First Weapons

Student Resources

Levels 5-10

Written by Culture is Life

Acknowledgement of Country

Culture is Life would like to acknowledge and pay respect to the Traditional Custodians of the lands and waterways of Australia. We pay our respects to Elders past, present and emerging, for they hold the memories, the traditions, the culture and hopes of our nation. We acknowledge that Aboriginal and Torres Strait Islander people continue to live in spiritual and sacred relationships with this country.

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Getting **Started**

How To Use These Resources

The resources are divided into 6 Episodes with discussion and inquiry questions and activities focusing on STEM learning areas.

You can view the entire episode or 5 minute clips in these resources, and select the questions and activities for your subject area and level.

You can view the entire episodes on ABC iView.

Watch on iView

The Resources

Before Viewing

Discussion Questions

Before viewing any of the episodes or short clips, answer these questions:

- What does the title of the series tell us?
- What might we be learning from studying a series called ‘First Weapons’?
- What group of people’s knowledge might this series teach us about?
- How might this relate to the subject or area of study we are doing now?
- What is one thing that I would like to know more about from watching this series?
- Do you know of any Australian Aboriginal Weapons?

Before Viewing

Activity: Understanding Country

- This series and resources references Country from a First Nations perspective. Research or talk to local First Nations peoples at your school and community about the significance of Country and the relationship that First Nations peoples have with Country.

- If Country is all living spirits. Does this include you? Do you have a role and responsibility to look after the lands and the waterways where you live? Journal or discuss.

Episode 1

Returning Boomerang

Episode 2

Amerr

Episode 3

Leangle and Parrying Shield

Episode 4

Kodj

Episode 5

Longspear

Episode 6

Wartilykirri

Episode 1

Returning Boomerang

The Returning Boomerang is a strategic hunting weapon, designed to deceive and frighten its prey. Its winged edges and distrinctive shape create complex aerodynamics. The unique design and airflow propsel the weapon back to the thrower.

Returning Boomerang

Synopsis

Host Phil Breslin visits South Australia to investigate Australia's most iconic and scientifically complex weapon - the Returning Boomerang. After sourcing the hard rubbish for weapon maker Moogy Sumner to upcycle into the famous weapon, Phil learns the ancient techniques of design and crafting passed down through generations.

Phil is given a crash course in throwing ... and catching before he and Moogy travel to Brisbane to unpack the ingenious design and flight of the Returning Boomerang and reveal how the user and weapon interact.

In an ultimate challenge the world's original flying craft is put through its paces by the newest flying aircraft in the ultimate race of Returning Boomerang V Drone. Phil and Moogy go head-to-head with FAI Drone Racing World Champion Rudi Browning.

Before Viewing

Discussion Questions

Discuss what the class knows about the returning boomerang. Where have they seen once used and what is its purpose?

List and define aerodynamic principles including:

- Turbulence
- Drag
- Lift
- Average Centre of Lift
- Centre of Mass
- Gyroscope
- Velocity
- Biomechanics

Uncle Moogy & Phill want to learn what makes the returning boomerang so unique and why it comes back. In the lab we test the boomerang in a wind tunnel, where the effects of lift, drag & turbulence are explained. We then go onto the oval where the gyroscope and the boomerang throw is explained using boomerang animation.

Testing Aerodynamics

Discussion Questions

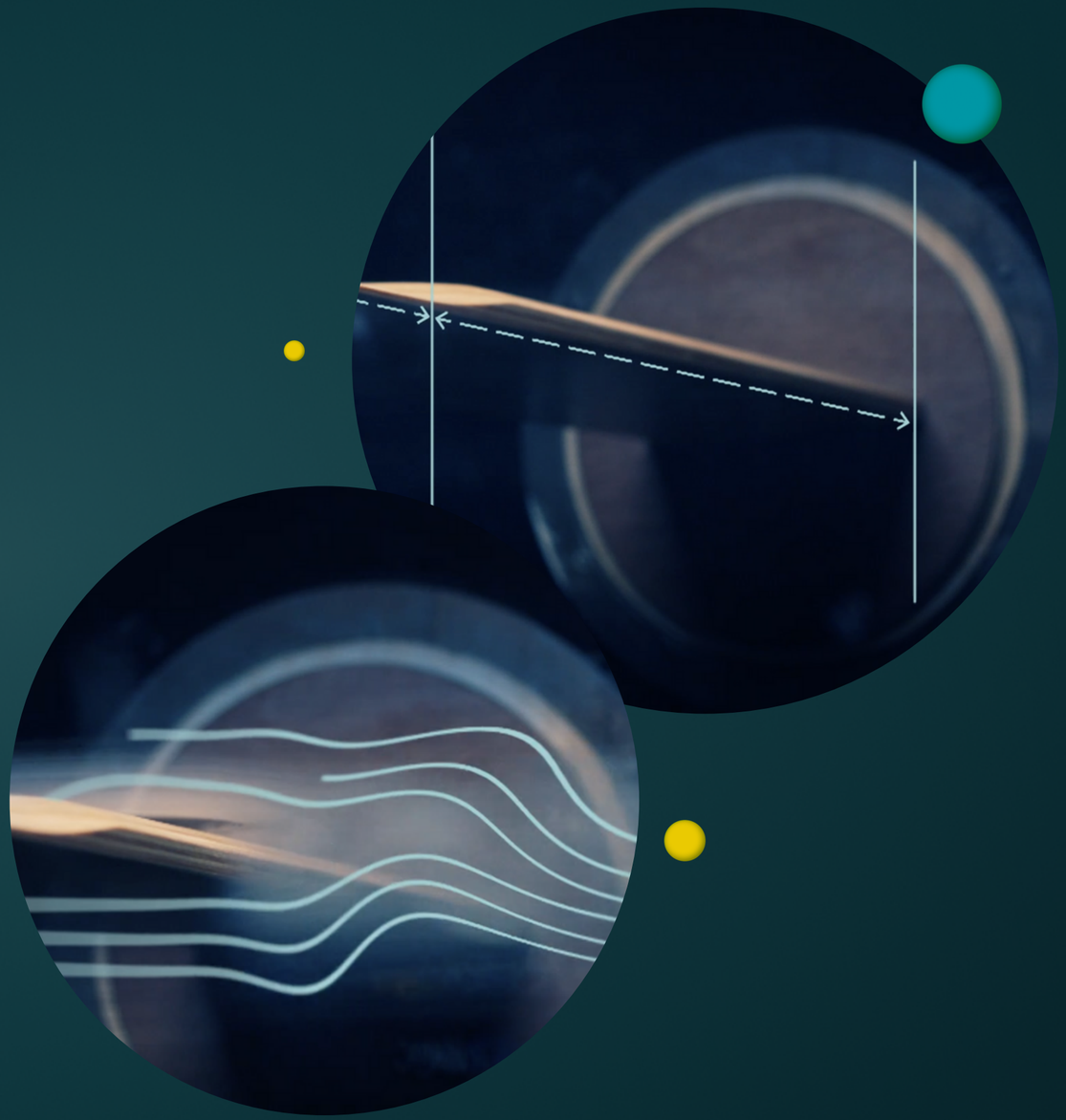
- How does mechanical engineer, Dr Conrad Stacey, explain the focus of his PhD?
- What does the wind tunnel look like in the lab?
- Describe what the aeroplane wing looks like compared to a boomerang wing?
- How does this demonstrate a difference in the aerodynamics?
- What do the curved streamlines over the top of the wing and curved streamlines underneath the wing do?

