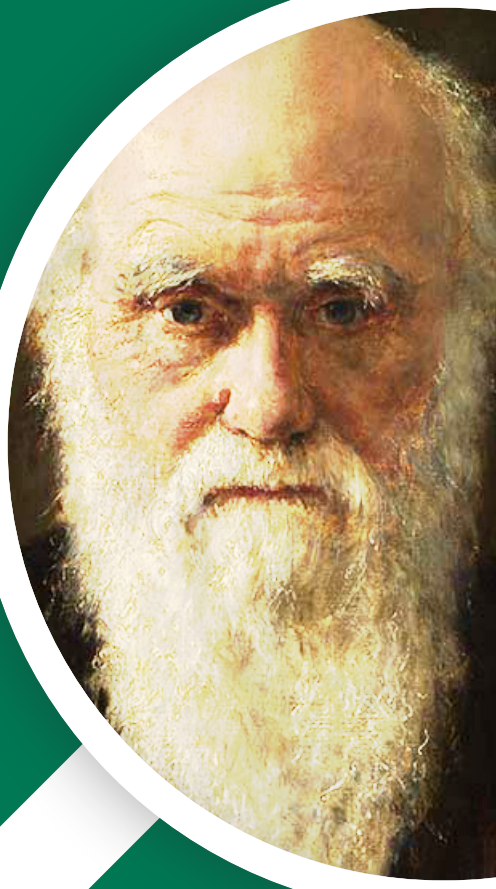
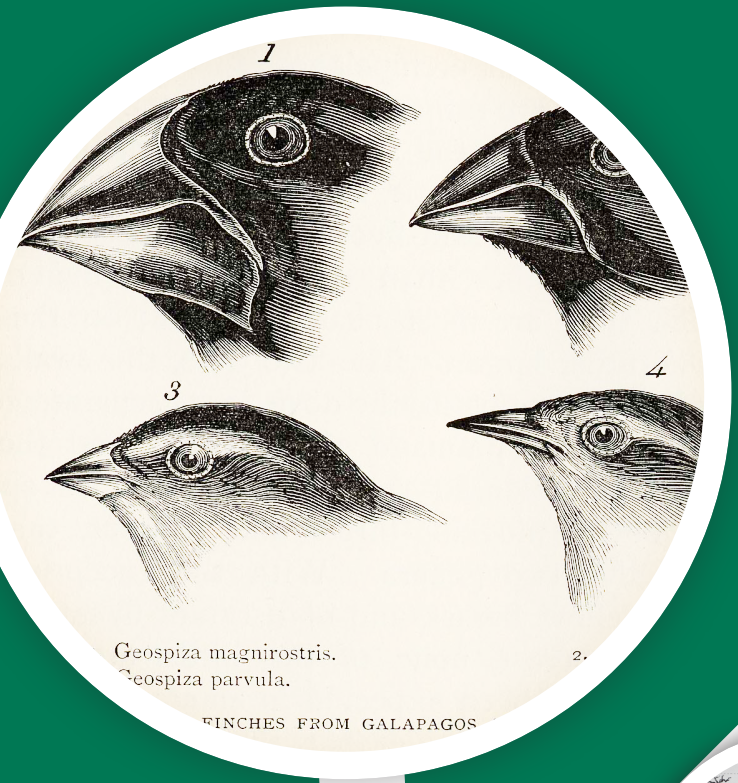
Evolution

Activity Pack for Primary Teachers





LinneanLearning

Discovery Kits

Discovery Kits

Incorporating practical activity into science lessons can be tricky at a primary level, particularly for non-specialist teachers. A recent SCORE (Science Community Representing Education) report found that many schools lack sufficient resources for teaching practical science. These loan kits not only provide some of the equipment necessary for practical lessons, but also provide ideas and guidance for teachers - we hope you find them useful!

The activities suggested in the packs are by no means an exhaustive list of the possible lessons you could carry out using the Kit provided. We have tried to provide a variety of indoor and outdoor practical activities, suitable for pupils in Key Stages 1&2. Many of the activities are cross-curricular, providing opportunities to develop skills in literacy, mathematics, art and ICT.

If you have an idea for using the equipment in this Kit, we would love to hear about it! If you'd like your idea added to this activity pack then full credit will of course be given to you.
Email us with your suggestions: learning@linnean.org

Please check at our website for full details of other available kits, covering topics such as **plants**, **life cycles**, **habitats** and **classification** - www.linnean.org/discovery-kits.

