

NTI DAY #10

(weather-closed school day)

PACKET

TEN

(Science)

General Directions:

Due to weather, Harrison County Schools are closed. In an effort to utilize this day on the school calendar, your child is assigned and should work on this “packet” of school work today. It will count as a grade for this subject. The work attached is specific to the subject listed above. Please contact your child’s teacher of this subject at 234-7123 in the event you/your student have questions on this packet. Staff and teachers reported to HCMS today and are available should you have questions.

While this is DUE two (2) weeks after our return to school, we **strongly encourage** students to turn it in to their teacher **as soon as it’s complete** (soon after the NTI day) to avoid it being lost, eaten by the family pet, burned to keep warm, etc ☺

6th Grade Science Students,

The following packet contains the work needed to qualify for NTI day 10.
Please complete **both** activities.

Activity 1: Read both articles completely and answer the questions on the worksheet that follows.

- Read: BYE BYE BAO BAO
- Read: ALIEN HUNTING TELESCOPE
- Extra: DOUBLE TROUBLE(**Not required.**)
- Complete: CHECK FOR UNDERSTANDING

Activity 2: Got Energy Food Web Activity

- For step two you **may** write the names of the animals on a sheet of paper instead of cutting them out.
- You **ONLY have to choose** and complete three of the five food webs.
- Label each organism in the food webs.
- Answer the 6 analysis questions.

Name _____ Date _____ Period _____

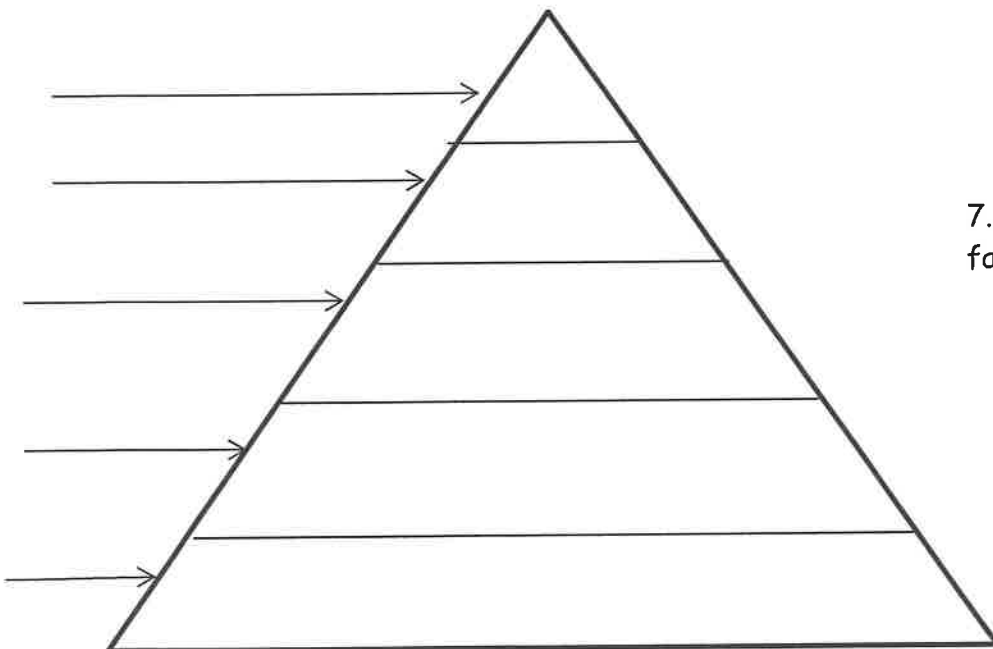
Got Energy? Food Web Activity

1. Obtain a Food Web Sheet from your teacher.
2. Cut- out each organism and create a food web with the organisms present in your ecosystem. Make sure to draw arrows to show the movement of energy.
3. Label each organism as a producer, herbivore, omnivore, carnivore, or decomposer.
4. When you are done, complete the analysis questions below.

Analysis

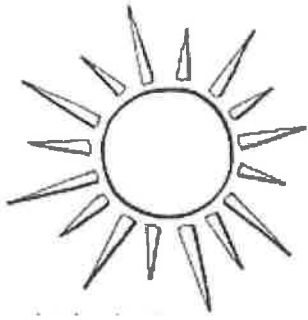
1. In which biome is this food web most likely to be found?
2. List some of the biotic and abiotic factors that exist in your ecosystem?
Biotic:

Abiotic:
3. What is the ultimate energy for your food web?
4. Identify one example of a food chain within your food web with at least 4 organisms and write it below.
5. The 1st organism in a food chain must always be what type of organism?
6. Place the names of your organisms into this energy pyramid. On the arrows, label producer, primary consumer, secondary consumer, and tertiary consumer, Quaternary consumer (if any) AND label the Trophic Levels (T1, T2, etc.)

