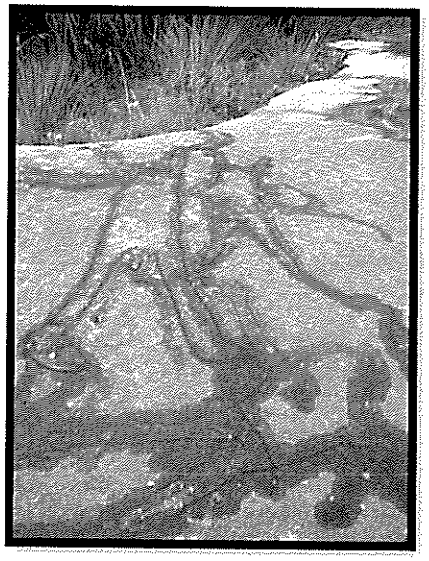
ABORIGINAL EDUCATION

SCIENCE

A TEACHER / STUDENT

RESOURCE

David Unaipon



Aboriginal Engraving Site – West Head

Collated By Dave Lardner
NSR Aboriginal Project Officer

PROVIDING AN ABORIGINAL PERSPECTIVE

INTRODUCTION

As educational professionals, we are trained and required to have certain levels of expertise when teaching our students. However a knowledge and understanding of Aboriginal culture requires a different approach.

It is essential that the content of a subject contain an Aboriginal perspective.

Aboriginal perspectives are not in themselves a unit of work but rather the way in which curriculum is developed. It is *not* an additional item to be dealt with separately but an *integral* part of what a school is already doing. It is the Aboriginal view taken toward a particular matter that is of concern to Aboriginal people, their society and their culture.

"A perspective is a way of viewing the world, the people in it and their relationship with each other and the environment in which they live. The ability to recognise our own perspective and the perspectives of others extends our views and increases our understanding of the world."

An Aboriginal perspective will:

- Recognise and value Aboriginal culture and identity.
- Add balance by including the Aboriginal views relevant and appropriate to the particular subject being taught.
- Should be inclusive and be incorporated where it retains cultural validity and integrity.
- Develop a respect and appreciation of the diversity and integrity of Aboriginal culture.
- Broaden the learning experiences of all students and develop an appreciation of and sensitivity to Aboriginal societies and culture.

By providing an Aboriginal perspective, you will explore the cultures, languages, lifestyles and identity of Aboriginal peoples. Such exploration will also provide an understanding of issues central to Aboriginal societies and the relevance of these to the entire Australian community.

For Aboriginal students, this will increase their self esteem and raise pride in their cultural heritage and identity. For all students, this will allow an appreciation of a culture rich in heritage and tradition since the beginning of the Dreaming.

The success in providing an Aboriginal perspective across the curriculum is best defined through the process of consultation with Aboriginal people. It involves utilising the knowledge and expertise of local Aboriginal people. They are the people who best know the local culture, history and significant events. They will be able to advise on particular issues which are sensitive and those with implications for local Aboriginal people. Consultation needs to be an ongoing process between the teacher, school and local Aboriginal community. This can be best achieved through the local

AECG, role of the Aboriginal Community Liaison Office (ACLO) and Regional Aboriginal Education Consultant.

When implementing an Aboriginal perspective:

- Do not include an Aboriginal perspective if it is not relevant. Don't force the integration of a perspective into a program.
- Do not include an Aboriginal perspective that may stereotype Aboriginal peoples. It must be remembered that as there is a great deal of diversity within the dominant Australian culture, there is also a great deal of diversity within Aboriginal society.

The following perspectives have been selected as a guide only. They are descriptive in nature in providing a selective range of suggestions, strategies and resources. For the purposes of programming a unit of work, they can be a useful reference.

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Prescribed Focus Areas

PFA	Stages 1–3	Stage 4	Stage 5	Stage 6 (Preliminary)**	Stage 6 (HSC)**
	A student:	**A student:**	**A student:**	**A student:**	**A student:**
History	**appreciates contributions made by individuals, groups, cultures and communities to scientific and technological understanding**	**identifies historical examples of how scientific knowledge has changed people's understanding of the world**	**explains how social factors influence the development and acceptance of scientific ideas**	outlines the historical development of major principles, concepts and ideas (area specified)*	evaluates (discusses) how major advances in scientific understanding and technology have changed the direction or nature of scientific thinking
Nature and practice	gains satisfaction from their efforts to investigate, to design, to make and to use technology	uses examples to illustrate how models, theories and laws contribute to an understanding of phenomena	describes the processes that are applied to test and validate models, theories and laws	applies the processes that are used to test and validate models, theories and laws of science with particular emphasis on first-hand investigations in (area specified)	analyses the ways in which models, theories and laws in (area specified) have been tested and validated (applies the processes that have been used to test and validate models, theories and laws to investigations)
Applications and uses	initiates scientific and technological tasks and challenges and perseveres with them to their completion	identifies areas of everyday life that have been affected by scientific developments	**evaluates the impact of applications of science on society and the environment**	assesses the impact of particular technological advances on understanding in (area specified)	assesses the impact of particular advances in (area specified) on the development of technologies
Implications for society and the environment	shows informed commitment to improving the quality of society and the environment through science and technological activities	identifies choices made by people with regard to scientific developments	**discusses scientific evidence supporting different viewpoints**	describes (identifies) applications of (area specified) which affect society or the environment	assesses the impact of applications of (area specified) on society and the environment
Current issues, research and developments	**appreciates the significance of Australian scientific and technological expertise across gender and cultural groups exhibits curiosity and responsiveness to scientific and technological ideas and evidence**	describes areas of current research	**analyses how current research might affect people's lives**	describes (identifies) the scientific principles employed in particular areas of research in (area specified)	describes possible future directions of (area specified) research

* Area specified refers to Biology, Chemistry, Earth and Environmental Science, Physics or Senior Science.

** The outcomes for the Senior Science course may differ from those of the other Stage 6 courses. Where this is the case the outcomes related to the Senior Science outcomes or differences in the Senior Science outcomes are shown in brackets

KEY LEARNING AREA : SCIENCE

TOPIC	STRATEGIES / SUGGESTIONS	RESOURCES
Use of local flora and fauna and concept of seasonal change	Discuss how Aboriginal people were dependent upon the natural environment for all requirements. Change of seasons observed through animal behaviours, changes in plants & animals before and after climatic events (flood, fire, rain, drought). Change in season affected needs. How? Why were observation skills so important to Aboriginal people? Construct a seasonal calendar. Coping with seasonal change.	VHS : Bush Foods Bush Foods. Aboriginal Food and Herbal Medicines by J. Isaacs Field Studies Centres – DSE Royal Botanic Gardens Met. North Book VHS : Nature of Australia (Land of Flood and Fire) Survival by N. Parbury
Use of Bush Foods	Look at the traditional Aboriginal food in the local area. Compare the diets of traditional Aborigines and Europeans (nb high fibre/low fat diet of traditional bush tucker). Discuss role of men and women in food gathering and hunting. Use of firestick farming. Examine techniques for food preservation – smoking, drying, leaching in water, using moss to retain moisture and to keep alive living specimens. Cooking techniques – hot ashes, steaming in ground oven, roasting on coals. Plant a bush tucker garden (record growth, build up a data base on plants used). Design a poster promoting healthy bush food. Discuss the scientific finds being made about Aboriginal Bush foods including commercialism and marketing.	Field Studies Centres – DSE Wild Food in Aust. By J. Cribb Wild Plants in Aust. By J. Cribb Bush Food by J. Isaacs Bush Tucker Supply Co. (Phone (02) 9554 9477 Local Nursery Aboriginal Australia Kit – ATSIC Local butcher e.g. kangaroo meat Local Aboriginal community The Bush Food Handbook by V. Cherikoff *www.roebourne.wa.edu.au/culture/bush.hthm* *http://indigenousaustralia.frogandtoad.com.au/bushtucker.html*

TOPIC	STRATEGIES / SUGGESTIONS	RESOURCES
Understanding medicinal use of plants	Knowledge of medicinal powers of various plants. Natural resins and gum from trees. Use of these substances-separation, extraction, prep & application techniques. Treatment of wounds and disease.	Aboriginal Australia Kit – ATSIC Bush Foods, Aboriginal Food and Herbal Medicine by J. Isaacs Before the Invasion by Bourke and White *www.aboriginal.artonline.com/culture/medicine.php*
Use of naturally occurring substances	Investigate the use of resources used by Aboriginal people to meet their needs – tools, artefacts, weapons, utensils, ochre mixes. Research and describe range of materials used (e.g. clay, grasses, stems, sticks, stone, fibres).	Aboriginal Australia Kit – ATSIC Australia's Living Heritage by J. Isaacs End. Of Aboriginal Australia Vols. 1 & 2 *www.anbg.gov.au/education/pdfs/aboriginal_plant_use_and_technology.pdf*

In your Junior Science Classroom...

