

Nighttime Rocks!



Learn and have fun with this nighttime activity book for both kids and their parents.

By the International Dark-Sky Association, Tucson AZ, USA, www.darksky.org

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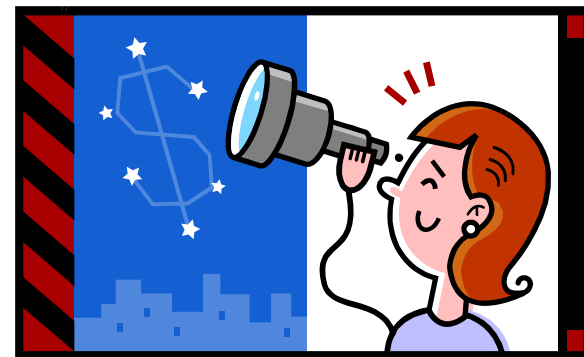
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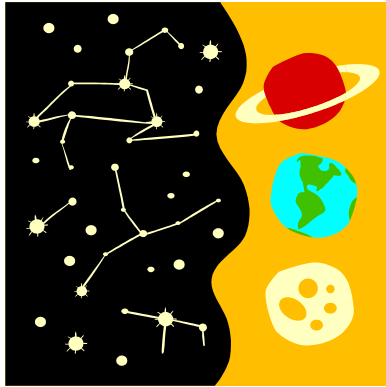
Wall poster—page 35

Working on a light pollution project? Read how to apply for the George and Edythe Taylor Student Award. Winners in their age category receive \$100 prizes—pages 36 & 37.

Help keep the skies natural and support IDA. Membership form also available online at www.darksky.org—page 38



Help Us Protect the Natural Night



The International Dark-Sky Association (IDA) welcomes you to the natural night time world of nocturnal animals, stars, and artificial light. The activities that follow are designed to help families learn about the world of the natural night. Why is it important and what happens when we humans disrupt this world.

What is affected by the light and how do we solve this problem.

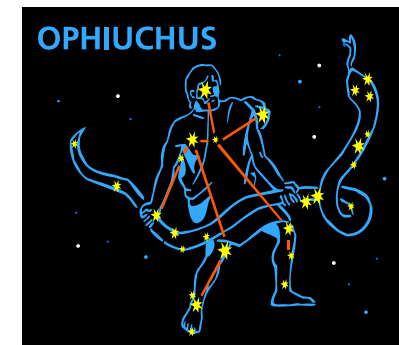
The United Nations estimates that in 2010 the earth became 51% urban, and 49% rural for the first time in history. This means more development and more encroachment into the rural world than ever before. Why is this significant? It is estimated that 2/3 of the world's population has never seen a truly natural night sky. They have never seen the wonders of the Milky Way circling the earth. Why? Too much artificial light in urban areas has obscured our view of the stars. The only celestial bodies most urban dwellers have probably seen are the moon, the sun, and a scattering of the brightest stars. They don't even realize what they are missing, and that's a shame.

As you venture into the great outdoors, please understand that the night is a big part of your nature experience. Reducing outdoor artificial light at night can increase the enjoyment of your total experience in the wilds. And it's easy to do.

Turn off outdoor lighting when you aren't using it. Only light for the task at hand. Can you see the lock on your back door just as easily with a 100 watt bulb, as you can with a 250 watt bulb? That might be a great activity for you and your family to work on when you get home.

We at IDA want you to be safe and happy when you're outdoors. We also want the plants and animals to be happy as well. Does that sound as if it's impossible to achieve? Actually, it's easier than you think. Make sure all outdoor lighting is fully shielded and allows no light above the bottom of the light fixture. This will save you money as well because you are now concentrating your light where you need it, and you can probably use a lesser wattage bulb, and produce a better lit area. Use timers, dimmers, and motion sensors to turn the lights on and off when you are not around. Motion sensors are particularly good at keeping you safe, because they only come on when you need an alert that someone is walking nearby. And you save money because the lights are off when they aren't needed.

We hope you have as much fun doing these activities as we have had in bringing them to you. Happy Night Skies!



Nocturnal Animals

Nocturnal is defined as belonging to or being active during the night. Nocturnal animals are defined by being active during the night and resting during the day. Diurnal animals are active in the daytime and rest at night and crepuscular animals are active during periods of twilight, such as dusk and dawn.

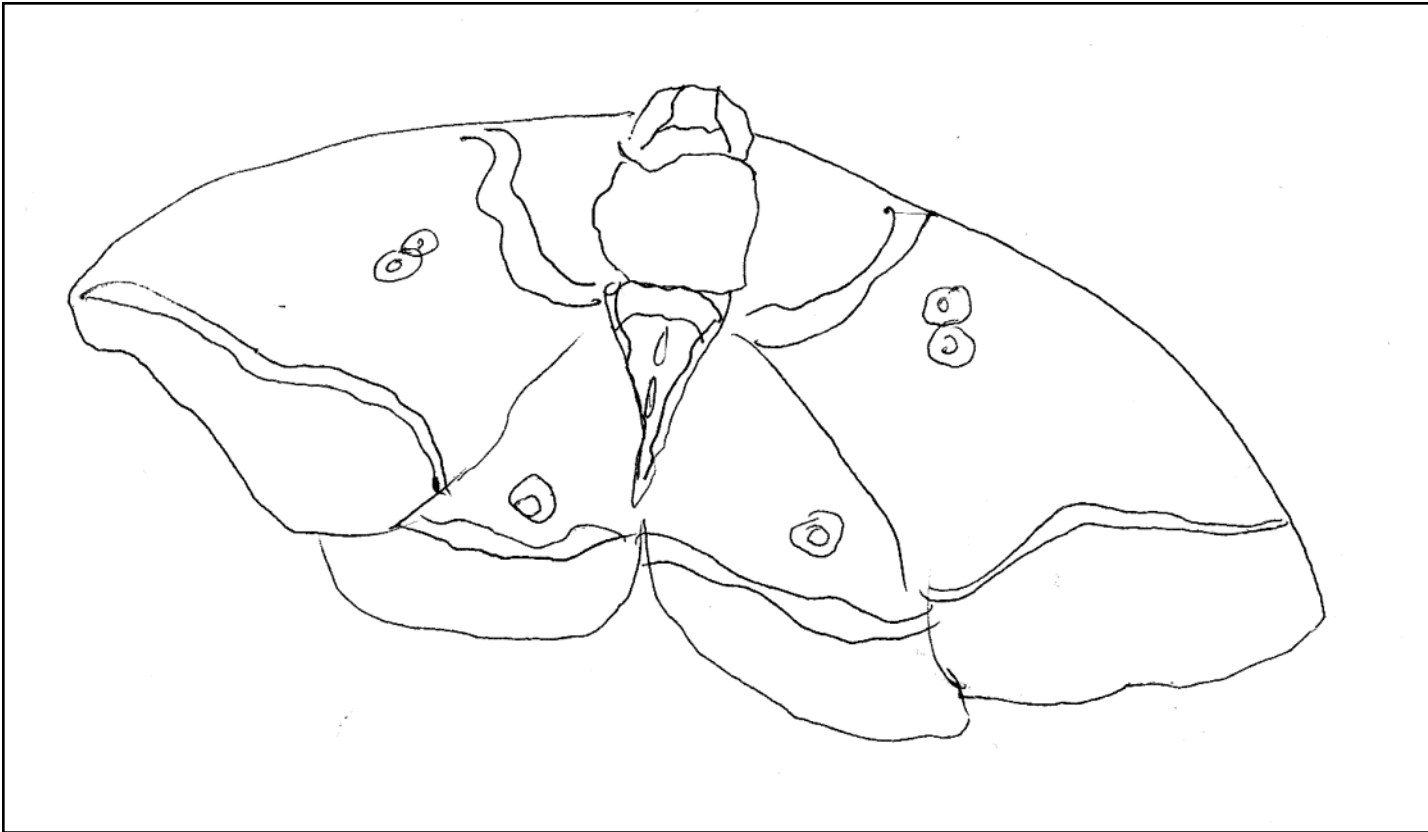
Nocturnal animals have carved out a special niche in the animal world. Either to avoid predation, or ecological factors such as extremely hot days, they have adapted to life at night.

We are going to look at some nocturnal animals and discuss how too much artificial light at night can disturb their night time habits of hunting and foraging, mating, and migration.

Activity: Identify nocturnal animals native to your home town and discuss ways that you may be able to help them.

