

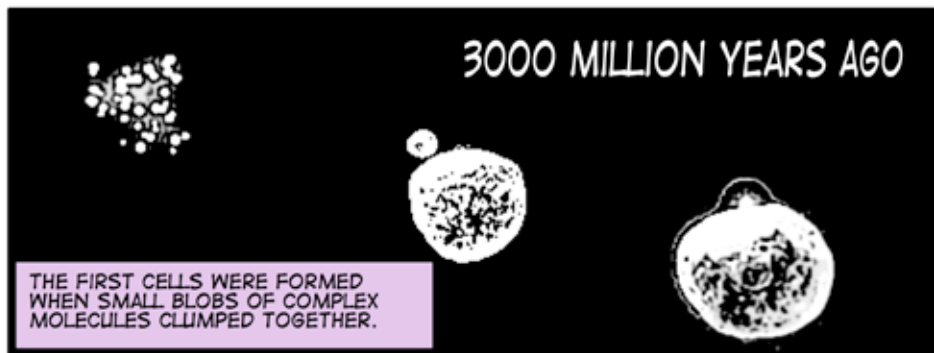
# Tree of Life

## BACK TO OUR ROOTS

### STUDENT WORKSHEET

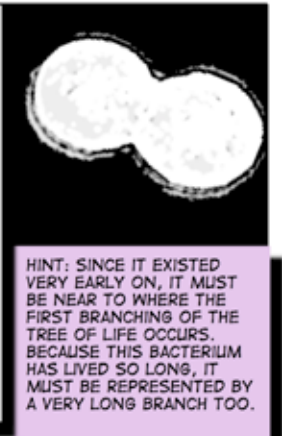
Based around the Wellcome Trust's *Tree of Life* ([www.wellcometreeoflife.org](http://www.wellcometreeoflife.org)). Watch this and use the interactive version to answer the following questions.

**3000 MILLION YEARS AGO**




THE FIRST CELLS WERE FORMED WHEN SMALL BLOBS OF COMPLEX MOLECULES CLUMPED TOGETHER.

**Q1** EARLY LIFE FORMS REPRODUCED BY CELLS SPLITTING IN TWO, JUST LIKE BACTERIA DO TODAY. ON THE INTERACTIVE, SEARCH FOR AND FIND THE NAME OF A BACTERIUM THAT WAS ALIVE AT THE EARLIEST TIME AND IS STILL FOUND ON EARTH TODAY.



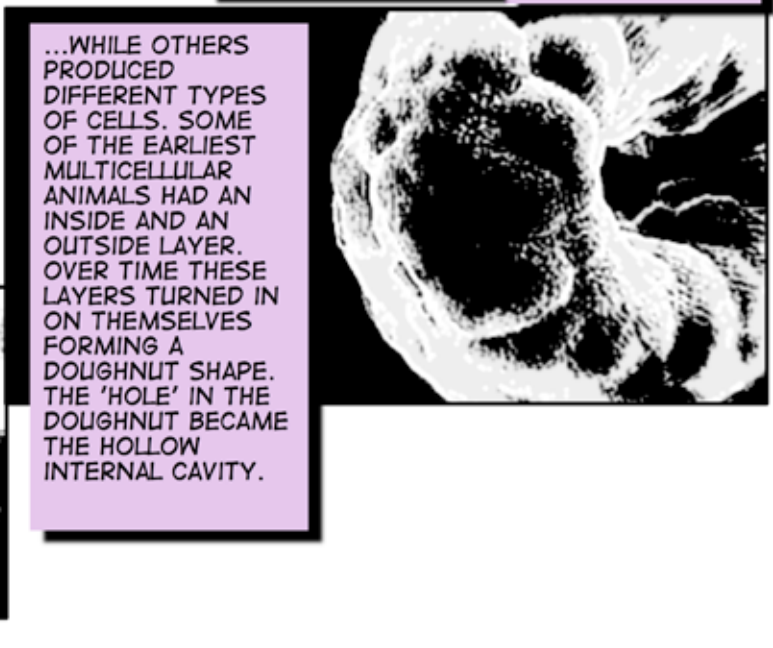
HINT: SINCE IT EXISTED VERY EARLY ON, IT MUST BE NEAR TO WHERE THE FIRST BRANCHING OF THE TREE OF LIFE OCCURS. BECAUSE THIS BACTERIUM HAS LIVED SO LONG, IT MUST BE REPRESENTED BY A VERY LONG BRANCH TOO.

