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The Reebop Project

This model organism for teaching genetics was developed by Patti Soderberg of the University of Wisconsin [1]. Although *Reebops* have been around for a while we had not come across this delightful creature until a recent workshop delivered by Diane Donnelly of Queensferry Primary School.

Reebops provide a fun and simple way of introducing children to ideas of inherited characteristics and variation within a species. The genes and features are fantastical, and teachers may want to tell their pupils that genes would not usually throw up a three eyed baby from two eyed parents, for example. The original Reebops were made from marshmallows, toothpicks etc. However if these are unavailable or you don't want your Reebops eaten before their time, they can be made successfully from other materials. The ones in the photographs were made using coloured, commercially available modelling dough but plasticine would work just as well. They could even make their own and colour with different food dyes [2]. The colours used for body parts and legs are not important provided there is sufficient material of each of those colours to make all the Reebops in the population. In addition you will need drawing pins for the eyes, card for the legs and pipe cleaners for the tail.

In this exercise you will be considering the following genes on the chromosomes of Reebops.

Symbol for gene: Dominant/recessive	Feature
E/e	number of eyes
D/d	number of body segments
T/t	shape of tail
L/l	colour of legs
Codominant	
A/a	number of antennae
Q/q	colour of nose
M/m	number of humps

Table 1 – Gene symbols

Reebops in their natural habitat

Dominant, recessive and codominant genes

Pupils will be able to see dominant genes, such as in the gene for the number of eyes: *EE* and *Ee* give 2 eyes, *E* being *dominant* (or visible) while *e* is recessive (or hidden). Recessive genes are only visible when there are two copies inherited, e.g. three eyes are only produced by *ee* combinations. Codominant genes are different: each version of the gene is as strong as the other and each combination will give different results e.g. in the case of nose colour, *QQ*, *Qq* and *qq* all produce different colours.

Preparation

First of all make your parent Reebops. The parents look exactly the same and there is no (genetic) distinction between male and female!! Reebops have seven pairs of chromosomes: Mum's should be printed on coloured paper (pink?) and Dad's on a different colour (blue?). It's a good idea to make a Mum and Dad Reebop to show pupils before the process of creating baby Reebops begins. The "genetic code" used for these models is given in Table 2.

Copy the same number of pink and blue chromosomes. Cut out the chromosomes and put each set into an envelope marked "Mum" or "Dad" as appropriate. Distribute one envelope to each pupil. The next stage is mating. This may need careful handling in the classroom!

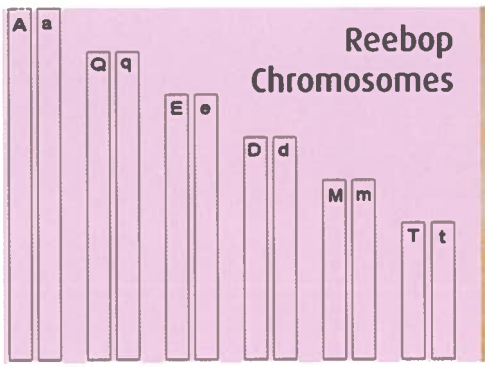


Figure 1 – Mum's Chromosomes

Figure 2 – The Happy Couple

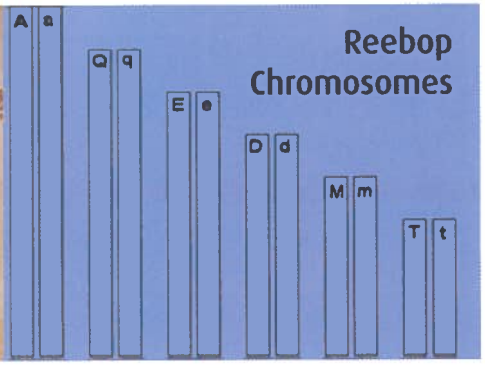


Figure 3 – Dad's Chromosomes

AA – 1 antenna	Aa – 2 antennae	aa – no antenna
QQ – red nose	Qq – orange nose	qq – yellow nose
EE – 2 eyes	Ee – 2 eyes	ee – 3 eyes
DD – 3 body segments	Dd – 3 body segments	dd – 2 body segments
MM – 1 hump	Mm – 2 humps	mm – 3 humps
TT – curly tail	Tt – curly tail	tt – straight tail
LL – blue legs	Ll – blue legs	ll – red legs

