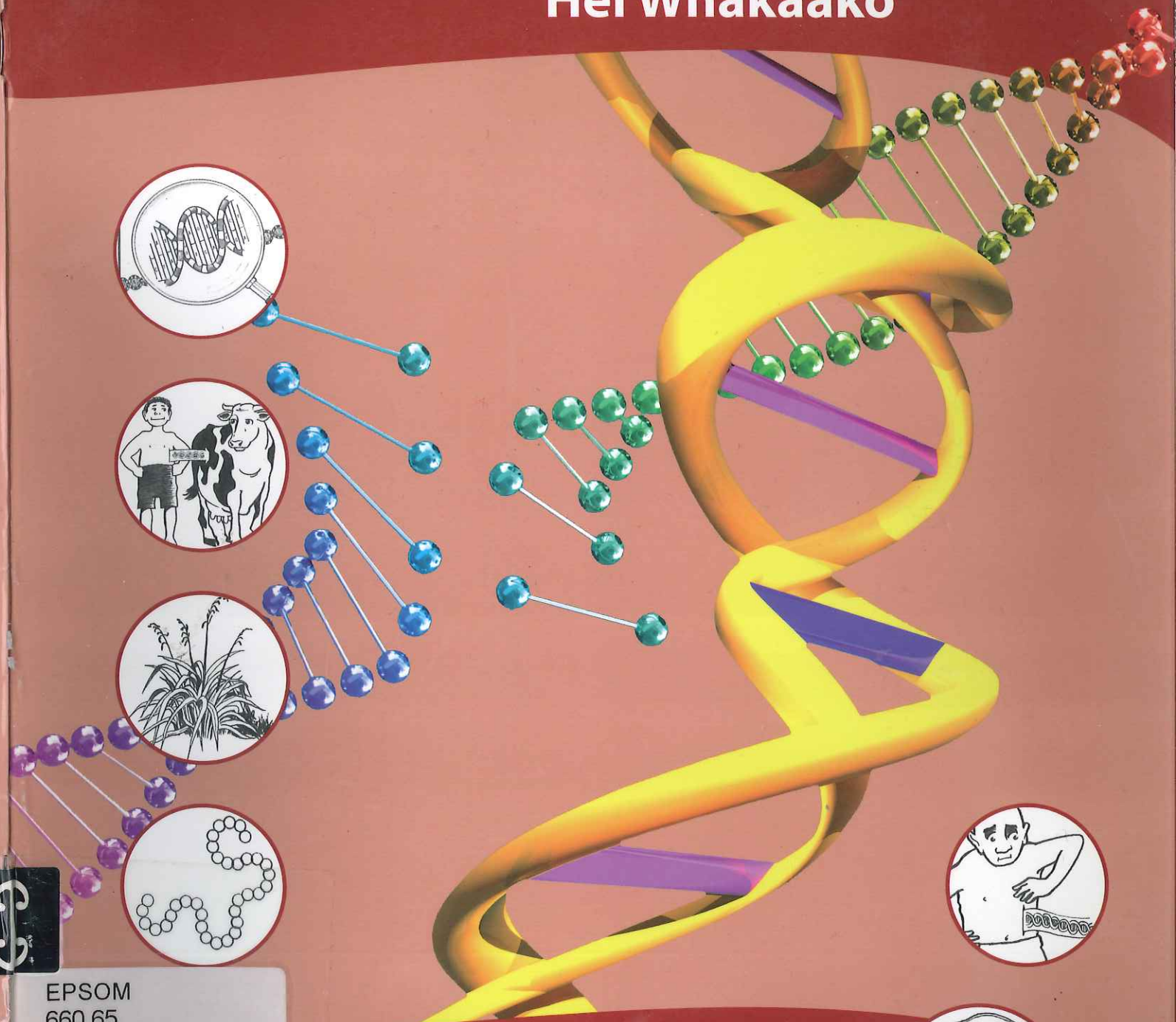


Te Raweke Ira

He Puka Mā Te Pouako
Hei Whakaako



EPSOM
660.65
THO
NZ

Wāhanga Ako
Te Aho
Taumata

Hangarau
Hangarau Koiora
6-7



He Mihi Maioha
Mei kore ake ēnei tātanga i te rauemi nei. Nā ā Huia mahi i whatu, nā ō rātou whakaaro i tātiko.
Deanne Thomas
Bevan Tipene-Matua
Hirini Moko Mead
He Kupenga Hao i te Reo mō ētahi o ngā kupu whakamārama.

Me mihi hoki ki a Brian Gunson nāna ngā pikitia.

Mana tārua i tēnei pukapuka © Te Tāhuhu o te Mātauranga 2008

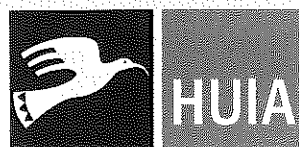
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Kua rāhuitia ngā motika katoa kia āta whakaaetia rā anō e te hunga
kei a ia te mana tārua.

UNIVERSITY OF AUCKLAND

-- SEP 2009



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Introduction

Mātauranga Māori

Pērā i te reo he oranga tō te mātauranga Māori, he whakapapa hoki ōna. He mātauranga i ahu mai i ngā atua Māori, i tikina mai ai e ngā mātua tīpuna hei kōrero tuku iho mā tātou. Mā tātou o ēnei rā tonu te **haepapa** kia tāpirihia ngā kōrero hou ki ēnei kōrero tuku iho hei mātauranga Māori mō nāianei tonu hei āwhina, hei tautoko i ngā akoranga o ngā rā e heke mai nei. He mātauranga mutunga kore te mātauranga Māori.

E tautoko ana te puka nei i Te Marautanga o Aotearoa. E hāngai tōtika ana ki te Wāhanga Ako Hangarau, taumata 6 me te 7 me ngā Paerewa Paetae Hangarau taumata 1 (MAS90045, MAS90051). He hononga hoki ki te wāhanga ako Pūtaiao me te Paerewa Paetae Pūtaiao taumata 1 (MAS90729).

Māori knowledge

*As the Māori language provides well-being to people, so too does knowledge of things Māori and the associated interconnections. Originating from the gods, it is a knowledge formulated by the ancestors and left as a legacy. Present-day Māori have been given the **responsibility** of incorporating this knowledge with contemporary knowledge, creating a new knowledge for future generations. This knowledge drawn from the past is infinite.*

This guideline supports the New Zealand Curriculum, specifically levels 6 and 7 of the Learning Area, Hangarau and Hangarau Achievement Standards level 1 (MAS90045 and MAS90051). Several links can also be made with the Learning Area, Pūtaiao and Achievement Standard level 2 (MAS90729).

*‘Tāku ahi tūtata, tāku mata kikoha,
tāku ahi mamao, tāku mata kiporo’*

When my fire is close by, the point of the weapon is sharp; when my fire is distant, the point is blunt – ‘Me whakakoi te hinengaro kia mārama ai ki ngā take o te wā’.

He Kupu Whakamārama

Explanatory Note

He pukapuka tēnei mā te pouako hei whakaako, hei āwhina i te whanaketanga o te kaupapa ‘Te Raweke Ira’ ki tā te tirohanga Māori.