Explain this principle in a diagram annotating the flow on the top versus flow underneath and what this means.

Testing Aerodynamics

Discussion Questions

- What difference do we see, and does Dr Conrad explain, about the smoke around the boomerang wing?
- What does this turbulence cause?
- Why is it important that we have a drag on the trailing edge of the boomerang wing?
- Why is it safer for the thrower?



Putting It To Practice

Discussion Questions

- What do we learn here about why this particular design of boomerang comes back if thrown correctly?
- What is a gyroscope and what are examples of these in your world?
- What is the bicycle wheel used to explain?
- What happens when the wheel isn’t spinning?
- Where is the centre of mass?

Types of Boomerangs

Research Activity

Research the different types of boomerangs and their unique shapes and purposes. Draw the different types of boomerangs researched and label the significant characteristics of the boomerang on your drawings. Based on your findings, what boomerang do you believe to be the most useful for survival and explain your response.

When you throw the boomerang, one arm of the boomerang is advancing and one arm is almost still. One arm has twice the velocity of the boomerang.

- How do we see this in Phill’s throw with the leading edge highlighted?
- How is the difference in life explained from the top arm to the bottom as it rotates?

Types of Boomerangs

Research Activity

Describe aerodynamic drag in relation to the throwing of the returning boomerang.

- What three components are measured in the Boomerang Animation?
- What about the center of lift and the center of mass makes the boomerang lie down as it’s turning?
- What do we see in the flight path of the boomerang?

Full Episode

Extended Curriculum

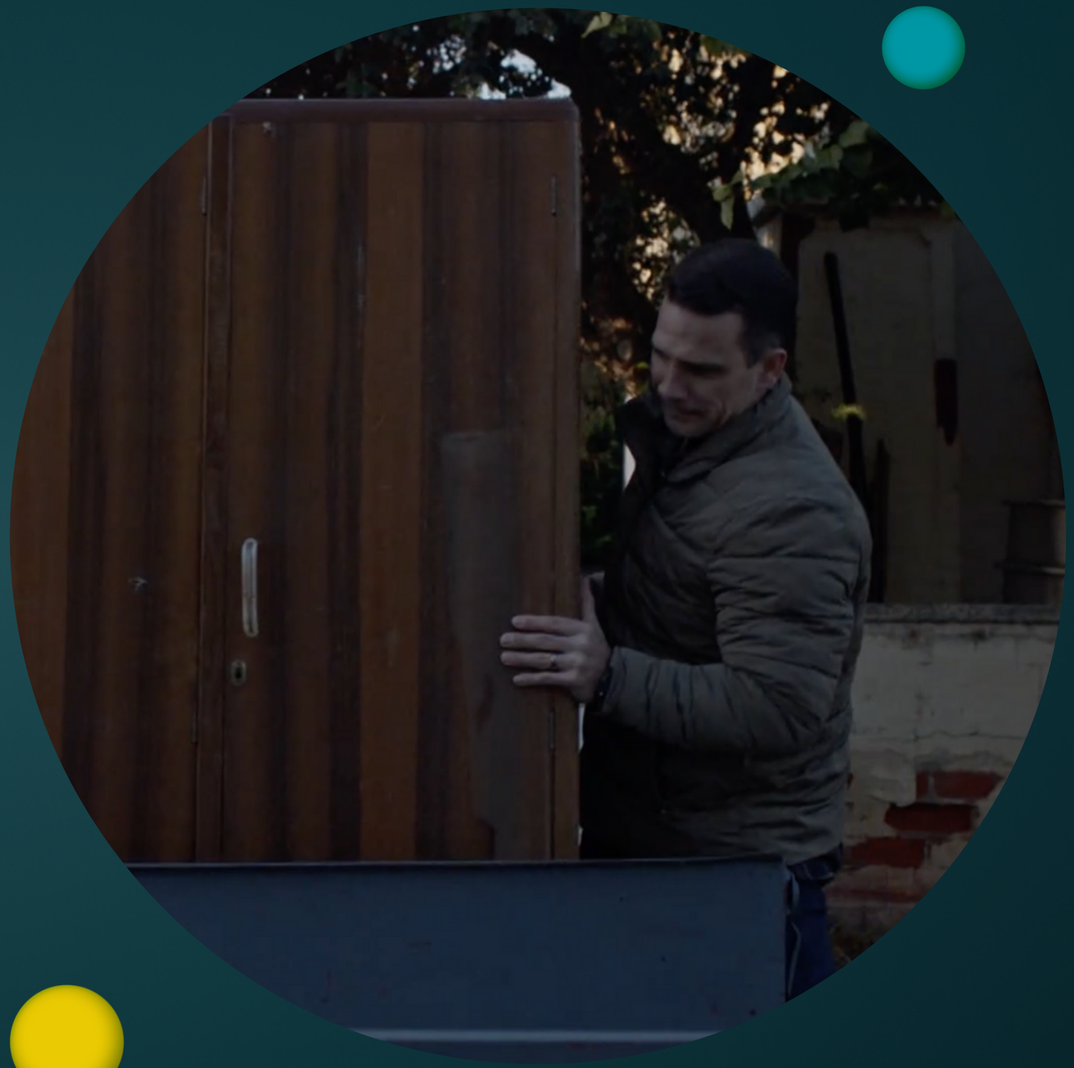
Local Weapons

Research Activity

The weapons in this series are found in different places throughout Australia and some places may have a different variation of a similar weapon shown in the series. Connecting, learning from and sharing with your local Aboriginal and community is so important, as this is the Country that looks after them and the people who have cared for it for millenia!

Research online or in person using services and people in your local community. Research weapons traditionally and/or currently made in your local area that your school is located, where you live or your family is from.

Sourcing the Raw Materials



Discussion Questions

- What Country is Phil visiting and what do we learn about Uncle Moogy and where he is from?
- What tree do we learn about here?

‘Nothing will go to waste.’ Discuss this as Aboriginal lore. What does this mean, what is this teaching us and how might we practice this resourcefulness and appreciation of Country in our everyday life?

- What parts of a tree might we find the appropriate curve for a boomerang?

‘People don’t realise what they are putting out, someone else can use.’ Explain this concept in relation to what Uncle Moogy is teaching here. Why is this important for the sustainability of Country for generations to come?

Making the Boomerang

Discussion Questions

- What is the first step in making the boomerang from plywood?

