

## Where's the Science in this?

The problem with attempting to isolate aspects of Indigenous practice and thinking as examples of 'Indigenous Science'.

By Pip Deveson

This paper reconstructs a voyage of discovery. It is the story of a workshop organised by community educators at the Yirrkala school, (the Yirrkala CEC or Community Education Centre), in NE Arnhem Land. It is a story about a different way of teaching and learning. It also tells of a learning process that I have gone through in making a film about the renewal of the Yambirrpā at Mirriki.

In 2004 community educators at the school at Yirrkala decided to hold a Galtha workshop on the renewal of a traditional fishtrap, or Yambirrpā.

The word Galtha means 'to pierce' in Yolŋu matha, the language of the Yolŋu people of Arnhem Land. It refers to the action of piercing the ground with a spear following the negotiation of an agreement between different groups of people about the form that a ceremony or some other group action should take. In the context of education Galtha indicates the participation of people with different perspectives that are each recognised to have value. According to Michael Christie (1992:33), "Galtha emphasises that knowledge is not constituted by objective facts, but by ongoing negotiation of our various partial perspectives..."

There were a number of motivations behind the idea of running a workshop on the construction of a traditional tidal fishtrap: it would follow on nicely from a focus unit on 'gapu' or 'water' that had been held earlier that year; one of the senior elders at Yirrkala had for some time wanted to organise the building of a traditional estuarine fishtrap in an effort to maintain knowledge of how this should be done; and the Principal at the school was keen to use the building of a fishtrap as a metaphor for health and welfare messages about healthy living and the importance of working together as a community.

A colleague and I were asked to film the workshop, both as a record for the school and as a resource for the Australian Research Council project we are working on.

Our project, '*Indigenous knowledge and western science pedagogy: a comparative approach*', is funded by an ARC Linkage grant with the Yirrkala CEC, the NSW Department of Education and Training and the Australian National Maritime Museum as partners. It aims to look at ways in which Indigenous knowledge systems encode and transmit an understanding of the world. A secondary objective is to consider ways of incorporating aspects of Indigenous knowledge within the NSW secondary school science curriculum.

With this in mind, we were hoping that the building of a traditional fishtrap would demonstrate an Indigenous understanding of natural processes, in the form of tides, and a technology that utilises them. In other words, we were thinking that the building of a fishtrap would demonstrate something that we could flag as 'Indigenous science' and we were expecting that the science we were looking for would reside in the fishtrap.

Our thinking was the product of an approach that is typical of recent work in the perhaps contentious area of 'Indigenous Science'. We were seeking to identify Indigenous practices that were 'science-like' and so an early version of the website we were developing for the project included a section called 'Yolŋu science' where we looked at things like seasons and seasonal indicators, ethno-botany, use of fire in land management, astronomy, and Yolŋu classification.

Along similar lines, a recent science textbook aimed at NSW and Victorian secondary schools has a chapter on Australian Indigenous science that gives examples of firestick farming, bush medicines, seasonal calendars, and 'Indigenous geology' evident in the use of stone for tools and ochres. It also finds science in the technology of weapons like boomerangs and spears. Diagrams demonstrate the way in which a spearthrower is an example of a 'second-class lever': "The peg is the fulcrum, the spear is the load, and the effort is applied at the top of the spearthrower, by the thrower."

The approach is similar to some of the early strategies of a NSW Department of Education 'Science in Context' program motivated by a perceived need for science teachers "...to develop curriculum materials that are connected to the lives of Aboriginal students." The original idea of the program was to find science in activities that Indigenous kids enjoyed. So something like surfing, for example, could be used as a way into talking about wave formation and oceanography. Fortunately, as the Science in Context program developed, more emphasis was placed on the need for students to "...engage in the learning of Aboriginal community knowledge to strengthen and maintain Aboriginal identity and culture." Science teachers in pilot schools that had been chosen to develop Science in Context teaching and learning units sought the help of local Indigenous communities to run excursions that focused on their knowledge of the local environment.

Even here though, some of the teachers were keen to try to 'bring out more science' in these activities and so the excursions were seen as providing a way into looking at the operation of ecosystems and food chains and as an opportunity for bringing materials like Eucalyptus leaves and bark back to the science lab to investigate the extraction of resources from living things. Interestingly, this approach is similar to that of Yirrkala CEC's 'two way' or 'both ways' teaching method. On consecutive Gapu (water) workshops, for example, students heard songs and stories relating to the sea country of different clans

and then participated in a marine debris survey, the results of which were later tabulated back at school.

The Yambirra (fishtrap) workshop was something quite different however. It did not attempt to incorporate a western science approach, although it would have been quite easy to do so: some discussion of tides, for example, would have fitted in well. Instead, the excursion concentrated on Indigenous understandings.

