is fastened to the cage using a bar with a nut and bolt or a couple of chains. Feeder mix, grain or similar food is then sprinkled over the board.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging.

Housing type and Species: This device can be used in all housing environments for all species. The chimpanzee foraging board consists of a 3" PVC pipe cut in half length-ways and bolted to the cage. No Astroturf is added to the chimpanzee foraging board.

Enrichment Category: Physical, occupational, nutritional, sensory

Pros: This device simulates the natural behavior of foraging through grass to find food. Depending on the amount and size of the food used with the device it could encourage lengthy bouts of foraging behavior.

Cons: If purchased, this device is expensive, making purchasing large quantities difficult. Making this device is difficult unless the facility has physical plant or maintenance department capable of working metal.

Instructions to Make: This device should be purchased.

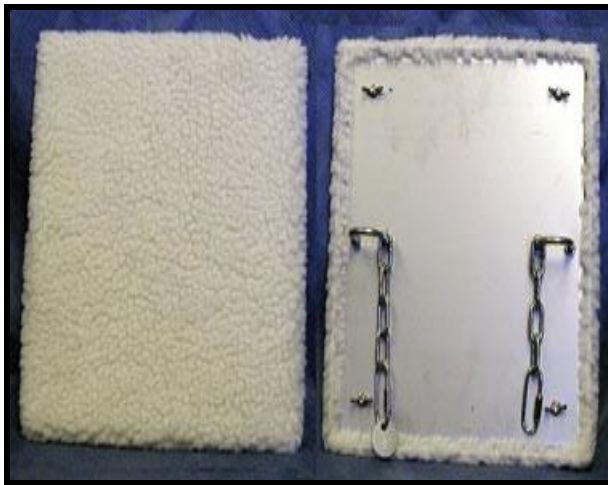
Materials and Cost:

To purchase-

1. Tuff Turf foraging board: \$46.00 each (Bio-Serv)

Instructions to Use: Fasten device to cage temporarily or permanently. After the device has been fastened to the cage scatter the food items over the entire board. The animal will then have to dig around through the Astroturf to find the food. The smaller the food, the farther down in the Astroturf it will go, and the more challenging it will become for the animal. If the device is fixed permanently to the cage, it will need to be sanitized periodically. If it is not permanently fixed to the cage, then it should only be used for 2-3 days. Optimally, this device should be used in rotation or conjunction with other devices to maintain novelty.

Grooming Board



Photos courtesy of Bio-serv

Description: The purchased version is made of sheet metal. It has two complimentary pieces that fit together and held with bolts. The fleece is held in place by being folded over the front piece and having the back piece tightened down on it. The handmade version can be as simple as a piece of cutting board cut to the specifications desired, and then fitted with a piece of fleece the same size bolted to it at the corners.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and grooming.

Housing type and Species: This device can be used for all species.

Enrichment Category: Physical, occupational, nutritional, sensory

Pros: When used with fleece or other, similar material this device is a good tool to initiate grooming behavior. It can be used to encourage foraging when used with item such as butcher paper. This device can be purchased or made.

Cons: If purchased, this device is expensive. This device is very bulky and takes up a lot of storage space. Due to the cost, large quantities of this device cannot be purchased, prohibiting distribution to a large numbers of animals at the same time. Due to the destructive nature of some animals, fleece cannot always be used.

Instructions to Make:

1. Cut a piece of polycarbonate cutting board to a dimension of 6"x 6".
2. Insert and secure a 5/16" drill bit into a power drill.
3. Drill a 5/16" hole in each corner.
4. Cut a piece of fleece to dimensions of 6"x 6".
5. Drill a 5/16" hole in each corner.
6. Cut two pieces of 2/0 straight link coil chain 6-8 links long.

7. Set fleece on top of cutting board so that all holes line up.
8. Run a 5/16"x 1 1/2" bolt with washer through both holes on the bottom of board.
9. Place a washer on each bolt.
10. Thread a 5/16" lock nut onto each bolt.
11. Run a 5/16"x 1 1/2" bolt and washer through an end link of each piece of chain.
12. Run the bolts with chain through the top two holes of the board.
13. Place 5/16" washers onto the bolts.
14. Thread a 5/16" lock nut onto each bolt and tighten.
15. Place a 1/2" socket on a ratchet. Using the socket and a 1/2" wrench tighten all nuts onto the bolts until secure.
16. Place a snap hook through the two trailing end links of chain.
17. Secure clip to chain by squeezing in a vise.