Continue to add each step as a flow chart of the list to create instructions on how to make the boomerang the way Uncle Moogy teaches it.

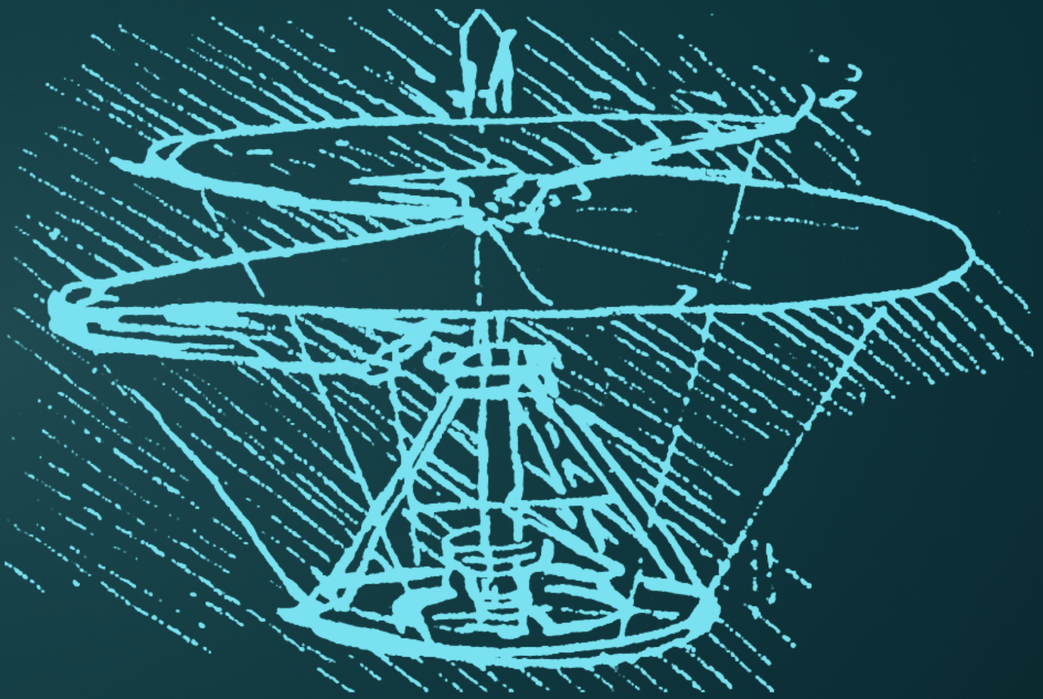
Here we see stencils drawn close together to maximize the amount of boomerangs that can be made from the wood from the cupboard.

- What tools would have First Nations peoples have traditionally used to make boomerangs?
- How does Uncle Moogy explain cutting the flight pattern into the boomerang?
- What are the two names of the edges on the boomerang?
- What would happen to the flight path of the boomerang without these edges cut?

David Unaipon

Activity

The Boomerang Principle was very much a helicopter. Developing concepts for the helicopter, further research David Unaipon, Ngarrindjeri Man, and The Boomerang Principle. Write a report explaining what was significant about the time of Australian history for Aboriginal people like David Unaipon. Write your reflections in learning about this story and the principle Unaipon discovered.



Episode 2

Amerr

The Amerr is the spear thrower, also known as woomera. It is an extroadinarily versatile weapon, but its primary purpose is for hunting. A spear is loaded onto its peg and then acting as an extension of the arm, it propels the spear further, faster and with greater precision.

Amerr

Synopsis

Host Phil Breslin visits Alyawarr country in the Northern Territory to discover a weapon that was once one of the fastest weapons on earth - the Amerr. Spending time with weapon makers Donald Thompson, John Duggie, Casey Holmes and Frank Holmes, Phil learns how to source, craft, and throw the Amerr.

In Brisbane they unpack the scientific principles that make this weapon so special, revealing how the ingenious design supercharges the spear's distance, speed, and accuracy. The expert team reveals how Phil interacts with the weapon before Dr Adam Griffin demonstrates just how lethal the combination of spear and Amerr can be.

The challenge tests historian Eric Wilmott's statement "that until the invention of the self-loading rifle, the woomera and spear were the fastest weapons on earth".