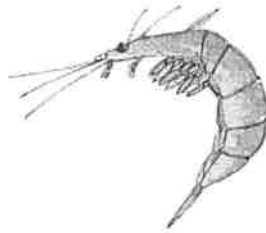


7. Predict how a change in an abiotic factor such as sunlight would affect your ecosystem?

Marine Ecosystem Food Web



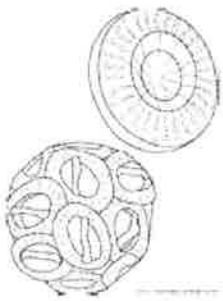
Sunlight



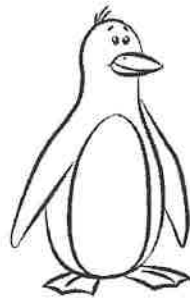
Krill



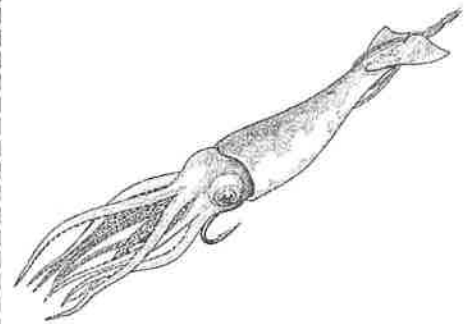
Seal



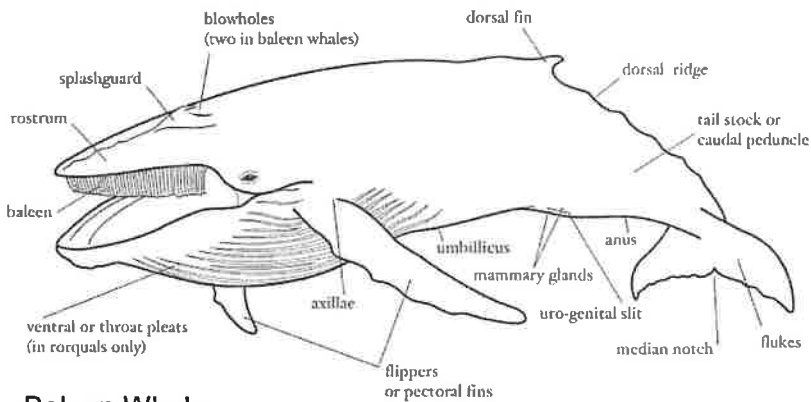
Phytoplankton



Penguin



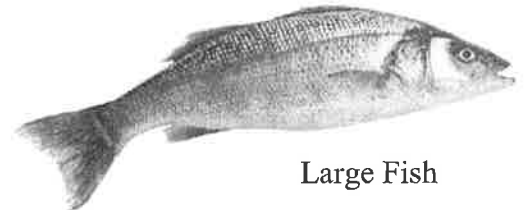
Small Squid



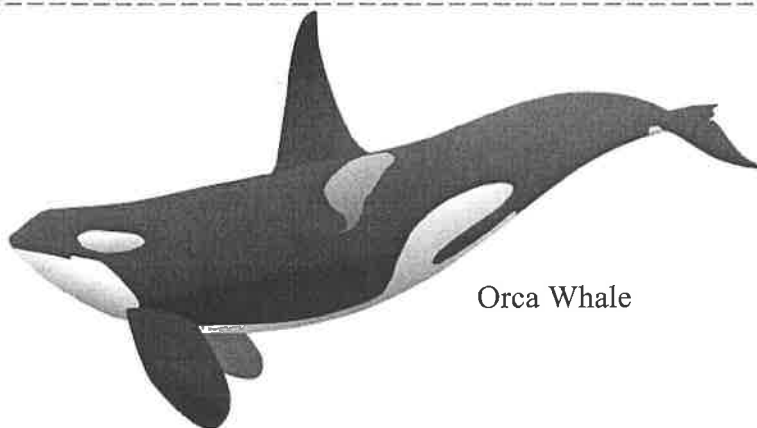
Baleen Whale



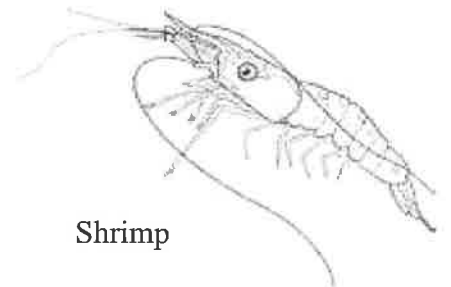
Small Fish



Large Fish



Orca Whale



Shrimp

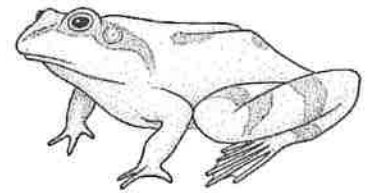
Grassland Food Web



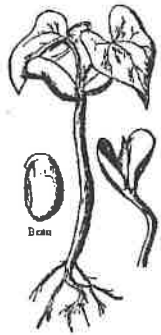
Grass



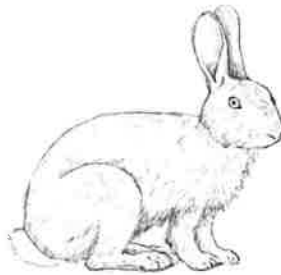
Dragonfly



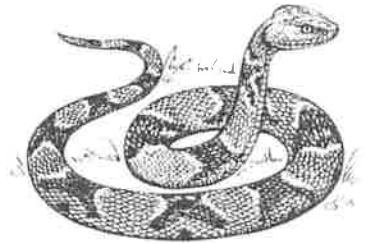
Frog



Bean Plant



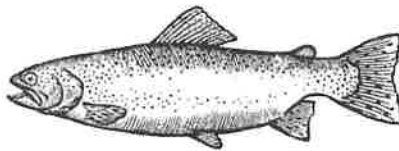
Rabbit



Snake



Hawk



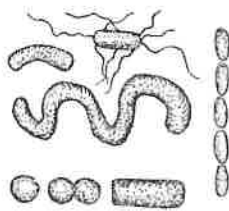
Trout



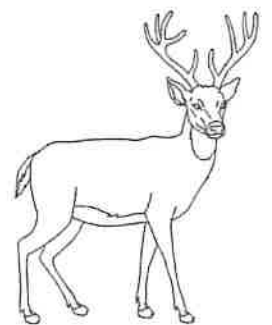
Human



Fox



Bacteria

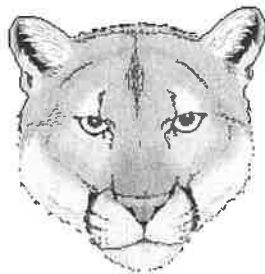


Deer

Deciduous Forest Ecosystem Food Web



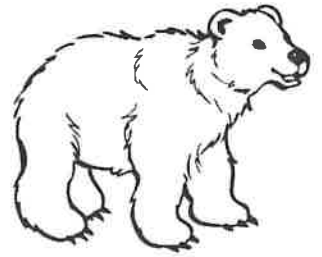
Owls



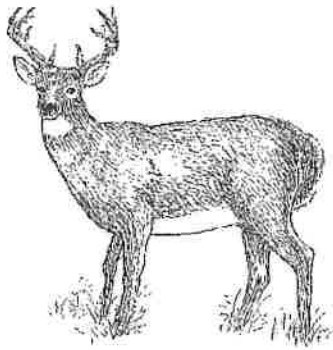
Cougar



Fox