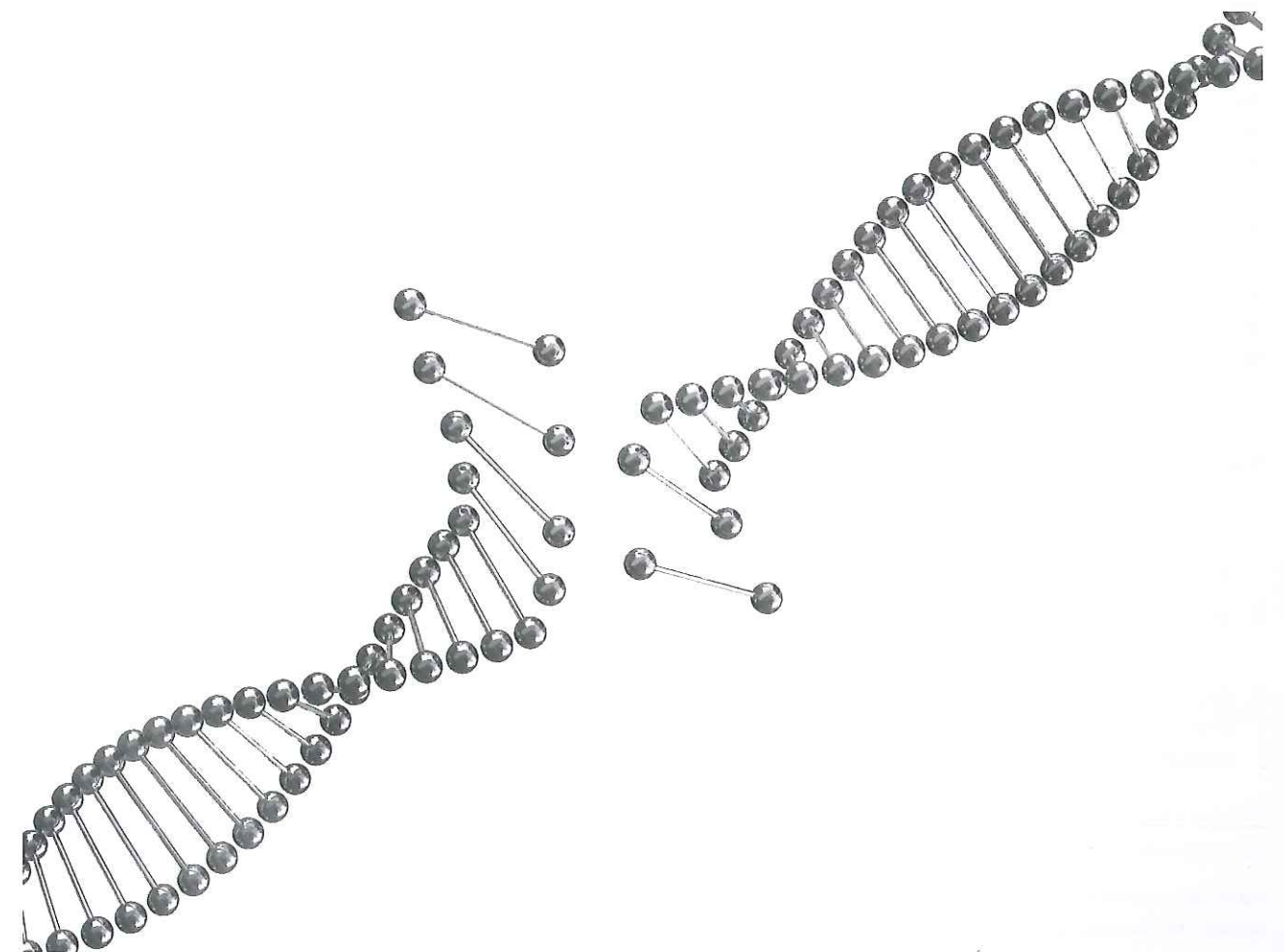
Kei te pukapuka nei he anga aromatawai e whakarato ana i tētahi huarahi hei aromatawai i ngā take hangarau, ngā āhuatanga rānei e wero atu ana i ō tātou whakaaro, i ō tātou whakapono, me ō tātou uaratanga e pā ana ki te ‘Te Raweke Ira’.

Kua whakarārangi hia ētahi kupu pūtaiao me ngā whakamāramatanga. E whai ake nei ko ētahi ngohe e āhei ai ngā ākonga ki te wero i ō rātou ake mōhiotanga.

This is a book to assist teachers in their teaching and development of the topic ‘Genetic Engineering’ from a Māori perspective.

This book contains an assessment framework that provides an opportunity for schools to assess issues with a technological content and other issues that challenge our thinking, values and beliefs concerning genetic engineering.

A list of scientific terms and explanations has been included. Some activities have also been included to enable students to challenge their knowledge.



Wāhanga Tuatahi

He tirohanga Māori

Ahakoa te take hangarau ka matapakina, ka wānangahia i ēnei rā, pēnei i te **raweke ira**, **whakawhitinga ira**, **whakawhitinga whēkau** me ērā atu take taupatupatu he tirohanga Māori tōna. E whai ake nei ko tētahi tukanga, arā, tētahi anga aromatawai hei āwhina i te ākongi ki te whakatau i ōna whakaaro ki tā tēnei tirohanga Māori.

Te anga aromatawai

I ahu mai ēnei whakaaro i ngā kōrero a Hirini Moko Mead, *Tikanga Māori – Living by Māori Values*, Huia Publishers, 2003.

E rima ngā āhuetanga hei whakamātautau: ko te **tapu**, ko te **mauri**, ko te **take-utu-ea**, ko te **tauirā**, ko ngā **mātāpono**. E rima ngā mātāpono, ko te **whanaungatanga**, ko te **manaakitanga**, ko te **mana**, ko te **noa** me te **tika**.

Whakaaro whaitake

Mā te whakaaro whaitake ka āhei te ākongi ki te āta whakaaro ake ki ngā take hangarau e taea ai e ia te whakatau i ōna ake whakaaro. E whai ake nei tētahi kōrero hei taunaki i te whakaaro:

Ka whakaekea tonutia e Tūmatauenga ōna tungāne. Kāore hoki a Tangaroa, a Tāne, a Rongo, a Haumietiketike i tautoko i te pakanga o Tāwhirimātea ki a ia. Nā tēnei, kei te patua tonutia e Tūmatauenga ngā uri o ōna tungāne hei kai māna. Koinei te take ka rapua e te tangata te kai hei oranga mō rātou.

E whai ake nei ngā tukanga hei whakamātaumau i ngā momo take hangarau.

1. Whakaarohia tētahi take hangarau (e whai ake nei ētahi tauira).
2. Pātaihia ngā pātai hei tātaru i te take hangarau.
3. Me tautoko ngā whakautu kia mau ai te whakaū ki tētahi tirohanga, kia **taunaki** hoki i te tirohanga Māori.

Ētahi tauira take hangarau

Ka whakawhitia te ira ika ki te tōmato

Ka whakaurua te manawa poaka ki roto i te manawa tangata

Ka whakaurua te ira tangata ki roto i te poaka, te kau, te hipi

Te whakapūruatanga

He pire hou hei rongoā mō tētahi **tahumaero**

Section 1

A Māori perspective

Regardless of the technological issue being discussed these days, such as genetic engineering, genetic modification, transgenics and xenotransplantation, a Māori perspective can be adopted. The following is a process, that is, an assessment framework, to assist the student to form his or her own opinions from a Māori perspective.

Assessment framework

These ideas have been developed from the book Tikanga Māori – Living by Māori Values, Huia Publishers, 2003, written by Hirini Moko Mead.

There are five aspects to examine: tapu, mauri, take-utu-ea, tauira and mātāpono. There are five mātāpono: whanaungatanga, manaakitanga, mana, noa and tika.

Deductive thinking

Through thinking deductively, the student is able to carefully consider technological issues and form sound opinions concerning those issues. Here is a text to support this theory:

Tūmatauenga continually fought against his siblings. Tūmatauenga was not supported by Tangaroa, Tāne, Rongo and Haumietiketike when attacked by Tāwhirimātea. Due to this lack of support, Tū continues to take the descendants of his siblings as a source of food. This is the reason Māori seek food as sustenance.

Follow these steps to test the various technological issues.

1. Choose an issue (there are examples following).
2. Using the assessment framework, ask questions to analyse the chosen issue.
3. Ensure that any answer assists in establishing a point of view and **reinforces** a Māori perspective.

Examples of hangarau issues

Transferring fish DNA to a tomato

Inserting part of a pig's heart into a human's heart

Inserting human DNA into a pig, a cow and a sheep

Cloning

New types of medicine as cures for **diseases**

Ngā whakamātautau

Whakamātautau

Whakaaro whaitake

Ngā pātai

1. Ko te āhuetanga Tapu

I heke mai te tapu i ngā atua.

Pātaihia ngā pātai e hāngai ana ki aua tauira kua kōrerohia kia kitea mēnā i takahia te tapu o te tangata.

Test to see if any breach of tapu has occurred by asking questions related to the examples previously mentioned.

Kua takahia te tapu o ngā atua?

Kua tūkinotia te ika?

Kua pai ake, kua kino rānei te āhua o te tōmato i te mahi raweke ira?

breach

Kua noa te tapu o te tangata i te whakaurunga atu o te manawa poaka ki roto i a ia?

Kua takahia te mana o te tangata kua whakauru nei te manawa poaka ki roto i a ia?

He hua anō kei roto i te mahi raweke ira?

Ka whai hua anō te tangata i te mahi raweke ira?

2. Ko te āhuetanga Mauri

He mauri tō ia mea ahakoa te aha.