Integration of an Aboriginal approach is possible within a number of science units already being taught.

1. The lifestyle of the Aboriginal peoplecan be used as an example of a **dynamic entity within the ecosystem.**

   Example: Consider the relationship between the Aborigines and water.

   - how did the Aborigines conserve and carry water?
   - what were their techniques for finding water? (i.e. what signs did they follow?)
   - how significant were legends which told of the creation of waterholes, soaks and rivers in describing the whereabouts and type of water?

2. The Aboriginal lifestyle can be used to illustrate the **importance of continued observation.** (Apply to both observation within nature and observation within a single experimental investigation).

   - note importance of observational skills to their continued existence.

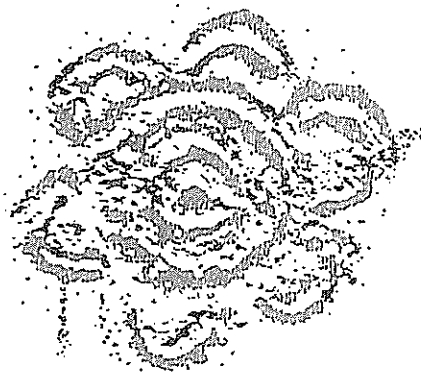
     The Aborigine was fully dependent upon the natural environment for all requirements.

   - note types of observations

     * observing animal behaviours
     * noticing changes in plants and animals before and after climatic events (e.g. flood, fire, rain, drought).

3. The use of local flora and fauna by the Aboriginal people can be incorporated into other units in such diverse areas as:

   * food
   * medicines
   * water supply
   * paint pigments



SCIENCE

Aboriginal studies can be integrated into the Science Curriculum over a broad spectrum.

There is probably no area of Aboriginal culture which cannot be viewed in terms of conventional science. It is not necessary, however, to interpret alternative technologies and sciences only to present them for what they are. The emphasis on integrating **Science, Technology and Society** as an approach to the curriculum, will give wider access to perspectives of Aboriginal 'sciences'.

Rather than compare information, it can all be considered in parallel. The dynamic nature of Aboriginal relationships with the land and culturally, maintaining where possible the ecosystems, low energy use and observation of strict social behaviour are all relevant to modern society.

Diet, health, environmental conservations and energy conservation are all issues through which the Aboriginal perspectives can be introduced.

The Junior Science Syllabus especially lends itself to a 'perspective' approach, allowing for the start of an ongoing awareness of Aboriginal people and their culture.

Later, some of the 'core' and 'elective' units with the Senior Science Curriculum can be used rather than follow 'traditional' European perspectives.

Generalisations of any kind should be avoided. There are bodies of 'information' still available in reference libraries which are erroneous and continue to perpetuate 'white' myths.

The use of the most current data available when discussing population distribution, group movements, subsistance, environmental management, history, anthropology and archaeology should be sought and checked for hints of stereotyping. Where necessary, check with the local Aboriginal Consultative Group.

A comprehensive reference list is included at the end of this section.

* tool making
* clothing
* housing
* carrying devices
* weapons

4. **The topic "Food"** can incorporate an Aboriginal perspective.

- compare the diets of traditional Aborigines and Europeans. Note the high fibre/low fat diet of the Aborigines (the catch cry of modern 'experts' in dietary practices!)
- examine the Aborigines' techniques for food preservation
  * smoking
  * drying
  * using moss to retain moisture and to keep alive living speciments.

SOME MORE IDEAS....

Other areas of high interest to both students and teacher, that can be integrated within the Science Curriculum include:

- local Aboriginal names of places, plants and animals, thus allowing for a variation in a naming and classification system.
- art, including many animals and plants, and the variance of this art between tribe and region. The type of art also indicates the most important observable features that allow for future recognition.
- observed behaviours of animals, needed for successful hunting, also used in ceremonies and dance.
- natural health aspects and remedies.
- factors influencing life expectancy; limits upon population size with regions and tribal groups. This would include the social organisation within the tribal group.

- fire making; involving unit areas on friction.

- the study of the structure and dynamics of the Aborigines' weapons.

- blood type frequencies, which could lead to a discussion of physiological adaptions and the blood group patterns of Aboriginal people.

- coping with seasonal change, insulation of the body with smeared-on fat for colder regions and when swimming in cold waters. Also the heating of stones that could be slept upon when covered with furs.

It must be remembered that all of the above are only suggestions and could be expanded upon considerabley. However, the main intention at all stages is to foster and develop a positive attitude towards the Aboriginal People and appreciation of their history, culture and lifestyle.

THE SCIENCE, TECHNOLOGY AND SOCIETY (S.T.S.) APPROACH.....

A number of articles can be read on the establishment and growth of Science, Technology and Society, including - "S.T.S.: The Future Mode of Science Education" by Dr. Ian Lowe in The Australian Science Teachers Journal, May 1985 Vol. 31 No. 1. See also "Challenges to Science Education and the S.T.S. Response" by Charles McKavanagh and Mary Mahe in The Australian Science Teachers Journal, August, 1982 Vol. 28 No. 2.

A recent trend in Science teaching has been toward a 'Science, Technology and Society' approach.

Areas of the Aboriginal Education Policy (or for that matter areas of the Multicultural Policy) can be included and developed through the S.T.S. approach. One of the main aims of the Aboriginal Policy is to enable all students to have some knowledge, understanding and appreciation of Aborigines and their culture. The adoption of a Science, Technology and Society approach can realise this policy aim, without threatening or belittling any cultural group.

ONE EXAMPLE

"Living and Non-Living Things" - A Year 7 Unit

Main Concepts

Science

1. Characteristics of a living thing.
2. Classification of plants.
3. Classification of animals.

Technology

1. Agriculture: discussion and study of systems (e.g. action of micro-organisms within an agricultural system).
2. Introduction or destruction of micro-organisms.
3. Breeding of new species - allowing the overcoming of particular environmental conditions (e.g. breeding cattle to be tick resistant.

Society

1. Recent and future food supplies.
2. Intensive Agriculture methods (e.g. use of growth stimulants and drugs in animal raising; hydroponics and other alternative plant growing techniques.
3. Actions of Government at all levels, National to Local Council (e.g. National Parks and other associated legislative bodies).

To incorporate an Aboriginal perspective into such a Unit design, consider the following suggestions:

Science

How is the traditional Aborigine part of the ecology of an area?

Upon what basis was the Aborigines' classification system devised?

Technology

What uses were made of local resources by Aborigines?

Society

Why were animals and plants drawn? Consider the shape and structure of these drawings.

What link exists between Aboriginal dance and the importance of native animals?

A useful resource related to classification and uses of local resources is the article: "Experts Find Relics in Black Campside", Newcastle Herald, 3rd May 1979.

Typical **OBJECTIVES** for such a unit might include the following:

1. Students will be able to draw and label a diagram of their individual observations of living and non-living things.

2. Students will be able to group items into sets.

3. Students will be able to classify living things into the categories 'plants', 'animals', and 'others'.

To add an Aboriginal perspective:

4. Students will compare their own drawings and observations with those made by the traditional Aborigines.

5. Students will come to realise the importance of such drawings (diagrams) in communicating the essential features of the animal or organism to other members of the tribe.

ANOTHER EXAMPLE.....

"Energy"

Typically, objectives for this topic reflect a modern, Western perspective.

For example:

1. List different forms of energy (e.g. heat, light, electrical, chemical, kinetic, potential, solar, nuclear, etc.)

2. Note that energy cannot be created or destroyed.

3. List fossil fuels and the reasons for their conservation.

4. Describe alternative energy sources.

An Aboriginal perspective added to this topic might demonstrate that traditional Aboriginal society was typified by low energy usage - for example, the structures used in fishing and hunting. It is of interest to note how some western societies are investigating the use of alternative or lower energy usage systems. Thus in studying individual Aboriginal situations, hints may be given as to some ways in which western cultures may benefit.