ALSO! We love seeing your pictures. Tweet us @LinneanLearning #DiscoveryKits

Disclaimer: The Linnean Society is pleased to lend these kits to schools, and believes each kit to be suitable for its suggested use. However, we recommend that teachers thoroughly examine and check each kit to make sure it is fit for the purpose intended, making any risk assessment that is appropriate. The Linnean Society excludes any liability for injury or damage howsoever caused by the use of the kits, is not responsible for the standard of development or safety of any of the products used in the kits, and makes no warranty against errors and omissions in any kit or accompanying material.

Objectives & Links

The activities in this pack encourage students to:

- Observe and raise questions about animals and plants concerning how they are adapted to their environment
- Compare how living things are adapted to survive in different environments
- Analyse the advantages and disadvantages of specific adaptations
- Appreciate the work of historical scientists such as Mary Anning, Charles Darwin, Robert Hooke and Alfred Russel Wallace
- Work together in pairs or groups, taking turns and sharing fairly
- Communicate through conversation by sharing experiences, ideas and information
- Develop scientific and research skills, either individually or in groups

We've designed the pack to help teachers cover the following curriculum areas:

Year 2 & 3

- Animals, including humans, have offspring which grow into adults
- Fossils are formed when things that have lived are trapped within rock

Year 4

- Environments can change and that this can sometimes pose dangers to living things

Year 6

- Living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- Animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

What's in the Kit?

4x 3D-printed hominid skulls

Homind skulls guide

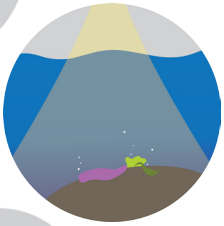
6x Magnifying glasses

6x Fossils

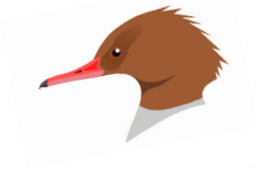
Fossil guide

Plesiosaur photo

10m tape



Toilet Paper Timeline resource set (Teacher Pack, Event cards)



Battle of the Beaks resource set (10 x 2 beaks, bird 'food')

10x Rulers

10x Who's the daddy magnets & 3 mats

Superdog pack

Feathers

String

Activity Ideas

Picking your brains

Investigate the size and shape of different skulls and learn how our ancestors brains and skulls have changed over millions of years.

In the Kit:
3D printed skulls
Hominid Skulls Guide

Info:

The evolutionary history of Homo sapiens is not as many expect, a linear progression changing from ape to man, but rather that we are part of a large family tree like other animals. The difference is that we are the only remaining species in our genus, but members of our (Hominidae) family still exist, like orangutans, gorillas and chimpanzees.

Let's go!

We have provided four 3D printed skulls made from scans of real skulls that have been found through excavation. There is also a short guide to these skulls provided to indicate important and interesting features.

Split the class up into four groups and give a skull to each. Ask each group to list all the features of the skull they have. You can give them tips about what to look at (e.g. height, width, length, shape of the brow, curvature of the forehead, shape of teeth, cheek bones etc.). Ask each student to make a drawing of what they think their skull species would have looked like when it was alive.

Collate the answers that people have and then ask them to put the skulls in order of time. You can then use the provided guide to inform the students about the skulls and the differences that researchers have identified. Students could draw a timeline or make infographic about the first skull they saw, or all of them.

AfricanFossils.org

This fantastic website is a great interactive way to look at different excavated skulls and bones. We recommend you display this on a large screen rather than letting the students loose. The first page is an interactive 'lab' space where you can select different skulls or bones on display for more information. You can search and explore different species in the website and there is also an interactive timeline to visualise when other similar species lived.

Fabulous fossils

Handle and study real fossils and create biological illustrations for others to use.

In the Kit:
Magnifying glasses
Fossils
Fossil Guide

Info:

Over the last 3.5 billion years, animals and plants have been continually evolving through natural selection so that the species remains adapted to their current environment. Species that did not, or could not, adapt were disadvantaged and often went extinct. Fossils can give us information about how animals and plants used to be millions of years ago and can also tell us about species that are now extinct.

Palaeontologists can work out how species evolved, how they lived, how they interacted with one another, and how they interacted with their environment, all by studying fossils.