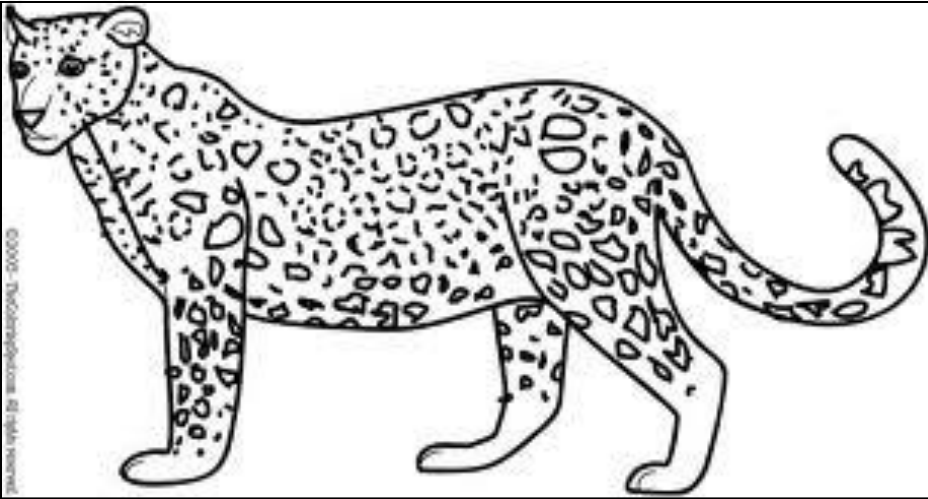


This is a Koala bear. Go ahead and color him while your parents or a friend reads to you more about how they live. Koala Bears are not really bears. They are marsupials, like the opossum. They live in Australia. A Koala spends 75% of its day sleeping usually in a tree. They become more active at sunset and they tend to live longer when they are left in their natural habitat. So how does light pollution affect them? If there is too much man made light near where they are sleeping how do they know when it's sunset? If their activity time is shortened, that means they have less time to feed and mate. How to help them? Keep the lights off around Koala habitats.



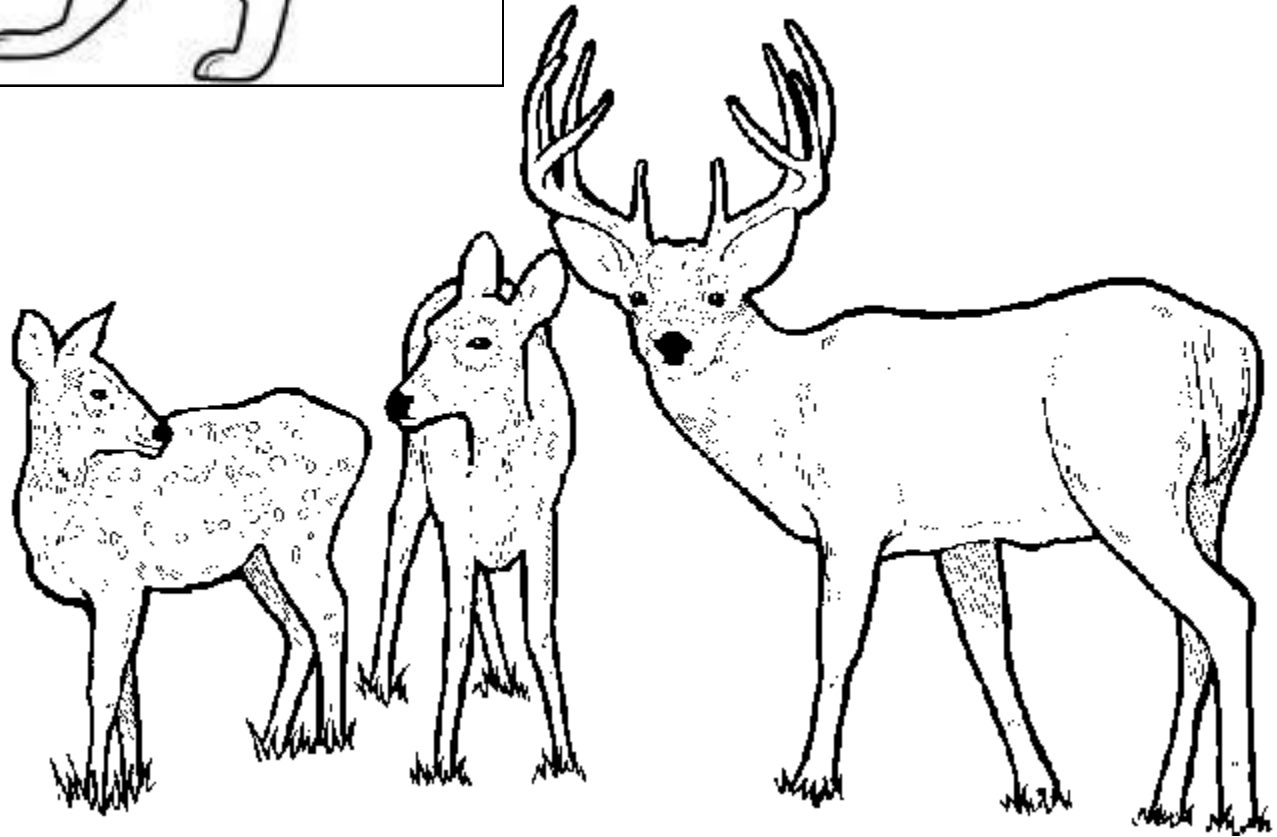
Color me while we learn a bit more about life at night.

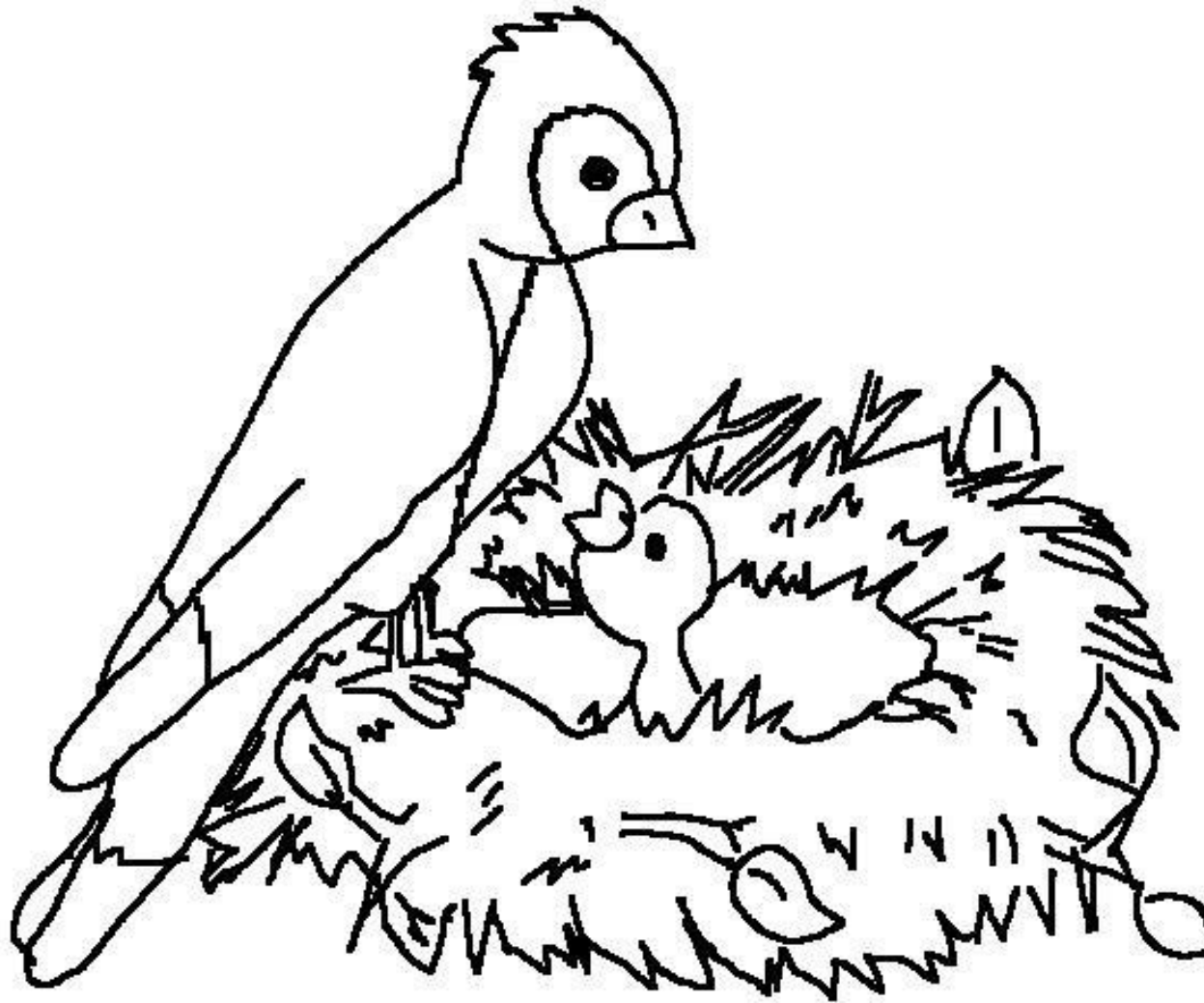
Have you ever gone outside at night and seen moths flying around your porch light? Well, this happens because moths become fixated or “trapped” by the beam of light. This means they are not able to leave the light beam, they fly until they are exhausted and die. What does this mean in the animal kingdom? It means moths are not able to perform their night time pollination, and they don’t reproduce to make new moths. Those species that prey on moths for their food supply are also affected, because now they don’t have enough food.