An example of this low energy, high efficiency technology is described by Coutts et al. 1978 in the description of canals. "In the Lake Condah area of western Victoria a complex of races and walls is used by Aborigines to artifically connect lakes and swamps and direct discharge through traps set in canals for catching eels.... It is clear that the Aboriginal fishermen made optimal use of the topography of the area which in most cases lends itself to this type of fishing industry. It is also clear that the Aboriginals understood the hydrology of the lake and used it to full advantage. Likewise, their use of basalt as a building material was logical and resourceful. Their construction of these complex fishing systems without the aid of surveying aids is a tribute to their ingenuity". (Coutts, P.J.F., Frank, R.F. and Hughes, J., "Aboriginal Engineers of the Western District, Victoria". Research of the Victorian Archaeological Survey, 7, 1978).

AND SOME IDEAS FOR SENIOR CLASSES.....

Senior 2 unit Biology Course - The Elective "Disease" (C2) can include a case study on the effect of "European" diseases on the Aboriginal people after the arrival of the first Europeans. The elective may be further extended by studying the main diseases that affect the Aboriginal Society today, highlighting possible causes and effects. From this, a study can be made of the development of "immunity" to these introduced diseases.

The other electives that can incorporate an Aboriginal Perspective include:

- "Human Environmental Impact", (C5)
- "Human as Unique Animals", (B3)
- "Ecology of an Area", (B4)

Also the three "Core" units,

- "Reproduction and Genetics"
- "Diversity and Evolution"
- "Ecology"

may use an Aboriginal Perspective.

The 2 Unit General Science Course - includes within its selection of "Depth Studies" a number of topics that could take an Aboriginal Perspective. For example, Group B's depth study B14, "The Australian Aborigine", lists four areas of investigation from the past through to the present and the future. There are also a number of the "Survey Units" within this course which can easily reflect an Aboriginal Perspective.

2 Unit Physics Course - The study of sound waves within open and closed pipes leads on to the discussion and study of harmonics, etc. The Aboriginal musical instrument, the 'didgeridoo', can be used as an excellent example of an open pipe system rather than the traditional set of organ pipes.

IN CONCLUSION.....

An Aboriginal perspective in Science can be implemented in most areas of the curriculum, especially if a Science, Technology and Society approach is undertaken. However, teachers of Science must be confident of their facts and not dwell on "erroneous generalisations".

SECTION A

PLACING ABORIGINAL TECHNOLOGICAL ITEMS INTO THE SCIENCE CURRICULUM

PHYSICS

- MOVEMENT IN FLUIDS

  boomerang
  bundi

- SOUND

  didgeridoo

- LEVERS

  spearthrower
  digging stick
  harpoon
  nulla nulla

- SHAPES

  dish or coolamon
  watercraft

- HYDROLOGY

  eel traps
  fish traps

- FRICTION

  matchstick firestick

- SPRINGS

  net traps

- PROJECTILES

  spear
  spearthrower

CHEMISTRY

- CHEMICAL CHANGES

  art pigments - turning yellow ochre into red ochre

- CHEMICAL SEPARATION

  macrazamia nut (method of removing poison)

- POISONS

  medicinal plants

- PHYSICAL SEPARATION

  seed grinding stones

- THERMO-PLASTICS

  spinifex resin
  native bees wax
  natural resin

GEOLOGY

ground stone tools
seed grinding stones - millstones
heat treatment of siliceous rocks
kopi-weathered powder of gypsum
ochre mining
quarry mining

BIOLOGY

medicinal plants
seasonal calendars

SECTION B

TECHNOLOGICAL ITEMS IN ALPHABETICAL ORDER

1. Art pigments
2. Boomerang
3. Bundi
4. Didgeridoo
5. Digging stick
6. Carry dish - Coolamon
7. Eel traps
8. Harpoons
9. Ground stone tools
10. Heat treatment of siliceous rocks
11. Kopi - weathered powder of gypsum
12. Macrozamia nut - cycads
13. Matchstick
14. Medicinal plants
15. Native bees wax
16. Natural resin
17. Net trap
18. Nulla nulla
19. Ochre mining
20. Quarry mining
21. Seasonal calendar
22. Seed grinding stones
23. Spear
24. Spearthrower
25. Spinifex resin
26. Watercraft

SECTION C.

GEOLOGY UNIT INCORPORATING ABORIGINAL PERSPECTIVES

The following ideas on curriculum material could be used within the framework of an existing geology unit for Junior Secondary Science.

The Aborigines were the first field geologists on our continent. Knowledge of the types of rocks necessary for the manufacture of tools, weapons and pigments was essential and not only were rocks identified and classified but they were put to practical use. Rocks were classified on their hardness, flakeability, ability to act as a grinding surface, ability to be ground, their weathered properties and their colour.

On a broader scale, the geological landscape acted as a natural division between tribal groups and prominent geological features were and are still sites of special significance.

KEY QUESTION 1

Traditional Aboriginal technology was a stone or rock technology.

What is a stone?

Are all stones the same?

ACTIVITY

1. Collect different stones/rocks.

2. Examine the properties of the samples and compare hardness, ability to be chipped, rough/smooth, grinding ability.

To what use did traditional Aboriginal people put stone?

1. adzes for tools, weapons

2. rocks used for grinding

3. weathered rocks used for pigment

EXTENSION

1. Students view samples of use of rocks in Aboriginal culture - tools, weapons, pigments.

2. Students attempt to make a stone tool - see A.S.E.P. "Australia's Past and Present" Manufacturing Tools - pupils will certainly appreciate the involvement.

3. Discuss mining.

Quarry sites have been identified throughout Australia and the rocks exchanged along major trading routes.

* 20,000 year old flint quarry on Nullabor Plain
* Mt. William, Victoria - quarry site for volcanic greenstone - has hardness, toughness and fine grain needed to make heavy-duty stone axes with a ground edge
* Quartzite quarry at Ngillipidgi on the upper Walker River in eastern Arnhem Land
* Quarrying and surface sites on Groote Eylandt and at Oenpelli

KEY QUESTION 2

What are the properties of the stones/rocks used in tools and weapons which make them suitable for cutting, hammering, piercing?

ACTIVITY

1. Examine the types of stones/rocks used - basalt, chert, quartzite, flint
2. When a piece of rock is hit, how does it fracture?
3. Relate to properties of hardness and fracturing of minerals which make up rocks
4. Moh's scale of hardness - find where stone tools/weapons fit in

EXTENSION

Technology involved in the heat treatment of siliceous (quartz containing) rocks.

Observed in Kimberleys and Central Australia and evidence shown in Tasmanian artifacts of heating improving the flakeability of siliceous rocks. The heat draws out the interstitial water and increases the number of internal micro features, also causes the stone to become more vitreous (glossy) and can change colour.

The temperature must be raised and lowered over periods of several hours to avoid thermal shock and maintain a temperature of about 276 degrees C. for eight hours.

Using heat treatment, the manufacturer was able to reach his goal with less expenditure of effort and greater economy in raw material use.

(ref. Flemikan and White - bibliography).

KEY QUESTION 3

Which rocks were used for grinding? - compare these rocks with sandpaper.

1.Examine various types of sandstone:

a) Sandstone with clay and iron as matrix
b) Sandstone with CaCo3 as matrix
c) Sandstone with silica as matrix
d) Sandpaper

2. Rub basalt, chert and flint on samples

3. Try using water as a lubricant and a wash as you grind the stone

4. Relate to Moh's scale of hardness

Good sandstone for grinding is uniformly fine-grained, having sharp quartz grains 0.3 - 0.5mm across with bonding by clay and iron compounds that constitute about 15% by weight of the stone. Bonding with CaCo3, and still more silica bonding, make sandstone unsuitable because the grains are held too tightly to the matrix.

HOW DOES THE GRINDING WORK?

In grinding, the quartz grains act as tiny chisels, each gouging a minute amount of stone out of the tool. As the kinds of stone used for ground hatchets are tough and fairly hard, around 6 on Moh's scale where quartz has a hardness of 7, the grains are soon blunt and no longer cut. The presence of water allows the spent grains to be washed out and a new surface exposed.

