



# BIOLOGY UNIT OF STUDY 4

■ YEAR 11 ■ NCEA AS90926 ■ LEVEL 1.2 ■ DURATION 2-3 weeks

Supports internal assessment for Achievement Standard 90926

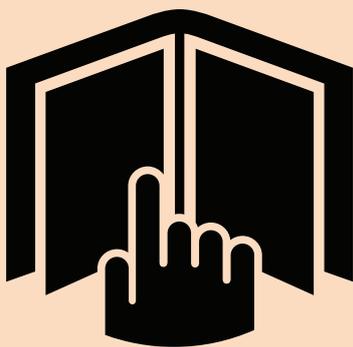
Report on a biological issue

## A LESSON IN ETHICS AND NON-HUMAN AWARENESS



# Sentience is the Bedrock of Ethics

A study of sentience in non-human animals



### TEACHER GUIDELINES

The following guidelines are supplied to enable teachers to carry out valid and consistent assessment using this internal assessment resource.

### CONTEXT/SETTING

This activity requires students to collect and process data and/or information to report on a biological issue. An issue is one on which people hold different opinions or viewpoints. The issue that this research assignment will explore is **sentience in non-human animals**.

Sentience in non-human animals has been and continues to be contested and debated extensively in the scientific community. New discoveries regarding sentience in non-human animals are made on a regular basis. This is an important topic for science students to consider because of the ethical implications involved in the use of animals in science and in experiments.

Science students are required “to consider the social and ethical implications involved in making responsible decisions about living things” (*Science in the New Zealand Curriculum* p. 52). Learning about sentience in non-human animals will help students when making ethical and responsible decisions about the use of animals in science.

The study of ethology has in recent years changed the cultural and scientific perceptions and treatment of non-human animals and continues to do so. Great Apes are not used in experiments in the Netherlands, New Zealand, the United Kingdom, Sweden, Germany and Austria, largely due to new knowledge and understanding of sentience in these animals.

This assignment will include the processing of information and the linking of the processed information to a use of science. At Level 1, teacher direction sets the scope of the research by:

- choosing the topic to research
- providing templates on which the students base their reports indicating the presentation of the information and links required.

In order to report comprehensively students must:

- refine a suitable question or purpose
- identify multiple links between the biological ideas that are related to the question or purpose

- collect and process primary or secondary data and/or information from a range of sources
- evaluate sources of information/ data in respect to the question or purpose
- identify at least two different points of view supported by evidence
- take and justify a position with a recommendation for action
- present findings in a report.

A choice of topics is provided for this research assignment. These topics will help students explore the behavioural, emotional and sensory worlds of non-human animals. Students will be asked to consider animal intelligence, pain perception, awareness, communication, sociability and morals.

Research topics students can choose from include:

- evidence of **intelligence** in non-human animals
- evidence that non-human animals experience **emotions and physical sensations**
- evidence that non-human animals are **aware** of their surroundings
- evidence that non-human animals **communicate** their needs
- evidence that non-human animals are **sociable** with others
- evidence that non-human animals are **virtuous**.



This assessment is an open-book research assignment.

The assignment consists of two parts that lead to the production of a report.

**Part 1** involves processing information. This information can be researched or provided.

**Part 2** involves interpretations of the information and reporting

the research results. The report will follow the provided format or template.