Too much light at night makes mammals think there is a full moon all the time. They adjust their habits to wait for a dark night that never comes. If a mammal has adapted to seeing in the dark, they are at a disadvantage if that darkness never arrives? Why do you think that is?

Snow leopards and many species of deer are nocturnal creatures. This means they are most active during the night.



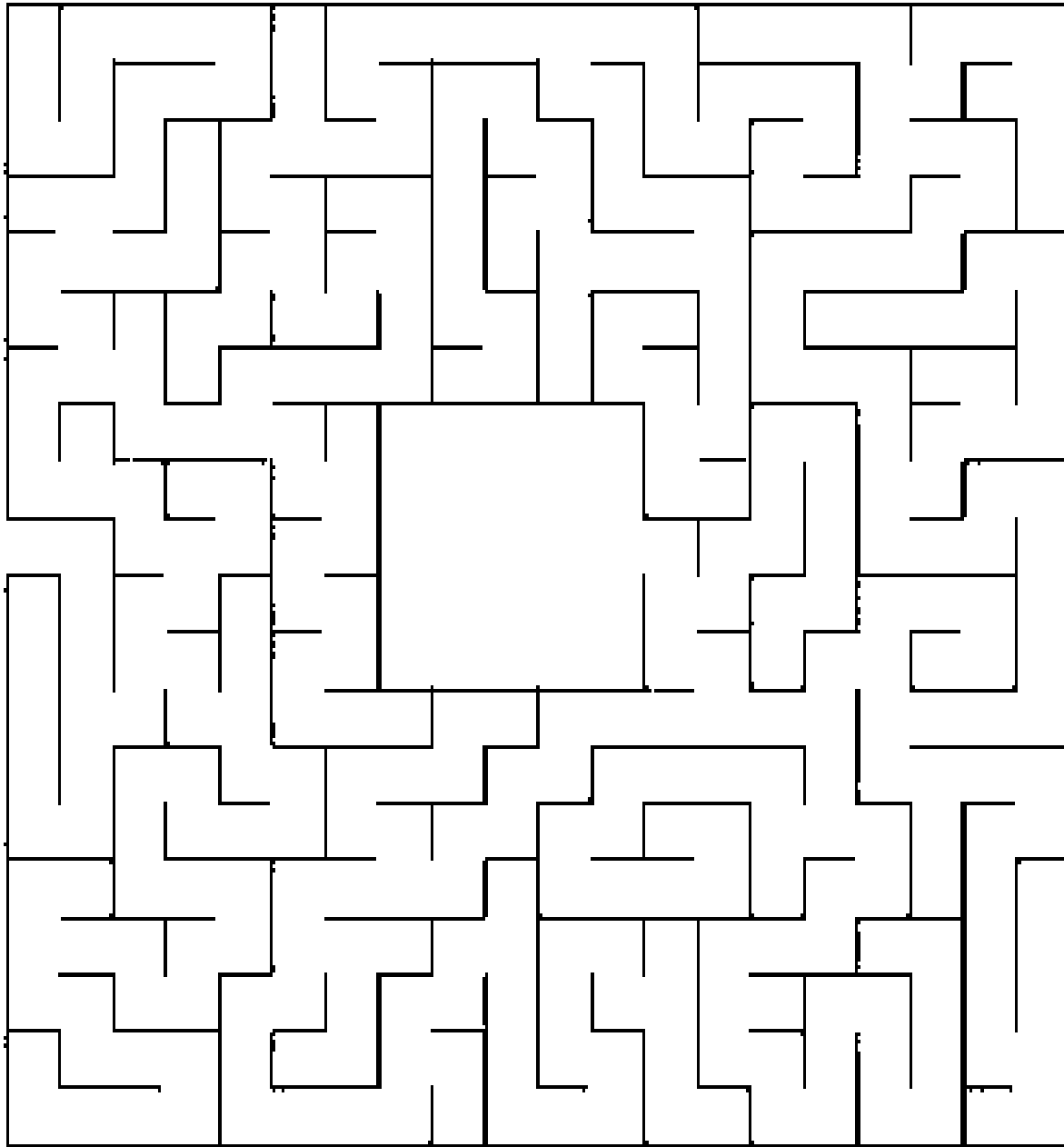


Birds have a very hard time with light pollution. They may fly into buildings because their navigation is confused by the overly bright lights. Sometimes they become trapped in search lights, just like the moths we learned about earlier and fly around until they die from exhaustion. Many species of song birds are threatened because their numbers are declining. What can humans do to reduce the number of birds that fly into buildings?

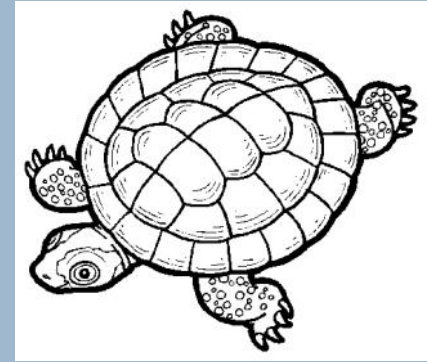


Light pollution reduces the suitable area of feeding habitat for owls and other night hunting birds. Owls are signaled to begin the hunt when the sun goes down. If humans have created a constant state of man made "twilight," the owls natural cues are disrupted, and they may not hunt for as long as they need to.





aMAZEing



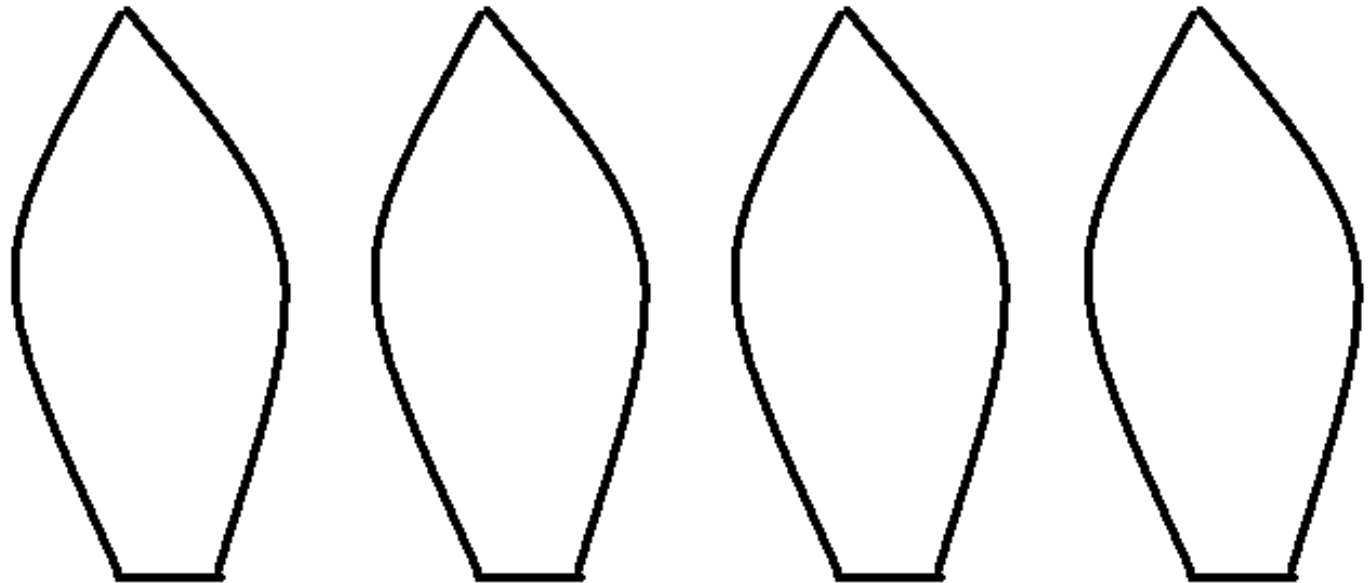
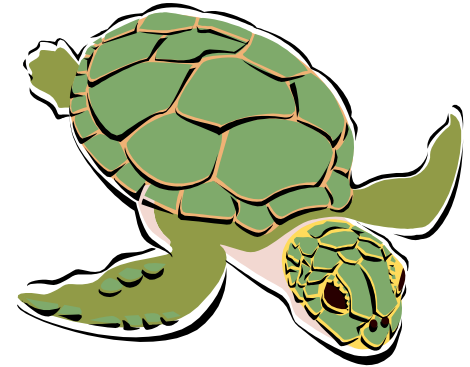
Many animals are affected by light pollution. Baby sea turtles, after hatching, often have difficulty finding their way to the ocean due to artificial lighting. They can wander into dangerous situations and are more easily preyed on.