Let's go!

Divide the class into small groups and share out the provided fossils amongst them. Students are encouraged to (gently!) handle the fossils and study them using the magnifying glasses. Once groups have finished with their initial fossils, ask them to swap with another group so that everyone gets a chance to look at all of them. **Please note that these are real fossils, so ask your students to take extra care when handling them (though we expect some natural wear and tear).**

After everyone has seen all the fossils, students should choose a fossil and create an accurate sketch annotated with any observations they made whilst studying it, such as anatomy, texture, colour and weight. You could use examples from Robert Hooke's "Micrographia" to explain and demonstrate the activity. Students should include a scale bar so that other scientists can tell the size of their fossil. They may also wish to include a magnified region where they show what part of the fossil surface looks like under a magnifying glass.

Discuss with the students what these fossils can tell us about the prehistoric plants and animals from which they came. For example, we can tell what these prehistorical animals ate based on the shape of their teeth. Are there any similarities between the fossil samples and species that exist today? The Fossil Guide should help with stimulating a class discussion. The annotated sketches produced in this activity could be used in the 'Toilet paper timeline' activity. Approximate ages are given in the Fossil Guide

The perfect Plesiosaur

Using an image of an uncovered Plesiosaur fossil to sketch what this ancient creature may have looked like.

In the Kit:
Plesiosaur photos

Info:

Mary Anning was born in 1799 and became world-reknown as the first great fossil hunter. On a beach in Lyme Regis, she discovered the first complete skeleton of a Plesiosaur - which is now on display in the Natural History Museum.

You can download a free poster about Mary Anning by visiting www.linnean.org/Mary.
We can also send you a high quality poster for free - just email us at learning@linnean.org.

Let's go!

You should have a laminated sheet with a Plesiosaur skeleton printed on. This is available online at www.linnean.org/EvoKit. Show this to your class and inform them that this was just found on a beach, but that it lived over 150 million years ago(!). Ask them what kind of creature they think it is. They can each draw the creature, either from the same overhead perspective or thinking about it swimming in the water.

Allow every student to show their Plesiosaur, and then show them what scientists think the Plesiosaur looked like (laminated image also included).

Take it further:
If you do the Toilet Paper Timeline activity, you could ask the students at what point in time they think the Plesiosaur would have lived
(200 - 175 million years ago)

Toilet paper timeline

Timescales involved with the history of the Earth are too large for most students to mentally visualise. Work together as a class to create a to-scale timeline so that they can see when key events occurred and the short period of time humans have been on the planet for.

In the Kit:
10 meter long tape
Teacher Sheet
Key Event cards

You need to provide:
400 sheets of toilet paper
Pins, tent pegs, or weights

Let's go!

The cards provided have key events in the history of the Earth. You can play this activity how you'd like but here are a couple of suggestions.

Toilet paper:

Unravel 400 sheets of toilet paper and pin/weight them down. Mark out 500 million year time periods for reference (40 sheets of toilet paper). Hand out the event cards, 1 between 2, or several within a group. First ask the students to try and get the events in the correct order - you have the correct order and timings in your Teacher Info Sheet.

Once complete, ask the students to try and line up where they think the events happened along your toilet paper timeline.

Depending on the year group, you could tell the students where to stand, give them the time in billions/millions of years ago and ask them to calculate themselves where to stand, or you could ask them to guess how long ago events occurred.

Alternatives:

Instead of toilet paper, you could use a ream of tinsel!
Another alternative is using a 10 meter long tape. For this option, mark out every 2 meters as 1 billion years.

It is very difficult to accurately date some of the key events used in this activity. The dates provided are generally rounded up and should be taken as an approximate .

Battle of the beaks

Simulate bird feeding, beak adaptations and competition by collecting different types of "food" with different types of "beak".

In the Kit:
Battle of the Beaks resource set

You need to provide:
10 metal spoons
1 cup per student
Any other 'bird food'

Let's go!

Provided is a two-sided worksheet. One side is for you and the other side is for the students. Photocopy the student side for as many students as you have in your class and hand them out.

Each student should select a 'beak' and collect a plastic cup or beaker to use as their 'stomach'. Meanwhile, distribute a single food item evenly across a cleared out 'feeding area' in your classroom.