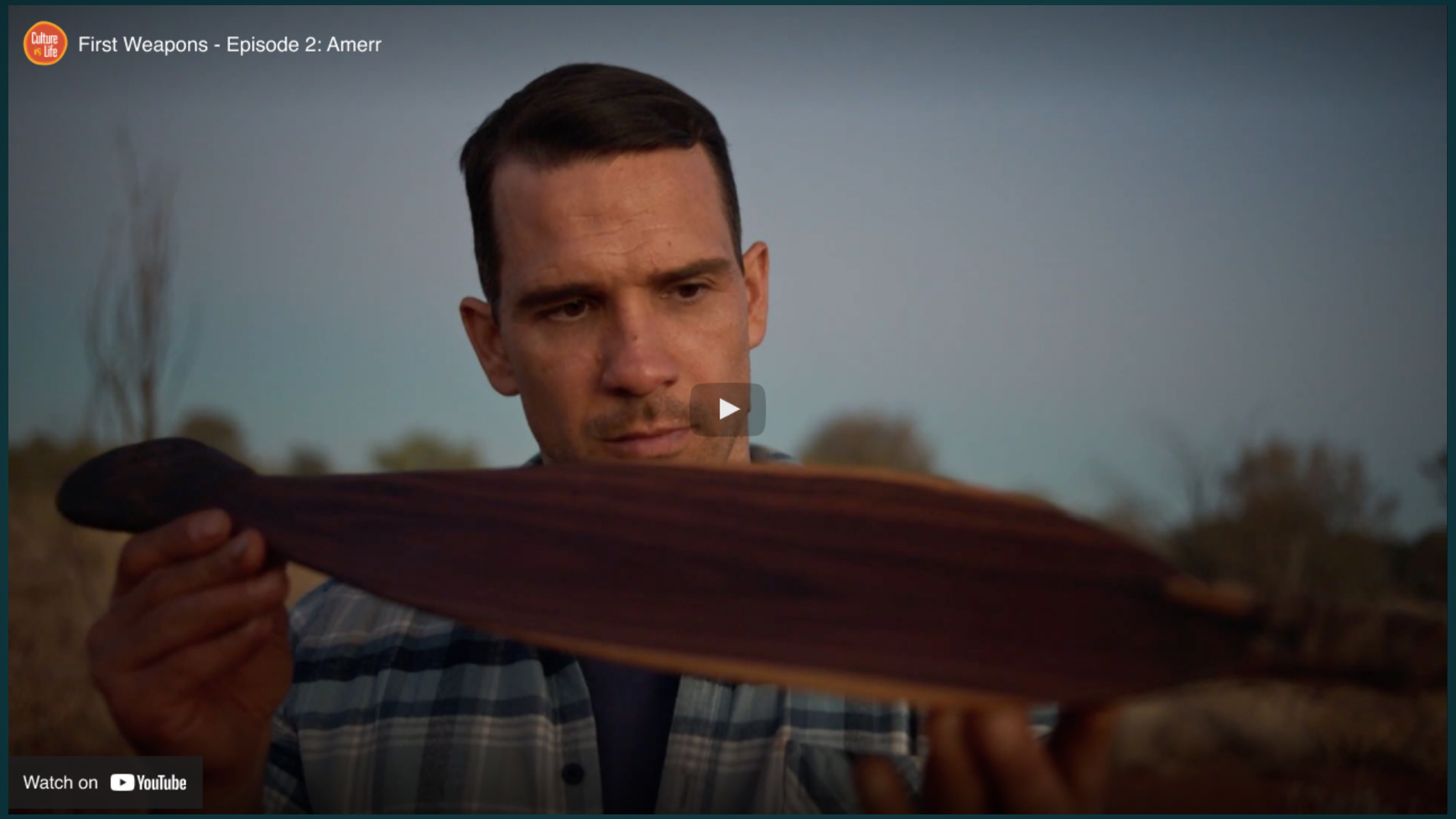
Before Viewing

Discussion Questions

Have you heard of a Spear Thrower or Amerr - sometimes called a Woomera? If so, where have you heard these names and what do you know about them?

Define the below terms:

- Engineering
- Distance
- Leverage



Here we are introduced to the Amerr (pronounced Ah-mud-da), an extraordinarily versatile weapon, before collecting materials on Country; the spinifex grass for resin and the Mulga tree and the Emu bush. The men then melt the spinifex to make the resin, bush glue, before beginning to carve the wood collected.

Collecting the Materials

Discussion Questions

The first job after collecting the materials is to separate the sticky resin that coats the spinifex. This gives us the glue to create the Amerr.

- What does the spinifex look like?
- How does Phill explain that it feels and smells?
- How is its taste described?
- What are the next steps after the grass is collected?
- What do we see the men do?
- What is the purpose of this process?
- What's another way Phil describes the sticky resin?

Spinifex

SPINIFEX

Triodia basedowii

Research Activity

Research where the grass known as spinifex is grown and its traditional and modern uses. Reflect on why this is so significant to Aboriginal people and their practices and consider any alternatives to spinifex's uses traditionally and in modern times.

- After the bush glue is sauced, we go to find the wood.
- What do the Mulga trees look like?
- Why does Frank think this is a good tree for the Amerr?
- What does Frank teach us about selecting the right tree?
- What does this teach us about cultural practices and Aboriginal lore?
- How is this different from European ways of doing?
- How is the tree cut?

Observe the angles and how the tree falls. Draw a diagram of this teaching, labeling the approach and its purpose.

- How might this hard and heavy wood benefit the weapon we are making?

The Right Wood

Discussion Questions

- What is the English name for the tree we are shown to make the peg?

The next process takes concentration and skill. We need to make the resin fine by crushing it up. The resin is like carrying around a repair kit for your tools!

- What modern equipment is John using to sift the resin?

Discuss the sustainability behind repurposing used materials and how this is beneficial to the environment.

Describe the next step in turning the resin into bush glue.

- What is used for heat in this process?
- How does the resin look after being heated?

Full Episode

Extended Curriculum

Theory of Motion

Discussion Questions

In Meanjin, Brisbane we meet Renee Wootton, aerospace engineer and pilot. Here we want to discover what is actually happening when this spear is being launched into the air! As a class, discuss The biomechanical principle of Motion and how it relates to linear motion, velocity, speed, acceleration, and momentum.

- What does distance and leverage mean?
- What is the difference in the starting position if you were to throw a spear without a woomera?
- How many centimetres does Phill move his arm from starting point to release point?

Now when we add the Amerr:

- What changes in the distance traveled from starting point to release point?
- How could you describe this difference?

Speed and Velocity

Discussion Questions

- What is speed and how do we measure it?
- What is velocity and how do we measure it?
- How does this double in length traveled from starting point to release point affect the velocity?

The Amerr gives you a longer arm so the spear can travel further!

Testing Velocity

Activity

Velocity (m/s) = Displacement (m) / Time (s)

Using the principle of velocity above, test and compare two objects that can be safely thrown in space. Sport equipment are great examples. Measure the speed and the distance of these objects thrown. Report on these objects and how they were thrown. How did their velocity compare? Explain what made one object faster and throw further than the other.

SPEAR TOP SPEED

49+ km/h

SPEAR TOP SPEED

112+ km/h

Making the Amerr

Activity

Create an instruction guide to teach the steps of making the Amerr taught in this episode. You can include photos and diagrams and improve on your memory of these steps by preparing and teaching it to your classmates with little to no looking at the steps. The below is written as a guide to start you off.

1. Collect the spinifex
2. Collect the Mulga tree wood for the spear
3. Collect the wood for the peg.
4. Crush the resin and heat it on the fire to make bush glue.
5. Dig a round hole to place the wood in to split the wood in half with an axe.
6. Cut down the wood with the axe and carve the wood with an axe, file and spring from the car.
7. Heat the resin and glue the pointy tip
8. Tie the emu tendon to the tip like a rope on top of the resin and cover in dirt.
9. Dig a round hole to dig the wood in standing up to split the wood in half.
10. Test the shape and balance

Your Local Elders and People

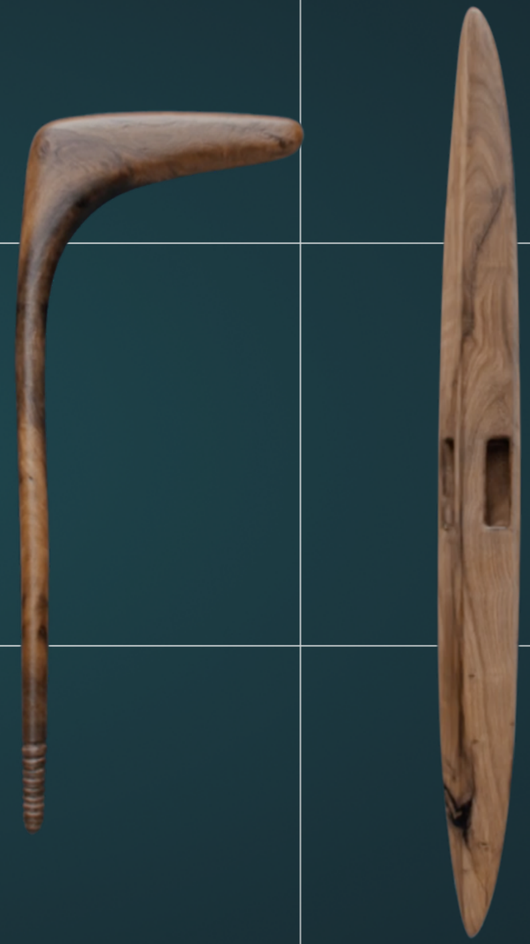
Activity

What traditional lands is your school located on? Research or discuss your relationships and knowledge of your local Aboriginal groups in your school community and who are their Elders. Discuss these relationships as a class and protocol and ways you can contact the local Aboriginal land council or build relationships with traditional custodians that the school can invest in to come share local knowledge and stories with your class.