KEY QUESTION 4

To what use did traditional Aboriginal people put weathered rocks?

ACTIVITY

1. Examine samples of weathered rocks

2. What do you notice about the colour, texture of these rocks?

3. Grind samples of rock to a fine powder and mix with wáter

4. Are these powders suitable for painting?

5. What happens when your paint dries?

Many Aboriginal paints are obtained from weathered rocks. During weathering, concentration of minerals occur and these minerals are able to be mined.

EXTENSION

1. When ochres and clays which have been mixed with water and used for painting, dry, they flake off. A bonding agent or fixative is needed.

   Aborigines relied on their natural surroundings for fixatures. They used fat, blood or some starchy material obtained from plants such as 'pig face'.

   The Melville Island Aborigines used three different fixatures -

   1a) the gelatinous sap of one of three tree orchids
   1b) the wax and honey of the wild bee (well mixed together)
   1c) yolks of eggs of the sea-going turtle

2. Refer back to Key question 1 - mining

   Ochre pigments used for painting were traded widely throughout Australia from ochre quarries. Expeditions were made from western Queensland all the way to Yarrakina red ochre mine at Parachilna in the Flinders Ranges in South Australia to obtain the special sacred iridescent ochre mined there.

   Ochre mines so far identified in Australia:

1. Parachilna in Flinders Ranges, S.A.

2. Near Mount Rowland in Tasmania - visited by George Augustus Ralunsan in 1834. Aboriginal women were the miners, hammer and chisel method used.

3. Wilgie Mia (or Wilgamia) east of Geraldton in the Murchisan District of W.A.

   Almost obliterated by European quarrying but is now protected area.

   On the north side of a hill, Nganakurakura, an immense open cut has been excavated between 15 and 30 metres wide and 20m deep from which small caves and galleries branch off as miners followed the seams of red and yellow ochre.

   (Excavations reveal stone implements of 1,000 year antiquity).

   Wilgie Mia is known as 'a place of fabulous wealth' to all Aborigines in the West and it is told how the ochre was formed by the death of a great kangaroo who was speared by the spirit being Mondong. The kangaroo leapt in his death agony to Wilgie Mia, where the red ochre represents his blood, the yellow his liver, and the green his gall.

   (Although ochre deposits are common throughout the continent, certain kinds of red ochre are more highly valued than others. Usually the highly valued ochres have a silvery sheen caused by an admixture of some element such as free mercury in the Partachilna deposits or tiny fragments of mica in the Campbell Ranges deposits).

4. Campbell Ranges in Central Australia - mine still used by Walpiri men.

   Deposit is soft haematite bedded in conformity with the bedrock (quartzite, haematitic sandstone and pebble conglomerate) in a seam about 1 metre thick

   Today, the mine is worked with the aid of electric torches and small metal axes hammers or metal digging sticks. In the past miners lit small fires (charcoal an pieces of wood can be seen on the floor) and used blocks of fractured quartzite dig out ochre.

5. Quarry site in A.C.T. - for possible excursion ochre and chert quarry

   Lyall Gillespie's property of Reidsdale on the tablelands near Canberra.

   Stone implements and waste material found at Reidsdale occur on a series of low rises close to two springs. The ochre is on the site, and the chert about 1 k away".

   ref. Josephine Flood - "The Moth Hunters" pp 162.

BIBLIOGRAPHY FOR GEOLOGY UNIT

1. A.S.E.P. "Australians - Past and Present" 1974

   (**Note**: This material was published 12 years ago and needs to be read with this in mind. More recent research has begun to shed light on the complexity of Aboriginal technology.)

2. Davidson, D.S. "Aboriginal Australian String Figures"
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3. Dickson, F.D. "Of Grinding Groves"
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   Archaeology and Physical Anthropology in Oceania Jounal Vol. 15 1980

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   Collins, Sydney, 1983

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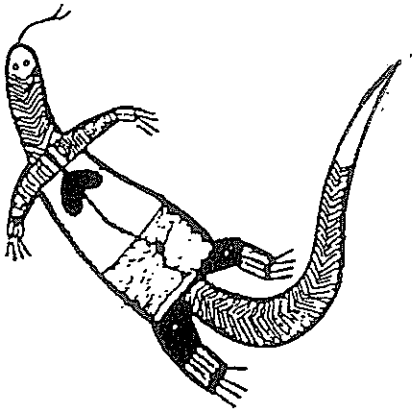
ABORIGINAL

EDUCATION

ACTIVITIES

AND

INFORMATION



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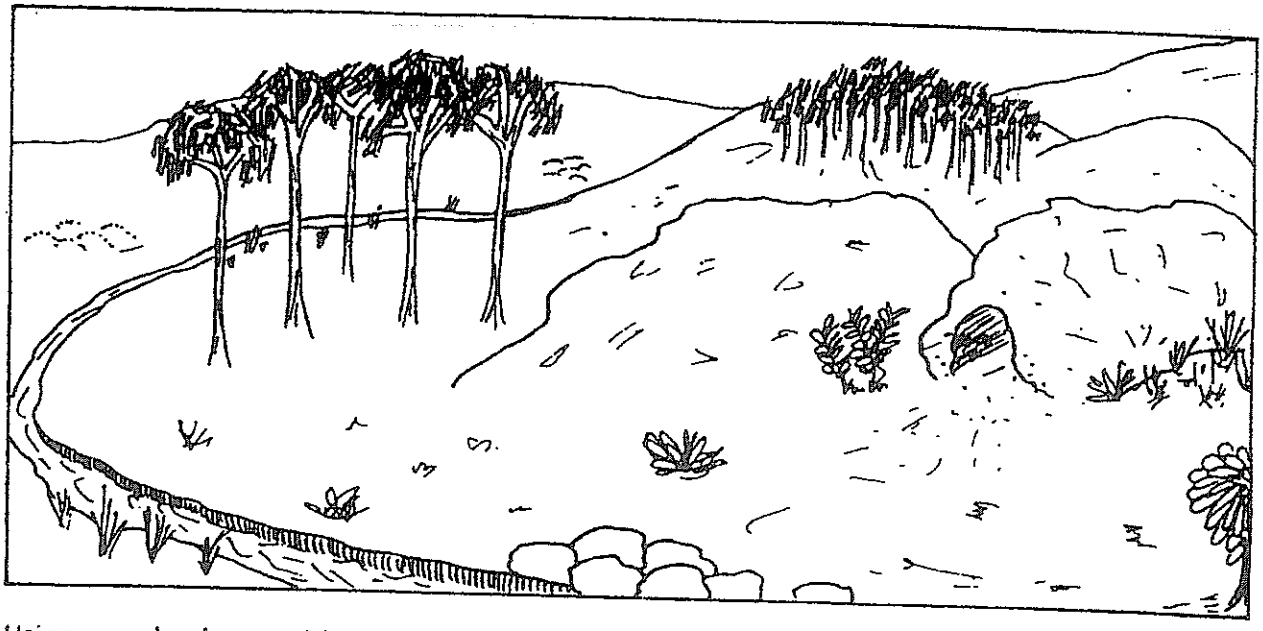
ENVIRONMENTAL AWARENESS

Aborigines developed a unique way of life, intertwined with the natural world of animals, plants and the land.



Using your background knowledge of Aboriginal Culture, imagine you are to survive in this imaginary environment. Identify and label the main requirements for your survival. Below are some ideas to help you:

Shelter, food, recreation, implements, weapons, water, clothing.

Now investigate your specified area. Look around. If you had to live here for a week:

Where would you: sleep, spend your time, etc.
What would you: eat, drink.
How would you: keep warm, cook, etc.

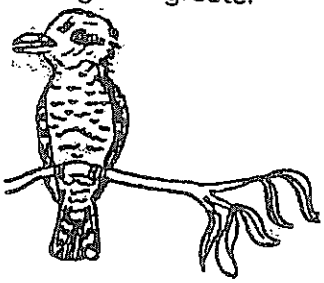
Complete the following table:

Survival Requirement	Resources Needed
eg. Food	Kangaroo, etc.

OBSERVATION

Nature and humans have to live in close harmony so that both may survive. Aborigines have a deep knowledge of their environment and have developed a unique way of life, rich, and in close contact with nature.

Use all your senses to observe your specified areas of the environment to gain a greater understanding of its features.