Whakamātauria ngā mōrearea kei tūpono takahi i te mauri o te rauropi.

Test for risks that could affect the mauri of the organism.

Kua takahia te mauri o te tōmato?

I takahia te mauri o te tōmato me ngā hua i te whakawhitinga i te ira ika?

risk

He tōmato tonu?

organism

Kua takahia te mauri o te tangata i te whakaurunga atu o te manawa poaka ki roto i a ia?

Kua takahia te mauri o te poaka?

He aha te rerekētanga o te kai i te mīti poaka ina kua whakaurua atu he kiko poaka ki te tangata?

Ka kai tonu i te mīti poaka ina kua whakaurua atu he ira tangata?

Ki te whakapūrua te tangata i tētahi mea, ka takahia te mauri?

to clone

He aha te tangata i whakapūrua ai i tētahi mea?

Ka puta he hua i te mahi whakapūrua?

Ka whai hua tētahi tangata, tētahi mea?

Me tūpatou tātou?

Ka takahia te mauri o te kōngahungahu i te mahi whakapūrua?

Whakamātautau	Whakaaro whaitake	Ngā pātai
3. Ko te āhuatanga Take-utu-ea	<i>Mā wai te mahi hē e whakatika?</i> Ka whakamātautau tēnei i te momo utu hei whakaea i te mea e hē ana, e hapa ana. Kua matapakina te take hangarau me ngā pānga? Ina whakaaetia, he mahi hē kua pā mai, anei ētahi pātai kia pātaihia. <i>Discuss the issues and their possible associated effects: negative or otherwise.</i>	Utu He aha te utu tika kia ea ai te take hangarau? Nā wai i mahi hē? Nā te aha i hē ai te mahi? Ka whara, ka ora rānei te tangata? I āta whakaarohia ngā pānga i mua i te mahi? <i>He tikanga Māori te muru, arā, ka tangohia ngā rawa katoa a te tangata.</i> Ea Kua kino te pā mai o ngā take hangarau ki te tangata? I whakatūpatongia te hapori?
4. Ko te āhuatanga Tauria	<i>Kua mahia kētia e ngā tipuna tētahi mahi e noho nei hei tauria?</i> He whakamātautau tēnei e kitea ai mēnā i mahia kētia te take hangarau e ngā tipuna. Ka noho te kōrero hei tauria mā ngā uri whakaheke. <i>Research examples of strategies the ancestors used when dealing with similar issues.</i>	He kōrero tuku iho ka taea te tiki atu hei āwhina? He atua, he tipua rānei kua oti kē i a ia tēnei momo mahi? He whakapapa tō ngā take hangarau?
5. Ko te āhuatanga Mātāpono	Arā atu anō ngā uara; ko te whanaungatanga, manaakitanga, mana, noa, me te tika. He whakahirahira ēnei āhuatanga me ngā mātāpono tā te mea e tautāwhi atu ana i ērā atu uara o te Māori, arā, i te aroha ki te tangata, i te whakaaro nui, me te ngākaunui. Ka whakamātautau tēnei i te take hangarau i runga anō i ngā mātāpono o ngā tikanga Māori.	

Whakamātautau	Whakaaro whaitake	Ngā pātai
Whanaungatanga	Ahako te take hangarau me mōhio ki ngā whanaungatanga o te hunga e pāngia nei. <i>What are the relationships of the people associated with the issue?</i>	He whanaunga, he hoa rānei kua pāngia ki te take hangarau? He kaimahi tētahi whanaunga e mahi ana i te take hangarau? He whanaunga kei te whare pāremata e tautoko ana i te take hangarau? Me tautoko e te Māori te take hangarau? E whakaae ana koe ki te take hangarau?
Manaakitanga	Whai aroha ki te tangata ahako ko wai. Ki te manaaki te tangata i ngā manuhiri ka whai oranga te whānau, te hapū, te iwi whānui. <i>Manaakitanga is a vital component of Māori culture.</i>	He oranga tō te raweke ira mō ngā whānau, hapū, iwi? He aha ngā pānga ki te iwi whānui? He aha te otinga ki te kore e tautokohia, e whakaaetia rānei te raweke ira?
Mana	Ko te mātāpono, kia kaua e noho pāmamae te tangata i te take hangarau. Ko te wawata ka whakakaha ake i te mana o te tangata. <i>Be sensitive to people's feelings.</i>	Mēnā ka hinga te kaimahi, ka hinga hoki tōna whānau, hapū, iwi? He aha ngā mea mōrearea hei whakaarotanga?
Noa	Me āta whakamārama atu ki te hapori, kia tau te whakaaro, kia mauritau te ngākau. Mēnā, kāore he raru, ka kīia kua noa te take hangarau. <i>Has the issue been accepted unanimously?</i>	He take ki te whakatakoto i tētahi mahere hei whakamārama atu i te hapori? He aha te tukanga pai hei whakamārama atu? He aha ngā mahi hei whakanao i te take hangarau? He ōrite te kupu whakamārama a tēnā <i>ahurea</i>, a tēnā <i>ahurea</i>? Ka raru, ka whai oranga rānei te hapori, te ahurea?

Whakamātautau	Whakaaro whaitake	Ngā pātai
Tika	He mea tuku iho te nuinga o ngā tikanga, ā, kua whakaaetia kētia e te iwi ki te whai i aua tikanga. Mēnā he tikanga hou i ahu mai i whenua kē me āta whakaaro te iwi.	E tika ana tēnei tūāhuatanga, arā, ā-wairua, ā-hinengaro, ā-tinana? He take kia hangā he tikanga hou? Ka whakaae te iwi ki te take hangarau? Me tautoko te take hangarau?

He kupu whakakapi

Nā, pūkana mai ana te ao hangarau ki a tātou te tangata. Ahakoa he painga, he kino rānei, e kore e taea te karo atu. Nō reira, mā te whakamahi i te anga aromatawai, ka whakatau i roto i te ngākau mēnā he hua, kāore rānei.

He Whakarāpopototanga

Ka pātaihia ana ngā pātai mō ngā take hangarau, ka whakahiatotia ake te tirohanga Māori hei āwhina i ngā ākonga ki te whakaputa whakaaro me te whakatau i roto i te ngākau me aha rātou.

Summary

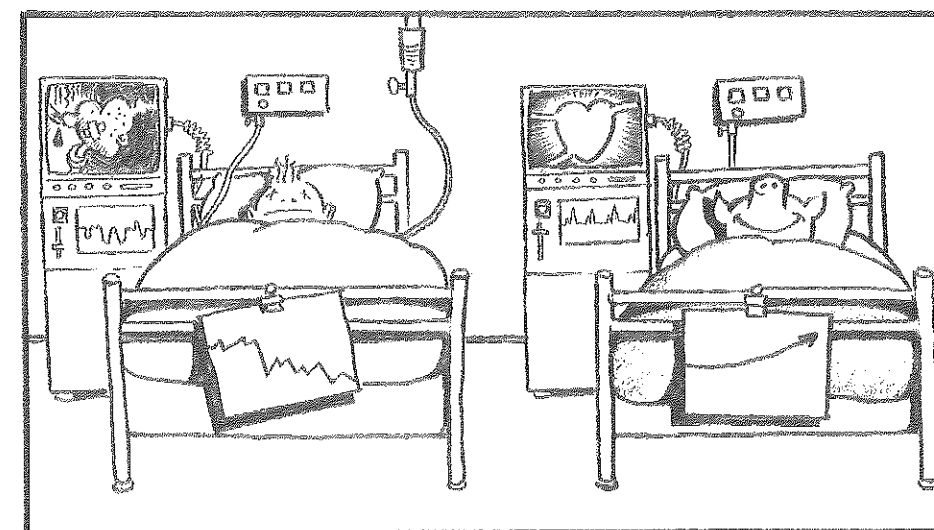
When questions about technological issues are asked, a Māori perspective is developed to assist students to express their opinions and reaffirm their personal stance in deciding what to do.