Episode 3

Leangle and Parrying Shield

The Leangle and Parrying Shield are combat weapons designed for engaging the enemy at close quarters. The leangle is used to strike the body and can hook the shield, exposing the opponent. Its companian, the parrying shield, can strike as well as defend. Together, they are a lethal combination.



Leangle and Parrying Shield

Synopsis

On Wadi Wadi Country in Victoria host Phil Breslin meets weapon makers Brendan Kennedy and Trevor Kirby to learn more about formidable hand combat weapons - the Leangle and Parrying Shield. On the bank of the Wakool River, Phil observes the knowledge, skill and craftmanship as the weapons are made, before enjoying a masterclass in the art of combat.

To unpack the science behind the Leangle and Parrying Shields ingenious design, Phil, Brendan and Trevor join a crack team of experts to test and reveal the science that makes them so deadly. In a challenge of courage and to celebrate Aboriginal Cricketer Dick-a-Dick's 1868 crowd-pleasing and fun demonstration, Phil faces down cricket balls traveling at more than 100 kilometres an hour.

Before Viewing

Discussion Questions

Reflect on how science has changed throughout history? Discuss what scientific knowledge might have gained throughout the years and what knowledge might have been lost?

What are some modern weapons you know of that are used today? Discuss some of their uses. What traditional Australian First Nations weapons do you know about? Discuss some of their uses.

Here the Leangle (pronounced lea-ung-gal) and Parrying Shield that Trevor Kirby and Brendan Kennedy made on Wadi Wadi Country are put to test, measuring Phil's strike speed and range of motion using a neuro muscular skeletal model. We then learn about Wotjobaluk man, Dick-a-Dick, and put the weapons to test at the national cricket centre with Trevor deflecting professional bowler, Josh Lalor's fast balls as Dick-a-Dick was famous for.

Leangle and Parrying Shield

Discussion Questions

- What traditional lands are we on at Griffith University, Gold Coast QLD?
- What does Laura and David research and what does the neuro muscular skeletal model provide us?
- What was the maximum velocity of his fastest swing?
- How is the Leangle range of motion explained and what joint do we expect to see a large range of motion in?
- How do the angles of the parrying shield reflect the cricket ball?
- What was Wotjobaluk man Dick-a-Dick famous for and how did Brendan test his skills he inspired?

LEANGLE

PARRYING SHIELD

Dick-a-Dick (Yanggendyinanyuk)

Activity

Research Dick-a-Dick (Yanggendyinanyuk), the first Aboriginal team to compete in England and present your finding to the class, reflecting on the following:

- Why is his story so significant?
- What was happening to Aboriginal people at the time that Dick-a-Dick and the cricket team competed overseas, making his experience so unique for Aboriginal people?

Further research your local Aboriginal or Torres Strait Islanders heroes stories and how these stories have an impact today.

Full Episode

Extended Curriculum

A Formidable Pair of Weapons

Discussion Questions

- What is the Leangle used for?
- What is the purpose for the design of the Leangle?
- What does its companion, the parrying shield do as well as defend?
- What is the importance of a handle on the Parrying Shield? And how does Trevor work out the sizes?
- What skills do we witness the men needing to fight with these weapons?
- Why might the shield come in handy?

Force Rating

Discussion Questions

Consider the force rates on the object below.

Force Rating Flat Plate (body) - 64 kgs

Force Rating Angle Plate (shield) - 16 kgs

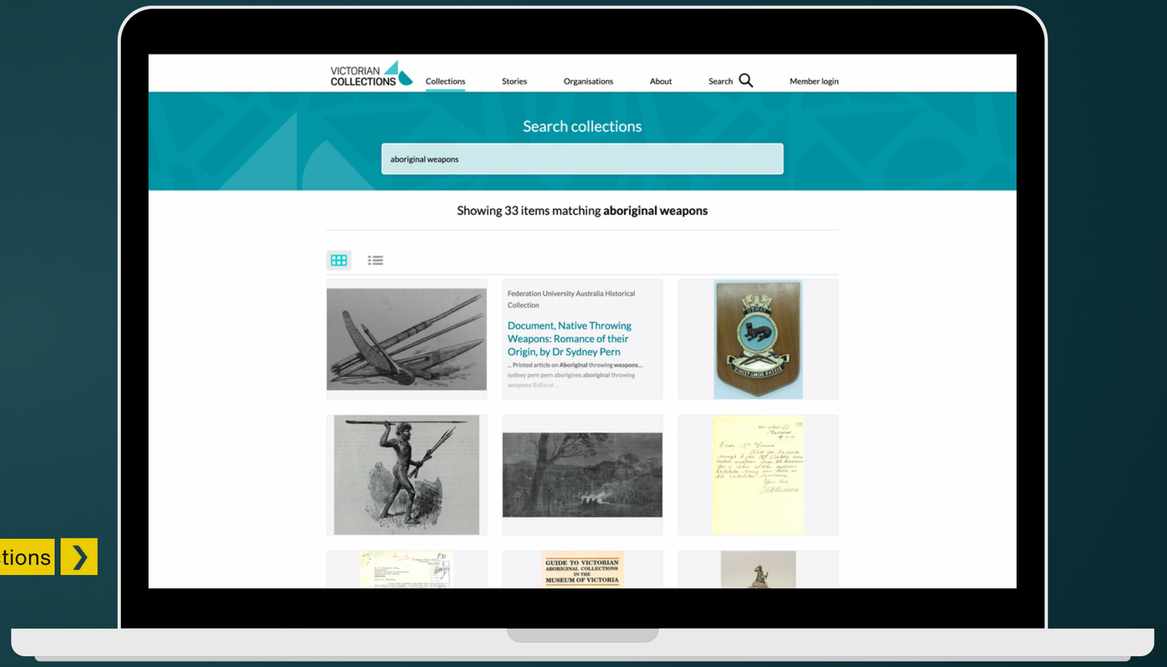
- Describe the difference between hitting a flat plate and hitting a shield with curved edges.
- What is the potential force of the Leangle and how might you deal with handling this force?
- What did we see the board do when the force is exerted onto it?
- Where did the force go?
- How might this knowledge help the person hitting the shield?
- How many times more force is placed on the flat wood?
- What might this mean in a fight scenario?
- What is Newton's second Law?
- What is the Formula for Force?
- What does this teach us in relation to the Leangle and Parrying Shield?
- How might you test force in your classroom?

Victorian Aboriginal Weapons

Activity

Search the Victoria Collections for ‘Aboriginal Weapons’ and research one of the 33 items that appear in the collections on the website. This might include correspondence, books or artefacts. Record any information available about where the weapons were from, who made them, what they were used for and where they are now, where known, and share this with your class.