SOME OF THESE CELLS REMAINED LINKED TOGETHER, FORMING LONG FILAMENTS...



**Q2** THESE PRIMITIVE SPONGES ARE CONSIDERED TO BE ANIMALS BUT DO NOT HAVE A GUT, SENSE ORGANS OR PROPER MUSCLES. FIND SPONGES ON THE INTERACTIVE AND USE THE INFORMATION PROVIDED TO FIND OUT HOW THEY OBTAIN THEIR FOOD.

...WHILE OTHERS PRODUCED DIFFERENT TYPES OF CELLS. SOME OF THE EARLIEST MULTICELLULAR ANIMALS HAD AN INSIDE AND AN OUTSIDE LAYER. OVER TIME THESE LAYERS TURNED IN ON THEMSELVES FORMING A DOUGHNUT SHAPE. THE 'HOLE' IN THE DOUGHNUT BECAME THE HOLLOW INTERNAL CAVITY.



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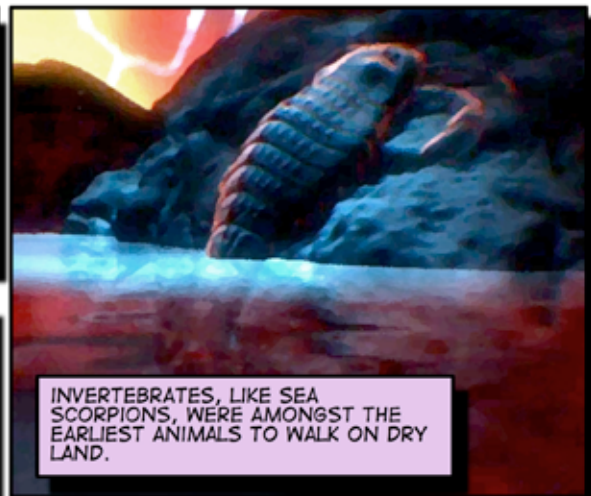
THE EARLIEST ANIMALS WERE EITHER SINGLE CELLS OR GROUPS OF SIMILAR CELLS. AS THE TREE OF LIFE BRANCHED OUT, ANIMALS DEVELOPED DIFFERENT TYPES OF CELL. THIS MEANT THEY COULD FORM ORGANS THAT COULD CARRY OUT SPECIAL TASKS SUCH AS MOVEMENT OR SENSING THEIR SURROUNDINGS. DEVELOPMENT OF BODY SEGMENTS WAS IMPORTANT TOO.



VELVET WORM



SEA SCORPION



INVERTEBRATES, LIKE SEA SCORPIONS, WERE AMONGST THE EARLIEST ANIMALS TO WALK ON DRY LAND.

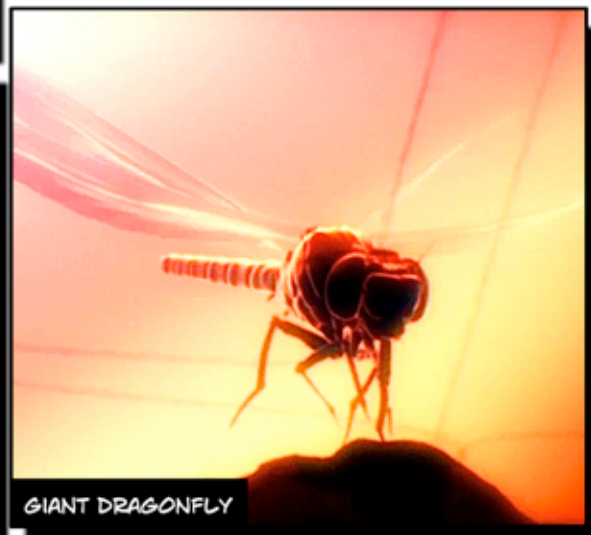
**Q3** FIND VELVET WORM ON THE TREE OF LIFE INTERACTIVE. SUGGEST HOW POSSESSING SMALL 'FEET' ORGANS IN EACH BODY SEGMENT GAVE VELVET WORMS AN ADVANTAGE OVER OTHER ANIMALS.

**Q4** THE SEA SCORPION IS AN EXTINCT ANIMAL THAT GREW TO 2 METRES IN LENGTH AND WAS ONE OF THE EARLIEST ANIMALS TO VENTURE ONTO THE LAND.

**A)** WOULD IT HAVE BEEN EASIER OR HARDER FOR ANIMALS TO MOVE ON LAND THAN IN THE SEA? WHAT DEVELOPMENTS MADE IT POSSIBLE FOR THE EARLIEST LAND INVERTEBRATES TO MOVE OUT OF THE WATER?