He Take Tautohetohe

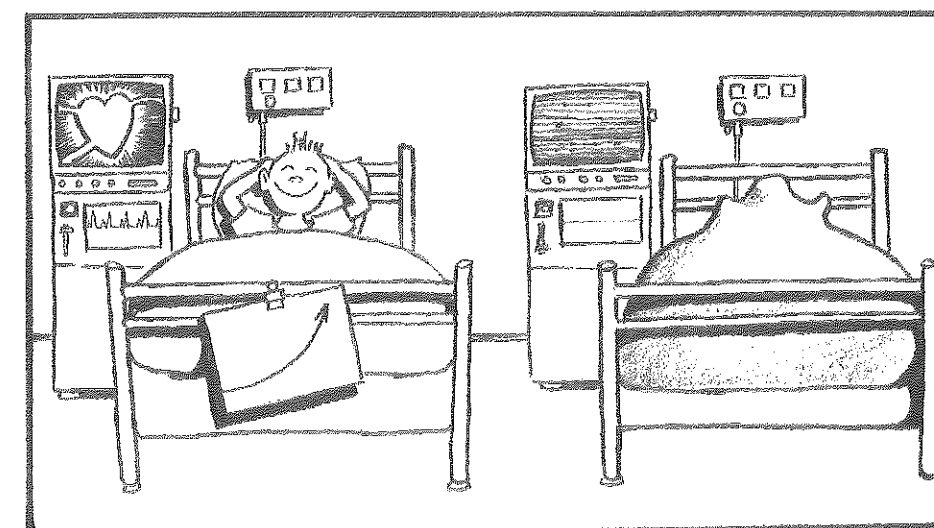
Whakamahia ēnei kaupapa hei take tautohetohe mā ngā ākonga.

Debating Topics

Use the following topics as a basis for student debate.



TAPU MAURI WHANAUNGATANGA
TAUIRA MĀTĀPONO NOA
MANAAKITANGA TAKE-UTU-EA TIKA MANA



Wāhanga Tuarua

Hangarau koiora

He nui tonu ngā whakamāramatanga mō te kupu hangarau koiora, waihoki, ko te raweke i te taiao, ko te whawhe hoki i ngā rauropi te mutunga atu. He hononga tō te hangarau koiora ki te pūtaiao me te rangahau. Ehara i te mea he tikanga hou te hangarau koiora. Mai rā anō te iwi Māori me ērā atu iwi huri noa i te ao e mahi ana i te *whakapūrua kore ira* (non-genetic cloning).

Kei ngā whārangi e whai ake nei ētahi whakamāramatanga o ngā kupu hangarau koiora, me ngā momo mahi e hāngai ana ki te raweke ira.

He rārangi kupu

ngota

Te wāhanga *mōkitokito* rawa atu o tētahi matū i hangaia ai taua matū. Kāore e kitea e te karu tangata, e te *karu whārahi* rānei.

pūmua

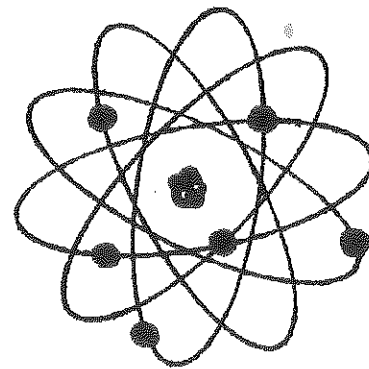
He rāpoi ngota roa te pūmua, ka hangaia ki te waikawa amino. Ko tā te pūmua he hanga pūtau hou e ora ai te tinana o te kararehe, o te tangata hoki. He nui tonu ngā pūmua i roto i te mīti, te hēki, te tīhi, te ika, me ngā momo tipu.

Section 2

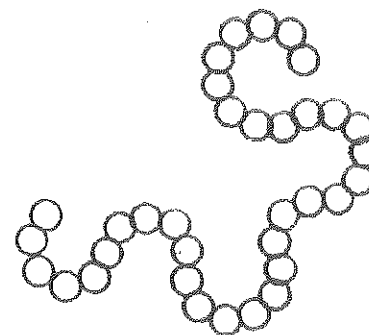
Biotechnology

There are various definitions of the term biotechnology, such as meddling with the environment and modifying an organism as the end result. Biotechnology has links to science and research. Biotechnology is not a new phenomenon. Māori and other indigenous peoples throughout the world have practised non-genetic cloning from time immemorial.

The following pages contain specific terms for biotechnology, relevant explanations and various activities pertaining to genetic engineering.



atom
microscopic
magnifying glass



protein

pūtau

Ko te tūāpapa mōkitokito e hangā ai ngā rauropi katoa. Mēnā, kotahi anake te pūtau i ētahi rauropi ka kīia nei, he *pūtau tahi*. Mēnā, he tini kē atu ngā pūtau o te tangata, o te kararehe, o te tipu ka kīia nei, he *pūtau tini*.

pūira

He wāhanga kotahi o te pūtau ira te *pūira* e kitea ai i ngā pūtau. He nui tonu ngā ira i te pūira kotahi.

rāpoi ngota

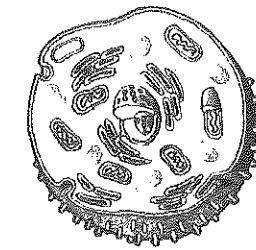
He kupu anō te kupu rāpoi mō tētahi huinga, nā reira he huinga ngota te rāpoi ngota.

pūtau ira

He *rāpoi ngota ā-whenu* te pūtau ira nō roto i ngā pūira e kawea ana i ngā tohutohu hei hanga pūtau e tū motuhake ai tēnā tangata, tēnā tangata.

ira

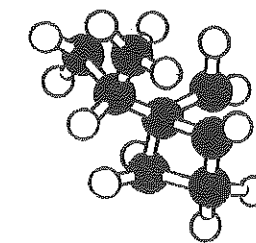
He wāhanga o roto i te *karihi* o ngā pūtau o tētahi rauropi. Ko tā ngā ira he tohutohu i ngā āhuatanga o te rauropi pērā i te tae o ngā whatu, te tae o te kiri, te aha, te aha. Ka tuku tohutohu hoki – pērā i te tohutohu hei whakatepe toto.



cell
unicellular
multicellular



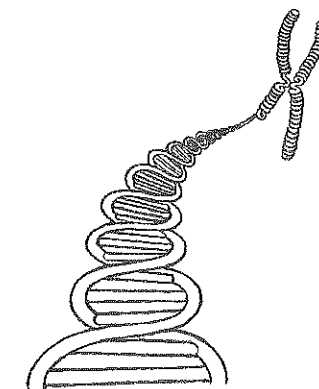
chromosome



molecule



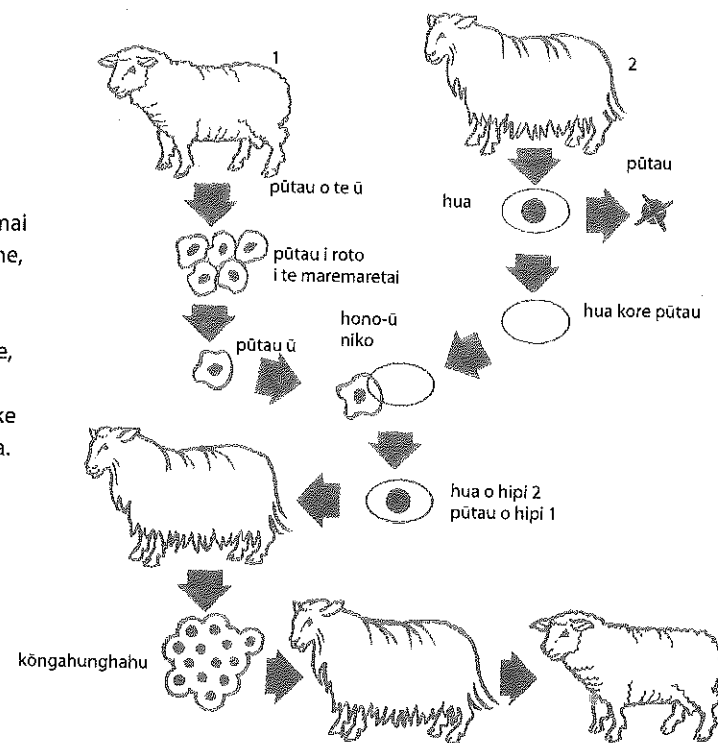
deoxyribonucleic
acid, DNA
strand-like molecule



gene
nucleus

whakapūrua

Ānō nei he tukanga tārua te whakapūrua. Ina waihangatia mai he āhua *ōritepū* o tētahi kararehe, tangata, aha rānei, koia nei te whakapūrua. Mā te āta tīpako i tētahi tūmomo otaota, kararehe, aha rānei e hāhiatia ana, pērā i tētahi tūmomo kai, mā te raweke rānei i ngā ira ka whakapūruatia.