Victoria Collections



First Warriors

Activity

There are many Aboriginal and Torres Strait Islander Warriors throughout history. One of the first known stories from the Frontier Wars being the stories of Pemulwuy and Bennelong. You can learn more about these heroes and the resistance that they lead, including their weapons used to fight the invasion and protect their people and Country in Episode 1 of The Australian Wars.

Research who are the Aboriginal and Torres Strait Islander Warriors from local Aboriginal groups, how did they protect their people and Country.

Episode 4

Kodj

The Kodj is multi-functional. The head features two edges. One is sharp for slicing and chopping. The other is blunt for pounding. The pointed handle can be used for climbing or combat. At approximately 45cm in length and 2.5kgs in weight, this little weapon packs a punch.

Kodj

Synopsis

Southwest of West Australia in Kinjarling - Albany on Menang country, Phil learns about the Kodj. A hafted axe well known and widely used by the Noongar people. Weapon maker Larry Blight teaches Phil how to source, construct and use the multipurpose weapon.

To discover more, Larry and Phil traverse the continent to meet with our crack team of scientific experts uncovering the scientific secrets of this ancient weapon.

But Phil's not done yet.

Upping the ante, he invites Champion Axeman Mitch Argent to take part in a unique challenge of speed and skill.

Before Viewing

Discussion Questions

- How would you describe the weapon just looking at the image?
- How long is this weapon and how much does it weigh?
- How does this length compare in size to the other weapons in the series?

Using the resin as a binding agent, Larry shows Phill how to make a Kodj before taking him out bush to put the two sides to use, axing a peppermint tree and hammering a Marri nut. Dr Veronica Gray, Mechanical Engineer and Physicist then measures how much pressure the stone edge of the Kodj can take.

The Kodj

Discussion Questions

- What does the Kodj look like when we first see it here in Larry’s shed?

We learn that there are two edges of the Kodj, one sharp edge for slicing and chopping, and the other blunt for pounding.

- What end of the Kodj does Phil use to cut the Peppermint Tree?
- What end of the Kodj does Phill use to crush the Marri nut?
- Describe how the edges look and might feel and how this is such a versatile weapon or tool.
- What does the compression test measure and in what units?

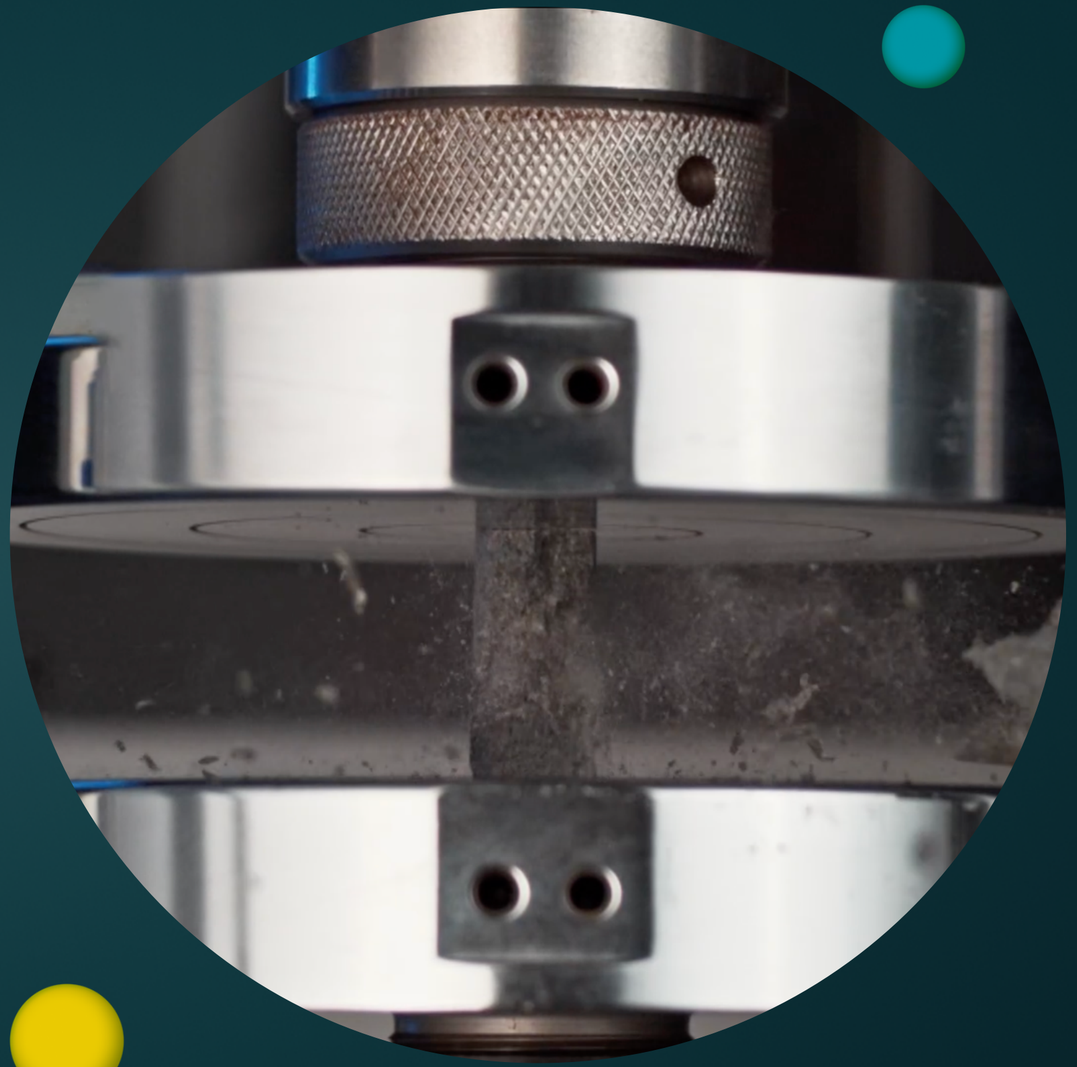
Dolerite

Discussion Questions

Here we not only measure how strong the Kodj is, but how it breaks.

- What happens when the edge is touched after the first break?
- What does this teach us about dolerite and its benefits?

Continue watching the full episode to see the results of the force test with small grains with no porous.



Full Episode

Extended Curriculum

Grass Tree

GRASS TREE

Xonthorrhoea spp

Here we learn that the Grass Tree (Xanthorrhoea preissii) grows about 3-5 mm in a year. How tall must the tree be if it is predicted to be around 800 years old?!

- What is another name for the grass tree?
- What does the tree bleed out when burned under 400 degree temperatures?
- How much resin does Larry say we are going to need for an axe or a Kodj?
- Now we crush the resin bulbs with a stone hammer. ‘This is where the chemistry starts!’
- Define chemistry? How is this an example of chemistry?
- What is carbon and what does it look like?
- Can you think of modern uses for carbon?

Next step is to mix the crushed resin with the crushed rock, carbon.

- What colour is the carbon and what colour is the resin?