### CONDITIONS

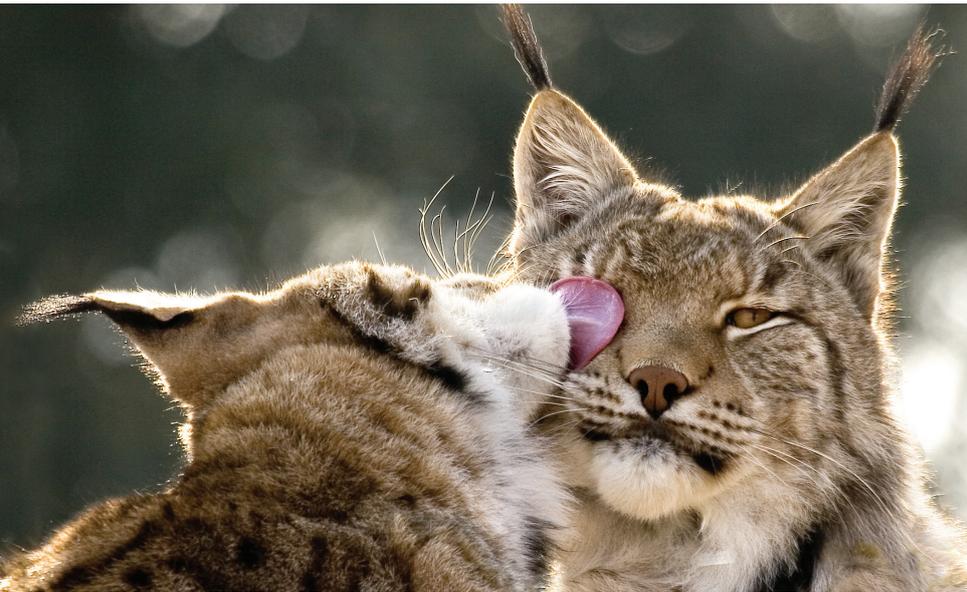
Students will need sufficient time to carry out the research, processing and reporting required for this activity. As a guide it is expected that the research component could be completed in **three to four hours**

with a further **one to three hours** required to complete the report. Students will need sufficient access to both computers and the internet either at school or at home.

This time could be allocated in a single fortnight or could be spread over a longer interval such as a school term to allow for research and processing of a range of source material. Teachers need to keep in mind the credit value of this standard when determining the time for this assessment.

All work is likely to be undertaken individually and appropriate measures should be taken to ensure authenticity. This could involve collecting all student notes with the final report; requiring authentication of any work undertaken at home and/or collecting work undertaken in class at the end of each lesson and returning it to students as required.

Teachers need to keep in mind the credit value of this standard when determining the time for this assessment.



### ADDITIONAL INFORMATION

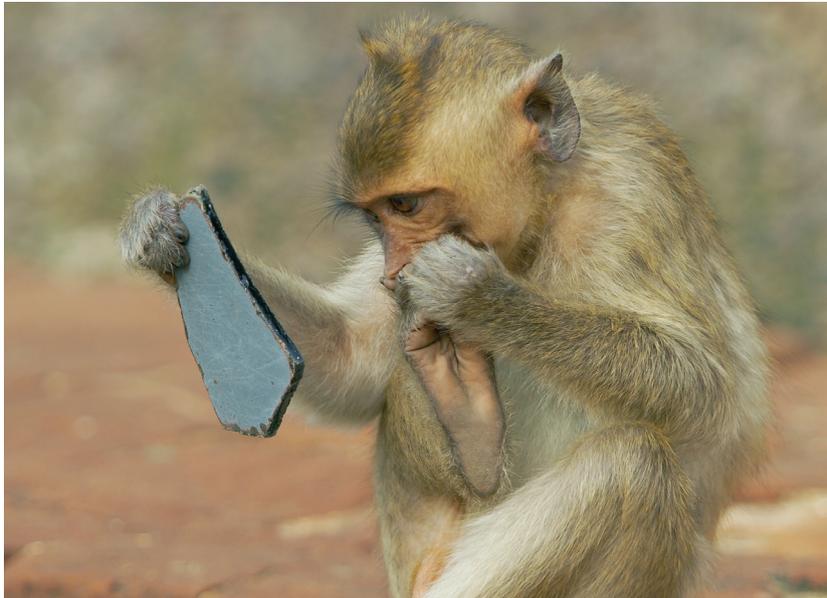
The following prior teaching is required:

- **Issues** – What makes a biology topic and issue (i.e. when people hold different opinions or viewpoints about it)?
- **Refining a question** – Taking a general question or purpose about an issue and refining it to make it suitable to guide research.
- **Making multiple links involving biological ideas** – Describing and explaining the biological ideas related to the question or purpose and identifying multiple links between the different ideas and the question.
- **Processing data/information** – Selecting biological ideas relevant to the issue from a range of sources and organising the ideas for reporting. A range is likely to involve at least three sources, and the sources can be the same type (e.g. all from the internet).
- **Evaluating sources** – Identifying sources that provide biological ideas relevant to the question and checking the sources for accuracy, being up to date and/or bias; providing reasons why a particular source was/was not used.
- **Using evidence to support different points of view** – Selecting at least two different points of view and then selecting biological ideas that support why a person, group or organisation holds each of these points of view.
- **Justifying a position** – Stating their own opinion with reference to specific information they have researched.
- **Giving a recommendation for action** – Saying what they believe should be done about the issue and why.
- **Presenting findings** – Structuring a comprehensive report to clearly present findings.
- **Recording sources** – Writing a list of sources in a way that can be accessed by others.



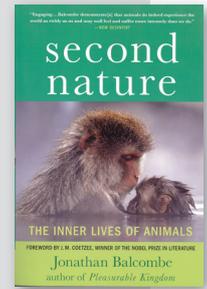
RESOURCE REQUIREMENTS

Students need to access a range of information sources. These may include biology magazines, internet sites, Alpha resources and other Royal Society resources. Use of primary sources (e.g. through interviews) is acceptable. Information is required on the biological ideas and processes related to the issue and on the different points of view held by people. Students also require access to computers and the internet for their research and reporting.



Key resource

Second Nature: The Inner Lives of Animals by Jonathan Balcombe. Palgrave Macmillan, 2010. pp. 71-99.



Secondary resources

Frozen Planet. BBC Natural History Unit. 2011.

The Life Collection: David Attenborough. BBC Natural History Unit, 2005.

The Blue Planet. BBC Natural History Unit, 2005.

Meerkat Manor. Oxford Scientific Films, 2005-2008.

Generic Assessment Schedule: Sci/1/2

AS90926 (Biology 1.2): Examples of evidence, relevant to the specific context being assessed, will need to be inserted in the spaces indicated before this schedule can be used.

Table with 4 columns: EVIDENCE, JUDGEMENT FOR ACHIEVEMENT, JUDGEMENT FOR ACHIEVEMENT WITH MERIT, JUDGEMENT FOR ACHIEVEMENT WITH EXCELLENCE. The table contains detailed criteria for each level of achievement.



## BIOLOGY UNIT OF STUDY 4

■ YEAR 11 ■ NCEA AS90926 ■ LEVEL 1.2 ■ DURATION 2-3 weeks

Supports internal assessment for Achievement Standard 90926

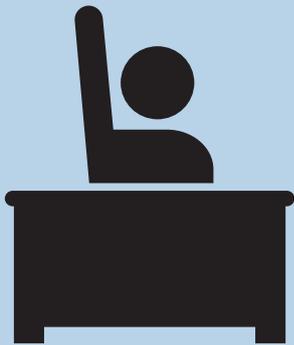
Report on a biological issue

### A LESSON IN ETHICS AND NON-HUMAN AWARENESS



# Sentience is the Bedrock of Ethics

A study of sentience in non-human animals



#### STUDENT GUIDELINES

This activity requires you to report on a biological issue. An issue is something on which people hold different opinions and viewpoints. There are a number of issues that impact on New Zealanders. In this activity you will be researching an issue related to sentience or awareness in non-human animals.

Sentience in non-human animals has been and continues to be contested and debated in the scientific community.

