Royal Albatross Centre Education

# Flight and Feathers

A Science Programme for
Primary Students
at the **Royal Albatross Centre**

Programme Booklet for Teachers
2011

# Programme Overview

**Objective:** To understand the principals of flight and how birds have structures and adaptations that make flight possible. The wing and flight style of the birds of Taiaroa Head are suited perfectly to the environment in which they live.

**Programme Description:** The programme will look at the adaptive features of birds and their mechanisms for flight. Students will look at the relationship between the shape of the wing and the type of flight. Observations of a variety of seabirds in flight from the Richdale observatory will illustrate how the type of flight is related to their feeding, breeding and movement. And the students can then decide if the design for airplane wings came from the study of birds in flight.

| | |
|---|---|
| Time: | 2.5 hours |
| Age Focus: | Years 4-8 (although can be adapted for younger groups) |
| Cost: | $4/person |
| **Curriculum Links:** | **Science Level 2-4** |
| | Physical World |
| | Living World |

# Spend the day on Otago Peninsula

## Trip on the Wild Side

Make the most of your bus trip and journey through time on the Otago Peninsula. Investigate how natural and social events have shaped the Peninsula environment in the past and may shape it in the future.

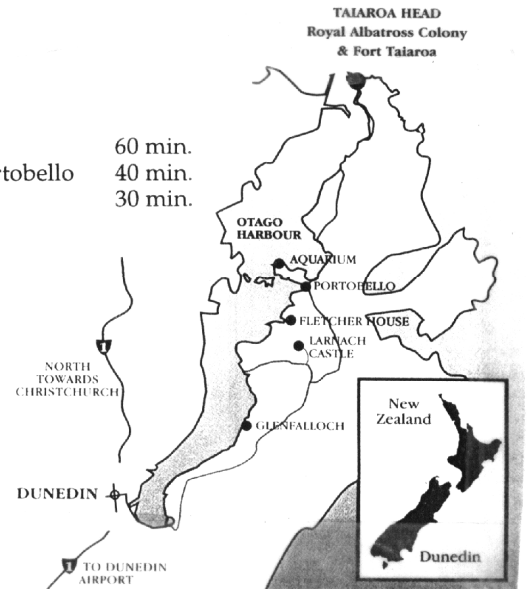
## New Zealand Marine Studies Centre:

There are a number of connecting programmes available at the NZ Marine Studies Centre and Aquarium. For programme details and bookings check out www.marine.ac.nz

**Location**

Travel Times (one way):

| | |
|---|---|
| Dunedin to the Royal Albatross Centre, Taiaroa Head | 60 min. |
| Dunedin to NZ Marine Studies Centre (Aquarium), Portobello | 40 min. |
| Royal Albatross Centre to NZ Marine Studies Centre | 30 min. |



# Standard Programme Plan:

| Time | Group A |
|---|---|
| | Arrive, meet guide at reception<br>- *please arrive 10 minutes early* |
| 0 | **Education Rm** (30 min)<br>- *What is a bird? (comparison of bird to cat)*<br>- *How do they fly? (flapping, soaring, gliding)*<br>- *Mechanisms of flight with demonstration*<br>- *Where do they go? (different wings for different jobs)* |
| 30 min | **Observatory** (30 min)<br>- *Viewing of flight (Albatross, gulls, shags)*<br>- *Identification of species and wing types with silhouettes*<br>- *Toroa – flight path*<br>- *Weighted birds – difficulties of flight* |
| 1 hour | **Cliff Viewing** (30 min)<br>- *shag viewing*<br>- *gull viewing*<br>- *act out gliding & flapping flight* |
| 1.5 hours | **Education Rm** (30 min)<br>- *series of activity stations to look at mechanisms of flight and how the birds are adapted for flight.*<br>- *DVD penguin and shag flight (display area)* |
| 2 hours | **Wrap up** (10 min)<br>- *Reviewing learning objectives*<br>- *Believe it or not - game* |
| 2.2 hrs | **Depart** |