The third ingredient looks like poo! And it is.

- What native animal’s poo is this?
- What does the grinded poo act as?

Measuring Force

Discussion Questions

- How do we measure force?
- What is the average amount of force from a strike with a hammer?
- Compare the force from the Kodj to the average hammer. How many newtons was Phil’s strike?

Veronica explains the impact of the Kodj in a targeted area, not distributed. Therefore, the full 1700 newtons landed in one area is a very deadly weapon!

The First Inventors

Activity

After seeing the process of making the Kodj, seeing the transform from powder to melted tar like substance to solid rock! Write a reflective piece or research paper imagining the first time this process was discovered.

- How did this happen?
- What may have they been trying to achieve?
- What could have gone wrong?
- What are the incredible uses of this resin, carbon and poo mixture?

Episode 5

Longspear

The Longspear or Allener us unique to Lutruwita, Tasmania. Ranging from 2.5 to 5 metres in length, the longspear is crafted from a sapling. The sharp point is at the thickest end of the spear with the thin end at the tail. Weighing as little as 850 grams, this weapon is designed for maximum flight distance, precision and lethal impact.

Longspear

Synopsis

Lutruwita - Tasmania. Host Phil Breslin meets weapon maker Dave mangenner Gough to learn about the Allener - the Longspear.

Heading to the mountains they source the perfect saplings to craft these ancient hunting weapons. Phil discovers the stripping and straightening process before learning how to throw this outsized weapon.

Next Phil and Dave travel to Brisbane to unlock the science behind the Longspear. Meeting our team of experts, they discover that this seemingly simple weapon contains complex scientific principles propelling it extraordinary distances.

Next Phil invites Paralympian Corey Anderson and three-time National U18's Women's Javelin champion Alexandra Roberts to put this weapon into action.

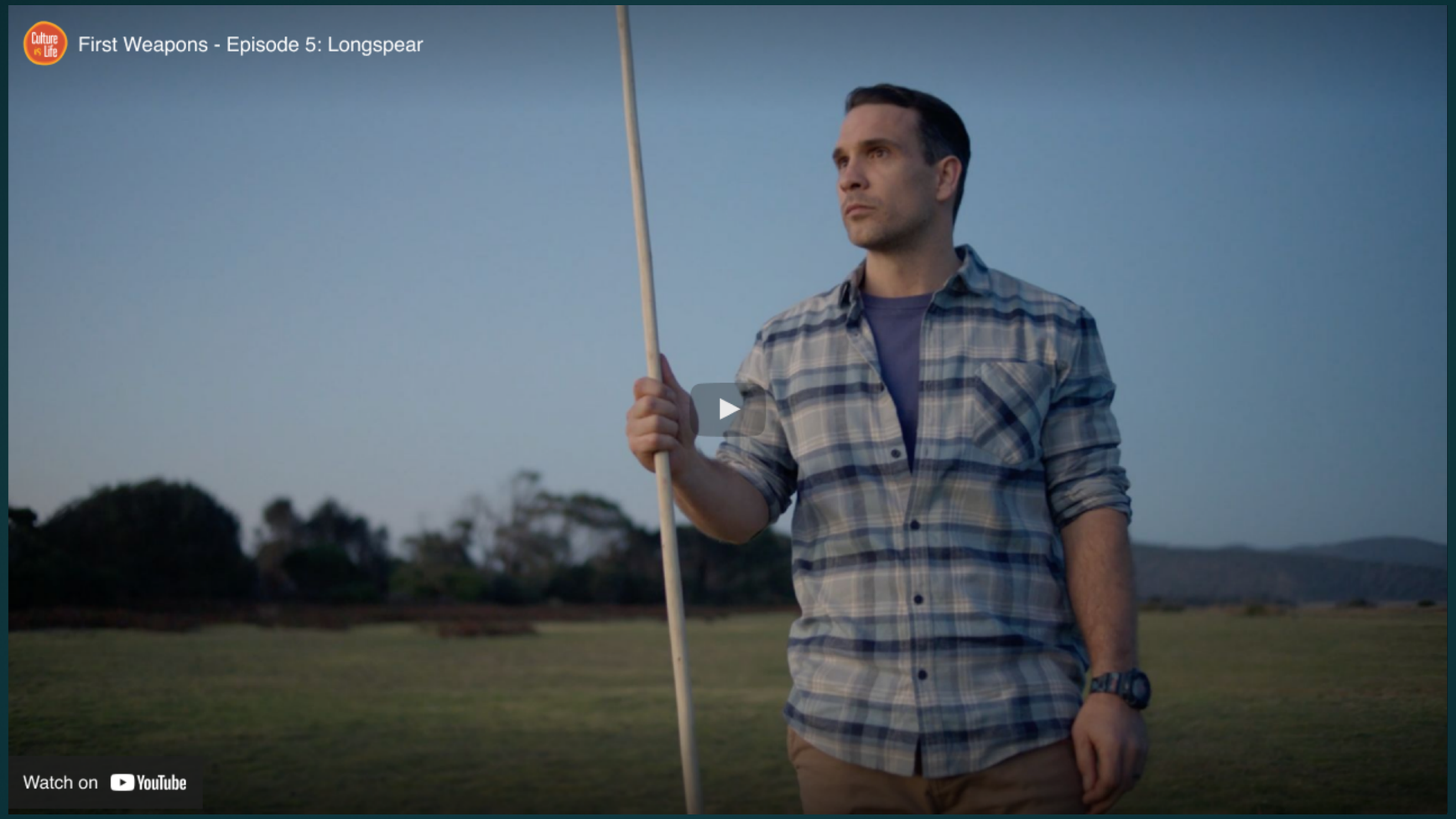
Before Viewing

Discussion Questions

In this Episode we visit Devonport, the lands of the Pannilerpanner (pa-la-pan-nan-na) people in Tasmania and meet trawlwoolway (trool-wool-way) man, Dave mangenner Gough.

Research and discuss as a class the European colonial history of Lutruwita (loot-tru-weet-ta)/ Tasmania and its current impacts. Explain to students that despite attempts of genocide, Aboriginal poeple and culture in Lutruwita/Tasmania is still alive and strong today.

Have you heard of the Longspear? Discuss many cultures around the world that use spears for hunting and how they may still be used today.



Here we are introduced to the Allenar (Ull (like null but no ‘n’) -en-na) and how it is unique to Lutruwita, Tasmania, its measurements, and what it is designed for. Dave teaches Phil how to source the wood, shave it down and heat and mould the spears pointing edge.

The Long Spear

Discussion Questions

• How many metres in length does the Allenar typically range from?

• What is the long spear crafted from and how much does it weigh?

• What is the Allenar designed for? Discuss the shape, size and weight and how this is fit for purpose.

• How does Dave explain the characteristics of the saplings?

• What industries and modern practices affect our amount and quality of resources such as native woods today?

