





Spring August to November 2013



xplorer

experiment discover create

liftout for young scientists

-  **ACTIVITIES**
make your own echidna
star in your own play!
armour word search
-  **INTERVIEW**
biomimetics with dr peter gray
-  **COLLECTOR'S CARD**
giant tasmanian crayfish
-  **INFO**
armoured animals
armour on display



INSPIRED BY NATURE

ARMoured ANIMALS

Hi, I'm Carla the Echidna!

You may have seen me around the Australian Museum. When I'm out in the bush, my coat of spines and bristles protects me from wild animals that might want to eat me, like dingos, foxes or cats.

My spines are sharp but they are also hollow so they don't weigh much. They are all attached to a big muscle that starts at the top of my forehead. If I'm threatened this muscle contracts and I can curl up into a small, spiky ball – all the better to scare off predators!

My spines all point backwards – can you guess why?

There are many other slow-moving animals that have scales, plates or spines for protection, like the turtle with its hard shell. Can you think of any others?

See back page for **answers**.



FUN FACTS

In 1990 Australia became the first country in the world to pass laws requiring people to wear helmets while riding. Safety first! We wear bicycle helmets to protect our heads. What other armour do you wear?

On the cover Armour is just one of many things inspired by nature. Styling by Jeremy Austen. Photo by Stuart Humphreys.

UNLEASH YOUR INNER SCIENTIST!

Visit the Australian Museum
Science Festival 2013

Science on Saturday 10 August
High schools 13–15 August
Primary schools 20–22 August

Details and bookings
www.scienceunleashed.net

MAKE YOUR OWN ECHIDNA

You will need:

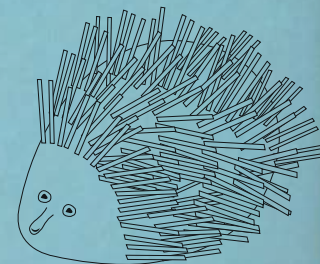
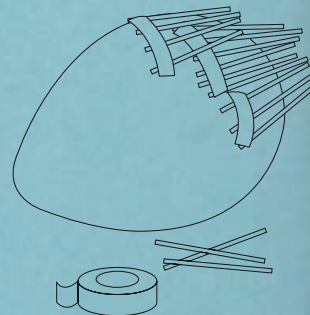
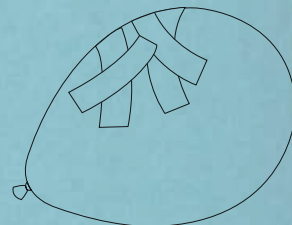
- a balloon
- vaseline
- scrap paper cut into long strips
- papier mâché glue
- masking tape
- cut-up drinking straws (you could also use cardboard, recycled plastic or seed pods)
- paint and paintbrush

To make the papier mâché glue whisk together:

- 1 cup of plain flour
- ½ cup of water
- 2 tablespoons of PVA or white craft glue



- 1 Blow up the balloon and tie off the neck.
- 2 Rub vaseline gently all over the balloon.
- 3 Paste the paper strips one at a time to the outside of the balloon until it's totally covered. Let it dry for a few hours.
- 4 Repeat with two more layers of paper, drying in between.
- 5 Once the final layer is dry, use a pin to pop the balloon inside.
- 6 Tape the straws to the back of your echidna to make the spines – remember they all need to point backwards. Start at the rear and work towards the head.
- 7 Paint your echidna's body and face.



What other models of armoured animals could you make like this?

SCIENTIST FOR A DAY

25 & 26 September Become a marine biologist
2 & 3 October Become a DNA detective

Do you have what it takes to be a marine biologist? Or maybe you're a DNA detective in the making. Find out in these fun, one-day workshops.

Ages 8–12 years

Bookings

t 02 9320 6389

e scicom@austrmus.gov.au

For the complete school holiday program, visit www.australianmuseum.net.au/whatson

◀ LIFT, STAPLES TO REMOVE XPLORER ▶

ARMOURED ANIMALS WORD SEARCH

How many of these armoured animals can you find?