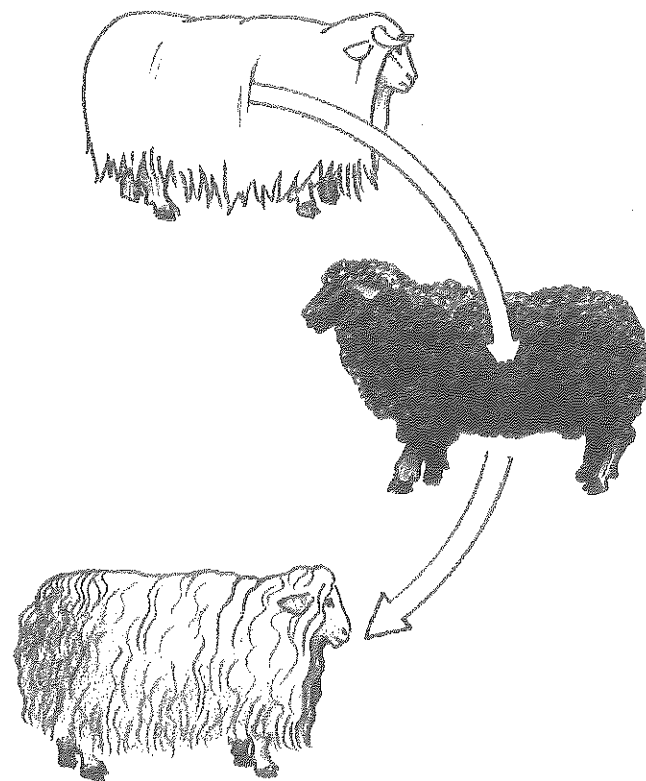


to clone

identical

raweke ira

He tukanga pūtaiao/hangarau hei whakamahi i te pūtau ira o tētahi rauropi. Mā te tāpirihanga o ngā pūtau ira o tētahi rauropi ki tētahi atu, ki tētahi *kaiaora* rānei ka rerekē te āhua o te rauropi, o te kaiaora rānei. Ka mahia tēnei tukanga hei whakarerekē, hei whakahou rānei i te āhua o ngā otaota, ngā kai, ngā kararehe me te tangata.

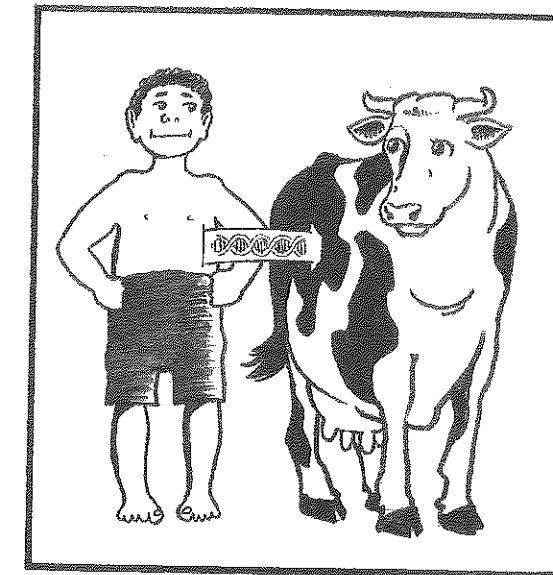


genetic
engineering/
modification

living organism

whakawhitinga ira

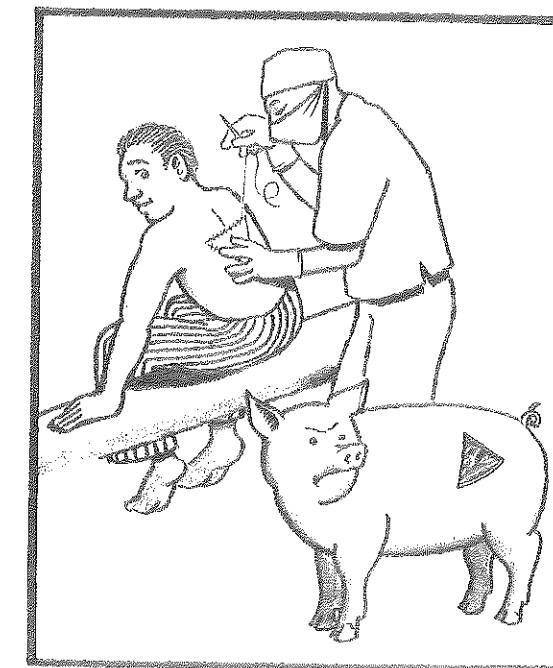
Ko tēnei tētahi take tino tautohetohe i te hangarau koiora, i te raweke ira. Nā te aha i pēnei ai? Nā te whakawhitinga o tētahi ira o tētahi rauropi ki tētahi atu, pērā i te ira tangata ki te kararehe. He take āwangawanga tēnei ki ētahi iwi.



transgenic,
gene transfer

whakawhitinga whēkau

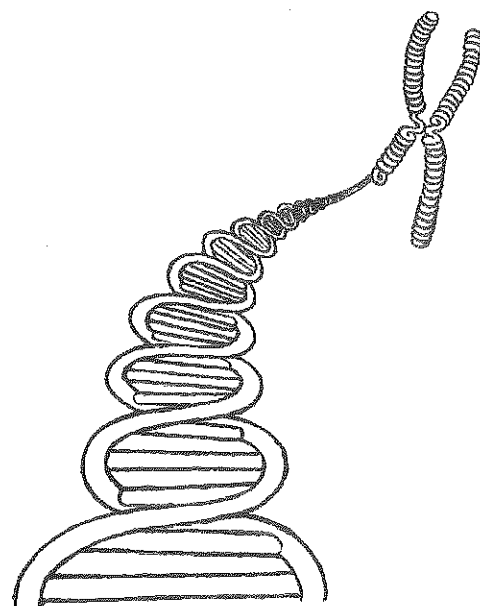
Ko te whakawhitinga o tētahi whēkau, tētahi wāhanga kiko rānei mai i tētahi rauropi ki tētahi tangata, tangata ki te tangata rānei.



xenotransplantation,
organ transplant

huingaira

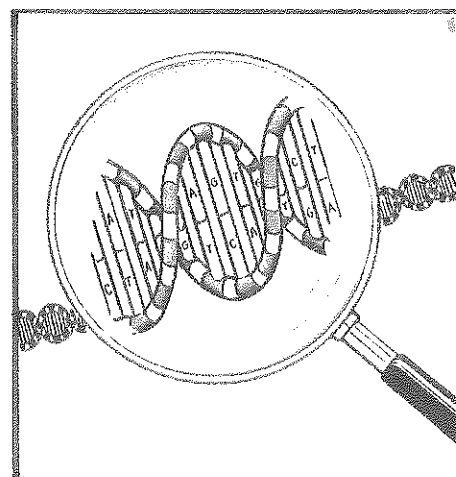
Ko te huingaira ko ngā tohutohu pītau ira katoa o te tangata kotahi. Kei tēnā tangata, kei tēnā tangata tōna ake huingaira motuhake. Ānō nei he mahere o te tinana te huingaira.



genome

huingairatanga

Ka hīkarohia te pītau ira i tētahi pūtau aha rānei e taea ai te āta tiroiro, te āta rangahau. Mā te huingairatanga ka whai māramatanga te tangata ki te pūtake o te hanga tangata.



genomics extracted

Kaupapa Huingaira Tangata

Kua tekau tau te roa o tēnei kaupapa e whakahaeretia ana. E tūhura ana i te raupapatanga o ngā tohutohu pītau ira e taea ai te whakawhānui i te mātauranga mō te tinana tangata me ōna āhuatanga katoa kia whakapai ake ai i te taha hauora.

Human Genome Project¹

Wāhanga Tuatoru

He painga, kāore rānei?
He aha ngā kaupūtaiao i whai atu ai i te 'Raweke Ira'?