In recent years ethologists (scientists who study animal behaviour) such as Jonathan Balcombe have started to explore sentience and the emotional lives of non-human animals. Dr Balcombe believes that “animal behavior is one of the clearest windows into animals’ inner lives. The way animals behave helps to demonstrate their sentience, and I like to say that sentience is the bedrock of ethics”: [www.guardian.co.uk/technology/2010/apr/25/jonathan-balcombe-animal-feelings](http://www.guardian.co.uk/technology/2010/apr/25/jonathan-balcombe-animal-feelings)

Peter Singer, a Professor in Ethics and Philosophy, explains the animal researcher’s dilemma in his book *Animal Liberation – Second Edition*: “the researcher’s central dilemma exists in an especially acute form in psychology: either the animal is not like us, in which case there is no reason for performing the experiment; or else the animal is like us, in which case we ought not to perform on an animal an experiment that would be considered outrageous if performed on one of us” (p. 52).

Ethologists such as Dame Jane Goodall have changed the way we view primates. New Zealand was one of the first countries in the world whose Animal Welfare Act prohibited the use of Great Apes in animal experiments (currently Great Apes cannot be experimented on in the Netherlands, New Zealand, the United Kingdom, Sweden, Germany

and Austria), the reason being that chimpanzees, bonobos, gorillas and orangutans have been proven to be cognitively so similar to humans that using them as test subjects is considered unethical. This decision was without doubt influenced by the work conducted by ethologists such as Dame Jane Goodall and Dian Fossey.

In this study you will use Jonathan Balcombe’s book *Second Nature: The Inner Lives of Animals* as a primary text to explore sentience in non-human animals.

In *Second Nature* Dr Balcombe explains the term ‘umwelt’, a term coined in 1905 by the German ethologist Jakob von Uexküll. “The idea is that variations in brains, sensory equipment, and lifestyles of different kinds of animals likely result in their having different mental and perceptual experiences. Dogs, for example, see mainly black and white, but their acute sense of smell allows them to discern a kaleidoscope of information. Just watch dogs on their walks: they spend a lot of time with their nose against the ground, sniffing up clues as to who or what has been there before.” (*Second Nature* p. 18.)



In this activity you will be required to individually develop and refine a suitable research question or purpose based on the issue of sentience in non-human animals.

In order to answer your research question and present your findings in a comprehensive report you are required to complete the following three tasks:

TASK 1 Develop and refine a research question

TASK 2 Collect and process information

TASK 3 Report your results

### TASK 1

#### Develop and Refine a Research Question

1. Develop possible questions suitable for research, relating to the issue of sentience in non-human animals.

The research topics or areas you can choose from include:

- evidence of intelligence in non-human animals
- evidence that non-human animals experience emotions and physical sensations
- evidence that non-human animals are aware of their surroundings
- evidence that non-human animals communicate their needs
- evidence that non-human animals are sociable with others
- evidence that non-human animals are virtuous.

2. Select and refine **one** question or purpose on which to base your research. This must relate to the biology of sentience. It will help you focus your research.

Use the references (derived from *Second Nature*) in Tables 1-2 to help you refine your question and choose an area of animal sentience to focus on.

3. Submit your research question or purpose to your teacher before beginning your research.

This is to be completed before:

---

(date)

NOTE: All work is to be completed at school OR you may do some research at home, but if you do you must get an adult to verify it is your own work. You will be required to hand in all your research notes, showing evidence of processing, with your final report. Processing information could involve listing, sorting, collating, highlighting, using stickies or summarising relevant scientific information.





## TASK 2

### Collect and Process Information

You will have **three to four hours** to collect and process your information.

**1. Use a range of at least three** sources to collect information related to your question or purpose. The information must include biological ideas about sentience in non-human animals. Also collect and process information on the differing viewpoints that people, groups and/or organisations have expressed about this issue.

**2. Make sure you collect enough** information to allow you to **take a position** on the issue. You will be expected to justify your position using information taken from your sources. You must also make a recommendation for further action and give reasons for your recommendation.

**3. Evaluate the information** in each source as you find it. Questions you could ask include:

- Is the information it contains useful?