ARMADILLO BALMAIN BUG BRITTLE STAR CHITON
CRAB CRAYFISH CROCODILE ECHIDNA HEDGEHOG
ISOPOD LOBSTER PANGOLIN PORCUPINE SEA URCHIN
SHINGLEBACK LIZARD TURTLE

C R A B R F L L P N K W J C A
R E L T R S E A U R C H I N C
O E V B R I T T L E S T A R V
C H I T O N A R M A D I L L O
O N S U U G C E B U V O X M H
D S O R N Z E R N Y S E V R E
I Q P T P A N G O L I N R L D
L N O L T B A L M A I N B U G
E S D E A M E C H I D N A B E
C N I H C R U A E S V I S R H
T S H I N G L E B A C K L E O
B V L I Z A R D N P E T L L G
L O B S T E R T W O L V M H P
I C R A Y F I S H D Z Z X X Q
F R L O F P O R C U P I N E Y

THE PORCUPINE FISH AND THE SHARK



In many cultures animals play an important role in storytelling. A fable is a type of folk story that uses animals as its main characters – like *The Tortoise and the Hare* or *Henny Penny*.

Now it's your turn to write a short fable called *The Porcupine Fish and the Shark*.

Think about your characters and what will happen in the fable: are they friends or enemies? Do they face a challenge and learn a lesson?

Visit the *Armour* display in the Museum, then make your own porcupine-fish helmet and shark-tooth sword using recycled cardboard, plastic and paper. Rehearse and perform your fable with a friend – invite your friends and family to be in the audience.

Try swapping roles. How does it feel playing a shark compared to playing a fish?

FUN FACTS



Two animals in the *Armour* display at the Museum are the Armadillo (a Spanish word meaning 'little armoured one') and the Pangolin (a Malay word meaning 'one that rolls up'). Check 'em out!



Each issue of Xplorer includes a collector's card for you to cut out and keep!

xplorer
collector's card

27



Giant Tasmanian Crayfish



HOOKED ON VELCRO

Scientists and engineers often look to the natural world for inspiration. Here Cat Beehag, Manager of the Australian Museum Science Festival, quizzes 3M's Technical Manager Dr Peter Gray about biomimicry.

CAT: What is biomimicry?

PETER: Biomimicry (from bios, meaning life, and mimesis, meaning to imitate) or biomimetics is a new discipline that studies nature, its models, systems, processes and elements, and then imitates these designs and processes to solve human problems by inspiring products with improved design and performance.

CAT: What are some famous examples of biomimicry?

PETER: The most famous is probably the invention of Velcro™ by Swiss engineer George de Mestral. It is based on the structure of a type of plant seed with hooked spines that can catch on clothing, hair or animal fur. It took de Mestral ten years and much trial and error to develop his product.

Arguably, 3M's most successful application has been multilayer optical films, inspired by the glittering wings of the Morpho butterfly which appear bright blue without

the use of colour pigment. By combining films in layers similar to the microstructure of the butterfly's wings, 3M has produced multilayer films for use in LCD displays to increase screen brightness, reduce glare and provide viewing privacy.

CAT: What is the future for biomimicry in product design?

PETER: Bio-inspired research is growing exponentially. A current area of interest is robotics and control, based on patterns of animal behaviour, but others include the design of buildings, cities and sustainable farming systems.

It seems the natural world will continue to inspire people to design new products that imitate the best features of those natural systems.

WEBLINK >

Read more about biomimetics at www.australianmuseum.net.au/explore-magazine.

THIS EDITION OF XPLORER COMPILED
BY LYDIA CLARE NICHOLSON

Dr Peter Gray is Technical Manager for technology company 3M, a key sponsor of the Australian Museum Science Festival. Photo courtesy Peter Gray.

Background: The invention of Velcro was inspired by the spiny seeds that cling to animal fur and clothing. Scanning electron micrograph by Sue Lindsay.



Giant Tasmanian Crayfish

The Giant Tasmanian Crayfish (or Freshwater Lobster), *Astacopsis gouldi*, is the world's largest freshwater invertebrate. It can weigh up to 6 kg but is slow to mature (females take 14 years; males 9 years), with some individuals living for up to 50 years. It is found only in freshwater streams in northern Tasmania where populations are now threatened from past overfishing and loss of habitat.

The giant crayfish has a pair of large chelae (pincers), eight legs and a blue to brown body. A spiny carapace (hard shell) covers its body and protects its gills. It is most active at night when it forages streambeds for rotting wood, roots, leaves, water plants and carrion.



Photo © Tasmanian Museum and Art Gallery.

ANSWERS from previous page

Armoured animals Carla the Echidna says: 'My spines all point backwards so I can push my way between plants and dig burrows without the spines getting caught. When I need to defend myself, I simply contract my main muscle and curl up into a ball so that my spines stick out to deter unwanted visitors'.

A shingleback lizard's tough scaly skin, an armadillo's bony-plated body and the hard, spiny shell of a crayfish are all examples of animals with body armour.