Help this sea turtle find its way home!

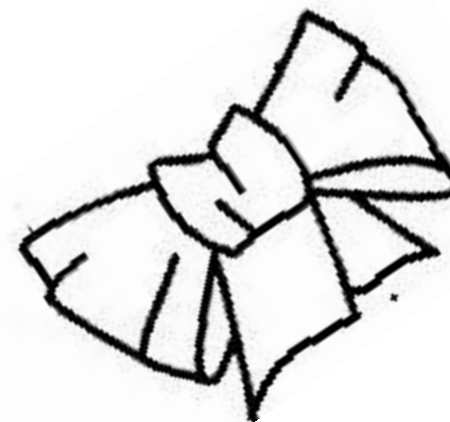
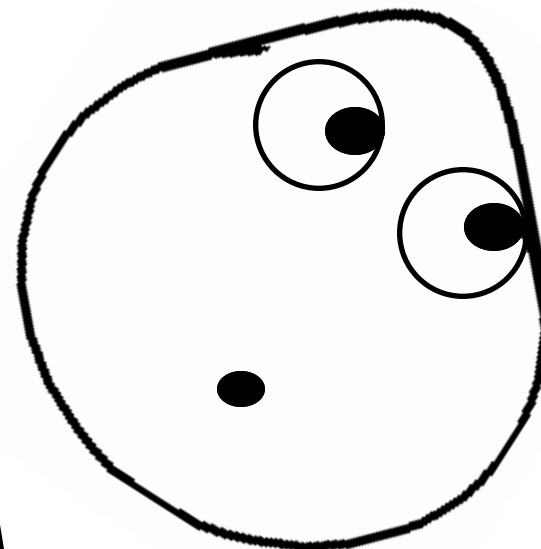
Turtle Art Project

Directions:

1. Print out a copy of pages two and three.
2. Color and cut out the shell, head, and one set of flippers for each student. The bow is optional.
3. Connect the flippers and head using brads, to create a colorful, moving baby turtle.



Baby sea turtles, after hatching, often can't find their way to the ocean due to artificial night lighting. They can wander towards the light which always, sadly leads to death. There are seven species of sea turtle, and all of them are threatened. Many communities are turning out the lights during hatching season and this is helping some of the sea turtle populations to come back.



Draw a Story

Draw a picture in each square and tell a story about an animal and light pollution. Draw what happens first, second, third, and fourth.



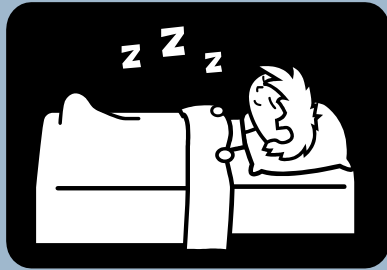
1

2

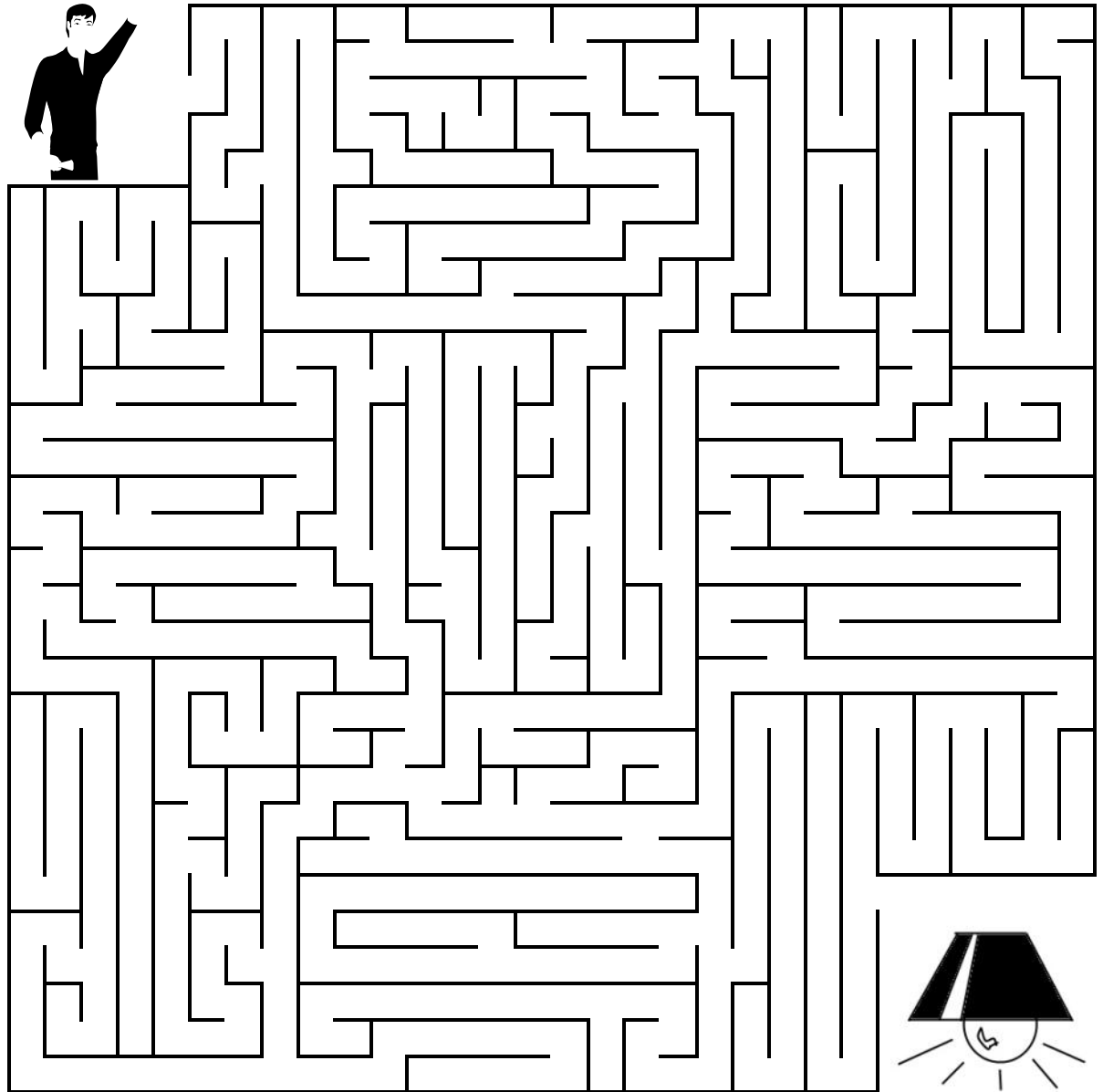
3

4

Sleep Tight



Help! There's too much light in Tommy's room for him to sleep. Help him find the lamp so he can turn it off and get a good nights sleep.