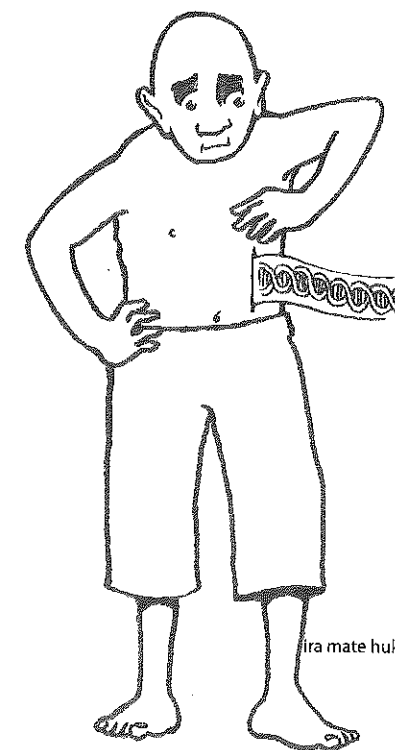
Tautohu tahumaero

Ko tētahi painga o te raweke ira tangata, ko te tautohu i ngā **tahumaero ā-ira**.

Kei te pāngia ētahi whānau ā-whakapapa nei ki ngā momo tahumaero ā-ira, pērā i te mate pukupuku, me te mate huka. Kua pēnei nā te hē o te raupapa o ngā ira, ā, ka heke iho ki ngā whakatipuranga. He mea **tupurangi** noa iho te whakaheke ira mai i ngā mātua ki ngā tamariki, nō reira, ka riro i ētahi o ngā tamariki, kāore i ērā atu.

Mēnā ka tika te tautohu i ngā ira kikino, e kīia nei he **irakē**, ka whai wāhi ngā tākuta ki te kimi rongoā hei whakahauora i te tangata, te whānau, te hapū, te iwi.

Mā te whakamātau, te tūhura rānei ka kitea tētahi mea whai oranga hei painga mō te katoa. Ki te kore e rapu mātauranga, e rangahau ka noho kūare tonu te tangata.



ira mate huka

Section 3

Beneficial or not?
Why do scientists pursue genetic engineering?

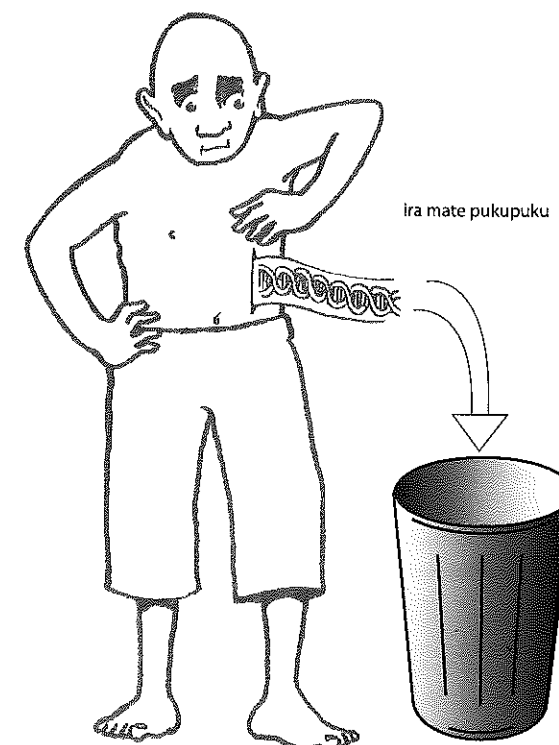
Identifying diseases

One benefit of genetic engineering is the ability to identify the presence of **genetic diseases**.

Some families are affected by hereditary disorders that are passed down, such as cancer. These are caused by the irregular placement of genes in DNA, and this abnormality is passed down to successive generations. The passing on of genetic disease is a **random** process, and it is known that some children of the same parents can be affected while the other siblings are totally free.

If the diagnosis of affected genes, also known as **mutated genes**, is correct, a doctor then has the opportunity to select the correct treatment to combat those genetic diseases.

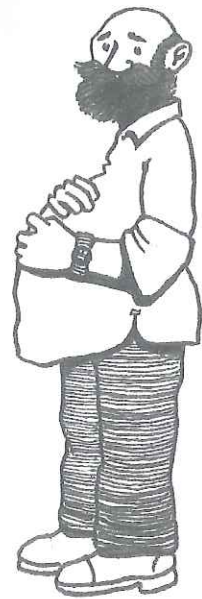
Through trialling and testing, a medical cure can possibly be discovered for everyone's benefit. If we don't research and seek knowledge, we will remain ignorant to possible cures.



ira mate pukupuku

¹ http://www.ornl.gov/sci/techresources/Human_Genome/home.shtml

Raweke ira tangata



Human genetic engineering



Ko te **hoahoa pēpi** tētahi take e kaha tautohetohetia ana huri noa i te ao. Kei te tika, kei te hē rānei te mahi hoahoa pēpi?

Ahakoia he wawata noa iho ki ētahi kaipūtaiao te hoahoa tangata, e ngana tonu ana rātou ki te raweke ira kia panoni i te āhua, i te whanonga rānei o te tangata kia tāroaroa ake, kia kaha ake, kia pakari ake, kia ātaahua ake rānei.

Ka taea pea te tae o ia whatu te whakarerekē kia whero tētahi, kia waiporoporo tērā atu. Ka raweke ira kia mātau ake pea te tangata. Mā te raweke ira ka kaha ake pea te tangata ki te mahi, ka iti hoki pea tōna hiahia kia moe roa, ka iti hoki pea te tikanga kia kōrerorero.

Ā tōna wā pea, ka taea e te tāne te whakawhānau pēpi. Ka raweke ira kia kaha ake ngā waewae o ngā kaioma kia kore ai e ngenge. Ka taea pea te whakaroa ake i ngā tau e ora ana te tangata i te mata o te whenua. He āhuatanga mutunga kore te raweke ira me ngā mahi ka taea.

Koinei ētahi take kei te noho tonu te kaupapa raweke ira hei take tautohetohe.

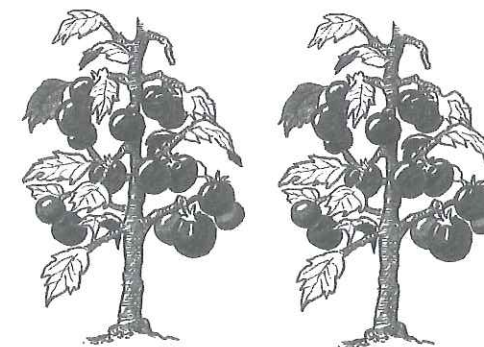
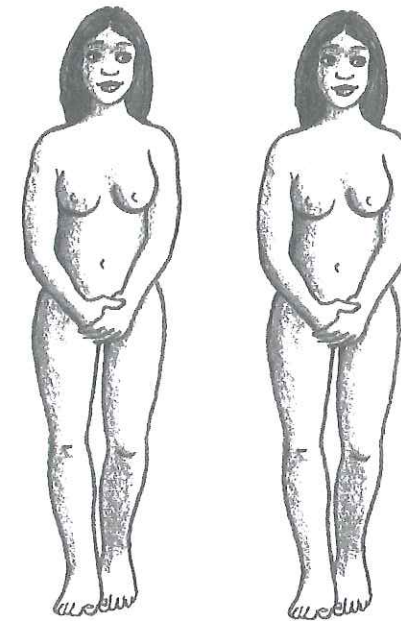
One topic being debated extensively throughout the world is **designer babies**. Is this practice morally right or not?

Even though some scientists believe that designing humans is far-fetched, others are ardently experimenting to modify human features so people can be taller, stronger, more beautiful or mature earlier.

Perhaps a person's eye colour will soon be able to be different so one eye is purple and the other red. Genetic engineering may make people more intelligent, stronger to be able to work longer with no desire to sleep for long periods and may lessen the need to communicate.

In time, perhaps, a man will be able to give birth to a child. The legs of runners could be genetically modified so that runners can run further and not get tired. Perhaps the life of humans will be extended. There is no limit, perhaps, to what can be achieved through genetic engineering. This is why genetic engineering will always remain a topic of fierce debate.

Whakapūrua



Kua oti kē i ngā kaipūtaiao ngā ira, ngā pūtau, ngā kiko, ngā otaota me ngā kararehe te whakapūrua. E ai ki ngā kōrero, kua whakapūruatia te tangata, engari karekau he taunakitanga i tēnei wā kia whakaponu atu.

Nā, ki te keria e koe tētahi pūharakeke, ka hutia ake, kātahi ka poua ki wāhi kē, kua mahia e koe te whakapūrua. He whakapūrua māmā noa iho tēnei momo whakapūrua. Heoi anō, ka taea te whakapūrua hoki ngā ira, arā, kia tāruatia ngā ira o tētahi rauropi kia hangā mai tētahi atu e ōrite pū ana te āhua.