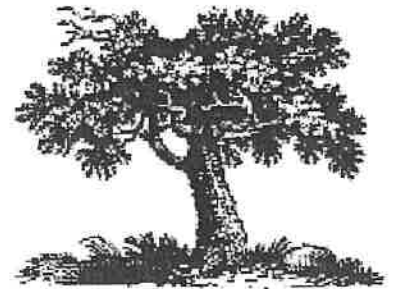
Bear



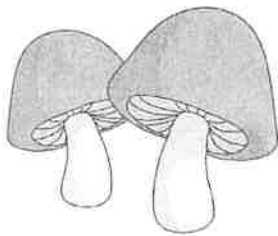
Deer



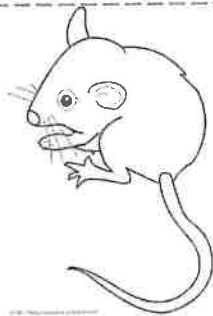
Skunk



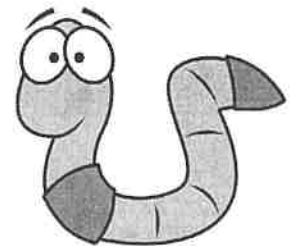
Deciduous Trees



Fungi



Small Rodents



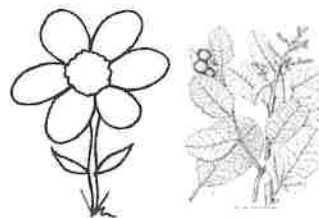
Nematodes



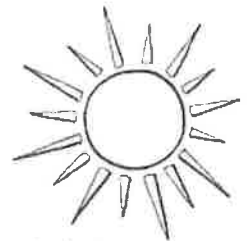
Birds



Insects



Flowers/ Berry Bushes

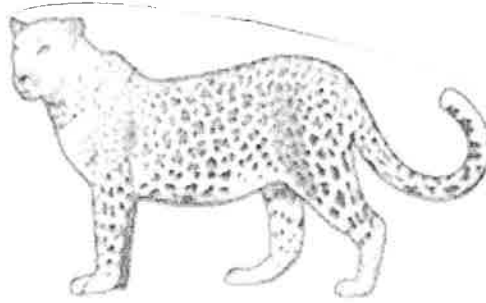


Sunlight

Savanna Ecosystem Food Web



Baboon



Leopard



Hawk



Snake



Tick Bird



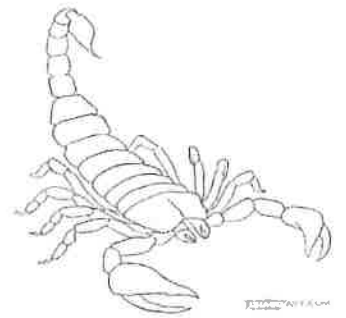
Tick



Grass



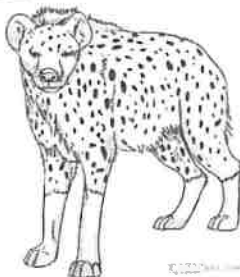
Impala



Scorpion



Seed-eating Bird



Hyena



Locust

Shrubland Food Web



Raptor



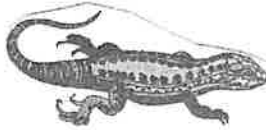
Sagebrush



Badger



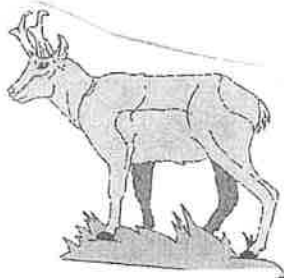
Coyote



Small reptiles



Mountain Lion



Pronghorn



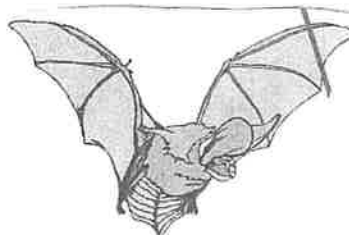
Desert Wildflower



Snakes



Squirrel



Bat



Insects




BYE-BYE,

FIRST HOME
Bao Bao spent the first three-and-a-half years of her life at the National Zoo in Washington, D.C.

BAO BAO!

*A panda that grew up in the U.S.
heads to a new home in China*

14 MARCH 6, 2017

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ESSENTIAL QUESTION: How might animal-breeding programs in zoos help increase the chances of an endangered species surviving in the wild?

For the past three-and-a-half years, an adorable giant panda cub has captured the hearts of visitors to the National Zoo in Washington, D.C. The panda, named Bao Bao (pronounced bow-bow), also has fans around the world. Thanks to the zoo's panda cams, people have been able to watch nearly every moment of Bao Bao's life by going online. But the panda's followers will soon bid her farewell. This winter, Bao Bao will board a special FedEx cargo plane bound for China—pandas' native home.

Bao Bao was born at the National Zoo on August 23, 2013. Her parents, pandas Mei Xiang (may-SHONG) and Tian Tian (t-YEN t-YEN), are on loan to the zoo as part of a breeding agreement between the U.S. and China. The zoo pays an annual \$500,000 fee to support panda conservation efforts in China. In exchange, it can exhibit Mei Xiang, Tian Tian, and any cubs they have to millions of zoo visitors and web viewers. According to the agreement, all panda cubs born in the U.S. must be moved to China by the time they turn 4 years old.