# Curriculum Links and Planning Guide

## Science

| Achievement Objectives | Specific Learning Outcomes | Activities |
|---|---|---|
| ***Nature of Science***<br>**Understanding about science**<br>(L2) Appreciate that scientists ask questions about our world and that lead to investigations and that open-mindedness is important because there may be more than one explanation.<br>**Investigating in science*:***<br>(L3) Build on prior experiences, working together to share and examine their own and others' knowledge.<br>Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.<br><br>***Physical World***<br>**Physical Enquiry**<br>(L2) Explore everyday examples of physical phenomena such as movement, forces etc. Seek and describe simple patterns in physical phenomena.<br>(L3/4) Explore, describe, and represent patterns and trends for everyday examples of physical phenomena, such and movement, forces etc. | Students will be able to:<br><br>1. Compare and contract flight features of a bird with that of other flying objects eg. plane.<br><br>2. Describe how a bird's wing is adapted for flight.<br><br>3. Discuss wing shape and type of flight. | At the Royal Albatross Centre:<br>- Education Rm Activity<br>- Observatory Visit |

| | | |
|---|---|---|
| ***Living World***<br>**Ecology**<br>(L2) Recognise that living things are suited to their particular habitat.<br>(L3/4) Explain how living things are suited to their particular habitat and how the respond to environmental changes, both natural and human induced.<br><br>**Evolution**<br>(L2) Recognise that there are lots of different living this in the world and they can be grouped in different ways.<br>(L3/4) begin to group plants, animals and other living things into science-based classifications. | Students will be able to:<br>1. Describe the structures of a bird used in flight and how the variation in wing shape affects their flight and life style.<br><br>2. Distinguish between 5 different species of birds by using the shape and size of their wing. | At the Royal Albatross Centre:<br>- Display Activity<br>- Observatory Visit |

## Other Curriculum Areas

- Social Studies, English, Arts, Maths, Health and PE

# Tour Guidelines

1. **Supervisors**

- Ratio of 1 adult to 8 students is required for primary level.
- Role of supervisors is to:
    - ensure that the students act in a responsible manner.
    - assist the students with the activities.
    - keep the noise level down and the group together.

2. **Dress warmly**

- It is always windy and cold at Taiaroa Head.

3. **Arrive 10 Minutes Early**

- If you are late, the time of your visit may be cut short as the observatory time is fixed and other tours are scheduled immediately after yours.
- Please allow time for a toilet break before the programme begins.

4. **Group Size**

- Please note only 25 people are allowed in the observatory at once.
- Please organise your students and adult helpers into groups of 25 or less before arrival.

5. **Programme Length**

- The programme is 2 hours and 15 min. long (includes 15-30 minutes in the Richdale Observatory.
- Please plan to have morning or afternoon tea before or after the programme (not during).

6. **Lunch Areas**

- Areas suitable for lunch include:
    - Pilots Beach, just below the head land, is a great place to view fur seals but please do not approach or disturb them.
    - grassy area to the east of the Royal Albatross Centre.
    - Education Room maybe available if the weather is wet (please check availability with Royal Albatross Centre staff in advance).

**Shop and Cafeteria**

- Please keep children out of these areas unless they are planning to make a purchase.

7. **Observatory**

- Please note that the observatory is unavailable from Sept 17th to November 23rd to avoid disturbing the birds during courtship and egg laying. During this time students will be taken to an outdoor viewing area where they will see fur seals, shags, other birds and possibly albatross flying. Students

will have the opportunity to view wildlife that is not normally part of the programme.

**No Smoking**

- To reduce the fire risk to the colony, smoking is not permitted.

# Pre-trip Preparation

In order to ensure that students get the most out of the programme we suggest that some pre- and post-trip work is done in the classroom prior to the visit to the Royal Albatross Centre.

## 1. Risk Assessment

Review guidelines on the web site and review with trip supervisors. **(**www.school.albatross.org.nz/resources_home.html**)**

## 2. Pre-trip Activities

Use the activities on the web site and the resources listed to introduce the students to albatross and the Taiaroa headland.

## 3. Background Information

Review the information provided in this booklet. Further information about albatross and the Taiaroa Headland site can be found on the web site and in the reference list

## 4. Work Sheets

Programme worksheets are available on web site. Due to limited time during the programme, we suggest that teachers use them to follow up the programme in the classroom.

## 5. Tour Guidelines

Please review the Tour Guidelines with your students and adult supervisors prior to the trip to the Royal Albatross Centre.