Word List:

Bat

Skunk

Light

Stars

Moth

Turtle

Owl

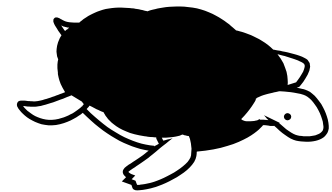
Frog



Animals of the Night

Word Search

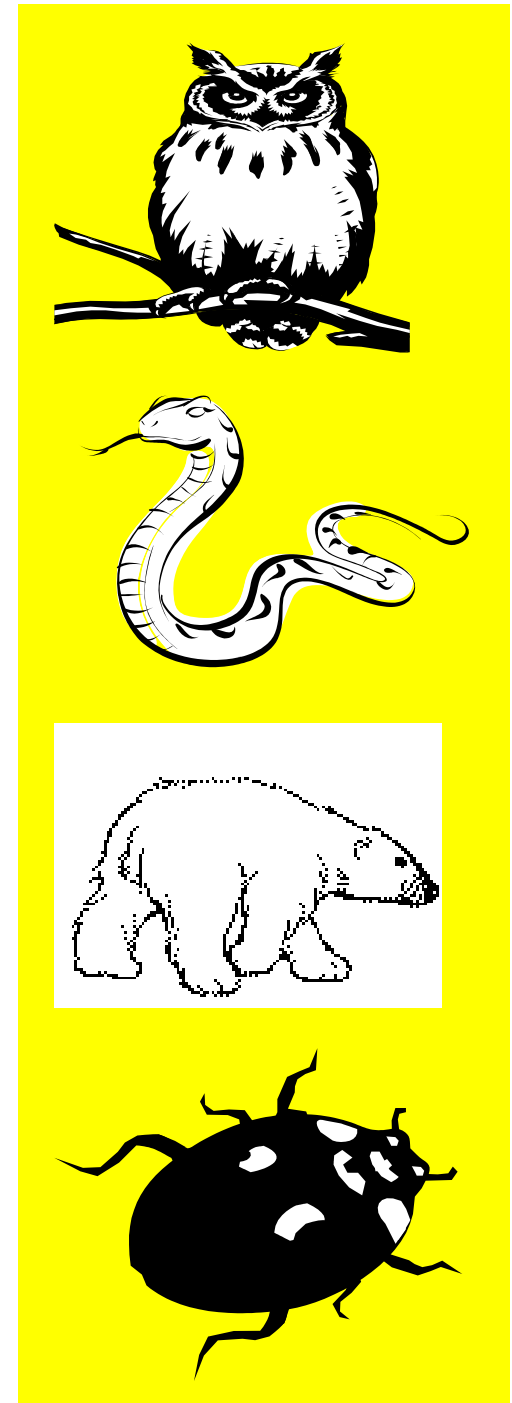
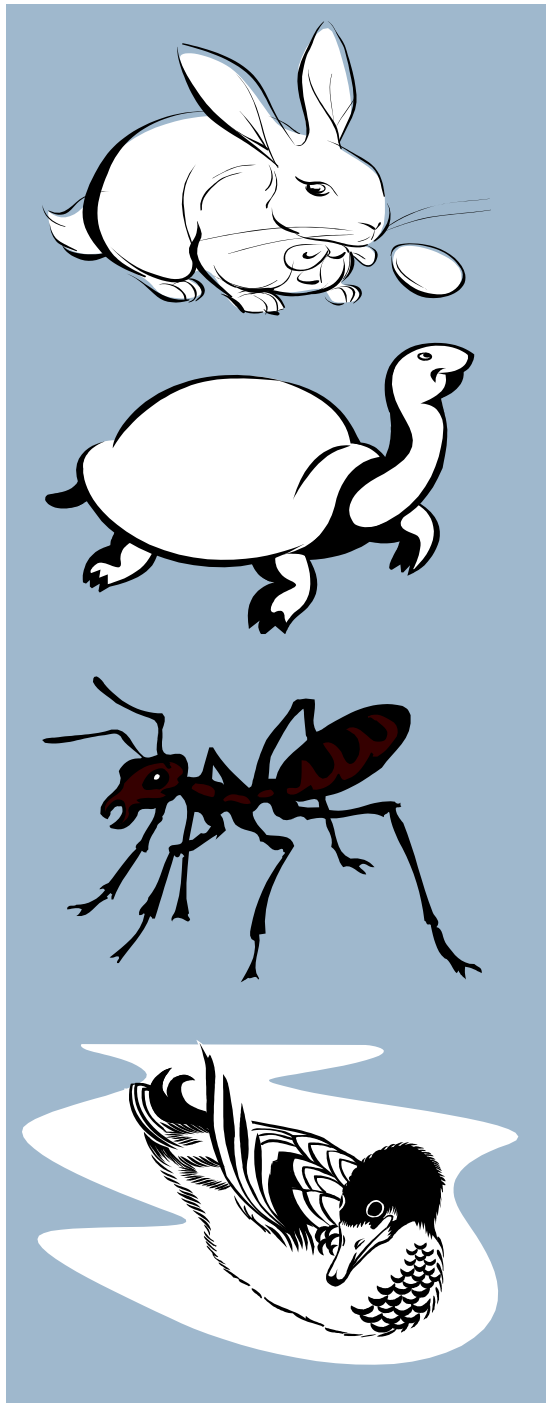
Find the missing words.

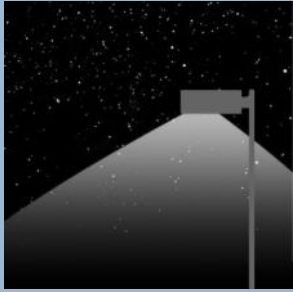


S	K	U	N	K	A	Z	G	R	T
M	S	R	L	T	F	R	O	G	A
N	M	D	M	B	D	T	J	H	S
P	H	B	O	W	L	W	Z	C	T
E	T	C	T	P	T	U	G	R	A
F	U	M	H	E	V	K	D	O	R
Z	R	Q	S	A	F	S	B	L	S
A	T	J	W	T	L	N	A	I	M
R	L	I	L	I	G	H	T	P	Q
U	E	D	E	X	E	N	Y	N	H

Matching Fun

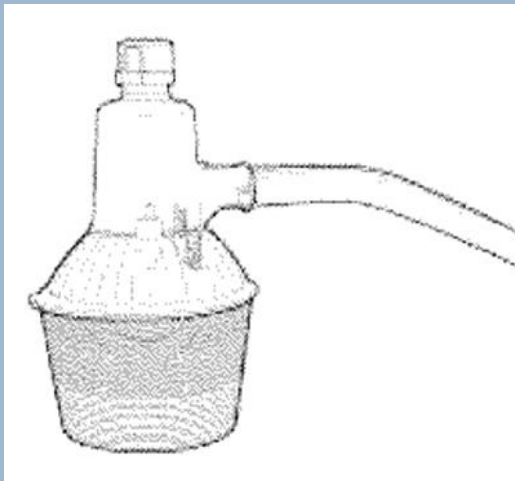
Color the animals and
then draw a line between
the two
reptiles, two birds, two
mammals, and two
insects.





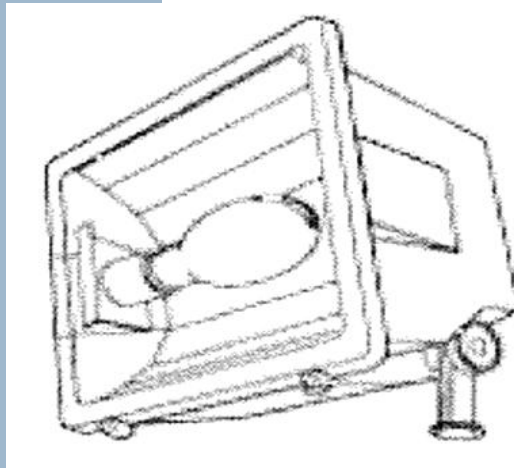
Good Light or Bad Light?

The best kind of lighting fixture is called fully-shielded. This means it cuts off any light from shining up into the sky. It does this by creating a solid barrier that only allows the light to shine onto the ground where it is needed. The picture to the right is a great example of a good lighting fixture! Look at figures A, B, and C below. Check “YES” if it is a good lighting fixture, or check “NO” if it is not.



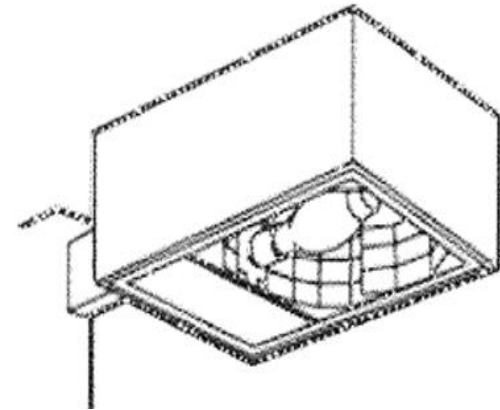
Yes

No



Yes

No



Yes

No

Hint: Good lighting protects our night environment from light pollution by using fixtures that shine light onto the ground because they are full cutoff or shielded fixtures.

Break the Code!

