

Key Stage 5 Worksheet

Earth LIVE Lessons: Chernobyl & How to Think About the Future



What is it about?

In this Live Lesson, marine biologist, documentary filmmaker, and storyteller Rob Nelson:

- Shares his story and discusses how he became a science communicator.
- Introduces a brief history of the **Chernobyl nuclear disaster**.
- Tells us about life after Chernobyl and what happened to the plants and animals that humans left behind.

Watch video here:
youtu.be/ZstuglBWo2c

Open file in your web browser to click on the links.

Background

- Looking at the past helps us understand the future.
- Many organisms can adapt to radiation, often the biggest threat to nature is the presence of humans.

About the presenter:

In this video, Rob starts by sharing his story and how he found his calling as a science communicator.

Rob became passionate about documentary film making when he went to Australia and found out about the Great Barrier Reef, “all you have to do is take a video camera and tell every story you can.” He went “all in” to becoming a marine biologist.

In 2003, he bought 6 plane tickets, a 1976 Chevy van, and drove 7000 miles through Mexico, with no air conditioning or seats, to film “The Biodiversity of Mexico”.

About the presenter continued...

In his own words, 'broke and poor', Rob lived on a sailboat (that cost \$900) off the coast of Hawaii, and studied behavioral ecology at the University of Hawaii. One day, without checking the forecast, he took his boat and sailed into the "storm of a decade". He lost everything; his research, scuba gear, clothes, and was rescued by the coastguard. "How am I ever going to get through this?" he thought. In the end, it gave him time to stop and think; "what is really important to me?" Rob decided to use his video camera to learn and communicate his findings to everyone else.

Chernobyl

The main topic of this video is looking at a past disaster to try and help us understand what we are currently experiencing in 2020. Chernobyl is now synonymous with nuclear disaster. In 1986, in modern-day Ukraine, the Chernobyl nuclear reactor emitted hundreds of times more radiation than an atomic bomb. The residents of nearby towns were evacuated from what to this day is known as the 'exclusion zone', and an army of half a million 'liquidators' were sent in to clean up the radiation.

- In the early morning hours of April 26, 1986, the Chernobyl Nuclear Power Plant in Ukraine (formerly the Soviet Union) exploded, during a routine maintenance check, creating a nuclear disaster
- Details on the explosion are complicated and its precise cause is an ongoing source of debate. What is known is that critical power control systems were switched off, against regulations, causing the reactor to become unstable. Two explosions occurred, the first involving an excess of steam and the second involving hydrogen.
- The explosions destroyed one reactor (reactor 4) and started a very large fire.
- Toxic fumes and dust were spread by the fire and carried on the wind.
- The Chernobyl Nuclear Power Plant is located about 81 miles (130 kilometers) north of the city of Kiev, Ukraine and about 12 miles (20 km) south of the border with Belarus.
- You can find out more about the long term health implications of the disaster in a World Health Authority report [here](#).

Life after Chernobyl

Rob visited Chernobyl to record a documentary called “Life After Chernobyl”. He wore a personal **dosimeter** on his body – to measure the cumulative dose of radiation he received, and a **Geiger counter** – a device that is used to give a reading of radiation being emitted by an object or a person.

Thanks to the site clean up scientists can now visit most of the site, for short periods of time, providing their radiation exposure is monitored.

Rob’s team were seeking answers to a number of questions:

- What would we find in Chernobyl?
- How had the site been affected?
- What had happened to the wildlife?

The team were taken aback at the level of wildlife in the area, the grass and forested areas had regrown across the site and the impact of humans was almost invisible. He remarked on how wild it looked, and how many animals had come back.

Rob showed us radioactive leaves from an aspen (*Populus tremula*) tree. Aspens grow in stands of ‘clones’ and grow back from the extensive root system.

All the animals they expected to find were still there, or had come back:

- Brown bears (*Ursos arctos*)
- Lynx (*Lynx lynx*)
- Otters (*Lutra lutra*)
- Przewalski’s horses (*Equus przewalskii*) (Endangered, **IUCN**)
- Moose, known as Elk in Eurasia (*Alces alces*)
- Fox (*Vulpes vulpes*) - “Simone” in Pripyat
- Wolves (*Canis lupus lupus*)

Rob found mixed results when looking at bird populations. Some birds had higher rates of cancers, cataracts, dull feathers, showed a high rate of albinism and had 5% smaller brains. Birds seemed to be gaining radiation doses from two sources, both from the ground and from the fruits they eat (bioaccumulation). However, not all bird species were impacted in the same way. Rob’s study found that 16 species of birds were doing better inside the zone.