## 6. Teacher led activities at Taiaroa Head

Extend your visit to Taiaroa Head by exploring the headland. Simple identification guides will help you find other species of birds and mammals that use the headland. Lunch at Pilot's Beach and follow a trail to look at how humans interact with the environment. Laminated copies of activity sheets are available from the Royal Albatross Centre.

## 7. New Zealand Marine Studies Centre

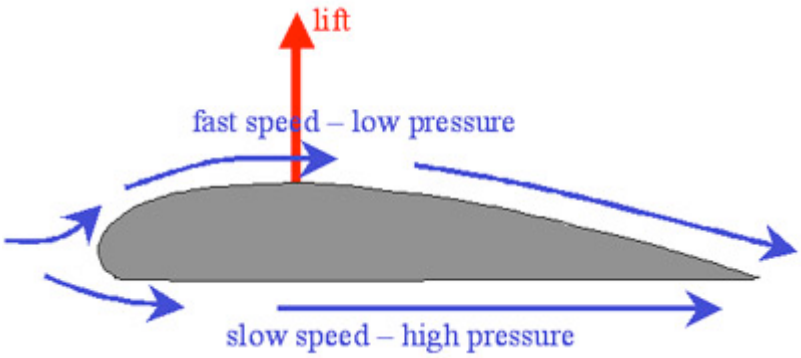
Combine at the Royal Albatross Centre programme with a visit to the NZ Marine Studies Centre and Aquarium. Spend the morning at the Aquarium and the afternoon with the Albatross or vice versa. The programmes are complementary and together create a unique learning experience for your class.

# Principles of Flight

## Aerofoil

An aerofoil is shaped so that air flows faster over the top than under the bottom. There is, therefore, a greater pressure below the aerofoil than above it. This difference in pressure produces the lift.

The lift generated by a wing is based on the principle that the pressure in a fluid decreases as its velocity increases (Bernoulli's Principle):




## How Birds Fly

The principles of how birds fly are the same for a bird as they are for an airplane.

Both the bird and an airplane overcome the downward pull of gravity by means of lift. Lift is caused by the forces of air as it moves past the wings. To move forward, both must overcome the resistance of air as well. Both a bird and an airplane overcome this resistance by means of a propeller.

In the case of a bird, the propeller is the wing.

A bird does not fly by simply flapping it's wings up and down. The down stroke is the most important in flight; it moves upward and backward.

On the down stroke, the wing has it's leading edge lower than the rear edge. As the wing cuts downward and forward through the air, the angle and shape of the wing is similar to that of a propeller blade when it is cutting downward through it's rotation.

In addition, each primary feather of the bird is under muscular control and may be rotated. Often, several of the outermost primaries are also turned forward so that the leading edge of each is low and each acts as a small, individual propeller.

When a bird's wing is held at too great an angle to the direction of flight or when the speed of flight is too slow, the smooth flow of air over the top surface of the wing is disturbed and lift is destroyed.
This is known as stalling.

Birds and airplanes are similar in the devices they use to help correct the condition. If any small wing is held in front of the leading edge of a large

wing, a slot is formed through which air flows. This air is speeded up; it smoothes out the flow of air over the top surface of the wing, and to a degree prevents stalling.

In birds the winglet (little wing) forms such a slot when it is extended. The tips of the primaries are also often spread to form slots.

There are almost as many shapes of wings are there are kinds of birds. Some wings are suited for short bursts of flight, other wings are suited for flight in ocean winds. A hummingbird's wings can even allow the bird to fly backwards. Other wings are made for soaring.

A bird uses it's tail to keep itself steady in flight. The tail also serves as a flap to slow air speed without stalling, very similar to how an airplane uses flaps in landing.

Some birds make sharp turns at top speeds. Others fly mostly in straight lines. The difference is in their tail design. Because the tail is used like a rudder the feathers are broad and stiff. These tail feathers open and close like a fan and move up and down. They also twist to the left or right.

Birds "bank" as they turn. They tilt one wing higher than the other. Banking holds the underside of the wings. Another way the bird turns is to beat one wing a little faster than the other.

The most unique flying bird is the hummingbird. It can fly in one place in the air for long periods of time. Their bodies are upright. Their wings sweep back and forth. This is like a helicopter. Since their wings make as much power on the up stroke as on the down stroke, their muscle structure is not like other birds.

How Fast Can Birds Fly?