Let's have some fun. Use the code provided and decode the secret message below.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
p	q	R	S	T	U	V	W	V	Y	Z				
16	17	18	19	20	21	22	23	24	25	26				

1)

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13 1 18 19 9 19 11 14 15 23 14 1 19

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2)

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10 21 16 9 20 5 18 9 19 20 8 5

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3)

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3 15 13 5 20 19 1 18 5 15 6 20 5 14

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1 4 9 18 20 25 19 14 15 23 2 1 12 12 19

Across:

The _____ includes the sun, planets, comets, meteoroids, asteroids, and dwarf planets, which are all in proximity to the sun. (two words)

A collection of stars that orbit around a common center point.

An intense and blinding halo of light that causes you to squint.

This is the new classification of Pluto. (two words)

The second planet from the sun.

All _____ need both daylight and darkness for normal functioning.

The path that an object in space follows around another object.

The red planet.

Down:

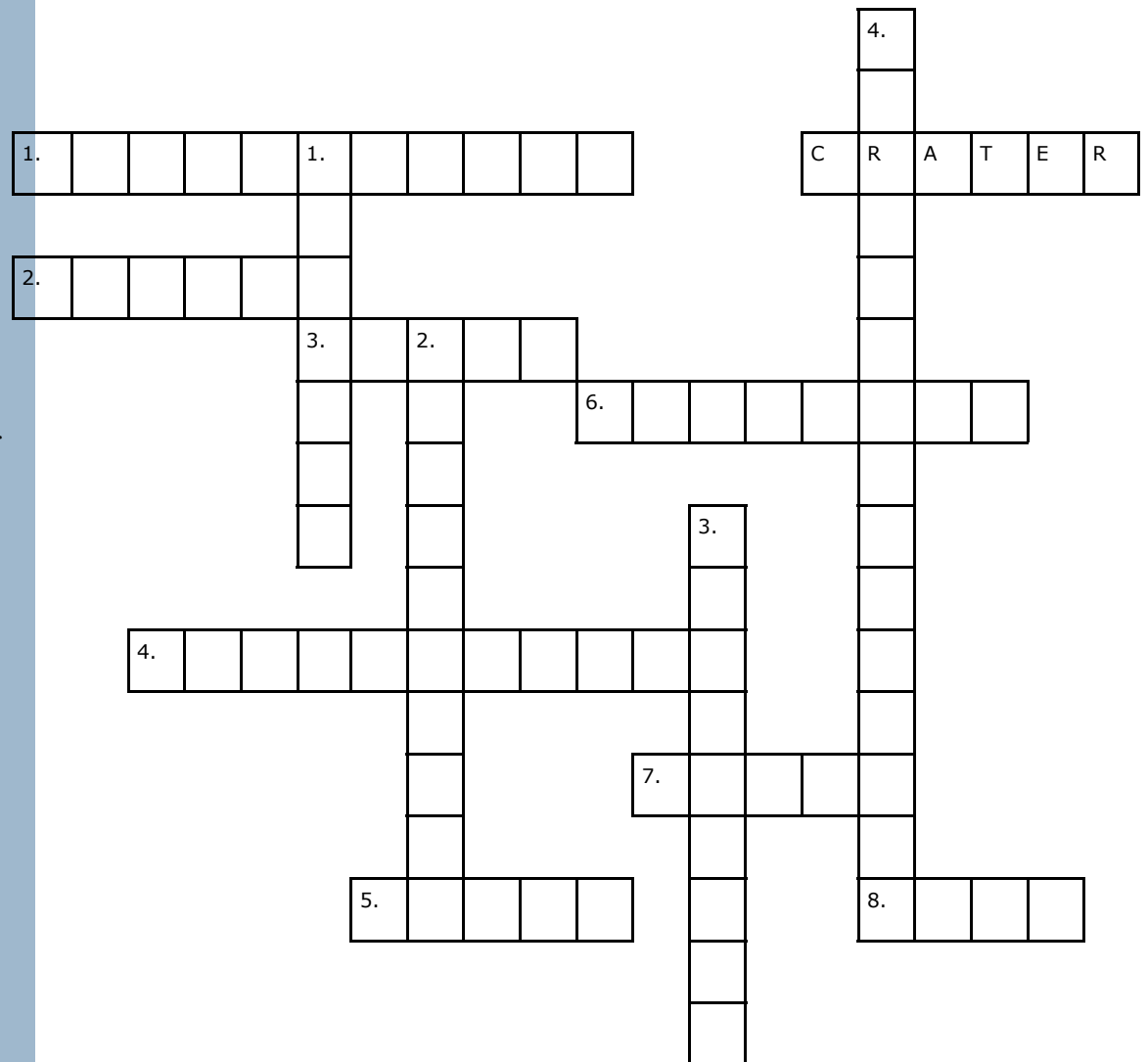
A brightening of the night sky by manmade outdoor lighting that blocks the view of the stars.

The gases surrounding an object in space, such as the air surrounding Earth.

A rock that orbits the sun in the solar system but is too small to be considered a planet.

The natural internal, 24 hour clock that human and other creatures have. (two words)

Crossword Puzzle



It might sound strange, but the energy you use to power things like lights and TVs usually comes from burning fuels such as coal and oil. This is making the Earth's climate heat up. The rise in temperature is causing the polar ice caps to melt and destroying the ice that polar bears hunt from. There are only around 22,000 polar bears left in the world, but this number could fall dramatically if the Arctic continues to warm at twice the rate as the rest of the world. The less energy you use, from turning off unnecessary lights, the less your climate will heat up and the more ice there will be for the polar bears!

Connect the Dots!



W G J K U A S M R E E N V I R O N M E N T W Q G
 E A R T H P K Y V X E O Z R S D H F D T E P M L
 I N S S P W Q Y T H N C L S N A B W U G V Z D A
 A T A T R R P L A N E T A R I U M F C I R S A R
 T I F H E W O A S G R U O I G N G T A O G E R E
 A L E G S D L I T T G R L E H B I U T S N E K S
 S F T I E O L O R T Y N H E T C O M I P Q S S N
 Y T Y L R H U I Q T I A W O S R K F O R C T K I
 N H T Y V H T E G E V L E N K I N G N S O A Y S
 O A I T A G I O T H O A T H I Z O P E F N R F O
 R P M I T Y O N I E T N Q U E E S B I R S S R T
 H P D C I Y N W H I E I C H S I X O P U T H I J
 J Y O G O D O V N T C M H S T R E P S R E I E G
 G N U N N G E R M I H A Y F U M P S E R L S N H
 N E I R S D H G I K N L B R I N K R H E A T D U
 I S M P S W X Z U M O S P S K Y Q E U I T J L R
 Z S A S T B F L I M L E R S C O M M U N I T Y Z
 A F R A T E L E S C O P E S N K E O N F O Y R J
 G B Q W E A E T U I G A L A X Y P N E D N A S C
 R Y Z U B U O M A F Y U E B A L C I S A S D A R
 A N F R U T K E N S T O U F F M W R N B R U M P
 T W E N G Y O H E A L T H N H U R T D E R K U M
 S A F E T Y P W H Z I M E T E O R S H O W E R S
 O A Q S K L C O M E T S E O J I Y a W Y K I I M

Word Search

Find each light pollution term listed below. The words are found horizontally, vertically, diagonally, frontward, or backwards. HAVE FUN!!!

- | | |
|-------------------|----------------|
| MILKYWAY | SAFETY |
| NOCTURNAL ANIMALS | CITY LIGHTS |
| EDUCATION | PRESERVATION |
| GLARE | HEALTH |
| ENERGY | STAR GAZING |
| DARK SKY FRIENDLY | METEORSHOWERS |
| NIGHT SKIES | BEAUTY |
| PLANETARIUM | STARS |
| POLLUTION | CONSTELLATIONS |
| TECHNOLOGY | WASTED LIGHT |
| TELESCOPES | GALAXY |
| HAPPYNESS | ASTRONOMERS |
| EARTH | SAFETY |
| ENVIRONMENT | COMMUNITY |
| | COMETS |


Light Pollution BINGO

Have each student fill in their BINGO cards with 24 of the terms listed at the bottom of their sheets. Cut out each term below and place into a bowl or other container. Draw terms out of the container and read the word to the students. Give a brief description of the word, and tell the students how it relates to light pollution. If the student has that word on their card, they mark it off or cover it with a BINGO chip. Small pieces of paper work great for this. Once the students have filled in a row of terms either diagonally, vertically, or horizontally they shout BINGO! You can provide small prizes for winners, and even play different variations of BINGO (IE; blackout, four square, etc...)