Materials and Cost:*If purchased-*

1. Grooming board: \$46.00 each (Bio-Serv)

If made-

1. Polycarbonate board: ~ \$10.00 (Wal-Mart)
2. Fleece: \$2.00/sq.ft (Wal-Mart)
3. Bolts: \$15.98 per 100 (Alamo Iron Works)
4. Washers: \$2.39/lb (Alamo Iron Works)
5. Lock nuts: \$6.95 per 100 (Alamo Iron Works)
6. Chain: \$1.55/ft (Alamo Iron Works)
7. Snap hook: \$2.27 each (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: Depending on the version used, after the fleece is secure, cover in honey, peanut butter, or similar food. Next, cover with grain, feeder mix or similar food. Hang the device where it is easily accessible by the animal. This device can be used for 1-2 days depending on food used. Optimally, this device should be used in rotation with other devices to maintain novelty.

Kong Feeder



Description: The device consists of a Kong on chain toy covered in a sticky substance such as peanut butter or honey. The device is then covered with feeder mix or some other food item.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and object manipulation. When frozen this device also serves as a type of sensory enrichment.

Housing type and Species: The device can be used for animals of all species depending on the size of the Kong. Small Kongs are used for macaque and baboon species, while larger Kongs are used for the chimpanzees.

Enrichment Category: Physical, occupational, nutritional, sensory (if frozen)

Pros: The device is easy to prepare and clean and is already in stock if you have Kong on chain. It can also be used as manipulable enrichment after the animal has removed all of the food from it.

Cons: The device can become messy during preparation, as well as when hung on the cages. This device often requires light scrubbing before being placed in the dishwasher.

Instructions to Make:

See Kong on chain

Materials and Cost:

To make-

See Kong on chain

Instructions to Use: Cover device with peanut butter, honey, or similar sticky food. Next, cover the device with feeder mix or other food items and place in freezer. After the device is frozen, clip it to the outside of the cage where it is easily accessible by the animal. This device can be left on the cage for 2-3 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Tube Feeders



Description: The device is a piece of 2" PVC pipe cut to 10-15".

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging, tool use, and object manipulation. When frozen this device also serves as a type of sensory enrichment.

Housing type and Species: This device is used in all housing environments for chimpanzees.

Enrichment Category: Physical, occupational, nutritional, sensory (if frozen)

Pros: The device is cheap and easy to make, prepare, distribute, and clean.

Cons: It can sometimes be difficult to retrieve this device from the animals. Animals must be trained to give device back or shifted out of area to retrieve device.

Instructions to Make:

1. Get a joint of 2" PVC pipe.
2. Cut the pipe at varying lengths ranging from 6"-12".
3. Using lopping shears, cut branch so that it is long enough to reach the end of the feeder and still long enough to be handled.

Materials and Cost:

To make-

1. PVC: \$30.29 per 20 ft (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: Fill pipe with food item such as oatmeal, pudding, etc. Place in freezer and wait until food is completely frozen, or use at room temperature. After food is frozen, give pipe to animal as well as a small stick for extracting the food. The device is left in the enclosure with the animal until it can be safely retrieved by personnel. This device can be used for 1-3 days or until device can be retrieved safely. Optimally, this device should be used in rotation with other devices to maintain novelty.

Puzzle Ball



Photo courtesy of Bio-serv

Description: The device consists of a medium jolly ball with varying sizes of holes drilled so that they cover the entire surface of the ball. A chain with a snap hook is bolted to the ball to attach the device to the cage. Food items are placed inside, and can be stuck to the outside.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and object manipulation.

Housing type and Species: This device can be used for animals of all species.

Enrichment Category: Physical, occupational, nutritional, sensory (if frozen)

Pros: The device can be purchased or made making it easy to replace. It is also easy to prepare and clean.

Cons: Being made of plastic the device can be easily damaged needing replacement.

Instructions to Make:

1. Obtain a medium size Jolly-Ball. Insert a 1/4" drill bit into a power drill and drill a hole completely through the ball.