For the past 26 years, pandas have been considered endangered. The breeding program aims to boost the panda population. It seems to be paying off. Last year, pandas' status was changed to *vulnerable*—still threatened with extinction, but to a lesser degree.

"People love pandas," says Laurie Thompson, the National Zoo's assistant curator of pandas. "If we didn't have them here, people might not get as interested in saving them—most people don't have the chance to go to China to see them in the wild."

GOING HOME

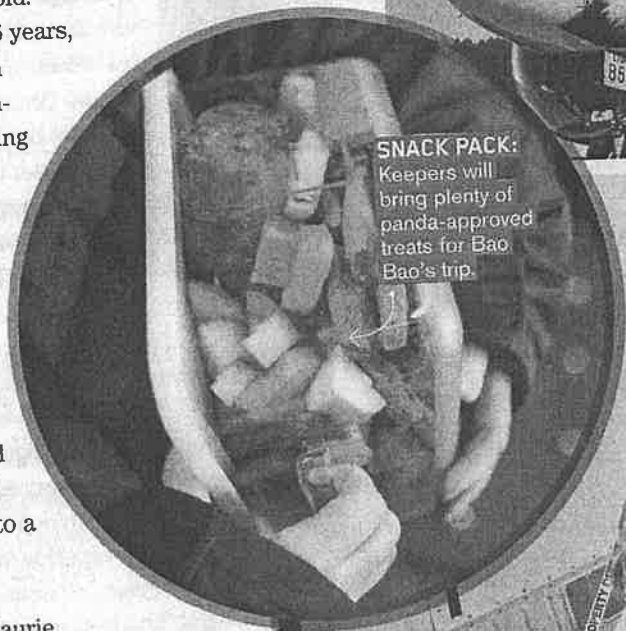
Keepers prepared the 82 kilogram (180 pound) Bao Bao for her journey by letting her get used to the crate they'd be using to transport her. It's the same type of large carrier that was used to move her older brother Tai Shan (ty-shon). He was relocated to China in 2010.

A panda keeper and a veterinarian will accompany Bao Bao on the 14-hour trip. They'll pack plenty of snacks, including 25 kilograms (55 pounds) of bamboo—pandas' preferred food—and 0.9 kg (2 lb) of fruit. Bao Bao will also have two bags of high-fiber biscuits, two sweet potatoes, and 38 liters (10 gallons) of water.

When Bao Bao arrives in China, she'll be transported to one of the bases run by the China

Continued on the next page →

EXPRESS DELIVERY: A special FedEx plane like this one will fly Bao Bao from the U.S. to China.



SNACK PACK: Keepers will bring plenty of panda-approved treats for Bao Bao's trip.

PRECIOUS CARGO: Bao Bao will ride in a travel carrier, like her brother Tai Shan did in 2010.



Conservation and Research Center for the Giant Panda. There, she'll eventually enter the center's panda-breeding program. If all goes as hoped, Bao Bao will begin raising cubs of her own by the time she turns 6.

BOUNCING BACK

Giant pandas are bears native to the mountainous regions of south-central China. The animals have large black patches around their eyes and over their ears. The markings make them easily distinguishable from the other seven members of the bear family, which includes black

bears, brown bears, and polar bears. Pandas are considered *carnivores*. But they actually prefer plants to meat. One plant in particular, bamboo, accounts for more than 90 percent of their diet. The animals typically spend more than 12 hours a day munching on bamboo's woody stalks.

Giant pandas once lived throughout China and some countries to the south (see *Shrinking Panda Habitat*, p. 17). Now the animals live in only a few remote mountain ranges in central China. For decades, people have farmed, built roads, and logged in China's lowland forests where bamboo grows. Since pandas rely so heavily on bamboo, destruction of their limited habitat has caused a steep drop in their numbers.

In 1988, scientists estimated that only 1,114 pandas survived in the wild. In recent years, panda populations have started to recover.

A survey in September counted roughly 1,800 animals in the wild. Zoos are home to about 375 additional captive pandas.