Most songbirds can fly about 20 to 30 miles per hour, but Common Eiders can fly nearly 50 miles per hour, and Dunlins (shorebirds) are suspected of reaching nearly 100 miles per hour.

Peregrine Falcons are considered the fastest birds. Experts think they may reach 200 miles per hour in dives.

# Resources

## Royal Albatross Centre Activity Sheets
**(download from** www.school.albatross.org.nz/resources_home.html**)**

**PRIMARY**
**Pre / Post Trip Activity - "Getting to know the Royal Albatross"**
This activity can be done individually, in groups or as a class activity. We suggest you do it prior to the visit and then ask children to use a different colour pen to change or add to their answers after the visit. Send your questions to the Royal Albatross Centre and the guides will try to answer them during your visit.

**Albatross and Seabird Observation Record**
Work sheetsfor students to record the birds observed during their visit.

**Food Web Card Game - "Gulp and Swallow"**
This card game illustrates local food chains and where albatross fit in. And excellent resource for both the Royal Albatross Programme and the NZ Marine Studies Centre programme.

**Create your own Albatross Mask**
Colour template to construct an albatross face mask with beak.

**Seabird Solutions Facts Sheets and Lesson Plans**
Information about seabirds and conservation issues.

**ALL LEVELS**
**Wildlife Viewing Guide**
Wildlife viewing activity guide for teachers.

**Wildlife Information Guide**
Species to look for at Taiaroa Head and information.

**English Activity – "Poems about Albatross"**
Encourage students to write about the flight observed in a creative way.

**Relevant Web Sites**

www.school.albatross.org.nz
The education part of the Royal Albatross Centre website. Lots of activities and information to download.

www.albatross.org.nz
The Royal Albatross Centre site with background information on the colony and history of Fort Taiaroa.

www.doc.govt.nz/seabird-resources
Southern Seabird Solutions fact sheets and lesson plans
Excellent resources

www.savethealbatross.net
Save the Albatross campaign by RSPB and Birdlife International.

www.forestandbird.org.nz/what-we-do/campaigns/save-albatross
Facts about the threatened albatross species and information on the campaign to prevent albatross deaths in the fishing industry.

www.wwf.org.nz/what_we_do/species/seabirds/
World Wide Fund for Nature site with information on conservation issues surrounding albatross.

www.oceanwings.co.nz/albatross
A tourism operation in Kaikoura. Has a conservation section and information on what birds (including albatross) can be seen.

http://science.howstuffworks.com/great-pacific-garbage-patch.htm
http://science.howstuffworks.com/clean-up-garbage-patch.htm
How stuff works articles on the problem the Pacific ocean is facing with plastics and how we can 'potentially' clean it up.

# FLIGHT AND FEATHERS

## Student Worksheet Answers

Complete these questions as you move around the different stations.

### #1. ALBATROSS PUZZLE - Life Size

Put the puzzle together and measure the…

Length of the right wing = **1.5 m**

### #2. BLACK BACK GULL – Stuffed Bird Skin

Examine the stuffed gull and measure the wing span (wing tip to wing tip) and compare it to the Albatross wing span.

Albatross wing span = **3 m**

Black back gull wing span = **1.2 m**

Size difference = **1.8 m**

### #3. WING SHAPE

Look at the bird wings. Use lines to match the bird name and method of flight with the wing number?

| WING # | FLIGHT | BIRD |
|---|---|---|
| A | Flitter ⟹ | Sparrow / Tiu |
| B | Flapper ⟹ | Shag / Kawa |
| C | Glider ⟹ | Sooty Shearwater / Titi |
| D | Swimmer ⟹ | Penguin / Hoiho |

## #4. WIND SPEED

Measure the wind speed three times during your visit and calculate the average speed.

| Time | Speed |
|---|---|
| | |
| | |
| | |
| TOTAL | |
| Average wind speed = Total / 3. | |

## #4. WING AEROFOIL

What direction does the aerofoil go when the curve is on the bottom?

**Up** *or* Down

## #5. FEATHERS

Complete the table

| Type of feather | Use | Sketch (time permitting) |
|---|---|---|
| Contour Feathers | **Streamline bird, help air flow over the wing.** | |
| **Down Feathers** | Keep the bird warm | |
| Flight Feathers | **Keeps the bird in the air.** | |

## #6. BIRD BONES

Examine the bones, feel their weight.
Which one is the bird bone?