2. Using a Unibit and a power drill, drill 3-4 holes at the largest setting randomly on the ball.
3. Drill holes with varying diameters randomly over the entire ball but so they are not any closer than a 1/2".
4. Using bolt cutters, cut a piece of 2/0 straight link coil chain 6-8 links long.
5. Run a 1/4"x 7" bolt through a 1/4" washer.
6. Using the first hole drilled, insert the 1/4" bolt and washer through both holes.
7. Slide the end link of the chain onto the bolt followed by a 1/4" washer. Thread a 1/4" lock nut onto the bolt.
8. Place a 7/16" box end wrench on the lock nut. Place a 7/16" socket on a ratchet.
9. Place ratchet on the head of the bolt.
10. Using the ratchet tighten the nut and bolt until secure.
11. Place snap hook through the end link of the chain.
12. Secure snap hook to chain by squeezing in a vise.

Materials and Cost:*To purchase-*

1. Challenger Ball: \$34.00 each (Bio-serv)

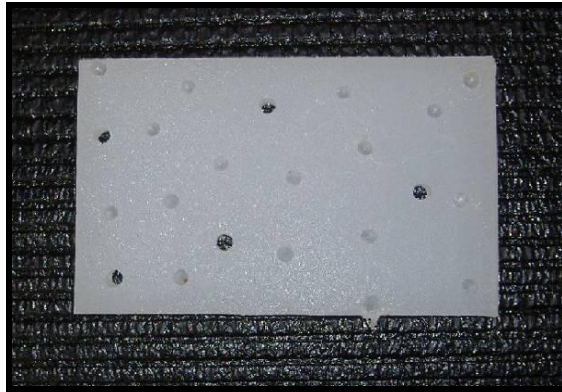
To make-

1. Medium Jolly Ball: \$6.89 each (Pet Edge)
2. Bolt: \$5.99 per 100 (Alamo Iron Works)
3. Flat washers: \$4.24/lb (Alamo Iron Works)
4. Locknut: \$5.39 per 100 (Alamo Iron Works)
5. Snap hooks: \$2.27 each (Alamo Iron Works)

Total: Less than \$15

Instructions to Use: To use this device place food items inside the ball through the holes. Use items of varying size and shape to make the puzzle more difficult. You can also smear a sticky substance like peanut butter or honey on the outside and cover with feeder mix or other food items. The device should be hung on the cage where it is easily accessible by the animal. The device can be left on the cage for 2-7 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Raisin Board



Description: This device consists of a piece of polycarbonate board cut to 4"X 8" dimension. Holes are drilled randomly over the entire board to different depths.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging, object manipulation, and problem solving skills.

Housing type and Species: This device can be used in all housing environments for chimpanzees.

Enrichment Category: Physical, occupational, nutritional, sensory (if frozen)

Pros: This device is cheap and easy to make, clean, and replace.

Cons: This device takes a while to prepare and usually does not take very long for most chimpanzees to empty.

Instructions to Make:

1. Insert appropriate blade for cutting plastic into reciprocating saw and secure.
2. Using the reciprocating saw, cut a polycarbonate cutting board into pieces of desired dimensions.
3. Insert a 1/4" drill bit into a power drill and secure.
4. Drill holes at varying depths randomly over the entire piece of cutting board.

Materials and Cost:

To make-

1. Poly carbonate board: \$10.00 (Wal-Mart)

Total: Less than \$5

Instructions to Use: Press a raisin firmly into each hole, once all holes are filled place device in the freezer. Once the device is frozen, give to the animal. Applesauce or similar food can be spread over the board to make the device more challenging for the animal to use and increase the time spent manipulating the device. Retrieve the device when safe for care staff. Optimally, this device should be used in rotation with other devices to maintain novelty.

Bleach Bottle Feeder



Description: This device is a 1 gallon bleach bottle. The opening is cut to a size appropriate for the species intended to be using it. Two holes approximately 1" in diameter are drilled on the sides. A chain is looped through the handle and connected to itself using a snap hook to enable the device to be hung on the cage.

Objective: This device provides the animals with occupational and nutritional enrichment, and is designed to encourage species typical behavior, particularly long bouts of foraging.