GETTING HELP

Pandas' ongoing recovery is largely due to the Chinese government's protection of the animals' habitat. The government established 67 nature preserves—27 of which were created in the past decade. "That's a lot of protection on the ground," says Binbin Li, a panda expert based at Duke University, in North Carolina. "However, 18 of the populations [some of them protected within preserves] have fewer than 10 individuals with extremely high risk of local extinction." Conservationists in China are also breeding the bears in captivity. The success of this breeding program relies on *genetic diversity*.

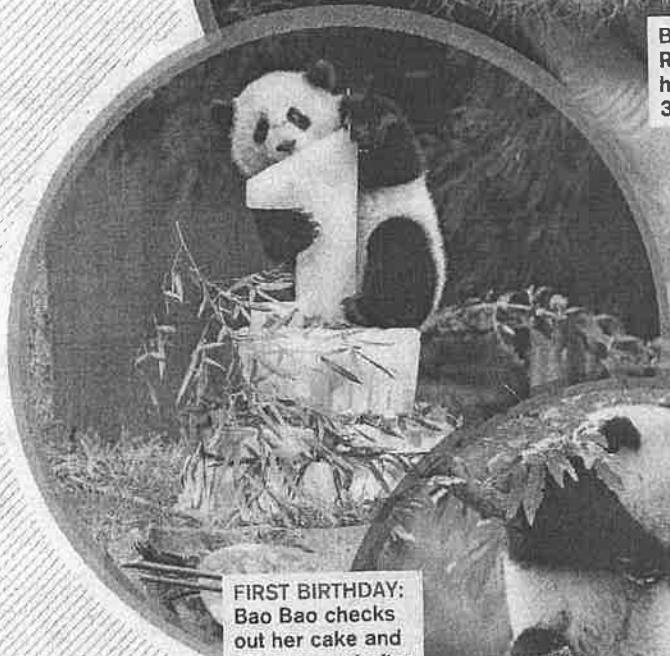
This term describes variation within a population's *genes*, or units of hereditary material. The best chance for Bao Bao to help her species is to breed successfully with unrelated pandas in China. That will help widen pandas' gene pool. If the program is successful, Bao Bao's cubs and grandcubs could one day be released into the wild.



GROWING UP: Bao Bao started out as a tiny newborn but quickly grew.



BABY BAO BAO: Ready to take her first steps at 3 months old.



FIRST BIRTHDAY: Bao Bao checks out her cake and plays around after turning 1 year old.



BABY BOOM: Breeding centers in China raise panda cubs in captivity to boost the panda population.

CUB CAREGIVERS: Center workers keep young cubs warm, fed, and healthy.

A FRESH START

Bao Bao probably won't be lonely when she starts her new life in China. That's because pandas are known as a solitary species. In the wild, panda cubs leave their moms by the time they are 2 to 3 years old. And they never interact with their dads.

Zookeepers gradually separated Bao Bao from her mom in March 2015, which allowed Mei Xiang to start preparing to have another cub. The newest roly-poly star of the zoo's panda exhibit was born five months later. The male cub is named Bei Bei (bay-bay). One day, he will follow his sister's journey to China.

"We know from the time they're born that all the cubs will get sent to China," says Thompson, one of Bao Bao's keepers. "We try not to get too attached—it's kind of hard because obviously they're very cute. For us, it's like sending your kid off to college. She's learned all the skills you can teach, and now it's time for her to go and do what she's meant to do—and that's make more pandas." ❀

—Rene Ebersole

SHRINKING PANDA HABITAT

Pandas were once widely found in China. They're now in just a few small areas.

- KEY**
- Historical habitat of giant panda
 - Current habitat of giant panda



CORE QUESTION

Discuss two steps the Chinese government has taken to save giant pandas.

VOG VIA GETTY IMAGES (ALL PHOTOS); JIM MURPHY/IN © MATHWORKS (M007)

ALIEN-HUNTING TELESCOPE

The world's largest radio telescope will study strange stars and search for alien life

TIME TO
BUILD:
5
YEARS

RECEIVER:
collects signals
reflected by dish

INSTALLATION:
required 4,450
triangular
aluminum panels



Construction of the world's largest radio telescope. The dish is made of 4,450 triangular aluminum panels. The receiver is located at the center of the dish. The telescope is located in the state of Yunnan, China.

ESSENTIAL QUESTION:

How do telescopes help astronomers study space?