Table 2 – 'Genetic code' for models

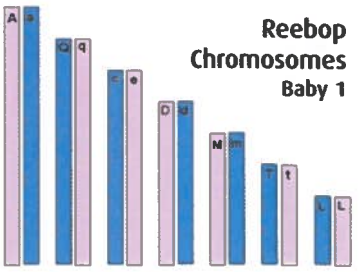


Figure 4 – Baby Reebop 1 Chromosomes

The Activity

Two pupils who have different coloured sets of chromosomes are paired up. The chromosomes should be laid face down on the table and each pupil randomly picks one chromosome of each length. The blue half set and pink half set are laid out as in Figure 4 – and thus the set of chromosomes for a new Reebop has been created. This set of chromosomes determines the baby's characteristics.Using the code given in Table 2, each pair of pupils makes their baby Reebop. The details of colours can be altered to suit the materials you have to hand.

Figure 5 – Baby Reebop 1

This Reebop (Figure 5) has been constructed using the set of chromosomes in Figure 4. In this case the Reebop has three eyes but in all other respects, looks the same as the parents. If you want the same parents (i.e. pair of pupils) to have another baby Reebop so that, for example, each pupil has their own Reebop to take home, the whole process should be repeated. This will also give you a bigger population in which to explore variations. Even with only seven chromosomes variation within the Reebop population will be clearly seen. To increase the variation, increase the number of chromosomes e.g. introduce *XX* (female) and *XY* (male).

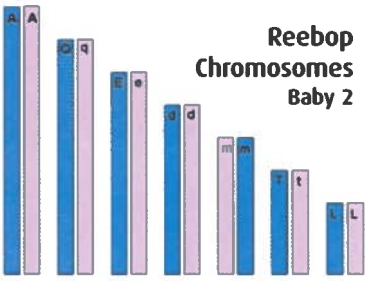


Figure 6 – Baby Reebop 2 Chromosomes

Curriculum for Excellence

This activity, with obvious links to reproduction, lends itself to addressing several other draft outcomes:

Science: Second Level – From a range of sources, including my local environment, I can identify and classify examples of living things to help me appreciate their variety. SCN 205B

Health and Wellbeing: Early/First Levels – I recognise that we possess similarities and differences and that we are all unique. HWB 022SS/HWB 123SS

Maths: Second Level – I can conduct simple experiments involving chance and communicate my findings using the vocabulary of probability. MNU 235Y

Figure 7 – Baby Reebop 2

Background Information

Meiosis is the process whereby eggs and sperm, which contain half the normal number of chromosomes, are formed. This is modelled when each pupil randomly selects half a set of each parent's chromosomes. Putting these two half sets together models the process of fertilisation. This set of chromosomes determines the baby's characteristics and thus the Reebop is "conceived". A full explanation can be found on the website[1]. Why not try out the Reebop Powerpoint activity (Figure 8) on the website version of Primary Science & Technology Bulletin 46 [3].

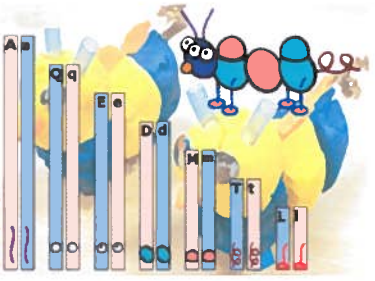


Figure 8 – Screenshot from Reebops Powerpoint

References

[1] http://www.wisc.edu/cbe/cbe_ pubs/reebops.html
[2] http://www.geocities.com/holidayzone/recipes/dough.html #perfect
[3] http://www.ise5-14.org.uk/Prim3/New_Guidelines/Newsletters/46/body.htm

Darwin 200

February 12th 2009 marks 200 years since the birth of one of Britain's most influential scientists, Charles Darwin. His book *On the Origin of Species by Means of Natural Selection* [1] caused controversy on its publication but is still the basis of our understanding of evolution.