Housing type and Species: This device can be used in all housing environments for macaque species and baboons (infants and juveniles only).

Enrichment Category: Physical, occupational, nutritional

Pros: This device is cheap and easy to make, prepare, and clean.

Cons: This device can be easily destroyed, especially if left on cage too long.

Instructions to Make:

1. Clean bottle thoroughly using soap and water and let dry.
2. Remove labels and any other items that the animals can remove.
3. Using a pair of wire cutters make the opening on the top of the bottle bigger on the side opposite the handle. The size of the opening is dependent the species it is to be used for.
4. Insert a Unibit into a power drill and secure.
5. Using the Unibit, drill two ½" holes on sides of the bottle opposite from each other.
6. Using bolt cutters, cut a piece of 2/0 straight link coil chain approximately 6-8 links long.
7. Loop the chain through handle.
8. Join the end links together using a snap hook.
9. Secure snap hook to the chain by squeezing in a vise.

Materials and Cost:

To make-

1. Bleach bottle: Free (left over from sanitation)
2. Chain: \$1.55/ft (Alamo Iron Works)
3. Snap hook: \$2.55 each (Alamo Iron Works)

Total: Less than \$5

Instructions to Use: Fill bottle to just below the holes with grain, feeder mix, etc. Hang device on outside of cage where it is easily accessible by the animals. This device can be used for 1-3 days depending on food used. Optimally, this device should be used in rotation with other devices to maintain novelty.

Fruit on Chain



Description: This device is a fruit or a vegetable with a bolt and chain running through it.

Objective: This device provides the animals with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging.

Housing type and Species: This device can be used in all housing environments for all species.

Enrichment Category: Physical, occupational, nutritional, sensory (if frozen)

Pros: This device is cheap and easy to make and clean.

Cons: This device can be used rather quickly in some instances, and thus does not provide much enrichment.

Instructions to Make:

1. Using bolt cutters, cut a piece of 2/0 straight link coil chain 6-8 links long.
2. Using a vise, expand one of the end links of chain so that it will slide onto a 3/8" diameter bolt.
3. Slide chain onto a 3/8" x 6" bolt. (Bolt can be as short as 5" and as long as 8")
4. Slide a 3/8" washer onto the bolt.
5. Thread a 3/8" lock nut onto the bolt.
6. Place a snap hook on the trailing end link.
7. Secure snap hook to chain by squeezing in a vise.

Materials and Cost:

To make-

1. Bolt: \$70.54 per 50 (Alamo Iron Works)
2. Washer: \$2.39/lb (Alamo Iron Works)
3. Lock nut: \$6.95 per 100 (Alamo Iron Works)
4. Snap hook: \$2.27 each (Alamo Iron Works)
5. Chain: \$1.55/ft (Alamo Iron Works)

Total: Less than \$10

Instructions to Use: Remove the lock nut from the bolt. Slide fruit or vegetable onto the bolt. Thread the lock nut onto the bolt. Attach a 9/16" socket to a ratchet. Place socket onto the head of the bolt and a 9/16" wrench onto the lock nut. Tighten nut onto bolt until a few threads of the bolt protrude from the lock nut. Hang on cage where it is easily accessible by the animal. This device can be used for 1-2 days. Optimally, this device should be used in rotation with other devices to maintain novelty.

Termite Mound



Description: The device consists of a 55 gallon plastic barrel with holes and slots cut into the side. A 3 gallon tub is filled with sticky food such as peanut butter and jelly, tomato paste, oatmeal, etc. and placed at the bottom of the barrel through an access door cut into the back of the barrel. The dimensions of the tub depends on the size of the access door made. Once the tub is in place, the door is closed and locked. The barrel is then chained in two places to a strong sturdy part of the enclosure.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and tool use and modification. This device simulates termite fishing as seen in the wild.

Housing type and Species: This device can be used for group housed chimpanzees that have access to large enclosures or areas.

Enrichment Category: Physical, occupational, nutritional

Pros: The device is easy to prepare and load. The device is fairly durable and cheap to make. This device encourages object retrieval, tool use and modification, as well increased bouts of foraging (foraging increased up to four hours in certain groups).

