

Energy Chains

Students will act out a skit to demonstrate how energy makes its way from the sun to us. This energy allows us to run, play and even do homework. Students will understand that energy doesn't get "used-up" it just changes form with some unusable energy escaping along the way.

Grade Level : 2nd Grade

Objectives:

- Students will understand that energy can not be created or destroyed, but unusable energy may escape.
- Students will understand that energy changes forms.

Materials:

- Sun, plant, and cow costumes
- Three yellow balloons
- Sets of laminated energy chain cards for student groups*
- Copies of "Our Energy Chain" worksheet for each student*
- Laminated print outs of large energy chain images*

*attached

Time Considerations

- Preparations: 20 min
- Activities:
 - 1– Energy in One Act: 20 min
 - 2– Energy Flows: 10 min
 - 3– Our Energy Chain: 20 min

Related Activities:

Energy Sleuths, Plants and the Sun, Solar Matters, Transfer Me This



Nevada Department of Education Standards

- **E.2.A Students understand that changes in weather often involve water changing from one state to another. E.2.A.1 Students know the Sun is a source of heat and light. E/S**
- **L.2.C Students understand that living things live in different places. L.2.C.1 Students know plants and animals need certain resources for energy and growth. E/S**

Excellence in Environmental Education Guidelines

- **Strand 2.1-The Earth as a Physical System (C—Energy): While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.**
- **Strand 2.2 — The Living Environment (D—Flow of matter and energy): Learners know that living things need some source of energy to live and grow.**

Background

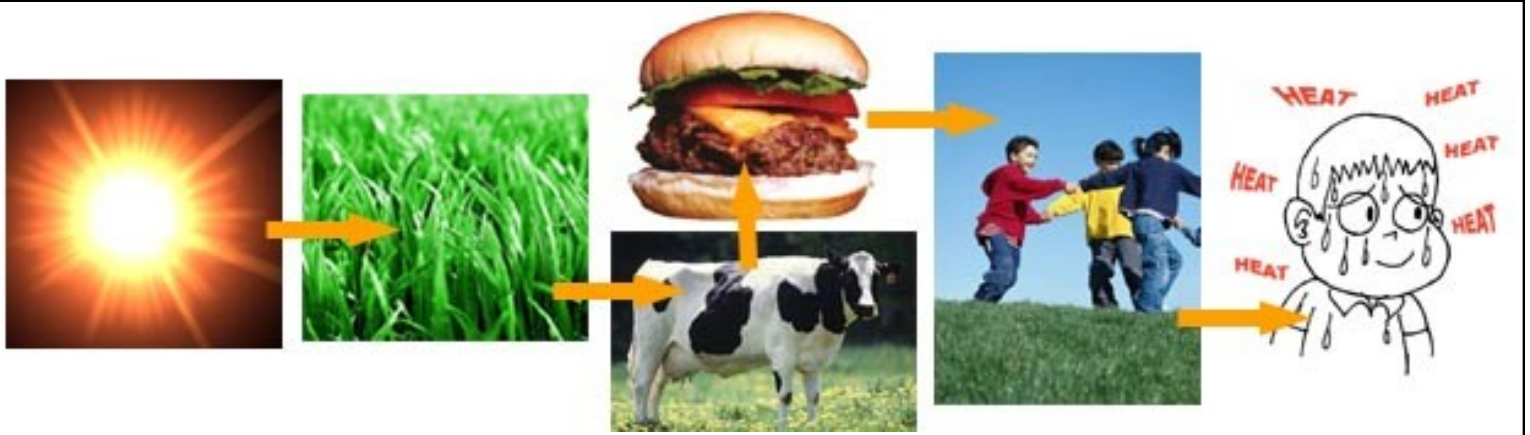
Everything we do involves energy. Energy cannot be created or destroyed—but it can be changed from one form to another. For example, the stored energy in wood that comes from the sun becomes light and heat when you burn it. Changing energy is how we control it for our use.

When you use one form of energy, it changes into one or more other forms of energy. Since energy cannot be created or destroyed, the total amount of energy at the start is the same as the total amount of energy at the end. This is known as the Law of Conservation of Energy.

Energy chains are a visual ways of explaining how energy



This is an example of a simple energy chain. The orange arrows show the transfer of energy. The sun makes energy that the plant turns into sugar—in this case an apple. The children eat the apple and use it's energy to play, then releasing heat through sweating.