Cloning

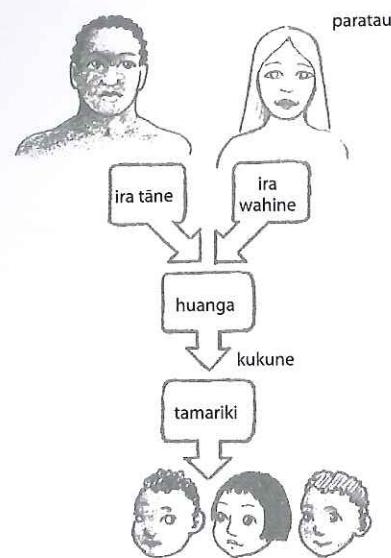


rīto, mātua, me ngā tipuna

Scientists have already successfully cloned genes, cells, skin, plants and animals. According to reports, the cloning of humans has also been successfully attempted, but there appears to be no evidence to support this claim at this time.

But, if you were to dig up a part of a flax plant and replant it elsewhere, you would have just completed the act of cloning. This is a very simple example of the act of cloning. However, the cloning of genes is also possible, that is, if the genes of organisms are copied to create an exact replica of the original.

Whakaputa uri



E rua ngā momo tukanga ki te whakaputa uri, ko te *paratau* me te *paratau kore*.

Paratau

Ina māori noa te whakaputa ira pērā i te whakaputa tangata, arā, mā te *aitanga* ka tukua iho ngā ira o te matua, o te whaea rānei ki te pēpi.

Paratau kore

Ka puta mai tētahi uri engari kihai i aitia tētahi tokorua. Nō reira, ka ahu mai ngā ira katoa o te rauropi i te pūtau o te rauropi kotahi, he uwaha, he toa rānei. Koinei te pūrua.

Raweke ira kai

Kua nunui tonu ngā mahi raweke ira ki ngā momo kai pērā i te raweke ira kānga. E rua ngā momo raweke ira, ko te raweke tonu atu ki ngā ira o te kai ka tahi, ka rua, ko te āta whiriwhiri i ngā kai e kaha nei te whakatipu pērā i te riwai, te kūmara, te āporo.

Whakapūrua tipu

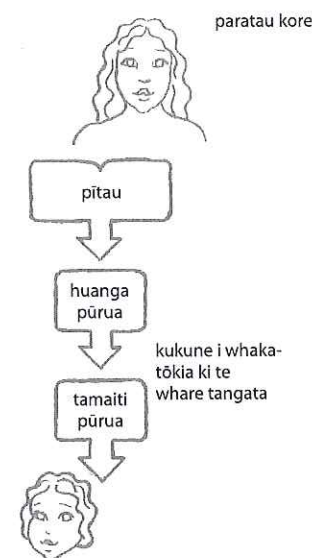
Ko te whakapiri i tētahi wāhanga o tētahi tipu ki tētahi atu.

He rauropi raweke

Ka wāwāhitia ngā ira o ngā rauropi e rua kātahi ka whakapirihiā kia tipu hei rauropi hou.

² He rauemi hei āwhina; Te Tau 11 Pūtaiao (Pathfinder Series, New House Publishers Ltd) http://www.tki.org.nz/r/science/putaiao/pathfinder/unit3/index_e.php

Reproduction



sexual, asexual²

Sexual reproduction

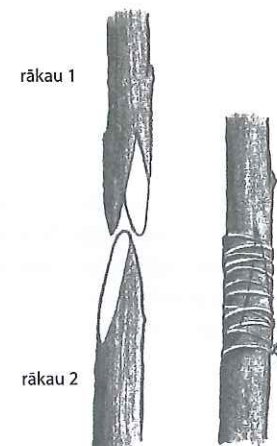
If offspring are produced naturally through copulation, like humans are produced, then the genes of the father and mother are passed down to the infant.

Asexual reproduction

If offspring are produced without the act of copulation, all the genes of that organism originate from a single cell of that organism, whether it be male or female. This is known as a clone.

Genetically modified food

There are many instances of genetically modified food, such as genetically modified corn. There are two types of genetic modification, direct modification of genes or careful selection of the most productive plants, such as particular potato and, sweet potato plants and apple trees.



grafting

genetically modified organism – GMO –

He aha e raweke nei te tangata i ngā ira o te kai?

Ko ētahi take e raweke ana te tangata i ngā ira o ngā tipu me ngā kararehe:

- kia tere ake te tipu
- kia whakaurua ngā **taiora**
- kia whakakaha ake i ngā tipu kia kore ai te ngāngara e ngau atu
- kia mutu te whakamahi i ngā **matū, matū paitini**
- kia maha ake te kai
- kia iti iho te utu mā te kaupāmu me te **kaiwhakapeto**.

Hei tauira ake, ki te tangohia pea te ira **kore totoka** o te ika noho Kōpaka Raro (Arctic fish), kātahi ka whakauru ki te hua whenua tōmato kia kore ai te tōmato e raru i te hukapapa.

Ki te tangohia te ira o te otaota tātā tiotio ka whakauru ai ki te otaota raihi kia taea ai te whakatipu i te raihi i ngā whenua **pakapaka**.

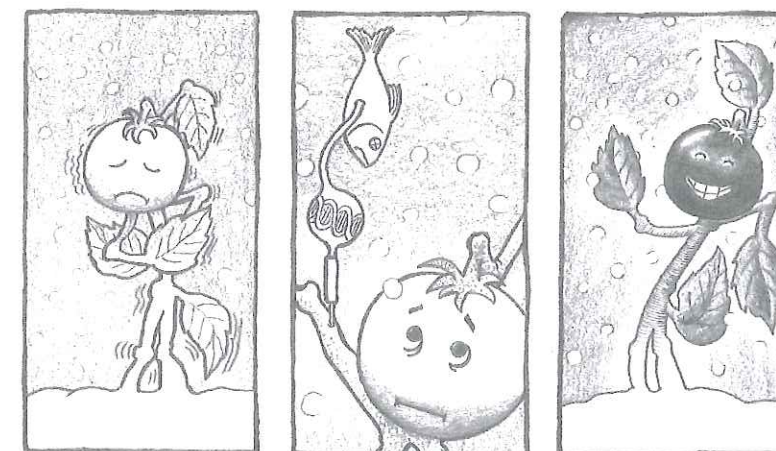
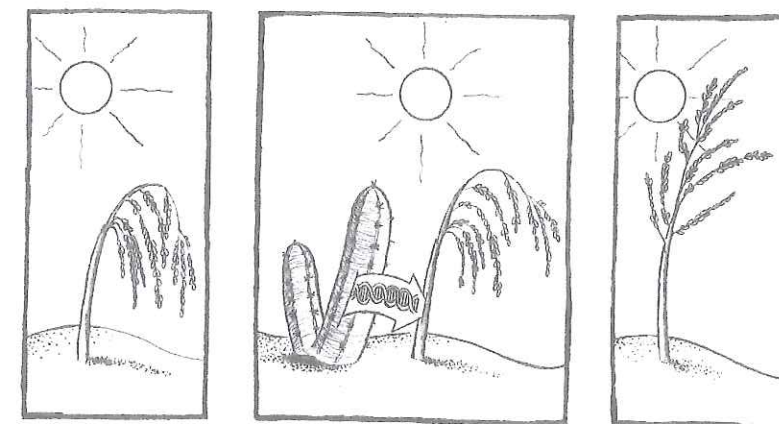
Why genetically modify food?

Some reasons for genetically modifying certain plants and animals:

- to enhance quick growth
- to insert **nutrients**
- to strengthen plants to withstand assaults from insects and diseases
- to end the use of **chemicals and poisons**
- to increase crop production
- to reduce the cost to the farmer and **consumer**.

For example, you might extract the **antifreeze** gene of the Arctic fish then insert it into the tomato vegetable so that the tomato is not affected by frost.

If you were to take the gene from a cactus and insert it into the rice plant, you might be able to grow rice in **hot and arid** lands.



Ngā Ngohe mā ngā Ākonga (*Mā te pouako e whakarite*)

Ngohe 1: Huingaira

Whāinga: Kia mārama ai te ākonga ki te hanganga o te pītau ira me tana mahi i roto i te tinana.

Ētahi rauemi hei āwhina:

Ko te ipurangi, patohia atu te kupu DNA.

Te Tau 11 Pūtaiao – Pathfinder Series, New House Publishers Ltd.