Rob’s research questioned how that might occur. For example, the Great tit (*Parus major*) produces compounds in its body that help make antioxidants to fight free-radicals – which can help to combat radiation exposure. It seems possible that some species had adapted to the conditions inside the radiation zone.

Activities – practical science you can do from a window

- Find a place to sit every day and learn about local wildlife. See the daily rhythms of life. Try sketching or scientific drawing.
- Try to identify some of the plant species growing in your garden or an outside space nearby. You can use apps on a phone to help you, such as **this app from Woodland Trust**.
- If you want to take species identification further, you could register on the **INaturalist** platform which is a place where everyone can share observations of wildlife across the globe and get help from experts in identifying species.
- Listen to a bird's song, you can use **this site** to try to identify the bird from its song.

Find out more about it

- Follow Rob on Social Media **here**.
- Or Read up on Facts About Chernobyl **here**.
- Rob's book: Tips to how to become a good science filmmaker, tips & tricks. Book, How to Make Science and Nature Films **here**.
- Further study: search UCAS for courses on Natural History, Marine Biology, Documentary Filmmaking and other subjects.

Questions

Interactive: Click on box to start typing

What is coral bleaching? How is it affecting the Great Barrier Reef, and what can we do about it?



What is biodiversity? Mexico is one of the most biodiverse nations in the World, why do you think that is? Do you know any other countries with high biodiversity?

What do you think, are the wolves more dangerous after the incident at Chernobyl? What was Rob's view?

Define 'species' and describe how species are named using the binomial naming system?

Rob said that all fauna that would naturally be present at the site have returned to the area now. We refer to the natural, evolved fauna of a region as 'native' to that area.

- a. Choose one (or more) species from the video, look up those species' natural geographical range,
- b. where else do those species occur?
- c. Some of the species are listed as 'endangered', what does that mean and how is it defined?

Another Kingdom of organisms, the Fungi, are very useful, from antibiotics to cleaning up oil spills. How can fungi help us clean up radiation?

Keywords list

Many keywords relevant to Biology were introduced in this podcast.

Make a definitions list here and have a go at learning some of them.

Habitat

Biodiversity

Adaptation

Radiation

Native Flora and Fauna

Mutation

Endangered

Natural range (for a species)

For teachers and home schoolers

Links to Science in the National curriculum for Wales (KS5)

This video encompasses a broad range of topics. Here are some ideas on how to link it to the curriculum, with a focus on biology.

Biology AS

Over time, biologists have categorized the vast array of living organisms by their similarities – this is called Taxonomy. This is an ongoing process that is now being aided by DNA ‘genetic fingerprinting’. Using the scientific name, or binomial nomenclature, of a species prevents confusion when discussing plants and animals. Rob gave us the example of the plant Artemisia (*Artemisia absinthium*), also known as wormwood and Chernobyl, in fact the town and then the power-plant were both named after the plant that is used to make absinthe.

There are several competing theories on how life has divided, and it is an ongoing area of research. One of these theories divides life into three domains: Archaea, Bacteria, and Eukarya, the latter with five kingdoms (see Table below).

The Five kingdoms of Eukarya:

Kingdom	
Prokaryotae	Prokaryotes
Protoctista	Protists
Fungi	Fungus
Plantae	Plants
Animalia	Animals

Biology – A2

Energy, Homeostasis and the Environment.

- Population Size and Ecosystems.
- Human Impact on the Environment.

Variation, Inheritance & Options

- Inheritance
 - e.g. the effect of mutagens, carcinogens & oncogenes.
- Variation & Evolution

Geography AS

- Coasts

Compare Chernobyl with the more recent disaster at Fukushima. How did a tsunami lead to nuclear disaster? How might the marine ecosystems be affected?

Geography A2

- Changing Places
- Global Governance: Change & Challenges

Physics

- Nuclear decay
- Nuclear energy

Tourism

- Dark Tourism

Where else can I go with a Geiger counter?

History

- Cold War/Former USSR/Gorbachev

Did Chernobyl signal the beginning of the end of the USSR?

Modern Foreign Languages (& Welsh)

e.g. discussion on wildlife, environmental issues, and nuclear energy in your target language.
(can you say, “where are the wolves?”)



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