**B)** WHAT IS MEANT BY THE TERM 'EXTINCTION'? WHY DO ANIMALS BECOME EXTINCT?

**Q5** INSECTS LIKE THE EXTINCT GIANT DRAGONFLY BELONG TO A GROUP CALLED ARTHROPODA. WHAT FEATURE DO THESE ARTHROPODS SHARE IN COMMON? LIST THE OTHER MAIN CLASSES (OR SUB-GROUPS) THAT BELONG TO ARTHROPODA.

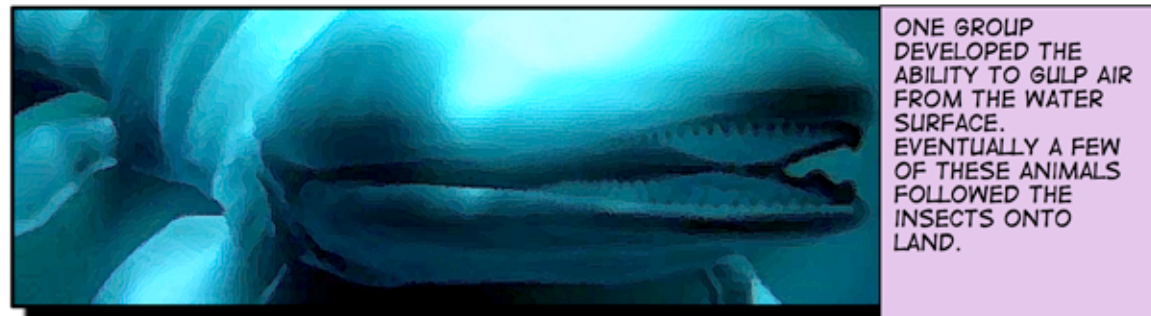


GIANT DRAGONFLY

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**Q6** THESE FISH-LIKE ANIMALS WERE THE ANCESTORS OF ALL MODERN VERTEBRATES. NAME THE FIVE GROUPS OF VERTEBRATES.

**Q7** USE THE INTERACTIVE TO SELECT THE FOLLOWING VERTEBRATES IN PAIRS. IF YOU CLICK ON ONE, THEN THE OTHER, THEIR MOST RECENT COMMON ANCESTOR SHOULD APPEAR. WHAT IS THE MOST RECENT COMMON ANCESTRAL STAGE FOR:

- A) A NEWT AND A CROCODILE?
- B) A DUCK AND A TORTOISE?
- C) A RABBIT AND A SNAKE?



**Q8** THE BONES IN THE FINS OF EARLY FISH CHANGED OVER TIME AND IN SOME FISH, GAVE THEM SUFFICIENT STRENGTH TO PRODUCE LEGS.

**A)** WHY WOULD LEGS TO SUPPORT AN ANIMAL ON LAND NEED TO BE STRONGER THAN FINS?

**B)** HOW DO SCIENTISTS KNOW THE DIFFERENT STAGES OF DEVELOPMENT FROM FINS TO LEGS, WHEN THESE ANIMALS ARE NO LONGER ALIVE?



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**Q9** REFER TO THE TREE OF LIFE FILM AND INTERACTIVE TO HELP COMPLETE THE TABLES BELOW BY PLACING A TICK IF YOU THINK THE DESCRIPTION MATCHES THE ANIMAL AND A CROSS IF IT DOES NOT. SCIENTISTS ARE UNCERTAIN ABOUT SOME OF THE FEATURES OF SOME OF THE EARLY ANIMALS SO IF YOU CANNOT MAKE UP YOUR MIND, YOU MAY WISH TO PLACE A QUESTION MARK INSTEAD.



	eggs surrounded by a hard shell	has teeth	has feathers	is warm blooded	has fur	cares for young
early amphibian						
early reptile						
tyrannosaurus						
archaeopteryx						
modern birds						
early mammal						
bat						
chimpanzee						

**Q10** WHAT ADVANTAGE DID THE DEVELOPMENT OF EACH OF THE FOLLOWING GIVE TO VERTEBRATES?

- A) EGGS WITH HARD SHELLS
- B) KEEPING BODY TEMPERATURE WARM
- C) CARING FOR YOUNG

**Q11** SCIENTISTS CONSIDER ARCHAEOPTERYX TO BE A VERY IMPORTANT EXTINCT ANIMAL TO STUDY. FIND OUT WHY.