Many events are being held throughout the coming year to mark this anniversary. See the special website at the Natural History Museum (NHM) for details [2].

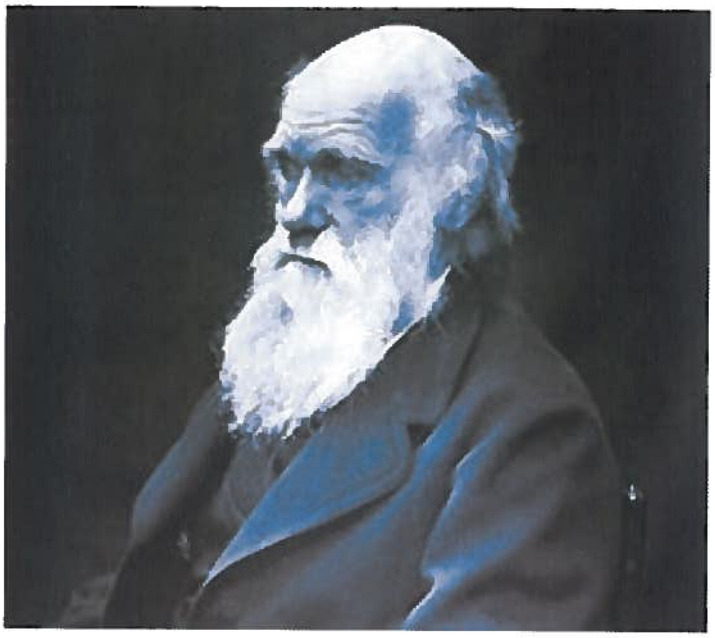
If your school or authority is holding an event the Advocacy Panel for Darwin 200 would love to know [3], and can help publicise it via the Darwin 200 website.

As part of the Darwin 200 celebrations, primary schools are being invited to take part in **The Great Plant Hunt**, a project which has been commissioned and funded by the Wellcome Trust in association with the Royal Botanic Garden, Kew (RBG Kew).

The project has been inspired by Darwin's scientific approach. Dr Steven Sinkins, Wellcome Trust Senior Research Fellow at Oxford University, comments: "Charles Darwin, perhaps the most influential scientist of all time, made meticulous observations of nature and maintained an open mind in interpreting what he found. His methods were low-tech, but his science has revolutionised our understanding of the world and of our place in it. Children in schools across the country can readily follow his inspiring example."

The Great Plant Hunt
...following in Darwin's footsteps
www.greatplanthunt.org

This innovative project aims to get primary school children out and about and excited by nature. It promises to give children aged 5-11 hands-on experience of what it's like to be a plant hunter, working with Kew's scientists who play a vital role in saving our natural world heritage.



Free resources

In Spring 2009, all the UK's 22,000 state primary schools will be sent a Treasure Chest full of free resources to be used in the classroom, online and in the great outdoors. The free resources are clearly mapped to the primary curriculum. With exciting missions to discover plants in the wild (from the school playing fields to weeds growing in the cracks in the pavement!) the Great Plant Hunt also gives children the chance to be part of the UK's biggest ever school science project. They will be invited to take part in a unique experiment to help scientists at Kew's Millennium Seed Bank. Secondary schools can sign up for their own free resources to support Darwin 200 [4]. See [5] for those who wish to receive advance notification of project developments or who wish to be involved in reviewing the project. Look out for more information about The Great Plant Hunt in future bulletins.

References

[1] http://www.zoo.uib.no/classics/origin.html
[2] http://www.darwin200.org/index.html
[3] http://www.darwin200.org/utils/contact.jsp?title=General%20enquiry
[4] http://www.survivalrivals.org/
[5] www.greatplanthunt.org

DARWIN200