* Find a quiet spot to sit on your own.
* Spend 10 minutes really getting to know your area.
* Look, listen, feel, smell.
* Share your observations and thoughts and discuss their significance with your group or leader. Record your observations below.

Why were observation skills so important to the Aboriginal people?

_____

_____

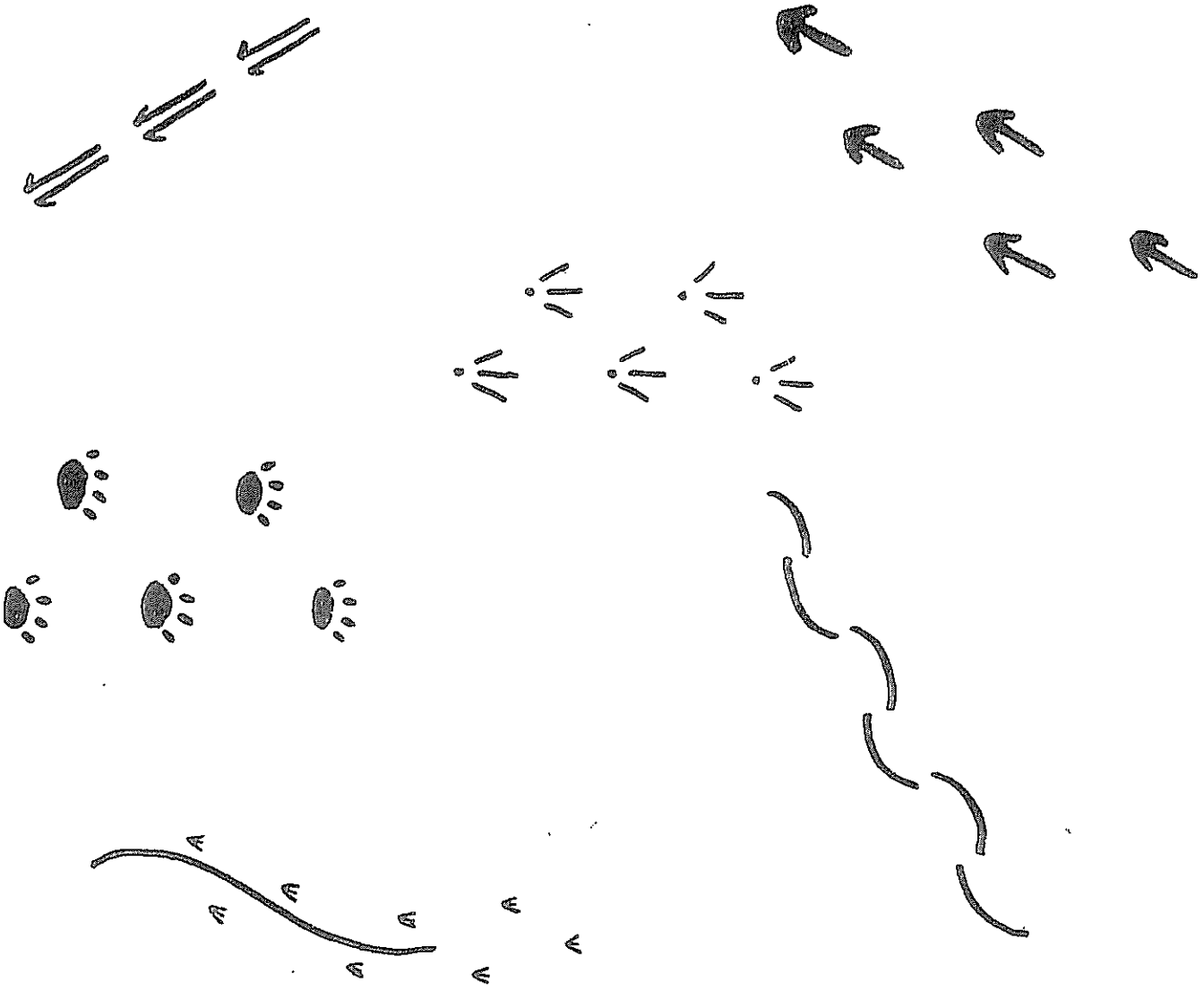
_____

ANIMAL TRACKS

Use natural materials to form a collage of tracks or make 'print' designs to represent animal tracks.

Study the tracks provided and identify their source and discover ways of making your own eg. imprints in sand/soil, use of twigs to reproduce symbols of tracks.

Which animals made these tracks?



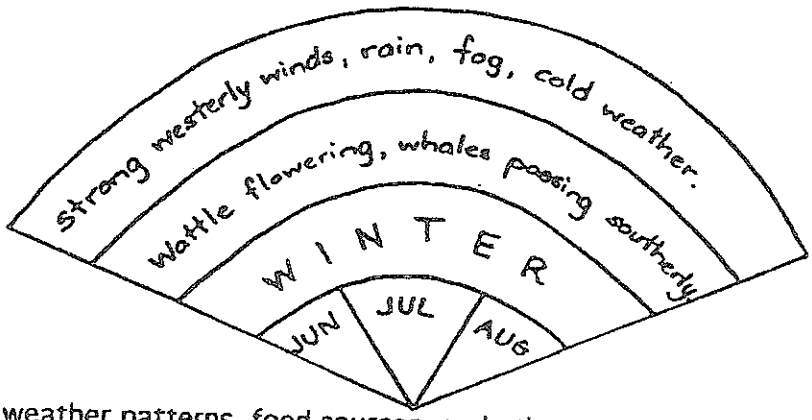
* Working with a partner, stamp out a trail of "tracks" and try to find each other's path.

* Investigate your specified environment for evidence of actual tracks - reproduce these marks.

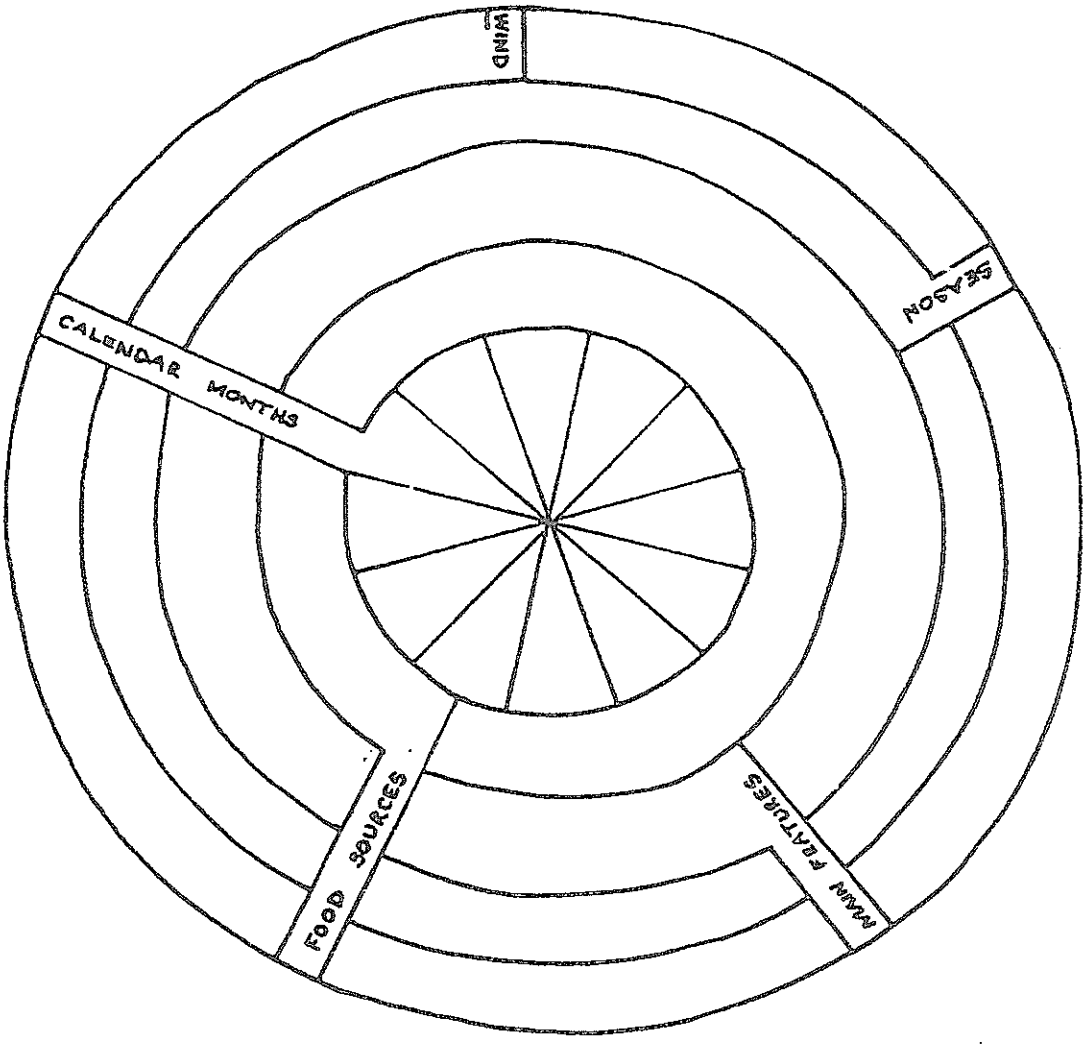
THE SEASONS

The movement of the Aboriginal people was based on the inter-relationship between the seasons, climatic conditions and food sources. Knowledge of this came from close observation of the natural environment.