The Process

Discussion Questions

• What industries and modern practices affect our amount and quality of resources such as native woods today? How can we protect our natural resources and what practices and policies are you aware of designed to protect Country? This can be discussed as a class or further research activity.

• What is used to shave the sapling tree down? What do we see coming out of the tree and it's shaven down?

• Explain the purpose of heating the wood and rubbing the point in this next process over the fire? What are we trying to achieve here?

Watch the full episode to learn the next steps and see them put the Allener to the test!

Full Episode

Extended Curriculum

The Design

- What are the 3 axis that enable and lock flight? Explain how these three axis are described in relation to the spear?
- What is the importance of finding the centre of gravity? How does this affect the flight path?
- What are the three physical features of the spear described? What does this contribute to?

The Impact

Discussion Questions

- What impact do we see the spear having on the gel torso?
- • What damage might be caused from this spear tip penetrating through the lungs?
- What is the primary motion of the spear throw?
- What are the revolutions per second and what does this culminate in?

The Javelin

Discussion Questions

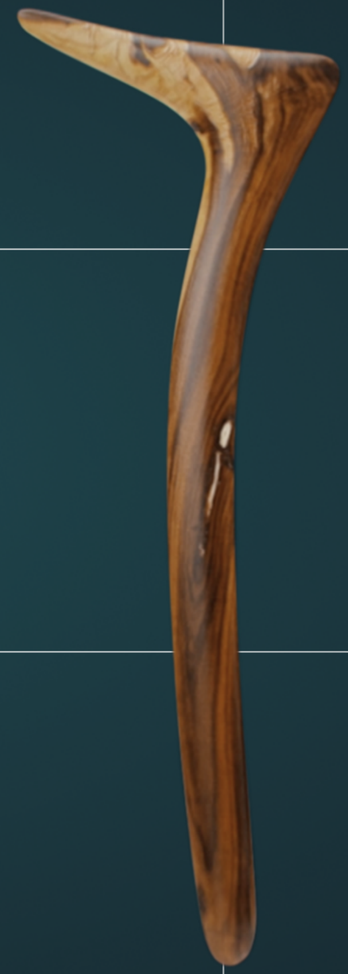
- What is the difference in centremetres between the long spear and the javelin?
- What are the athletes' personal best at throwing a javelin? How does this compare to their long spear throw?
- How does the extra metre of the long spear affect their throw in their angle of release and range of motion?

Alex throws 49 metres! Imagine this being thrown as a weapon and it’s advantageous. Definitely a unique and formidable first weapon!

Episode 6

Wartilykirri

The Wartilykirri is a non-returning boomerang, often referred to as the Number 7 because of its distrinctive shape. Designed for hunting and killing, it's carved from hardwood, and is heavier andlarger than its cousin, the Returning Boomerang. The Wartilykirri can be used in hand-to-hand combat or thrown at its target, reaching extroadinary distances around 100 metres.



Wartilykirri

Synopsis

At Tennant Creek, 500 kms north of Alice Springs, host Phil Breslin meets master carver and craftsman Joseph Williams to learn about the Wartilykirri, a non-returning boomerang, often referred to as the Number 7.

Phil sources the wood, witnesses the crafting and puts this weapon into action. He gets a crash course in throwing and manoeuvring this hefty weapon. Keen to unpack the science that makes this hunting boomerang unique, Phil and Joseph meet our experts who are ready and waiting to investigate the wonder of the Wartilykirri.

It's been quite the journey, but they're not done yet. Phil wants to see the Wartilykirri in full fight mode, and so in a battle royale - medieval combat fighters put down their swords and pick up the Wartilykirri.

Before Viewing

Discussion Questions

‘For thousands of years knowledge has been passed down through generations.’

Discuss this line from the opening.

- Why might this be called the Number 7 Boomerang?

Phil can’t wait to use the Wartilykirri (pronounced wah-til-gear-re), the Number 7 Boomerang he sourced and carved with Joseph, a Warrumungu man from Tennant Creek NT. After Phil and Joseph use it out bush, they take it to Meanjin where Dr Conrad makes a model of the boomerang to test in the wind tunnel.

Number 7

Discussion Questions

- Who are the Traditional Owners in Tennant Creek, Northern Territory?

Grandpa Walter taught Joseph how to make the Wartilykirri.

- What tools do we see him use to make the weapon?
- How does Phil explain the feel of the weapon?
- What can the hook be used for?

Flight Path

Discussion Questions

- What helps the boomerang generate lift in the air?
- How does low drag and reasonable lift support the flight path?
- Why do we want to reduce drag? Discuss accuracy, speed and flight.
- What does Conrad explain happens to the turbulence if you increase the angle of attack? What would happen to the boomerang in this case?

The aim is to reduce the drag to go faster and further. Accuracy and speed in flight is good for hunting!

Full Episode

Extended Curriculum

Drag and Lift

Activity

Draw a diagram of the boomerang in the wind tunnel and annotate the following elements and principles to explain the effects of drag and lift. Explain how the structure of the weapon is carefully designed to support its purpose.

- Drag
- Lift
- Flight Path
- Wind
- Angle of Attack
- Accuracy
- Speed
- Flight

Alternatively, draw a picture or the Wartilykirri and label these angles and other significant characteristics. Add descriptions to the labels to explain their purposes.

Angle of Attack

Discussion Questions

- Which arm of the boomerang is described as the negative angle of attack at the tip? Which area of the boomerang has a relatively neutral angle of attack?
- Why do we want to shift the lift back to the centre of mass?
- What role does the bend in the boomerang play in its flight?

Injury Index

Discussion Questions

Senior Forensic Doctor Adam Griffin sets up an experiment to measure the impact of the Wartilykirri on soft tissue structure.

- What major organ sits under the ribs on the right side? Why is this so dangerous to the human body if it strikes? What could this result in?
- What organs sit underneath the clavicle and what could result in this bone being fractured?
- What is the name of the flat bone that shields the heart? What can a strike to this bone structure result in?
- Here we measure how the human body and the Wartilykirri work in tandem. Laura and David measure Phil’s body movements when throwing and striking with the Wartilykirri.
- What speed does Phill throw and strike the weapon at?

Further Reading

Resources and References

- Map of Indigenous Australia | AIATSIS
- Human-factors engineering | Definition, Ergonomics, & Examples | Britannica
- Acknowledgement of Country and Welcome to Country | Reconciliation.org.au
- DeadlyScience
- David Ngunaitponi (Unaipon) | AIATSIS
- Aboriginal Stone Artifacts, F.S. Colliver | AIATSIS
- A Record in Stone: A study of Australia's flaked stone artefacts | AIATSIS
- Earliest evidence of the boomerang in Australia | National Museum of Australia
- 5 Indigenous engineering feats you should know about | SBS NITV

Feedback

We would love to hear your feedback on the resources and how you embedded the series teachings into your subject curriculum and classrooms, as well as learning outcomes and initiatives that the series and resources may have inspired. This helps us to better what we design and offer for you as teachers and for your students. Please contact us at info@cultureislife.org.

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