The students should pick up food items using only their *beak* and place the food into their *stomach*. The beak should be held with only one hand and scooping motions along the floor into the stomach are not allowed. Allow *feeding* to occur for 2 minutes (you may want to do this in small groups to prevent mayhem). Ask each student to count the number of food items in their cup and fill in their worksheet. Collate the data from the entire class for each beak type. Distribute the next food item evenly across the feeding area, and repeat process for each food item.

Distribute all the food items across the feeding area at the same time and repeat the challenge. Students with the most food may have acted strategically - knowing what their *beak* was tailored for meant they aimed for certain *foods*.

Take it further!

Ask the class to present the whole class data graphically (a bar chart works best) and use this to draw conclusions. Which beak was the best adapted for each food item? What is the dependent variable? What is the independent variable?

Ask the students to think about other species and discuss the adaptations that have led to their survival - e.g. camels feet are wide so they spread their weight on the sand and don't easily sink.

Testing traits

Introduce different types of variation and take part in a class survey of various characteristics.

In the Kit:
Rulers
Tape

Info:

Variation of a particular trait within a species can be classed as being either continuous (no limit on the value that can occur within a population) or discontinuous (variation falls within distinct classes or categories as features cannot be measured across a complete range).

Let's go!

Split the class into pairs or groups of 3 and ask them to work together within their groups to measure their own characteristics (e.g. eye colour, hair colour, number of fingers, tongue rolling ability, attached/detached ear lobe, hair length, height, hand span, maximum jumping height, running speed). Once they have measured each of their characteristics, collate all the class data together. Ask the students to prepare graphs of the class data for each characteristic.

Using the class data and the prepared graphs, explain the concepts of continuous and discontinuous variation. Are certain types of graph more appropriate for different categories? Do some traits vary less than others? Why might this be? If the students were wild animals, would there be any adaptive benefits to being at the extremes of the variation (e.g. being the tallest or the shortest of a species)?

Take it further!

Once the graphs have been prepared, you could use these and the class data to also introduce students to the concepts of normal distribution, averages (mean, median, mode), outliers, range and quartiles. By splitting the data in groups, perhaps based on gender, you could also introduce students to some simple statistics.

The class could also design their own trait variation survey to conduct on local plant life or insects.

Evolution Yoga

Explore the different theories of how Giraffes have evolved to have their long necks.

In the Kit:
Rulers
String

Let's go!

Hand out string to all the students and ask them in pairs to measure their partners neck - from their chin down their neck and to the tip of their chest-bone. Find out who the longest neck belongs to and congratulate them.

Explain that giraffes have evolved over time to have long necks. Their main food source is high up in tall trees, so giraffes with longer necks have more to eat and are therefore more likely to survive.

Next, lead the class in some general body stretches, but also mix in some face stretches, gently stretching the neck as if reaching for food. Ask the students to measure their necks again and see if it made any difference. If it did, you can congratulate the new winner.

Explain and discuss a theory of evolution that suggested that giraffes have long necks because their parents stretched a lot to reach the food. This theory suggests that our physical actions are passed onto our offspring (like if we dyed our hair pink, our children could have pink hair). In simple terms, this isn't thought to be true (but there is new research in this area that might interest you (Google 'Guardian trauma passed on' to read about it)).

Take it further!

This is a great activity that provides lots of numerical data that you can explore further with maths.

When you've collected the first neck-length results and ask the students to put the data in order from lowest to highest. You can then find out the mean, median, mode and range of the data-set. If you have a nice range, you could draw graphs of the data (bar chart would be best).

Who's the daddy?

Introduce to the concepts of heredity and variation with this card game.

In the Kit:
10x 'Who's the daddy?' magnets and 3x Image mats

Info:

Offspring are a combination of their parents genes, and so generally retain some characeristics from their parents. They will not be identical though due to the mixture of the two, and they will be different to their siblings due to variation.

Let's go!

Put the three image mats in different parts of the room and ask students to stand near one of the mat (i.e. 10 around one mat). Ask one student to come to the front of the class and give them a magnet which shows an adult animal. The student should then describe what the baby would look like without saying the name (e.g. it will come out of an egg, it will live in the water).

The other students should put their hands up if they think the baby animal is one their mat. They can then make a guess at the animal and the student at the front can confirm it or give more information.

Do this for 10 rounds until all of the magnets are with their baby. Once the students have created their family pairs, they should make notes of any similarities and differences between the parents and their offspring.