Below is an example of a seasonal calendar as we would record it.

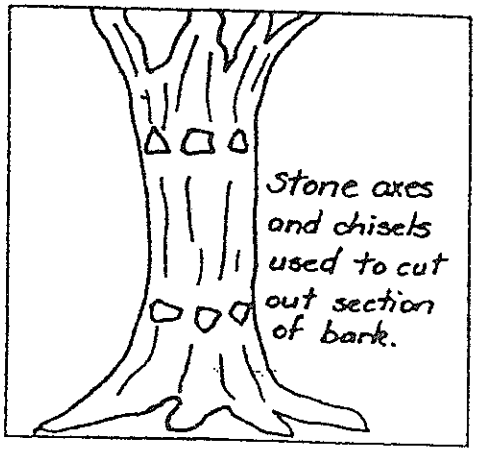


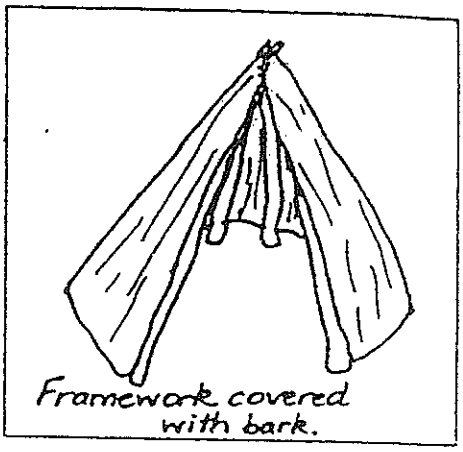
After observing weather patterns, food sources, and other naturally occuring events, complete the following seasonal calendar for your area.

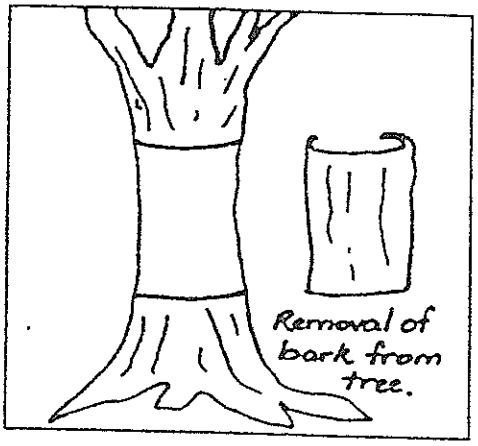


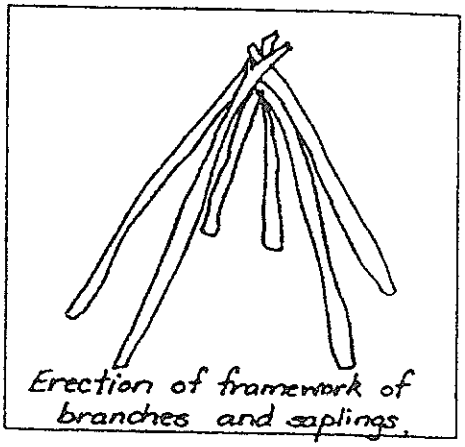
MAKING A BARK HUT

Sequence the illustrations by numbering 1 to 4 in correct order.









DESIGNING AND MAKING A SHELTER

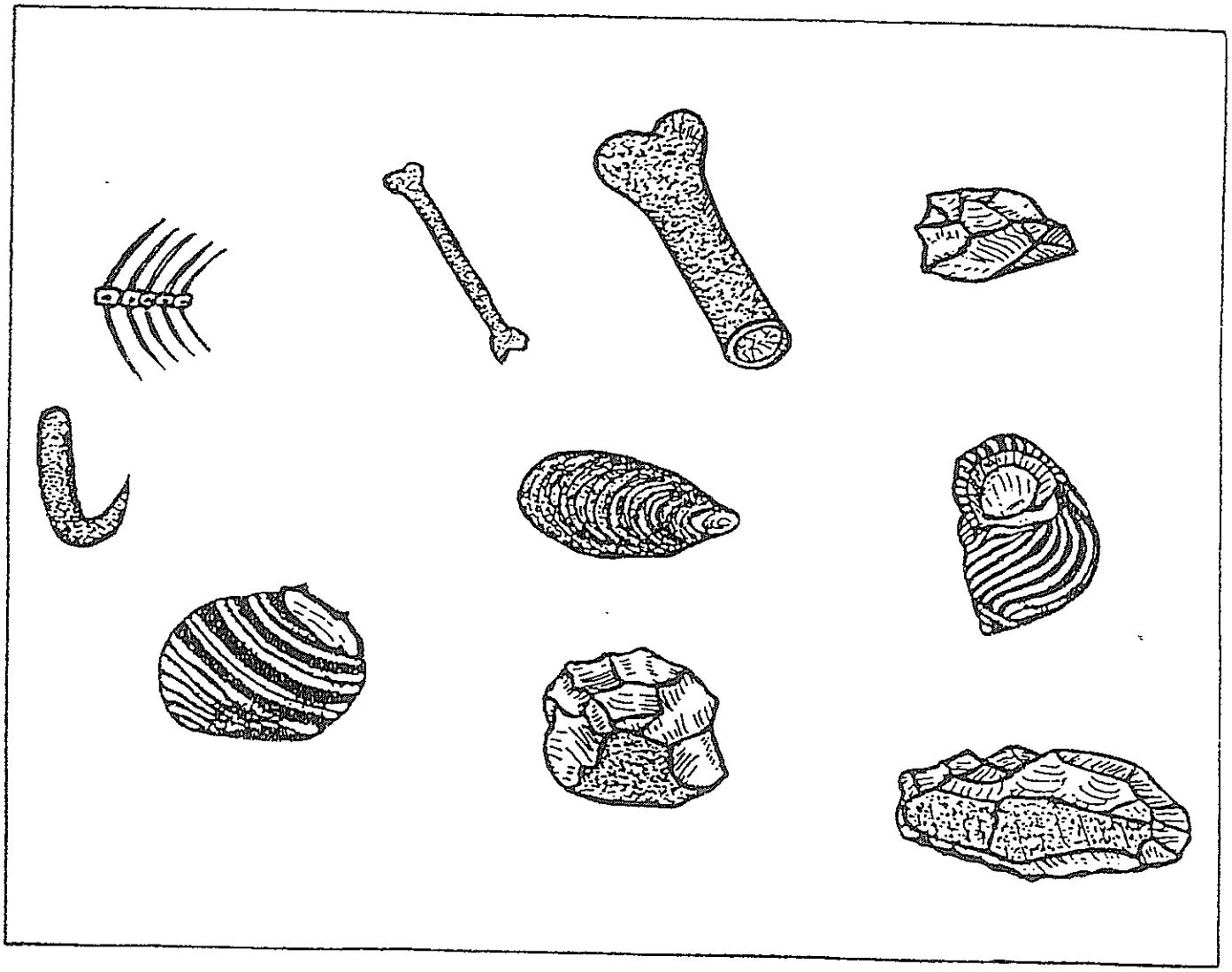
Group Task:

1. Decide on the purpose of the shelter.
2. What materials will you use? Compare the benefits and disadvantages of materials.
3. Select the method of construction. Will you need any particular tools?
4. How long will your shelter last? How could you find out? What factors would affect it?
5. How many people will your shelter accommodate?
6. Present a report on your work.