MOUNTAINS:
help block interference

AREA:
30 FOOTBALL FIELDS

DIAMETER:
1/2 of a mile

COST TO BUILD:
\$180 MILLION

Do aliens exist? If they're out there, a new telescope in China may be our best bet for finding them. Completed this past September, the Five-hundred-meter Aperture Spherical Telescope (FAST) is the world's largest *radio telescope*.

FAST detects *radio waves*, the same form of electromagnetic radiation used to broadcast music to your car stereo. Many objects in space—such as stars, galaxies, and clouds of gas and dust—emit radio waves. The telescope's dish acts like a huge antenna to pick up these signals. It covers an area about the size of 30 football fields. That's more than two-and-a-half times the size of the previous largest radio telescope (see *Record-Breaking Telescopes*, p. 22).

The enormous size of China's new telescope will help astronomers from around the world—including the U.S.—study fainter and more distant objects than ever before. They plan to use FAST to learn about unusual stars, study molecules in space, and hunt for signs of extraterrestrial life.

LISTENING IN

Radio waves allow astronomers to learn a lot about the universe. This form of energy can pass through barriers that visible light can't. "On a foggy day, you may not be able to see very far in front of you," says Joseph Lazio, an astronomer at NASA's Jet Propulsion Laboratory in California. "But your car's radio can receive signals broadcast from miles away."

In space, clouds of dust block visible light but not radio waves. "Using visible light, we can't even see halfway to the edge of our own galaxy, the Milky Way," says Lazio. "But we can pick up radio waves from all the way across it."

Radio waves are also one of the most promising ways to search for extraterrestrial life. The only example scientists have of highly intelligent life is right here on Earth: humans. Our technology—from television to cell phones—produces a lot of radio waves. Looking for radio waves elsewhere in the universe could help scientists find alien civilizations.

BUILDING A BEHEMOTH

When picking a spot for a radio telescope, a key goal is "getting as far away from people as possible," says Lazio. Signals from objects in space can be weak. That's one reason FAST is so big—so it can collect more radio waves from faraway sources. But things like cell phones, microwaves, and radio towers on Earth can cause *interference*. These devices give off their own radio waves. That background noise can make faint radio signals from space hard to detect.

To minimize interference, the FAST team selected an area in the mountainous Guizhou province of China. The site is in a *karst* region. This landscape is dominated by limestone, which erodes easily to form large, shallow

Continued on the next page →

valleys—some of which are just the right size and shape for a giant telescope dish. Surrounding mountains provide protection from interference. More than 9,000 people living in villages nearby were relocated to minimize human activity that could cause interference.

Workers began the construction of FAST's massive dish in 2011. It consists of 4,450

RECORD-BREAKING TELESCOPES



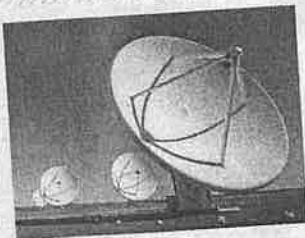
A GRAN TELESCOPIO CANARIAS CANARY ISLANDS

The world's largest telescope designed to gather visible light studies the formation of stars and galaxies.



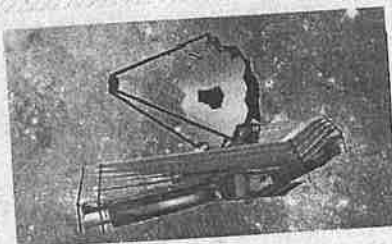
B FIVE-HUNDRED-METER APERTURE SPHERICAL TELESCOPE (FAST) CHINA

The new largest radio telescope will study stars and search for extraterrestrial life.



C SQUARE KILOMETER ARRAY AUSTRALIA AND SOUTH AFRICA

This array telescope, under construction, will combine data from thousands of dishes. An array is better than a single large dish at studying bright objects in detail but not as good at detecting faint objects.



D JAMES WEBB SPACE TELESCOPE

This new space telescope, scheduled for launch next year, will study objects farther away than those the Hubble Space Telescope can currently observe.

triangular aluminum panels. Radio waves from space hit these panels and reflect onto receivers hanging above the dish. Cables beneath the dish can be used to adjust its shape, allowing astronomers to focus the telescope on specific targets they want to observe.

FAST's engineers made the telescope's first scientific observation, often referred to as "first light," early last year. The dish wasn't finished yet, but the team focused it on a distant cloud of gas and dust called the Crab Nebula. They were able to pick up radio signals from a *pulsar*, a rotating star that shoots out a beam of radio waves, within the nebula.