Possible sources you may choose to use are:

#### Key resource

*Second Nature: The Inner Lives of Animals* by Jonathan Balcombe, Palgrave Macmillan, 2010.

#### Secondary resources

*Frozen Planet*. BBC Natural History Unit, 2011.

*The Life Collection: David Attenborough*. BBC Natural History Unit, 2005.

*The Blue Planet*. BBC Natural History Unit, 2005.

*Meerkat Manor*. Oxford Scientific Films, 2005-2008.

- Does it contain accurate biological information?
- Is the information up to date (look for the date it was developed or last updated)?
- Is the information fact or opinion?

**4. Record all sources** you collect information from in a way that allows another person to find the same source. Also note any sources you do not use and explain why they were unsuitable.

#### ANIMAL EXPERIENCE EVIDENCE CHART

The creation of an animal experience evidence chart will assist you with the collection and processing of information.

If your research question focuses on a specific animal experience or type of coexistence you can create an animal experience evidence chart as shown on page 66.

**Reminder:** The experiences and coexistences you can choose from are:

- Experience/Sensitivity
- Experience/Intelligence
- Experience/Emotions
- Experience/Awareness
- Coexistence/Communication
- Coexistence/Sociability
- Coexistence/Virtue.



ANIMAL EXPERIENCE EVIDENCE CHART

Animal species	Experience/Coexistence	Evidence
Grey squirrel	Deception	<i>“Grey squirrels practice food-burying deception. Close observations have found that these rodents will – in addition to burying nuts – dig and cover empty holes. Not surprisingly, this ‘deceptive caching’ occurred more often in the proximity of other squirrels, and it was found to be effective in reducing the likelihood of theft by ‘surrogate cache pilferers’, the humans studying them ... Once a squirrel has been purloined, s/he is more likely to engage in deceptive caching, as well as to bury nuts in places harder to reach ...” Second Nature pp. 74-75</i>
Adelie penguin	Deception	<a href="http://www.youtube.com/watch?v=LbTZg5TGM1c">www.youtube.com/watch?v=LbTZg5TGM1c</a> BBC film crew captures Adelie penguins stealing stones from each other’s nests and getting caught in the act on the documentary series <i>Frozen Planet</i> .
Monkey	Deception	<i>“Researchers at Yale University presented twenty-seven wild and free-ranging monkeys with two visually identical containers of food; one rattled when handled, and the other was silent. If a human sitting nearby faced the apparatus, the monkeys showed no preference from either container. But when the human’s gaze was averted, the monkeys showed a strong preference for the silent container. Thus, the monkeys attempt to obtain food silently only in conditions in which silence is relevant to obtaining the food without risk of detection by a bystander.” Second Nature p. 72</i>

EXAMPLE OF ANIMAL EXPERIENCE EVIDENCE CHART

RESEARCH QUESTION: Is there evidence that non-human animals are **aware** of themselves and others?

Examples of awareness include deception, alliances, planning, problem solving, tool use, humour, imitation, discrimination, gaze following, attention, anticipation, wariness, vigilance, theory of mind and metacognition.

Place your animal species in the first column, the experience or coexistence you are focusing on in the second column, and the evidence of the experience or coexistence in the third column.





## TASK 3

### Report Your Results

You will have \_\_\_\_\_ [insert time] to present your findings.

Write a comprehensive report on sentience in non-human animals in which you:

- State your research question or purpose, which must be suitable for research and refined from the issue above.
- Identify the biology relating to the question or purpose by making multiple links between relevant biological issues.
- Identify **two** different points of view on the issue of sentience in non-human animals supported by evidence (i.e. giving reasons why the people, groups and/or organisations hold these viewpoints).
- State your own position on the issue. Use information from your sources to justify why you hold that position, and make a recommendation with reasons for action in the future.
- Evaluate at least **three** sources of information you have used related to your question or purpose (i.e. explaining why they were suitable (or not) to collect information from). For example:
  - Is the information it contains useful?
  - Does it contain accurate biological information?
  - Is the information up to date (look for the date it was developed or last updated)?
  - Is the information fact or opinion?
  - Is the source biased to one particular point of view?
- Record the sources you used in a way that allows them to be found by another person. All processed material used in the development of the student's response (e.g. in a research logbook or portfolio) is to be submitted and may be used as evidence of authenticity, processing, integration and evaluation.