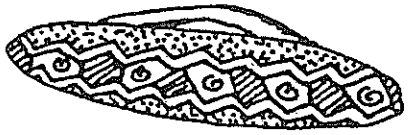
MIDDENS

Middens are a feature of past coastal camp sites that were used for long periods of time. The middens are basically the piled remains of rubbish disposed of by the Aborigines camped there. Each midden contains a variety of materials such as broken turban shells, mussel shells, periwinkle shells, mutton bird bones, mammal bones, fish bones, shellfish hooks, hand held stove hammers used for breaking shellfish off the nearby rocks, stone knives and scrapers. Softer materials thrown onto middens have by now broken down and disappeared.

* Few middens are now left. Give some reasons as to what has happened to most of them.
* What softer materials might once have formed part of middens?
* Use the list of objects named above to label the drawings of things found in middens.

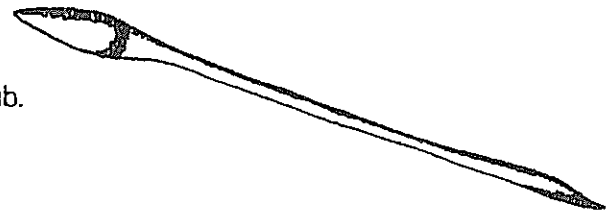


SHIELDS



For what purpose were shields used?

CLUBS

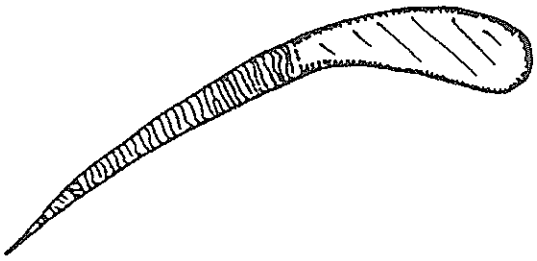


The thick end of these weapons was used as a club.

What animals would have been killed by clubs?

For what purpose do you think the pointed end of the club could have been used?

DIGGING STICKS



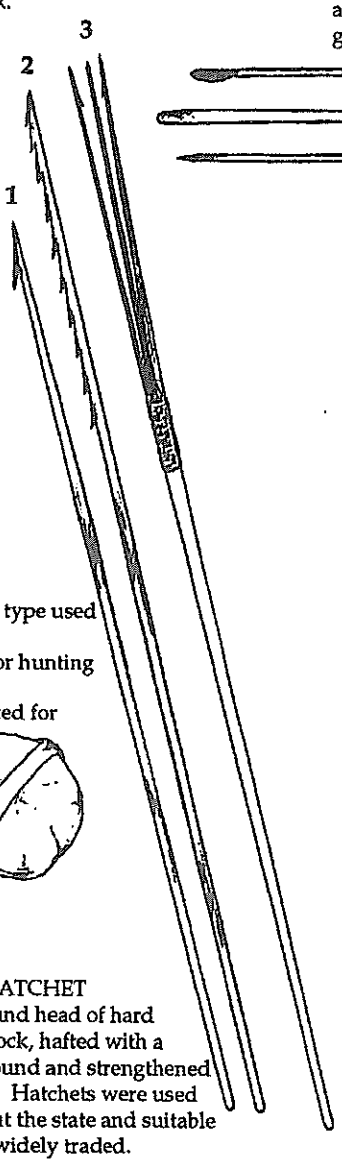
Find out what yams are.

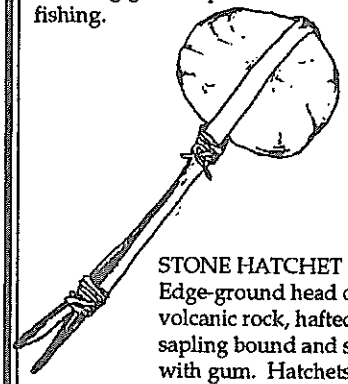
What other foods would be gathered using digging sticks?

Who in the tribe used digging sticks to gather food?

CLUB -A pointed type used throughout the state as a club and digging stick.

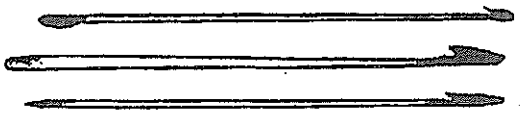
SPEARS
1. Simple bone-barbed type used for hunting game.
2. Multi-barbed type for hunting and fighting.
3. Fish-gig, multi pointed for fishing.

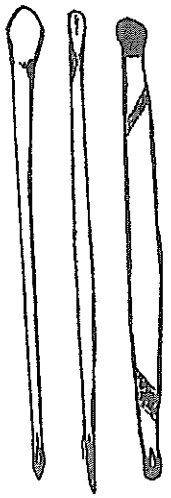




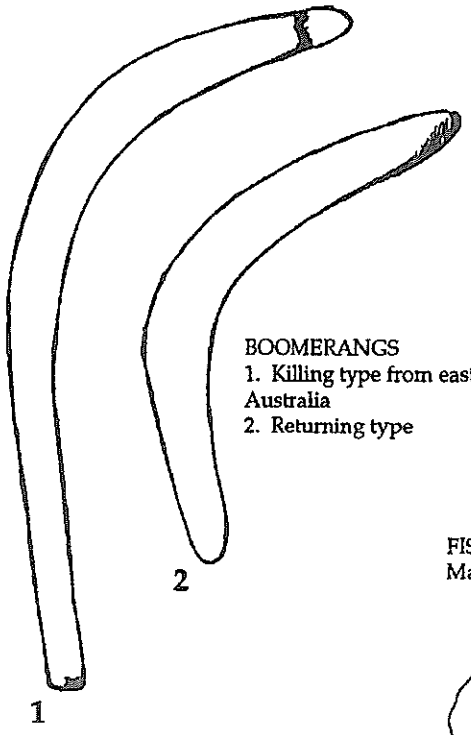
STONE HATCHET
Edge-ground head of hard volcanic rock, hafted with a sapling bound and strengthened with gum. Hatchets were used throughout the state and suitable rock was widely traded.

SPEAR THROWERS
Thin lathe type, with cut in pegs, from the Murray River area, and normal lathe type, with gum knob, from western N.S.W.

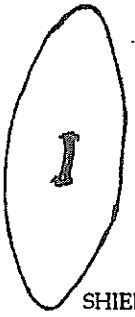




SPEAR THROWERS -
Spatula type with attached pegs from the east coast of N.S.W. Also had a shell attached to the handle for a scrapper.

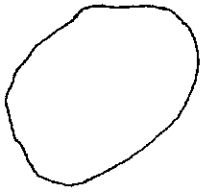


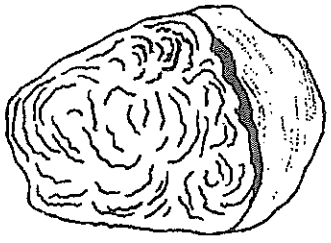
BOOMERANGS
1. Killing type from eastern Australia
2. Returning type