This is an example of an energy chain. The orange arrows show the transfer of energy. The sun makes energy that the plant turns into sugar. The cow eats the plant and stores the energy in its meat, which becomes a hamburger. The children eat the hamburger and use its energy to play, then releasing heat.

can change from one form to another and how energy is “lost” or “wasted” along the way—mostly in the forms of light, heat or sound. For example, a typical incandescent light bulb turns electrical energy into light, but also becomes warm and uses energy to create that heat. In fact, a typical incandescent light bulb only converts 5% of the incoming electrical energy into light, while the other 95% is converted into heat. Although no energy conversion is one hundred percent efficient, some energy conversions are more efficient than others. For example, a compact fluorescent light bulb provides the same amount of light as the incandescent light bulb in the example above but it uses 15-20% of the incoming electrical energy, so it is more efficient.

Preparations

Collect needed supplies. Print out pages 4 and 5, laminate and cut. Make sure to have enough sets so that each student group can be two or three students. Print out enough

copies of the student worksheet, page 6, for each student group. Print and laminate pages 7-12 to use when making a class energy chain.

Doing the Activity

Activity 1-

Energy in One Act

Start the lesson by having students act out a simple energy chain. First call up a student to be the sun. Give the student a large cardboard cutout of the sun, or a sun costume. The sun’s lines are: “I am the sun, I give energy to the earth.” The student will hold a yellow balloon (to represent the energy). Have the student practice and then have the whole class say it along with the student playing the sun.

Next call up a student to be a plant. Give the student a flower costume, or some other way of representing that they are a plant visually. The plant’s lines are: “I am a plant. I take the sun’s energy and turn it into sugar.” The plant takes the yellow balloon from the sun. Have the student practice and then have the whole class say

it along with the student playing the plant.

Then invite a student up to the front of the class to be a cow. Give them the cow costume to put on. They say, “I am a cow. I eat the sugar in the plant. I let off energy as heat by doing things and store some in my meat.” The cow gives lets out half of the air in the balloon while acting out what it is saying. Have the student practice and then have the whole class say it along with the student playing the cow.

Have one more student come up to be a student. Their lines are, “I am a human. I get energy from eating meat and plants and I let off energy as heat when I play.” The student will let all the air out of the balloon. Have the student practice and then have the whole class say it along with the student.

Now have the students act out the play three times. Start by having each actor repeat the lines after you. The second time, have the actors say their lines on their own. The third

time, have the whole class say the lines of the actors. You could also have another group of students come up and act out the same parts—in order for those students to also be accountable for the lines and concepts behind them.

Activity 2— Energy Flows

Ask students what happened with the yellow balloon? (The yellow balloon was emptied every time—representing the release of heat—and we had to use a new one for each play.)

Explain that even though the yellow balloon was emptied, that the energy it represents still exists as heat. Use this concept to introduce that energy can not be created or destroyed. So where does the energy we use to do things come from? And where does it go?

Trace this process by asking students how they get the energy to play at recess. Laminate and use the big pictures in the back of the lesson to follow along and make an energy chain as a class on the wall or board while you are sorting out this process with the students.

Ask students how they get the energy to play at recess? (Food—let's say an apple). Ask students where do apples (plants) get energy? (the sun!—through the process of photosynthesis). What about if we ate meat instead of a plant, where do animals we eat get energy? (plants, then the sun). Where does the energy they use at recess go? (it is released in the form of heat while sweating, etc.) At this point explain that the energy still exists, but humans cannot use it anymore.

Activity 3— Our Energy Chain

Now that you've worked through one energy chain with your students, have students work in small groups (two or three) to arrange the energy chain cards on the student worksheet in the correct way that energy changes forms from the sun through grass, a cow, a hamburger, children playing and finally heat.

Next ask how a TV gets energy. Have them show you in groups with the coal to heat/light energy chain.

Evaluation—

Informally evaluate students by their ability to arrange the en-

ergy chain cards in the correct order for both energy chains. Additionally, you could assess students' by having them act out the play in groups. Formally assess student's learning by asking students to write or draw each card they put in the space on the Our Energy Chain worksheet and to turn it in for credit.

Writing Enrichment—

Have students imagine that they are the energy being transferred from form to form—changing but never being destroyed. Have them write a page from the perspective of the energy. Have them start in the sun and imagine what it would be like to travel/change all the way into an energy of their choice and then ultimately ending up as heat, light or sound.