WASTED LIGHT	SAFETY	CONSTELATIONS	DROUGHT	PLANTS
ARCTIC	POLLUTION	BEAUTY	BIRDS	WASTED ENERGY
MILKY WAY	HAPPYNESS	ENVIRONMENT	DARK SKY FRIENDLY	HUMAN HEALTH
PLANETARIUMS	STAR GAZING	SCIENCE	EARTH	FISH
STARS	NIGHT	TECHNOLOGY	NIGHT SKY	MELTING ICE
ASTRONOMERS	CLIMATE CHANGE	COMMUNITY	GLOBAL WARMING	HURRICANES
TELESCOPES	NOCTURNAL	EDUCATION	SEAT TURTLES	SAFETY
POLAR BEARS	ANIMALS	SAFETY	FLOODS	AMPHIBIANS
GLARE	HEALTH	PRESERVATION	GREENHOUSE GASES	SKY GLOW
ENERGY	METEOR SHOWERS	CITY LIGHTS	CARBON DIOXIDE	REPTILES

Light Pollution BINGO

Choose 24 of the terms listed below and put them in the blank boxes on your BINGO card.

				
		FREE SPACE		

WASTED LIGHT	CONSTELATIONS
ARCTIC	BEAUTY
MILKY WAY	ENVIRONMENT
PLANETARIUMS	SCIENCE
STARS	TECHNOLOGY
ASTRONOMERS	COMMUNITY
TELESCOPES	EDUCATION
POLAR BEARS	SAFETY
GLARE	PRESERVATION
ENERGY	CITY LIGHTS
SAFETY	DROUGHT
POLLUTION	BIRDS
REPTILES	DARK SKY FRIENDLY
CLIMATE	EARTH
ARTIFICIAL LIGHT	NIGHT SKY
ASTRONOMY	GLOBAL WARMING
HAPPINESS	SEA TURTLES
STAR GAZING	FLOODS
NIGHT	GREENHOUSE GASES
CLIMATE CHANGE	CARBON DIOXIDE
NOCTURNAL ANIMALS	PLANTS
HEALTH	WASTED ENERGY
METEOR SHOWERS	FISH

Fun With Science

How Light Pollution Affects the Stars: Make your own magnitude reader.

Objective: To help students determine how light pollution affects the visibility of the stars by using a magnitude reader.

Materials Needed:

- Cellophane (clear plastic wrap)
- A penny
- Scissors
- A piece of thin cardboard about 1" x 5" (you can use a cereal box, shoe box, index cards, or in a pinch a paper plate)
- Tape or glue

Procedure:

1. Use the penny to trace five circles on the cardboard. The circles should make a straight line and be evenly spaced apart. Cut out the circles to create holes.
2. Tape or glue a piece of cellophane across the back of your cardboard, covering all the holes. Make sure not to get glue or tape on any of the holes. It will obstruct your view later.

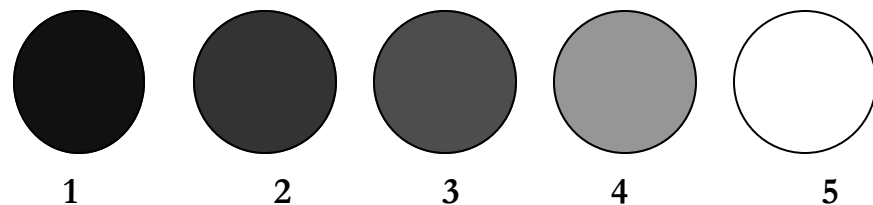
3. Next tape or glue a piece of cellophane over the last four holes, again being careful not to get glue or tape on any of the holes. Repeat this step by covering the last three holes, the last two, and then the last. The result should be that each hole has one more piece of cellophane than the previous hole. You now have a tool for measuring the magnitude of stars. Label the hole with only one piece of cellophane 5, the one 4, and so forth until you get to 1.

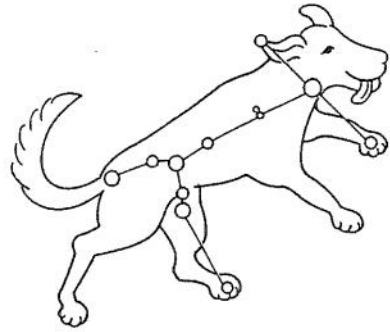
4. Find the constellation Orion in the night sky. Now, look at the sky and use your magnitude reader to view each star in Orion. On the drawing of Orion, write down which number you can see the star faintest through (i.e. if you can't see the star in hole 4, but you can see it faintly in hole 3, you would write down 3 for that star). Do this for each star in the drawing. You now have a list of the magnitude of each star in the constellation Orion.

5. Record the lighting situation where you recorded your data about Orion. Are the lights bright? Are they dim? Is there a lot of lighting in the area? Is any of the light fully shielded?

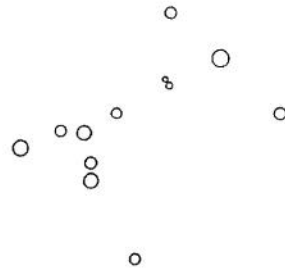
Group Discussion: Compare your results to the rest of the class.

Remember that lower magnitudes are brighter stars and higher magnitudes are dimmer stars. How did each star compare to the other students' data in each of their lighting situations? In brighter lights were the stars dimmer or brighter? How accurate is this data?

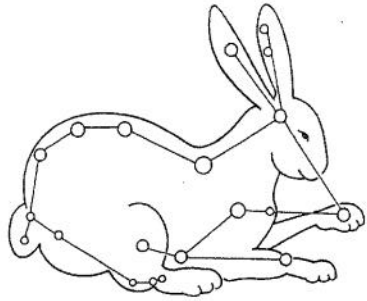




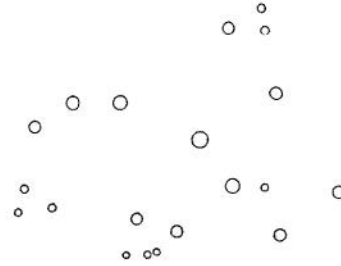
I used to be a dog.



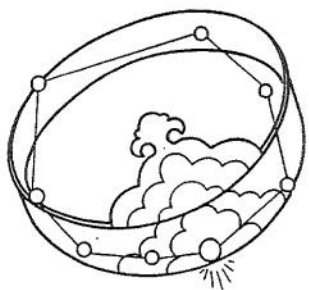
now I am _____.



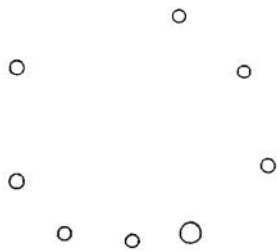
I used to be a rabbit.



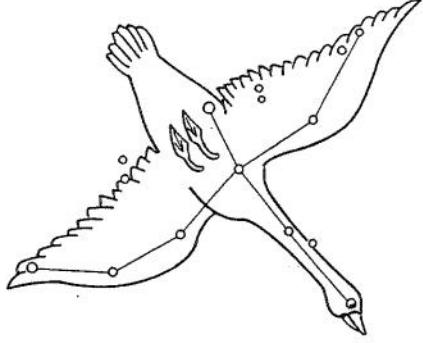
now I am _____.



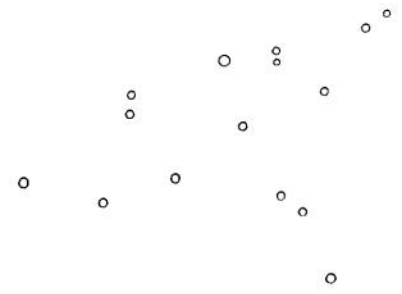
I used to be a crown,



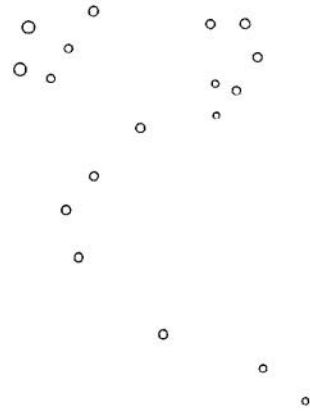
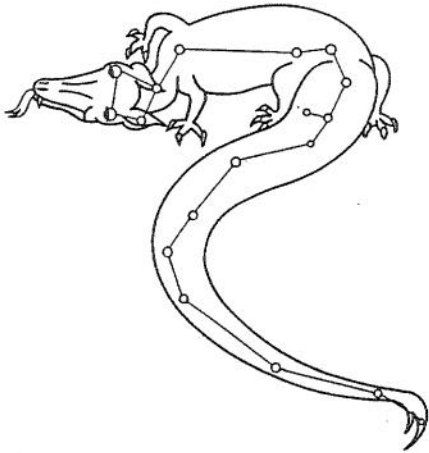
now I am _____.