Cons: The device is placed in the enclosure with the animals, so it is inaccessible until the animals can be shifted out of the enclosure. If animals cannot be shifted, then the device cannot be accessed to reload or clean. The shape of the barrel can create difficulties in reaching the top portion during cleaning and sanitization. Due to size, this device is best for animals in large enclosures.

Instructions to Make:

1. Retrieve a 55 gallon plastic barrel.
2. Using a permanent marker or china marker and draw a 12"x 6" box approximately 2" from bottom of the barrel.
3. Insert a 1/2" drill bit into a power drill and tighten.
4. Drill a pilot hole half way up the left side of the box.
5. Insert and secure a blade into the reciprocating saw.
6. Insert blade into the pilot hole. Using the saw and the marked lines of the box, cut out and remove the box from the barrel (this is considered back of barrel).
7. Remove the 1/2" bit from the drill and insert the appropriate bit that fits the 10-24 x 3/4" bolts for the hinges.
8. Using the bolts, evenly space and attach two hinges to the right side of the hole. Secure the bolts using #10 locking washers and the appropriate nut.
9. Attach the other side of the hinges to the right side of the piece removed.
10. Using more 10-24 x 3/4" bolts attach a hasp to the left side of the hole.
11. Using additional 10-24 x 3/4" bolts, attach the clasp portion to the left side of the piece removed in a location so that when the hasp is folded over the clasp, it will fit through the slot provided.
12. Drill a hole approximately 1/2" from the top left corner in both directions.
13. Repeat step 12 for the bottom left corner. Attach the metal bracket from a "U" bolt using bolts. Place a washer on a 3/8"x1 1/2" bolt. Place the bolt through the hole from the outside. Place the bracket onto the bolt on the inside followed by a washer and a lock nut. Tighten the nut down using a 9/16" box end wrench on the lock nut and a ratchet with a 9/16" socket on the bolt head.
14. Repeat step 13 for the three remaining holes. Use the remaining hole on the bracket to attach the bracket completely to the barrel.
15. Using various sizes of hole saws, drill holes randomly on the bottom half of the front and sides of the barrel. Do not make openings too big or animals will be able to reach hands in and grab food instead of fishing food out.
16. Cut two pieces of 2/0 straight link coil chain.
17. Drill two 1 1/2" holes spaced approximately 3' apart on the back of the barrel near the top lip. Repeat this step, drilling an additional two holes near the bottom of the back of the barrel.
18. Thread on of the cut 3' pieces of chain through the holes and around a support structure of the enclosure. Lock together to hold the termite mound securely in the cage. Repeat with the other cut piece of chain in the holes at the bottom of the barrel.

Materials and Cost:

To make-

1. 55 gallon barrel: Free (Left over from sanitation chemicals)
2. Chain: \$1.55/ft (Alamo Iron Works)
3. Lock: \$9.50 each (Alamo Iron Works)
4. 3 gallon tub: \$5- \$10 (Any hardware or feed store)

Total: Less than \$20

Instructions to Use: Using cutters, cut branches approximately 1 1/2" feet long so that there is one for every animal in the enclosure with a few left over. Fill a tub with a sticky food substance such as peanut butter and jelly, oatmeal, tomato sauce, etc. Unchain the barrel from the fence, unlock and open the access door at the bottom. Remove the old tub, and spray down the tub and barrel until clean. After cleaning, place the new tub in the barrel, close and lock. Set the barrel next to the fence and chain the barrel to secure structure. If animals are just learning how to fish, place sticks into the holes and slots to give the animals tools to access the food. After animals have become familiar with fishing, sticks can be hidden throughout the enclosure to make the device more challenging and fun. This device is left in the enclosure. The device can be reloaded anytime the animals are shifted out of the enclosure. The tub should be changed about every two days.

Pipe Feeder



Description: This device has two parts. The first part is attached to the cage, and consists of a steel plate approximately 18"x18" with a hole cut into the center. A threaded piece of pipe is welded to the middle of this plate over the hole. The second part is a piece of PVC pipe that has a slip cap on one end and a fitting that screws onto the threaded pipe on the other.

Objective: This device provides the animal with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and tool use and modification. This device simulates termite fishing as seen in the wild.

Housing type and Species: This device can be used in all housing environments for chimpanzees.