Extension Activities— Energy Food Chains

- Ask students if their energy chains look like another kind of chain they are familiar with (a food chain). Relate the transfer of energy to objects to the transfer of energy from animals and the things they eat. Have students draw an energy food chain and write



This is an example of an energy chain. The orange arrows show the transfer of energy. The energy stored in coal turned into electrical energy in a power plant. This energy is transferred along power lines to electrical outlets in houses. Televisions convert this energy to heat and light.

an explanation of how the energy moves from one food source to the next and where it goes at the “end” of the chain.

Energy Field Trip

- Organize a field trip for your students to a power plant. Have the tour guide discuss the form of energy used to make electricity and how the energy changes forms from that source of energy (say, coal) to make the toasters in our houses work.

The Original Source

- Ask students to name sources that humans get en-

ergy from (the sun, coal, oil, gas, wind, geothermal, and hydropower). Have students research in groups where the source of each of these energies come from. They will notice that all of the energies can be traced back to the energy from the sun and nuclear fission. Have student groups present on the sources of energy that we use and where that energy ultimately comes from. Students could also make a poster to display in your classroom or the school hallway.

Sources—

- Lesson plan adapted from: Project Learning Tree. *Energy and Society: Energy Education Pre K-8 Activity Guide*. Washington DC: American Forest Foundation, Project Learning Tree, 2006.
- Energy in One Act activity adapted from: Sussman, Art. “Planet Earth Show.” Lake Tahoe Environmental Literacy Summit. Sierra Nevada Journeys. Tahoe Center for the Environmental Sciences, Incline Village, CA. 11 October 2008.

Images—

- Kids playing: <http://theparablelife.blogspot.com/2008/07/lets-play.html>
- Hamburger: <http://www.seattlemet.com/blogs/sauced/carnivorehappyhour/>
- Cow image: harmless4life.wordpress.com/tag/silk/
- Grass: indabuff.com/?cat=3
- Sun: www.sec.noaa.gov/primer/primer.html
- Apple: http://www.sportsnutritionist.co.nz/index.php?pr=Nutrition_News_
- Sweating image: <http://entirelyrandom.wordpress.com/2008/06/10/ive-been-missing/>
- Coal: www.appaltree.net/aba/coalspecs.htm
- Power plant: NEED Project. *Primary Energy Flipbook*. Manassas, VA: 2008. p. 51.
- Power line: <http://www.bladeworkz.com/tutorial/21>
- Electrical outlet: <http://www.homefurnish.com/homeimprovement/electrical/electricaloutletcovers.aspx>
- Television: http://www.publicadvocatescorner.com/advocates_corner/accessing_city_services/

Energy Plays

- Have students create a play similar to the “Energy in One Act” activity for another energy chain. Have them create costumes (even just cardboard on a string with a picture of what they are), write lines to act out the transfer of energy from each object to the next. Additionally, make sure the students develop a prop to represent the release of energy from human control.

Vocabulary

Coal: A black mineral formed from the remains of ancient plants. Coal is mined underground and burned as fuel, often in power plants to make electricity.

Energy: power from coal, electricity, the sun, wind, or other sources that allows something to do work and produces heat.

Energy Chain: an ordered arrangement of objects that use energy in which each gets energy from the one before it.

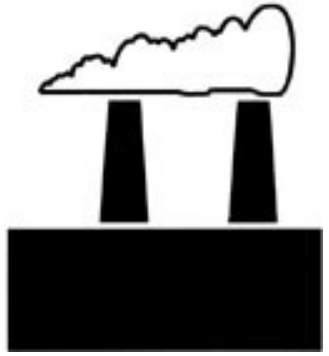
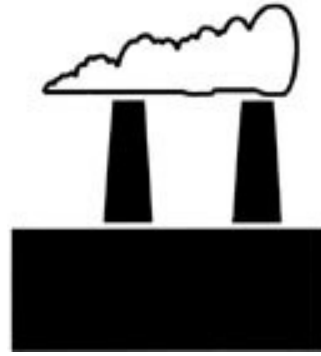
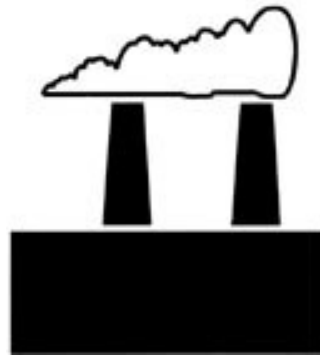
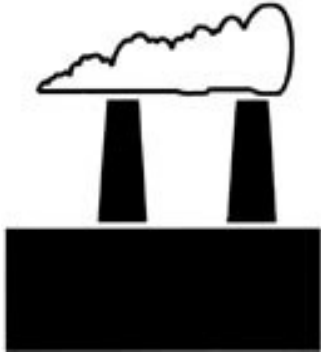
Heat: a form of energy shown by the increase of temperature.