SHIELD
Bark shield from east coast used to ward off blows

FISH HOOKS
Made from oyster shells

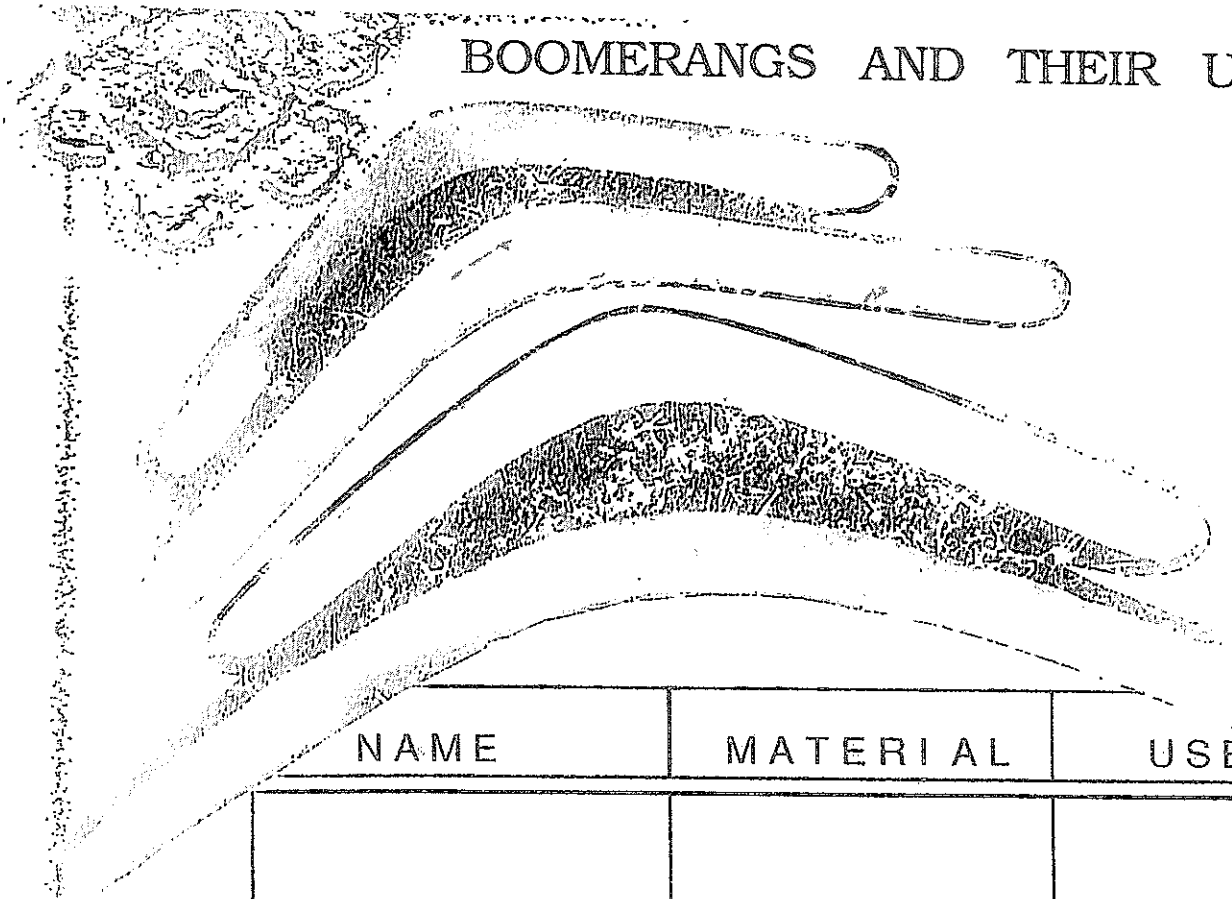




SHELL ADZE
Made from shell set in gum mounted on the end of a stick or woomera.

1. Fish hook shell blank
2. Blank flaked into a basic shape.
3. Finished hook after filing
4. Small fish hook

BOOMERANGS AND THEIR USES

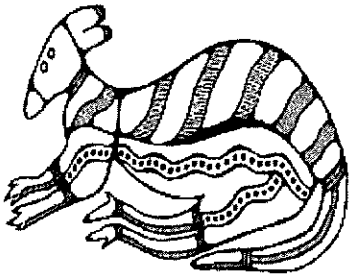
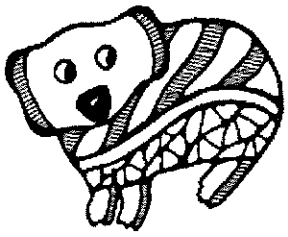
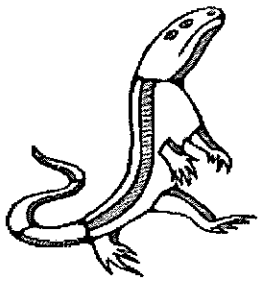
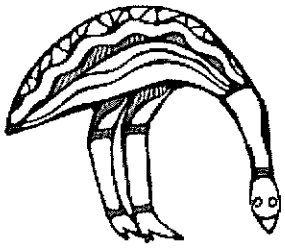
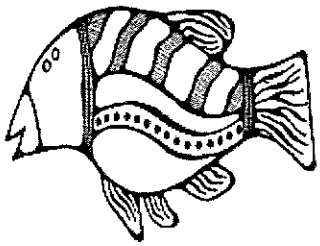
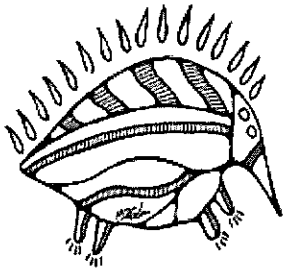
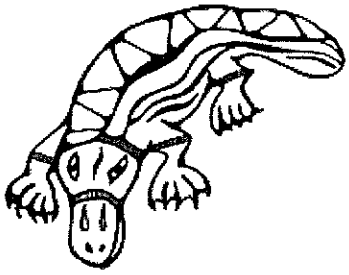
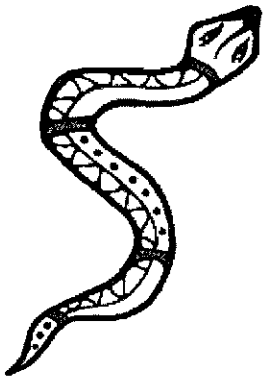
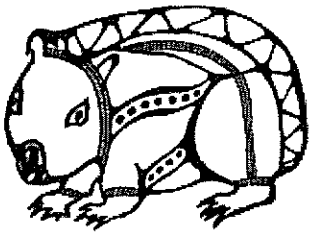


NAME	MATERIAL	USE

Student worksheets 9 HSIE

Matching English/Wiradjuri words to pictures

Colour in these pictures of Australian native animals in the song Old man Windradyne. Cut and paste the English and Wiradjuri animal names with their pictures.

		
		
		
wombat	koala	platypus
emu	kangaroo	echidna
snake	goanna	fish
ganyi	biladurang	girrawaa
guulang	gadhi	bandharr
barrandhang	dhinawan	guuya

Topic 4: Appendix 7

Wiradjuri animal word list

English	**Wiradjuri** (Pronounciation)
kangaroo	bandharr (ban thar)
goanna	girrawaa (girr a way)
emu	dhinawan (thin a wan)
fish	guuya (goo ya)
platypus	biladurang (billa doo ran)
snake	gadhi (gu thi)
koala	barrandhang (bu run than)
echidna	ganyi (gun yi)
wombat	guulang (goo lan)

Caring for Place – Caring for Country

Useful Websites for Incorporating Aboriginal Content/Perspectives in Science

http://www.curriculumsupport.education.nsw.gov.au/secondary/science/crosscurriculum/aboriginal/index.htm

Provides ideas and teaching strategies for including Aboriginal perspectives in the science program.

http://livingknowledge.anu.edu.au/html/educators/index.htm

Information on ways to incorporate Indigenous knowledge.

http://k6.boardofstudies.nsw.edu.au/linkages/IntegratedUnits/aboriginal/aboriginal.html

Board of Studies Indigenous cross curricula.

http://www.questacon.edu.au/starlab/aboriginal_astronomy.html

Aboriginal astronomy stories

http://www.bom.gov.au/iwk/climate_culture/index.shtml

Seasonal weather calendars, developed over thousands of years by Indigenous communities, are displayed on this new Bureau of Meteorology Indigenous Weather Knowledge website.

http://www.schools.nt.edu.au/walungurru/index.htm

Learn from the skills and knowledge of the students of Walungurru

http://www.abc.net.au/messageclub/

Youth site for upper primary and lower secondary Aboriginal and TSI students. Great activities for Indigenous and non Indigenous students.

http://www.criticalclassroom.com/

For teachers wishing to embed Aboriginal and TSI perspectives into classroom practice.

http://aboriginalastronomy.blogspot.com.au/

About Aboriginal astronomy

http://www.abc.net.au/dustechoes/

Great story/interactive site

http://www.atnf.csiro.au/people/rnorris/SydneyRockArt/public_list.htm

About Aboriginal sites around Sydney

http://www.gibberagon-e.schools.nsw.edu.au/page16/page16.html

Resources for teachers

http://www.det.wa.edu.au/aboriginaleducation/apac/detcms/aboriginal-education/apac/lesson-plans/science.en?oid=com.arsdigita.cms.contenttypes.CourseUnit-id-9475860

Science lesson plans for teachers – WA Education Dept