How can you tell? ___**The bones that are lighter are the bird bones as they have air spaces inside the bone.**

## #7. HEARTS

Who has a bigger heart? – A mouse or a **sparrow**

Why is this? **Sparrow is pumping more blood around the body than the mouse heart**

## #8. SKULLS

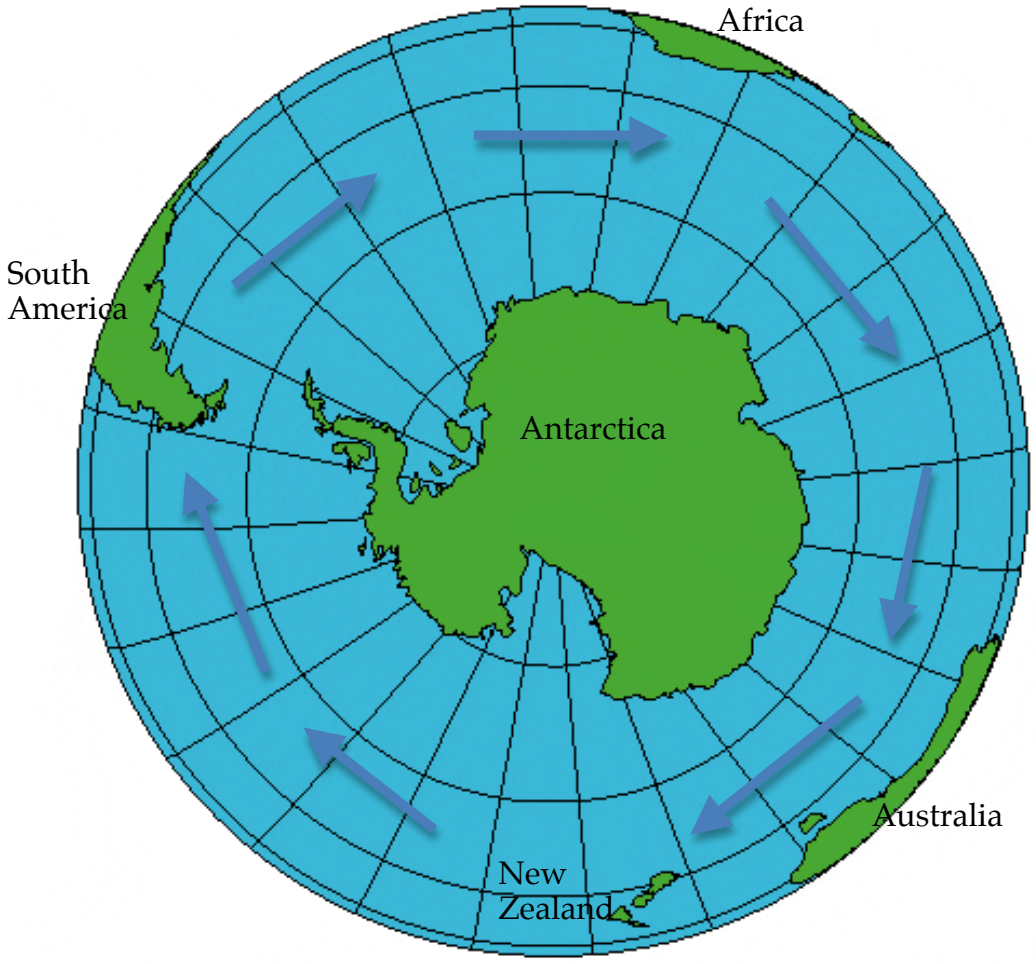
Examine the shag skull and describe how it is different to a mouse skull (left) and explain why.
**Shag skull is lighter as it does not have a heavy lower jaw or teeth. It has a bill instead and a more streamline shape.**

## #9 RESEARCH –Flight Path of Albatross

Albatross are long distance flyers. Transmitters were put on the back of juvenile albatross to find out where they go when they leave New Zealand.

Where do the Albatross fly to when they leave NZ.
**To Chile**

Look at the globe and predict the route they take to come home based on wind patterns. Use a line to mark their flight path and label the countries that you know.




Global Map Projection • South Pole