Photosynthesis: The process by which plants make sugar from air and water using energy from the sun.

Power Plant: an energy factory that commonly uses coal, nuclear energy, or geothermal heat to make electricity.



ENERGY CHAIN CARD TEMPLATE



**HEAT
LIGHT**

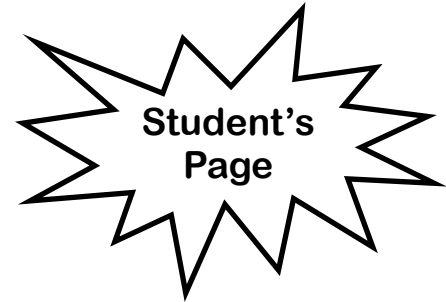
**HEAT
LIGHT**

**HEAT
LIGHT**

**HEAT
LIGHT**

OUR ENERGY CHAIN

Names _____



1

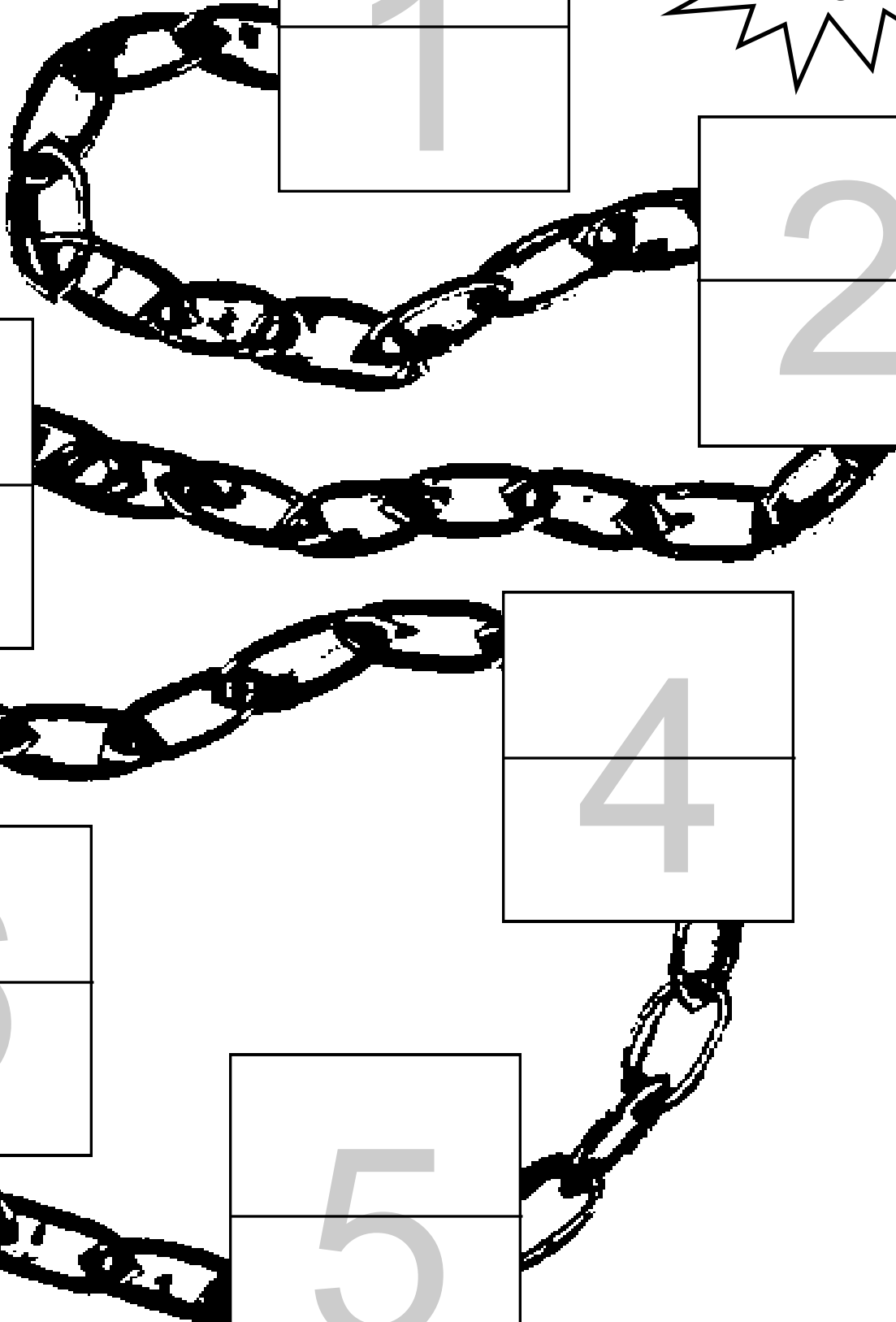
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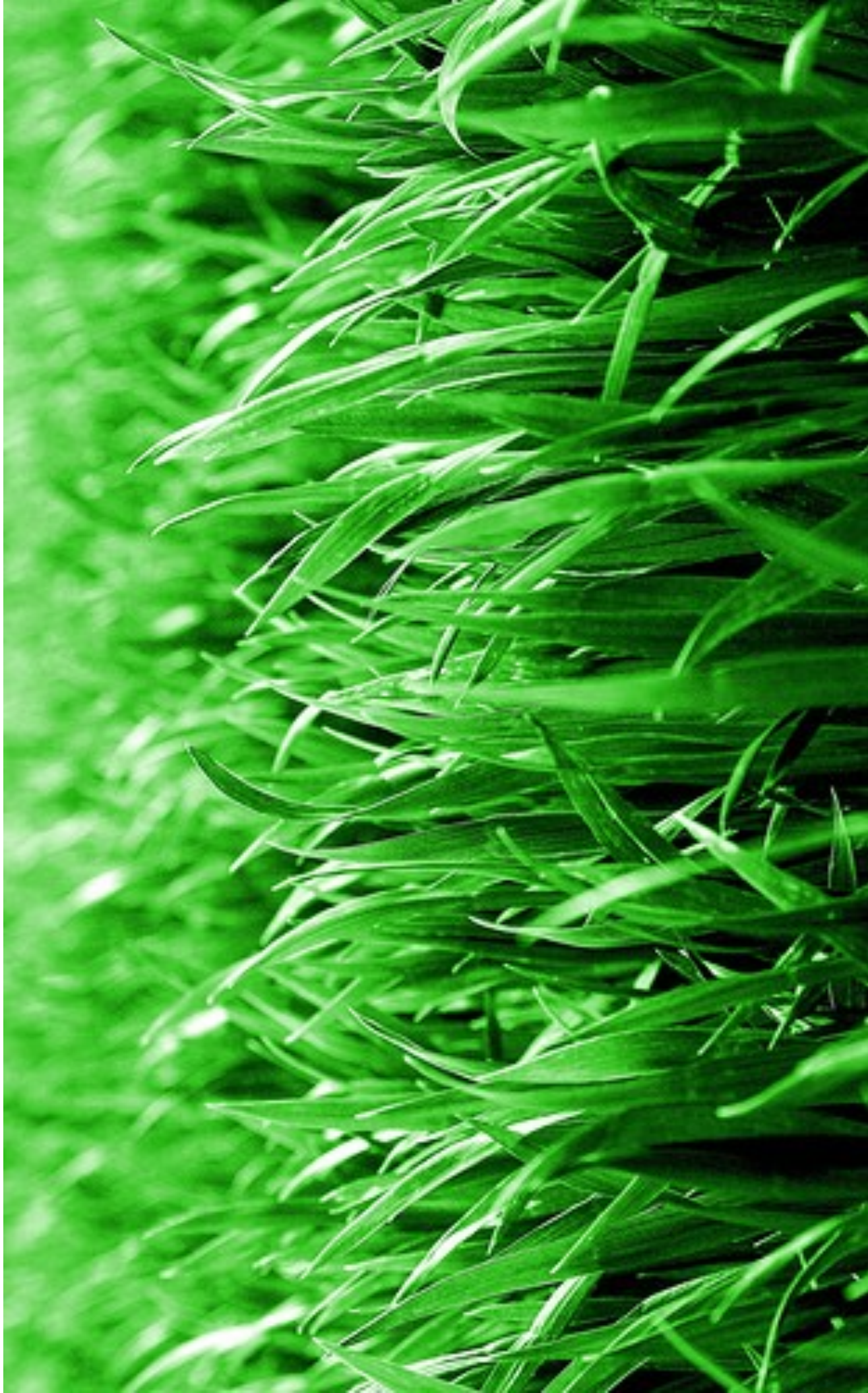
6