Ask the students why these similarities exist – this leads nicely on to a discussion about heredity. Why is it beneficial for the offspring to be similar to their parents? Examples could include them living in the same environment, being adapted to eating the same prey or avoiding the same predators, or being able to recognise their own species. Are their disadvantages to offspring being similar to their parents?

Ask the students why these differences exist – this leads nicely on to a discussion about variation, adaptation and natural selection. Why is it beneficial for the offspring to be different from their parents? Examples could include them living in different environments, having different prey/predators, different life cycle stages, or being potentially more suited to environmental changes. Are there disadvantages to offspring being different to their parents?

Superdog selection!

Introduce the concept of selective breeding (artificial selection) with this activity about superpowered dogs.

In the Kit:
Superdog pack

Info:

Selective breeding is different from natural selection because it is not due to a change in the conditions of the species, but rather it is a human-inflicted change. All common dogs are the same species because they can mate with eachother and produce fertile offspring. Some dogs may eventually diverge into different species but this change (evolution) takes place over centuries as genetic mutations build up.

In this activity we imagine that dogs have superpowers and we could breed specific dogs together to create dogs with new super-superpowers.

Let's go!

Provided in the Discovery Kit is a A4 booklet of Superdogs. You can also find this as a PDF on www.linnean.org/EvoKit.

Explain to the students that despite looking very different, all dogs are actually the same species (same for cats). They look different because humans have bred different looking or behaving dogs together over many years. We might do this so they look nice, or we could do this to make them more aggressive so they will defend our property.

Introduce each superdog and their superpower. Ask the students to pick two superdogs and think about what their offspring might look like, and what superpowers they may have.
It's important to think about what the offspring will look like as this is the outcome of real breeding, the superpowers are just a fun add-on.

The students could draw their new superdog and present it to the class.

Take it further!
When dogs are bred together, the results aren't perfect - breeding a white dog and a black dog doesn't necessarily give you a grey dog. You could explore what alternative dogs could be bred out of the same dogs they selected.

Picky peacocks

Female Peacocks are picky! They only mate with the most colourful male peacocks (sexual selection). Ask your students to make a piece of prose around this topic.

In the Kit:
Feathers

You need to provide:
Creativity!

Info:

Only 5% of male peacocks mate with all of the female peacocks (i.e. in a class of 20 males, only 1 would get chosen). This is because of sexual selection. The female peacocks only mate with the males that have the most beautiful tail feathers. Having flambouyant tails, with lots of 'eyes', is thought to show that the male peacock is fit and healthy (research suggests that peacocks with more 'eyes' have better immune systems). Peacocks shed their tails after each mating season, so they might have a better chance at growing a nice tail next year!

Let's go!

You may chose to ask the class to make a play around this fact, or make poems, stories or even write a letter to an agony aunt in the newspaper from a male with no feathers (another student could write back a response).
An **artificial** peacock feather and plain black feather are included in the Discovery Kit to enable your students to inspire your students (they do not need to be returned).

Example play:
Scene 1: A peacock is born with one small feather, the parents look concerned
Scene 2: The peacock (3 years old) now has more feathers, but they're all small and weird
Scene 3: The peacock moves towards the female peacocks but they're not interested
Scene 4: Another peacock with nice feathers enters and the female peacocks surround him
Scene 5: The main peacock is sad and starts exercising and eating healthily to boost his chances of growing a nice tail next year

Example poem:
I am a peacock
Without any colour
I am a peacock
My life could not be duller

The Linnean Society of London

This education resource was developed by Linnean***Learning***, the Education Team at the Linnean Society of London. The Linnean Society is the oldest active biological society in the world. Founded in 1788, the Society continues to provide a forum for the discussion and the advancement of the life sciences.

Our name is taken from the Swedish naturalist Carl Linnaeus who helped to shape our understanding of the natural world through his work in taxonomy and classification of living things. We're proud of our unique collections and of our history. Did you know it was at a meeting of the Society in 1858 that Charles Darwin and Alfred Russel Wallace outlined the theory of evolution?

Linnean***Learning*** is working hard to bring brilliant biology alive in the lives of people of all ages and walks of life. We'd love to hear from you if you have any ideas, or would like to collaborate on a project, or just want to give us some feedback.
Contact us at learning@linnean.org.

The LINNEAN SOCIETY of London

Discover more at www.linnean.org/learning