Enrichment Category: Physical, occupational, nutritional

Pros: This device elicits both foraging behavior and tool use in animals that do not have access to the termite mounds. The device is small and easy to make and clean. The device is also located outside the cage, making it easier to put up and take down.

Cons: This device is smaller than the termite mounds, so it does not take as long for animals to fish all of the contents from them. In some instances, it puts you in close proximity to the animals, so staff should be aware of animals in the cage.

Instructions to Make:

Mounting bracket:

1. Built by maintenance department.

Feeder tube:

1. Using a hacksaw cut a piece of 2" PVC to a length of 6" long.
2. Apply a PVC primer to the first 1/2" of one end of the pipe and inside of a 2" slip cap. After primer has dried apply PVC glue to the same areas. After the glue has been applied slide the slip cap onto the end of pipe.
3. Using the previous step glue a 2" fitting on the other end with female threading.

Materials and Cost:

To make-

1. PVC: \$30.29 per 20 ft (Alamo Iron Works)
2. Slip Cap: \$0.62 each (Alamo Iron Works)
3. Fitting: \$1.00 each (Alamo Iron Works)
4. Metal: Varies

Total: Less than \$20

Instructions to Use: The bracket must be fastened to cage prior to use and remains attached to cage between uses. To use, fill the feeder with a sticky substance like peanut butter, tomato paste, oatmeal, etc. Take feeder to cage and screw onto the bracket. Give animal access to a stick to fish food from feeder. This device can be used for 1-2 days depending on food used. Optimally, this device should be used in rotation with other devices to maintain novelty.

Peanut Cart



Description: This device consists of a plastic utility cart with a 3" hole cut into the center of it. From the bottom of the hole runs a 3" piece of PVC with half a slip cap on the end. Four chains attach the cart to the cage and prevent it from moving when in use.

Objective: The objective of this device is to provide the animals with occupational and nutritional enrichment, and encourages species typical behavior, particularly long bouts of foraging and tool use.

Housing type and Species: This device can be used for chimpanzees.

Enrichment Category: Physical, occupational, nutritional

Pros: This device is quick to set up and prepare. It is easy to clean and sanitize.

Cons: If not familiar with this type of device some animals have difficulty using it. It is very expensive to make due to the materials used.

Instructions to Make:

1. Acquire a plastic utility cart.
2. Insert a 3" hole saw into a power drill and secure.
3. Drill a 3" hole in the center of the top tray of the cart.
4. Acquire a 3" 45° PVC elbow.
5. Insert a 5/16" drill bit into a power drill.
6. Drill a 5/16" hole on each side of the elbow approximately 1" from the top edge of the elbow.
7. Slide a 5/16" washer onto a 5/16" x 1" bolt.
8. Slide the bolt through one of the holes drilled into the elbow.
9. Place an "L" bracket onto the bolt, so that the other part of the bracket sticks out over the edge of the elbow, followed by a 5/16" washer.
10. Thread a 5/16" lock nut onto the bolt.
11. Attach a 1/2" socket to a ratchet.

12. Place socket onto the head of the bolt and a 1/2" wrench onto the lock nut and tighten until secure.
13. Repeat steps 7-12 for the other hole.
14. Slide the elbow into the hole so the opening faces the length of the cart away from the handle.
15. Once in place, drill holes through the holes in the "L" brackets using the 5/16" drill bit used in step 5.
16. Slide a 5/16" washer onto a 5/16" x 1 1/2" bolt.
17. Going from the top down, insert the bolt through one of the holes.
18. Slide 5/16" washer onto the bolt.
19. Thread a 5/16" lock nut onto the bolt.
20. Attach a 1/2" socket to a ratchet.
21. Place socket onto the lock nut (an extension might be needed) and a 1/2" wrench on the head of the bolt. Tighten until secured.
22. Repeat steps 16-21 for the other hole.
23. After the elbow is in position and secured, use epoxy to fill in any gaps between the elbow and the cart.
24. Using a hacksaw, cut a piece of 3" PVC to a length of 3'. Also cut a 3" PVC slip cap in half.
25. Apply PVC primer to the first 1/2" of the pipe and the inside of the half of a slip cap.
26. After the primer has dried apply PVC glue to the same areas and slide the half of a slip cap onto the pipe.
27. This pipe and slip cap can be permanently fixed to the elbow using the same method used in steps 25-26 or can just be slid in and removed to allow for different variations of the device.
28. Insert a 3/8" drill bit into a power drill and secure.
29. About half way up each leg drill a 3/8" hole.
30. Using bolt cutters, cut four pieces of chain. Two of them 1' long, the other two 2' long.
31. Using a vise, expand one end link on each piece of chain so it slide on a 3/8" bolt.
32. Place snap hooks on the end link of chain that was not expanded.
33. Secure snap hooks to chains by squeezing in a vise.
34. Slide a 3/8" washer onto a 3/8" x 1 1/2" bolt, followed by a piece of chain.
35. Slide bolt through a one of the holes.
36. Place a 3/8" washer onto the bolt.
37. Thread a 3/8" lock nut onto the bolt.
38. Attach a 9/16" socket to a ratchet.
39. Place socket onto the head of the bolt and a 9/16" wrench onto the lock nut.
40. Tighten until secure.
41. Use steps 32-38 to attach the four chains. The two 1' pieces will go on the legs opposite the side of the cart with the handle. The two 2' pieces will go onto the remaining legs.