5



THE SUN





GRASS

FOOD (MEAT)





FOOD (PLANT)

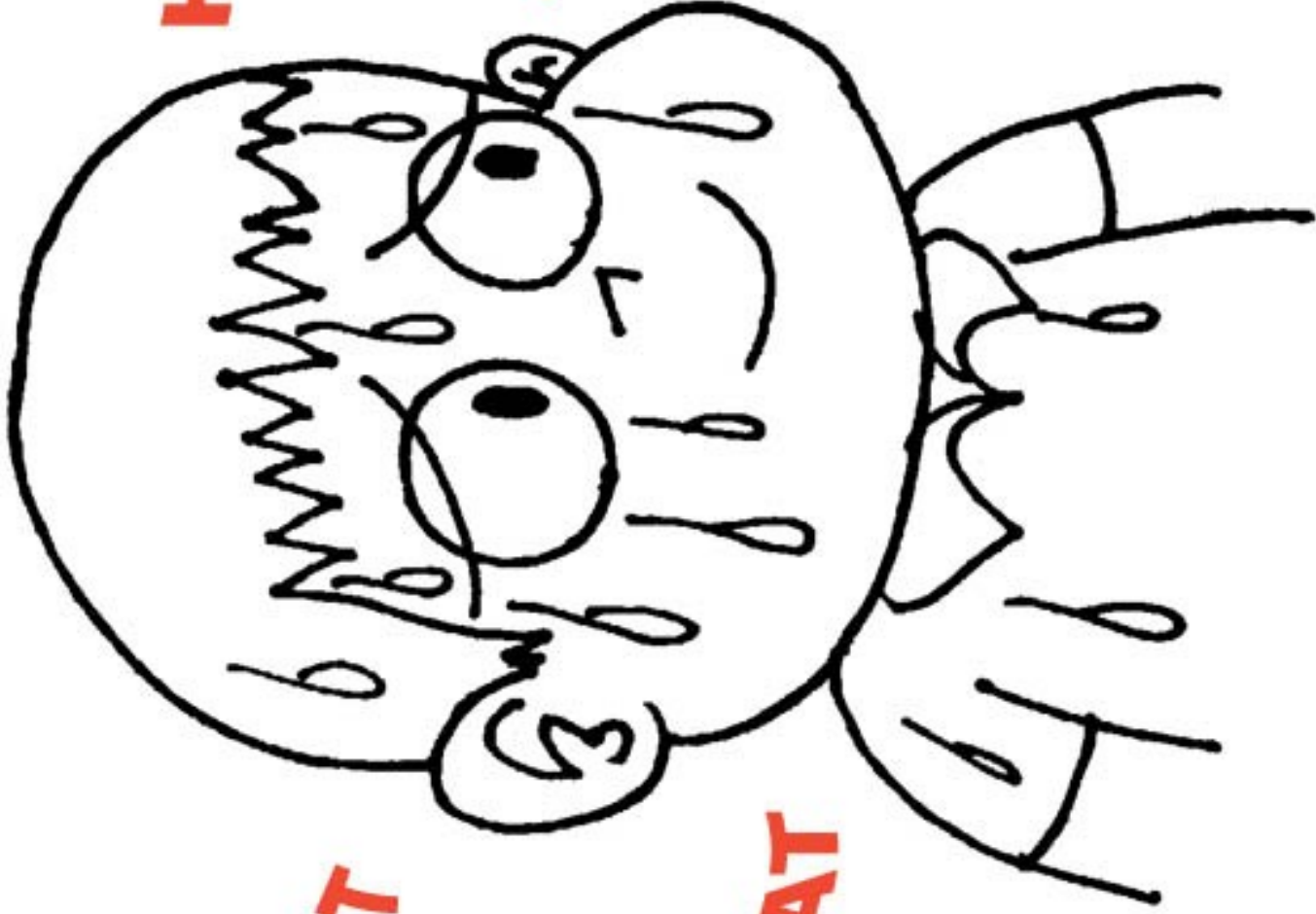


PLAYING

HEAT

HEAT

HEAT



HEAT

HEAT

HEAT