#### NOTES ON TABLES 1-2

Tables 1-2 are based on the key resource *Second Nature* by Jonathan Balcombe.

These tables refer to pages in *Second Nature* where you can find evidence to support your research question. Some extracts from *Second Nature* have been reproduced in this issue of *Animals & Us*.

The categories outlined in these tables can also be applied to, and used as a guide for, other resources and materials.

*Animals in Science* has been written in order to provide teachers and students with a set of materials that argue against animal experiments. The key resource *Second Nature* contains some examples of animal sentience where the animals involved are used in experiments. The following is a disclaimer from author Jonathan Balcombe regarding this issue.

#### Disclaimer:

*Please note that some of the experiments cited in this section caused varying amounts of avoidable harm to the animal subjects. The inclusion of these studies is intended to demonstrate the animals' sentience only, and is not meant as an endorsement of such methods.*

Jonathan Balcombe



**TABLE 1**  
Range of Experiences

Source: <i>Second Nature</i>	EXPERIENCE Sensitivity (pp. 74-80)	EXPERIENCE Intelligence (pp. 81-83)	EXPERIENCE Emotions (pp. 84-88)	EXPERIENCE Awareness (pp. 89-91)
	Navigation	Memory	Emotional fever	Alliances
	Perceptions	Delayed gratification	Gratitude	Deception
	Hearing	Teaching	Grief	Planning
	Flexible behaviour	Planning	Stress	Problem-solving
	Play	Awareness	Attention	Tool use
	Flight	Predator inspection	Interest in others	Humour
	Individual recognition	Protection of others	Persecution	Awareness
	Mother-pup reunions	Sentience	Post-traumatic stress disorder	Imitation
	Predation	Perceptions	Regret	Audience effects
	Activity levels	Learning	Abnormal behaviour	Discrimination
	Touch	Problem-solving	Emotions	Gaze-following
	Magnetic perception		Optimism and pessimism	Theory of mind
	Homing			Attention
	Eavesdropping			Metacognition
	Learning			Self-awareness
	Senses			Anticipation
	Need for control			Success
	Call signatures			Wariness
	Ultrasound			Vigilance
	Communication			
	Memory			

NOTE: Page numbers refer to *Animals in Science*



**TABLE 2**  
**Types of Coexistence**

Source: <i>Second Nature</i>	COEXISTENCE Communicating (pp. 92-96)	COEXISTENCE Sociability (pp. 97-100)	COEXISTENCE Virtue (p. 102)
	Communication	Sharing	Altruism
	Language	Collaboration	Courage
	Dialects	Midwifery	Consolation
	Vocabulary	Solidarity	Emotional awareness
	Communication with vertebrate	As mutualists	Empathy
	Calling by	Cheating	Communal nursing
	Sign language	Cleaner-client fish relations	Democracy
	Gestures	Role of pleasure	Peacemaking
	Semaphoring	Image-scoring	Reconciliation
	Triangulation	Punishment	Restraint
	Ventriloquy	Cognition	Sense of fairness
	Individual labelling by	Cooperation	Concern for others
	Recognition of others	Social, success of	Deference
	Symbolic communication	Sociability	Self-handicapping
	Alarm calls	Virtue	Pain
	Referential calls	Cooperative hunting	Conflict resolution
	Individual recognition	Communal nursing	Fairness
	Echolocation control	Reconciliation	Mirror neurons
	Ultrasound	Babysitting	Virtue
	Perceptiveness		Sympathy
	Problem-solving		
	Theory of mind		
	Awareness		
	Expectations		

NOTE: Page numbers refer to *Animals in Science*