Materials and Cost:

To make-

1. Equipment cart:\$189.65 (Rubbermaid)
2. Chain:\$ 1.55/ft (Alamo Iron Works)
3. PVC:\$69.35 per 20 ft. (Alamo Iron Works)
4. Slip cap:\$2.16 each (Alamo Iron Works)
5. PVC elbow:\$5.70 each (Alamo Iron Works)
6. Snap hook:\$2.27 each (Alamo Iron Works)

Total: \$200

Instructions to Use: Attach cart to the cage using the four chains so that the handle is away from the cage. Make sure that the half slip cap that forms the cup at the end of the PVC pipe is close enough to the cage that the animal can reach into it. Scatter peanuts, grapes, or similar food across the top of the cart. Give the animal a stick so that they can push or pull the grapes into the hole in the center. The food will then roll down the pipe and stop at the cup where the animal will be able to grab it. This device can be used for one day. Optimally, this device should be used in rotation with other devices to maintain novelty.

Sites Used

Ace Bolt & Screw	(www.acebolt.com)	1-800-292-5890
Alamo Iron Works	(www.aiwnet.com)	1-800-292-7817
Bio-Serv	(www.bio-serv.com)	1-800-996-9908
Lowe's Home Improvement	(www.lowes.com)	1-800-445-6937
Petedge	(www.petedge.com)	1-800-738-3343
Regal Plastics	(www.regal-plastics.com)	1-800-441-1553
Rubbermaid	(www.rubbermaidcommercialproducts.com)	1-800-810-7847
Wal-Mart	(www.wal-mart.com)	1-800-966-6546

Other Sites of Interest

A.P.E.S.	(www.absoluteprimate.com)	1-817-228-2283
Home Depot	(www.homedepot.com)	1-800-430-3376
L G L	(www.lglacp.com)	1-979-775-1776
Otto Environmental	(www.ottoenvironmental.com)	1-414-358-1001
Petco	(www.petco.com)	1-877-738-6742
Petsmart	(www.petsmart.com)	1-888-839-9638
Primate Products	(www.primateproducts.com/home.php)	1-866-881-5444

The following page is a sample of a filled out data sheet.

ENVIRONMENTAL ENRICHMENT DATA SHEET

LOCATION 23.01

MONTH January

YEAR 2006

DATE	ENRICHMENT (circle)					ANIMALS <small>(e.g. all, individual ID, or bay number)</small>	ADDITIONAL COMMENTS <small>(if necessary)</small>	INITIALS
1/2/13	fruit	vegetables	grain	feeding device	other	All but 12347	apples and bananas	RJJ
1/3/13	fruit	vegetables	grain	feeding device	other	All in 23.01	Puzzle feeders	RAJ
1/5/13	fruit	vegetables	grain	feeding device	other	All but 12345, 12346	Mixed veggies	STS
	fruit	vegetables	grain	feeding device	other			
	fruit	vegetables	grain	feeding device	other			
	fruit	vegetables	grain	feeding device	other			
	fruit	vegetables	grain	feeding device	other			
	fruit	vegetables	grain	feeding device	other			
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