I used to be a swan,

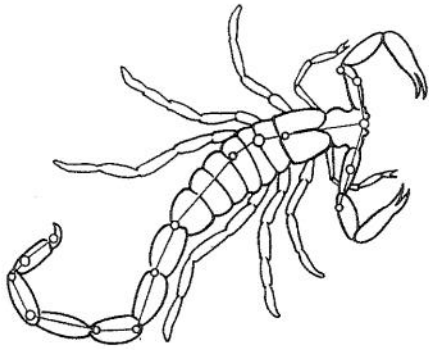


now I am _____.

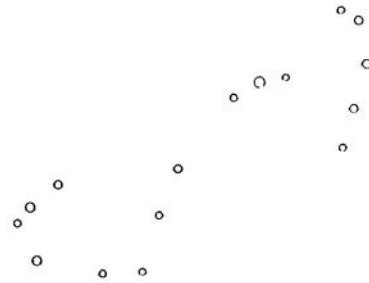


I used to be a dragon,

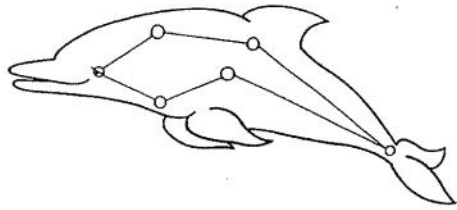
now I am _____.



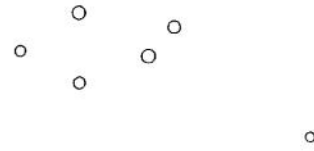
I used to be a scorpion,



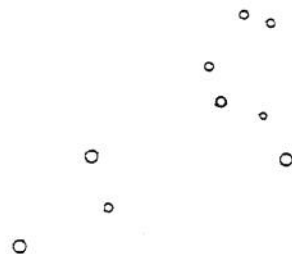
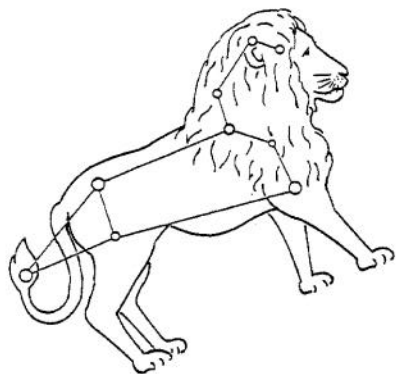
but now I am _____.



I used to be a dolphin,



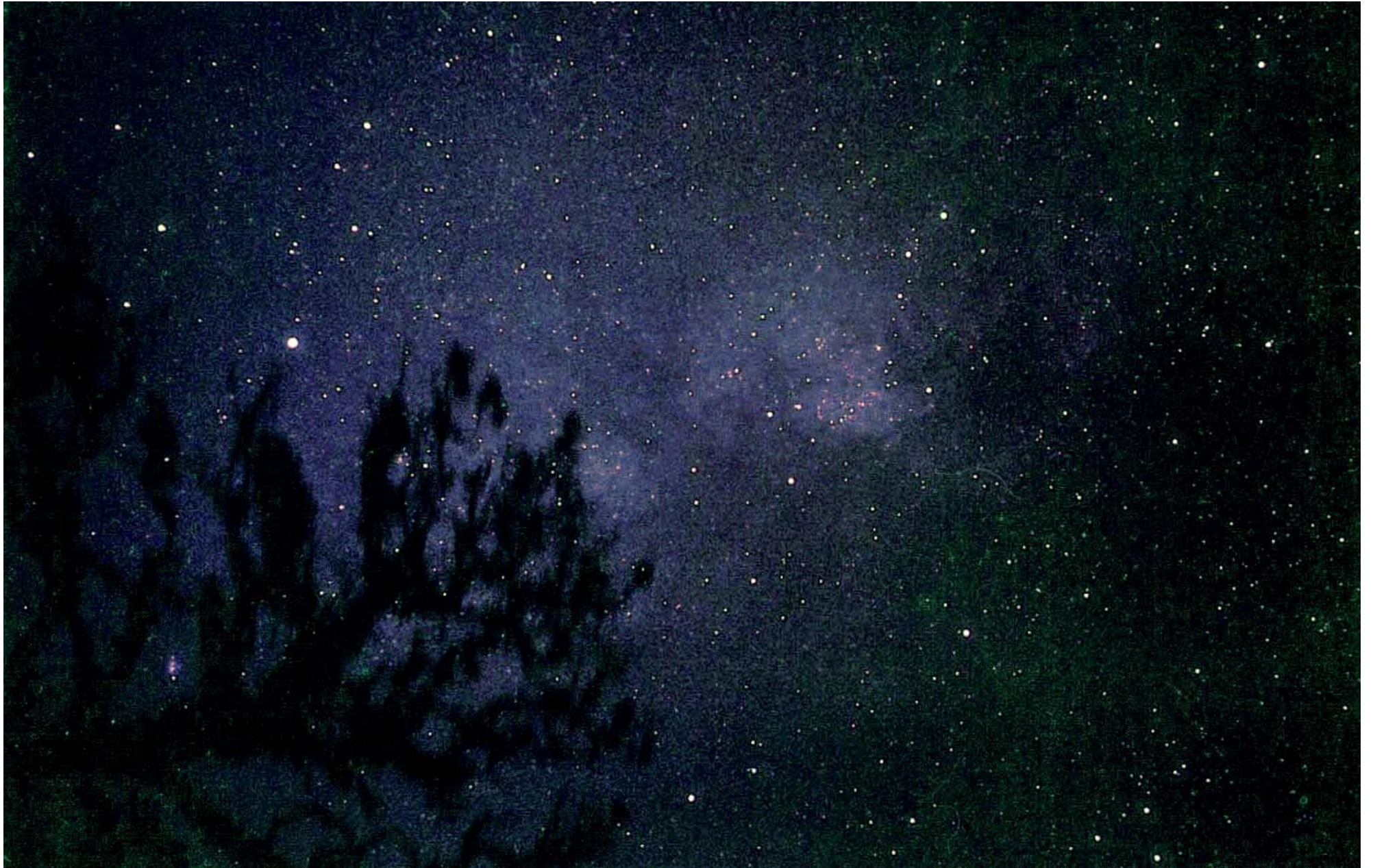
but now I am _____.



I used to be a lion,

now I am _____.

Sample Poster



International Dark-Sky Association

The Nightscape Authority

George & Edythe Taylor Student Award Submission Form

Submission for the following grade level:

- Kindergarten through 6th
 7th through 9th
 10th through 12th

Student Information:

Name: _____

Address: _____

City: _____ State/Province: _____ Country: _____ Postal Code: _____

Phone: _____ Fax: _____

Email: _____

Teacher/Mentor Information:

Name: _____

Address: _____

City: _____ State/Province: _____ Country: _____ Postal Code: _____

Phone: _____ Fax: _____

Email: _____

Please list any organizations or individuals (include contact information) which have supported this project and briefly state how they supported the project. Include the amounts of any financial support (please attach additional pages as necessary):

Organization/Individual 1:

Name: _____

Address: _____

City: _____ State/Province: _____ Country: _____ Postal Code: _____

Phone: _____ Fax: _____

Email: _____

International Dark-Sky Association

The Nightscape Authority

Organization/Individual 2:

Name: _____
Address: _____
City: _____ State/Province: _____ Country: _____ Postal Code: _____
Phone: _____ Fax: _____
Email: _____

Please ensure to attach the following:

- **Student Statement:** briefly summarize why you chose this project and what you learned or hoped to accomplish with it. Please limit your essay to 300 words and attach a separate page to the final application.
- **Teacher's Statement:** briefly cover anything about the student's work which you would like to highlight for the judges' consideration. Please limit your comments to 300 words and attach a separate page to the final application.

Acceptable formats for the project content are outlined on the award description page. Project materials submitted for this award will not be returned unless specifically requested. Awardee's names, city, state, and country may be used in announcements by the IDA. Any material submitted for consideration may be used by the IDA for future educational activities in the spirit of the IDA's mission.

By signing below, I ensure that all information submitted is my original work and that I agree to the conditions of this award.

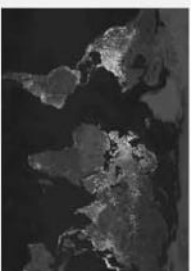
Student Signature: _____ **Date:** _____
Printed Name: _____

Teacher Signature: _____ **Date:** _____
Printed Name: _____

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