



How can you recognise life?

Life in space

time

60 minutes

learning outcomes

To:

- know that people on Earth are searching for life in space
- know what the characteristics of life are
- know that life is not always

immediately visible

materials needed

- yeast
- water
- small container
- plastic cup
- sugar

Preparation

For the activity **Searching for life** you will need yeast, water, sugar, a plastic cup, and a small container.



Searching for life 20 min.

Ask the children if they think there is life anywhere else in space apart from Earth. Why do they think that? Explain to them that up until now no life has been found anywhere else. Research looking at signs of life is being carried out, however. The project SETI (Search for Extraterrestrial Intelligence) was launched in 1999. Extraterrestrial means 'beyond the Earth'. In this search for extraterrestrial intelligence, radio telescopes search for signals in space that may have been sent by intelligent beings.

Explain that people are carrying out research into extraterrestrial life. But what is life exactly? What do the children think? The children complete Task 1 on the worksheet. Ask how they filled in the table, 'Is alive', 'Has lived' and 'Is not alive and has never lived'. Copy the table onto the board. Encourage the children to add their own ideas to the columns.

Together, look at the examples of life (from the categories 'Is alive' and 'Has lived'). What characteristics do these organisms display compared to inanimate objects (from the category 'Is not alive and has never lived')? Explain clearly the difference between living and inanimate things. Dead organisms were once alive, so they belong in the category life. So the opposite of living is not 'dead' but 'inanimate'.

Ask the children if they know what yeast is. Explain that we use yeast to make bread. The yeast helps the bread to rise. Demonstrate how yeast grows. Place a thin layer of yeast in the container. Stir the sugar into a plastic cup of water. Add this water to the yeast. What happens?



The children investigate how we determine if something is or has been alive.



Determining life 35 min.

Look together at the characteristics of life shown in Task 2 on the worksheet. Give an example for each characteristic. Ask the question: 'What characteristics of life do the items named in Task 1 display?' Encourage all the children to write down what they think and why.



Discuss the completed worksheets. Explain that a **human being** displays all the characteristics of life. You are born as a baby and grow into an adult. When you are an adult you continue to grow. For example, your skin heals when it has been damaged. People move. People absorb nutrients and oxygen from their environment to stay alive. They excrete substances, for example when they go to the toilet or sweat. People convert substances into other substances during digestion. For example, our bodies convert the carbohydrates in bread into sugars. People reproduce by having children. People respond to changes in their environment. For example, they shiver when they get cold, and they may decide to put on warmer clothes. **Apes**, and all other animals also display all the characteristics of life.

Trees also grow larger and larger. They move, but this happens very slowly, for example when they turn their leaves to face the Sun. Trees absorb carbon dioxide from the air and excrete oxygen into the air around them. Trees reproduce via seeds which are carried on the air or spread by birds who eat the fruit. They respond to changes in their environment, for example by dropping their leaves when the days grow shorter (in autumn). A **fallen autumn leaf** is no longer alive, but dead.

A **pen or a piece of cheese** do not display any characteristics of life. A **car** does display some characteristics of life (it moves, excretes substances into the environment, converts substances and responds to change), but these processes are caused by people. A car does not grow, neither does it reproduce, so it is not a living being.

Discuss which characteristics of life yeast displays. **Yeast** grows, because it absorbs water with sugar from its environment. This makes the yeast cells bigger. Yeast converts the sugar into alcohol and carbon dioxide and excretes this into the environment. And believe it or not, yeast also reproduces! The yeast cells are able to divide, and the separated cells grow independently. Yeast also responds to changes in its environment. If there is oxygen in the air, it makes carbon dioxide. If there is no oxygen, it makes alcohol. Yeast is a fungus.



Explain that it can be very difficult to determine what life is. Sometimes it can be very difficult to see if something, such as yeast or a tree, displays all the characteristics of life. Scientists are continually discovering new forms of life, so a complete definition of life has not yet been made.



Is all life visible? 5 min.

Ask the children if all life is visible. What is the smallest creature they can think of? Explain that there are very tiny bacteria that you cannot see with the naked eye.



How can you recognise life?

1	<i>Searching for life</i>
a	How do we search for life in space?
	
b	Is it alive or not? If it is not alive, has it ever lived?
	or not? Put the following items into the correct column: <i>man, pen, ape,</i>
	<i>cheese, tree, fallen autumn leaf, car, yeast.</i>

Is alive	Has lived (= dead)	Is not alive and has never lived (= inanimate)



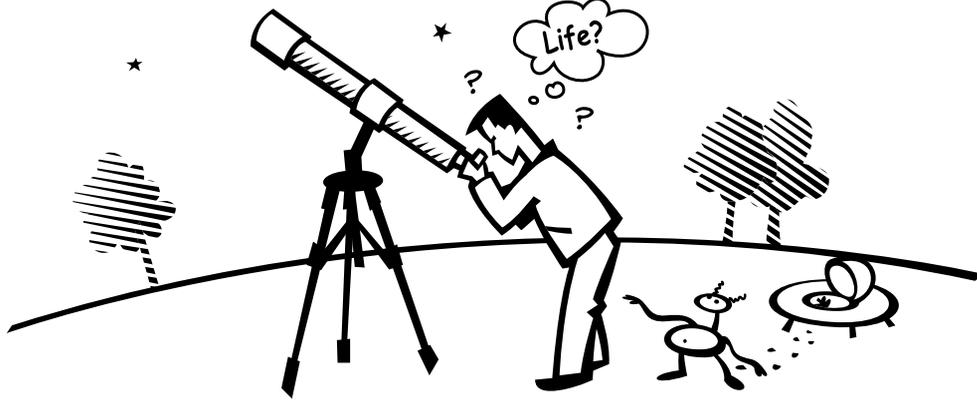
Answer the research question: *When is something alive?*

2 *Determining life*



One way of determining whether something is alive or not is if it displays the following characteristics:

- it grows
- it moves
- it absorbs substances from its environment
- it excretes substances into its environment
- it converts substances into other substances
- it reproduces
- it observes and responds to internal and external changes



a For each item in the list below, cross out the characteristics of life which it does not display. In the right-hand column, write why you think it does or does not fulfil these conditions and if it is alive or not.

write down why **HERE**

cross out what **DOES NOT** apply

human being	grows / moves / absorbs substances excretes substances / converts substances reproduces / observes and responds	
pen	grows / moves / absorbs substances excretes substances / converts substances reproduces / observes and responds	
ape	grows / moves / absorbs substances excretes substances / converts substances reproduces / observes and responds	
cheese	grows / moves / absorbs substances excretes substances / converts substances reproduces / observes and responds	
tree	grows / moves / absorbs substances excretes substances / converts substances reproduces / observes and responds	
fallen autumn leaf	grows / moves / absorbs substances excretes substances / converts substances reproduces / observes and responds	
car	grows / moves / absorbs substances excretes substances / converts substances reproduces / observes and responds	
yeast	grows / moves / absorbs substances excretes substances / converts substances reproduces / observes and responds	

b Which items in the above table display all the characteristics of life?