It was appropriately framed as a Galtha workshop, where different people come to an event with different ideas about what is going to happen and then work out a solution between them.

There were quite a number of different players. Firstly there were the Rirratjinu clan elders, who are the senior landowners at Mirriki, where the fishtrap was to be renewed. Most senior among this group was Lanani Marika, who remembered the building of the fishtrap from when she was a young girl. The second group of significance were the Djungaya, or classificatory 'sister's children' of the Rirratjinu who have the role of custodians or executors of Rirratjinu clan business, but who are also obliged to work for their mother's clan. A third group were the Dhimurru (Land Management Aboriginal Corporation) Rangers who had been asked to facilitate the workshop by providing vehicles and a quad bike to transport some participants who would have had difficulty walking to the site. However there was some overlap between groups here, as most of the Dhimurru Rangers involved were also Rirratjinu clan members. Then there were the teachers, some of whom were also Rirratjinu, and finally, outside organizers, like ourselves. Of course, the students constituted another major party, but they did not appear to have any input into the form that the event took.

Right from the beginning we were involved in the planning of the workshop with the Principal of the school, Leon White, and a former Principal, Greg Wearne, who happened to be visiting and was asked to help work on the proposal. They came to a decision about the best time to hold the workshop on the basis of tide charts that showed there would be a good high tide overnight on the night of the 31<sup>st</sup> August/1<sup>st</sup> September. A two day excursion was thus planned so that the fishtrap could be constructed at low tide on the 31<sup>st</sup> August and then checked for fish on the following day when the tide again receded. Interestingly, when the workshop went ahead at this time, one of the elders, Djuwalpi Marika, commented:

It's good to see this happening ...(however)... this should be happening in Midawarr season really ...(after the wet)... in April. April is the time we build the mirriki or the gumurr ...(fishtrap)... to catch the fish.

Translation from film shot for *Remaking the Yambirrpa*, The Centre for Cross-Cultural Research, 2005.

Several planning meetings were arranged both several months before and in the week leading up to the workshop. These involved the Principal and senior teachers at the school, the Deputy Chair of the School Council, Wally Wulanybuma and clan elders Lanjani Marika and Raymattja Marika. We were also taken out to see the site where the workshop would take place by some of the Rirratjinu clan Dhimurru Rangers, who were busy clearing an access track and a place behind the beach where it was planned that everyone would camp.

We showed a photo of the site to Lanjani, and she showed us exactly where the Yambirrpa should be built and talked about the shape that it should take. She confirmed our expectation that it would be like the fishtrap image that is used as the logo of the The Yirrkala Dhanbul Community Association, with a circle of stones opening to a narrow entrance on one side.

From this planning stage, it was interesting to see how things began to be negotiated.

The first change was made when Leon White, the Principal at that time, heard that there had been some talk about it being unsafe to camp overnight at Mirriki due to galka' or sorcery that was thought to have been causing recent troubles in and around Yirrkala. He immediately decide to cancel the overnight stay to avoid any possible blame should anything go wrong.

Once the excursion had been cut back to a day trip the whole plan had to be modified. It was clear that it would no longer be possible to construct a fishtrap at low tide and wait for the following low tide to strand fish in it. However we had no idea how this problem would be resolved.

On the day of the excursion everyone gathered at Nuwul, a headland just to the north of Yirrkala, and we began filming as Rirratjinu elders talked to the students. (And as they were speaking in language, we still had no idea what was being said.) We then began the walk along several beaches and across another headland to the site of the fishtrap, where a large rock platform actually forms a natural rock pool where fish get caught at low tide.

After more instruction about this special place, everyone proceeded along the beach to throw rocks onto two 'wishing' or 'turtle' rocks that are manifestations of two ancestral turtle hunters, one Djambarrpuyju clan and the other Rirratjinu. The throwing of rocks to make a wish for a good catch is a reference to the ancestral story where the turtle hunters were asked by their families to share their catch. The Djambarrpuyju hunter refused to share, and for this

reason the Djambarrpuyŋu rock will not bring you luck in fishing, though making a wish at both rocks is still important.

The men then began singing the song-cycle relating to the creation of a fishtrap in ancestral times as they processed back along the beach. The songs turned to the actual building of the Yambirra by the ancestral fisherman as they reached the Djambarrpuyŋu end of the rock platform. As these songs were sung everyone suddenly began building a rock wall across the middle of the rock pool. At the same time, some of the older boys went into the water and started spearing fish.