- Tuhia he pikitia e whakaaturia ai te hanga o te pītau ira.
- Whakamāramahia te hononga o ngā pūira ki ngā pūtau, ki ngā rāpoi ngota, ki ngā ira me ngā pūmua.

Ngohe 2: Tahumaero

Whāinga: Kia whai māramatanga ai te ākonga ki te pānga mai o te tahumaero.

Pānuihia te pukapuka *Gene Seekers* nā Bill O'Brien³

- Tirohia te rautaki i whāia ai e te whānau kia rangahaua te pūtake o te mate pukupuku.
- Whakaraupapahia te tukanga i whāia e ngā kaipūtaiao, tautohua ngā tino āhua i āwhinatia te kauneketanga o te rangahau.

Ngohe 3: Whakatauki

Whāinga: Kia mātau ai te ākonga ki te whakapapa, he tūrangawaewae mōna.

‘E kore au e ngaro, he kākano i ruia mai i Rangiātea’

- He aha te hononga o tēnei kōrero ki tōu iratanga?

Ngohe 4: Tautohetohe

Whāinga: Kia whakapakari ai te ākonga i ōna pūkenga kōhi mōhiohio, me te whakakaha ake i āna kōrero hei taunaki i ōna whakaaro.

Take tautohe ‘He mea hira tonu te whakapapa i tēnei rautau?’

Kia rua ngā rōpū; tētahi e whakaae ana ki te take tautohe, tērā atu e whakahē ana.

- Ka rangahaua e ngā rōpū te take tautohe (kia kotahi hāora) ka tahi.
- Ka rua, ka whakaritea he rōpū tautohetohe, ko tētahi hei whakaae, ko tētahi hei whakahē i te take kōrero nei.

Ko ētahi pātai hei āwhina;

He whakapapa whānui ake tō te tamaiti o ēnei rangi?

Me mātua mōhio, i ahu mai koe i whea? He aha koe i mōhio ai?

He aha te tikanga o ‘Whakapapa ki te whenua’?

Me wāwāhi te toto o tēnā iwi, o tēnā iwi i roto i a koe anō?

He pai ake ngā makawe roroa, makawe tōtika i ngā makawe popoto?

He aha ngā painga, ngā kino rānei o tēnei momo mātauranga?

Me whakaatu e ngā rōpū kōrero ā rātou whakamārama ki ngā take pūtaiao me ngā take tapatahi e pā ana ki te raweke ira tangata.

Ngohe 5: Whakapapa

Whāinga: Kia mārama ai te ākonga ki ngā āhuatanga whiwhi me ngā momo whakaheke, he aha te huaira me te ira.

A. Whakaarohia ōu ake tīpuna. He aha ngā āhuatanga ā-tinana, ā-whanonga, ki ōu whakaaro, kua heke iho ki a koe?

- Whakamāramahia te takenga mai o te kupu ‘mokopuna’.
- Tautohua ngā āhuatanga kua heke iho ki a koutou ko ōu tēina/tuākana. Whakaarohia te tae o ngā whatu, o ngā makawe, te tāroaroa, te poto rānei.
- Tuhia ki tāhau pukapuka, tāhau e kite ai.

E. Tikina atu ētahi whakaahua o tētahi whānau – kia toru ngā whakatipuranga. Me heke te tokotoru i te kāwai ure tārewa, arā, i te koroua, ki tāna tama ake, ki tāna mokopuna tama ake, me heke rānei i te kāwai whare tangata, arā, i te kuia, ki tāna tamāhine ake me tāna mokopuna kōtiro ake.

developed feature
inherited feature, trait

³ The Gene Seekers <http://www.learningmedia.co.nz/products/moecatalogue/moecatdetail?recno=601067>

- Tāruahia kia toru ngā kape o ia whakaahua.
- Whakatakotoria ngā whakaahua, kia pēnei:

koroua	tama	mokopuna	kia kitea ko ngā whatu anake
koroua	tama	mokopuna	kia kitea ko ngā ihu anake
koroua	tama	mokopuna	kia kitea ko ngā waha anake

- Uhia te kanohi kia kitea anake ngā whatu i te rārangi o runga, ngā ihu i te rārangi o waenganui, ngā waha i te rārangi o raro.
- Āta tirotirohia te āhua o tēnā wāhanga, o tēnā wāhanga.

I. Rangahaua ngā āhuatanga o te *ira-ngoi* me ngā āhuatanga o te *ira-ngoikore* kia mōhiotia ai e pēhea e heke iho ai ngā āhuatanga ā-ira mai i tētahi whakatipuranga ki tētahi atu.

- Rangahaua tētahi whānau o tō akomanga. Kei a wai ngā ira-ngoi, ira-ngoikore rānei o te whaea, te matua rānei? Mai i a wai ngā karu? Makawe? Ihu? Tāroaroa?
- Pānuihia te kōrero kei te moheni *Time – Designer Babies*⁴

Mēnā ka whakapūrua tētahi tāne i a ia anō;

- He tama, he māhanga rānei te mea whakapūrua o tēnei tāne?
- He aha te pānga o te mahi whakapūrua ki te whakapapa o te whānau?

Ngohe 6: Whakapūrua

Whāinga: Kia whakawhānui ake te mātauranga o te ākongā ki ngā āhuatanga whakapūrua me ngā take whakapūrua a tēnā tangata, a tēnā tangata huri noa i te ao.

Pānuihia te tuhinga *Scientist clone pit bull*⁵

- Matapakina tēnei tuhinga, arā, te whakapūrua kurī. Koinei te mahi a tētahi kamupene. He aha ētahi atu putanga atu i te whakapūrua kurī? He pai, kāore rānei?

Ina taea te whakapūrua tētahi kurī, ka taea hoki te tangata? Ko ngā kararehe rongonui kua whakapūruatia kētia ko 'Dolly' te hipi me 'Molly' te kau. Heoi anō, kāore i roa i mate ēnei kararehe.

Rangahaua tētahi o ngā kararehe nei, a Dolly, a Molly rānei,

- He aha i mate ai?
- I te tika te mahi a te kamupene?
- Me matapaki te pātai 'I te tika te mahi a te kamupene?' ka tuhi whakaaro hei tautoko, hei whakahē rānei i te mahi a te kamupene.

⁴ <http://www.time.com/time/magazine/article/0,9171,17696,00.html>
⁵ <http://www.thesun.co.uk/sol/homepage/news/article1519043.ece>

Ngohe 7: Raweke ira kai

Whāinga: Kia mōhio ai te ākongā, he take tōrangapū te raweke ira kai, ā, kua whakatū hoki i ētahi rōpū hei whakatau take, tuku taunaki hoki ki te kāwanatanga.

Rangahaua te mahi kua oti kē i a Monsanto⁶ te mahi.

- He aha ētahi take kua puta ake mai i ngā mahi raweke kai a Mosanto?
- Ko wai a ERMA⁷?
- He aha tā ERMA mahi?
- Ko wai kei roto i te rōpū 'Māori Advisory Group' o ERMA?
- He aha tā te rōpū Māori mahi?

⁶ <http://www.monsanto.com/>
⁷ Environmental Risk Management Authority; <http://www.ermanz.govt.nz/>

Kupu Taka

aitanga
haepapa
hangarau koiora
huaira
huanga
huingaira
huingairatanga
irakē
ira-ngoi
ira-ngoikore
kaiora
kaiwhakapeto
karihi
kore totoka
kukune
matū
matū paitini
mōrearea
ngota
panoni
paratau
paratau kore
pītau ira
pūira
pūtau
rāpoi ngota
rauopi
raweke ira
tahumaero
tahumaero ā-ira
taiora
tātari
taunaki
tautohu
tupurangi
whakaaro whaitake
whakapūrua
whakapūrua kore ira
whakarato
whakaū
whakawhitinga ira
whakawhitinga whēkau

copulation
responsibility
biotechnology
trait
zygote
genome
genomics
mutated genes
dominant
recessive gene
living organism
consumer
nucleus
antifreeze
embryo
chemicals
poisonous chemicals
risk
atom
change
sexual
asexual
DNA (deoxyribonucleic acid)
chromosome
cell
molecule
organism
genetic engineering, genetic modification
disease
genetic disease
nutrient
analyse
reinforce
identify
random
deductive thinking
to clone, cloning
non-genetic cloning
provide
establish, support
transgenic, gene transfer
organ transplant, xenotransplantation