"A pulsar is one of the most extreme objects in the universe," says Lazio. "It's like a lighthouse more massive than the sun that releases radio waves while spinning up to 700 times a second." Studying pulsars will be a big part of FAST's mission. Scientists hope to learn about unusual forms of matter that make up these stars and test ideas about the structure of the universe.

NEWS FROM E.T.?

One of the most exciting parts of FAST's work is the hunt for extraterrestrial life. Existing telescopes are already searching, but FAST's sensitive dish will add new capabilities.

Since nobody knows what a signal from an alien civilization might look like, astronomers will investigate any observation FAST makes that seems out of the ordinary. If researchers detect an unusual signal and can't find an explanation for it, they'll share the observation with other scientists for analysis.

No official global policy exists on what to do if a signal really does seem to be extraterrestrial. But many astronomers have agreed to informal guidelines on how to handle the situation. These involve informing the United Nations and other organizations. Then world leaders can decide whether to try to send a response to alien beings on behalf of humanity—and what that message should say.

Now that FAST's giant eye is watching, we may be closer than ever to finding signs of life beyond our home planet. ✨

—Jennifer Barone

CORE QUESTION

What are three potential sources of interference for a radio telescope, and why is it important to minimize interference?



TWO-FACED
 This shark's head has two eyes, a mouth, and a brain, like a typical shark.

STUCK TOGETHER
 The conjoined sharks shared a single tail.

DOUBLE TROUBLE

A few years ago, a fisherman working in the Indian Ocean off the west coast of Australia reeled in an unusual catch—a tiny two-headed shark! The man found the *pup*, or baby shark, inside a pregnant blue shark.

Scientists believe the strange shark likely started out as an *embryo*—an organism in the earliest stages of development—that split in two. This occurrence normally leads to identical twins. But in this case, the embryo didn't completely separate. The two sharks' bodies remained *conjoined*, or attached. Unfortunately for the shark, two heads are not better than one. According to scientists, it would never have been able to swim properly, making it an easy target for predators.

Only about half a dozen two-headed sharks have ever been reported, and most have been blue sharks, says Valentín Sans-Coma, a biologist at the University of Málaga in Spain. "However, there is no reason to think that any species of shark is more prone to produce conjoined twins than any other," he adds.

In fact, Sans-Coma recently discovered a conjoined sawtail catshark in his own lab. Not all shark pups grow inside their mom's womb. Species like sawtail catsharks reproduce by laying eggs. Sans-Coma was raising these animals to study, when he spotted a strange two-headed embryo growing in its translucent egg.

It was the first time this phenomenon had been seen in an egg-laying shark species. How rare is it? Sans-Coma says that there was only one double-headed fish out of nearly 800 embryos he examined.

—Shira Polan

NAME: _____

BYE-BYE, BAO BAO! PAGE 14

DIRECTIONS: Choose words or phrases from the box below to correctly fill in the blanks in the following sentences. Each word or phrase should be used only once.

bamboo	destruction	India	solitary
carnivores	diversity	loan	unrelated
China	endangered	preserves	vulnerable
herbivores	extinct	roots	Washington, D.C.

- The native home of pandas is _____.
- Pandas at the National Zoo are on _____ from China as part of a breeding agreement.
- An animal that is _____ is at a lesser risk of extinction than an animal that is _____.
- More than 90 percent of a panda's diet is made up of _____.
- Giant pandas are considered _____ even though they eat mostly plants.
- Habitat _____ caused the number of wild pandas to drop in past decades.
- In the last 10 years, China has established 27 _____ to help protect pandas.
- Genetic _____ refers to the variation of genes in a group's population.
- To widen pandas' gene pool, scientists will breed Bao Bao with _____ pandas in China.
- Pandas are _____ animals that typically live on their own in the wild.

ALIEN-HUNTING TELESCOPE PAGE 20

DIRECTIONS: Read each statement and decide whether it is true (T) or false (F). Write your response in the space provided.

- _____ 1. Radio waves are a form of electromagnetic radiation that can pass through matter.
- _____ 2. Only human-made technology emits radio waves.
- _____ 3. Radio telescopes are built in remote regions in order to reduce radiation exposure for humans.
- _____ 4. All telescopes designed to study space objects are radio telescopes.
- _____ 5. Scientists will investigate unusual signals picked up by FAST to determine if they may have been caused by extraterrestrial life.

ANSWERS ON TB

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