Our initial reaction was one of amazement. Perhaps partly because we couldn't understand a lot of what was being said, we were struck by the way in which everyone had been so suddenly mobilized into building that rock wall. It really seemed as if the singing had made it happen – and, in a sense, it had.

In retrospect, everyone seemed to feel that the day had been an enormous success. The Rirratjingu women that we talked to at the end of the day talked about how the excursion had made the dhāwu (story) 'real'. But we were a little disappointed. We felt that the technology of a traditional fishtrap had not been demonstrated. The rock pool that formed a natural fishtrap had simply been divided in half and this division could not be seen to have had any effect on the number of fish that were caught, even though there was some attempt to 'herd' the fish from one side to the other through a narrow opening that had been left in the centre of the wall. There didn't seem to be much science in what had taken place.

But what we had witnessed was in fact a very neat resolution of the problem brought about by the decision to limit the excursion to a day trip. As it had no longer been possible to construct a fishtrap that could be left overnight for the tide to cover, the workshop organizers had taken advantage of the fact that the rock platform at Mirriki formed a natural fishtrap. They knew that there would be fish caught in the rock pool at low tide, so they decided to divide off part of that rock pool to simulate a traditional man-made fishtrap with a narrow entrance on one side.

When we got translations of what we had filmed it became apparent that the only person who did not seem to be thinking along these lines was the senior Rirratjingu elder, Lanani, who still seemed to be talking of an overnight event:

So where would you like us to make the gumurr?  
Where you will lay the rocks down?  
So tomorrow we can come back again.  
Then the Djungaya ...(managers of custodians)... will go and  
check on the fish. Then they will say, "Come, the fish is here".

Subtitled translation from *Remaking the Yambirrpa*, The Centre for Cross-Cultural Research, 2005.

Whether she was simply talking hypothetically, and thinking in terms of an ideal situation, is unclear. This may have been the case though, because despite other participants' apparent intention to build a straight dividing wall across the rock pool, she also still seemed to be thinking of a traditional round formation:

**Balupalu Marika:** Now we are going to start to build the gumurr ...(fishtrap)... over here. In the middle here. We will close one area off and we will make an opening for the fish to come in...

**Lanani Marika:** Yes we'll build around the sides and right up to the front where we'll bring them together. (*ibid*, 2005)

The fact that Lanani seemed to be experiencing what was happening in terms of an 'ideal' is interesting, as there are signs that other participants were doing the same. One of the men introduced a set of songs relating to Djambuwal, the thunderman, by exhorting the singers to "Call the rains to come!" and not long after this one of the women commented that the songs were "...starting to make lightning now". At a later point, Raymattja Marika called out "Look - the fish are jumping! - jumping into the fishtrap!"

There is a sense in which the whole excursion could be seen as a reliving of the past that quite literally, as Rarriwuy observed, made the dhäwu real again. At the beginning of the day, Dhuwarrwarr Marika made the following speech to the school children as they assembled on the headland at Nuwul:

You are those flowers - the Bulpu| ...(morning glory from this area)... Murukun ...(another name for morning glory).  
You are those rocks – bandan milirrman - over there.  
You are sitting down in a line in the same way as the clouds sit along the horizon. Turn towards the sea and have look - sitting down as we are. That is what you are doing.  
That's the story that these elders are re-establishing now.  
It's not just a story - the way that we are going to go and get fish - no it's not. The story for this is the way you walk, the way you sleep, the way you sit under the shade when you sit down in the shade on the beach. Bunumbirr ...(under the shady trees). You are sitting under the crown or leaves of the Maya-Walarritjli when you sing. And also we cry ...(keen)... you through that. We will cry you through your reliving of the actions of the past - the way you walk and the way you sit.  
From when you catch the fish and get the firewood and how

the fire 'gurru-nyiryun' ... (burns). That word comes from the sounds of the fish cooking. This is not made up yesterday, but comes from the ancient past, dear children. You are that flower and you are those rocks... You are the Gulundayngu, ray-bulunumi Yolngu (literally people who live where the east wind comes and caresses your cheek) - the original people of this place.

Translation from film shot for *Remaking the Yambirrpa*, The Centre for Cross-Cultural Research, 2005.

Dhuwarrwarr's use of special words to describe ancestral people, events and features of the landscape was preparation for the words that the children would hear in the songs the men went on to sing. A translation of one of these songs reveals some of their richness as records of the nature of the world and of the place of humans in that world:

Sitting along in a line,  
the breeze caressing the cheeks of the people from that place.  
Sitting down watching the tide go in and out,  
thinking about the tantalising smell of the fish.  
Thinking about the fish over there at Dhupilayu and Djalarinya.

Sitting down in row,  
the faces of the original tribes lined up in profile,  
watching the calm sea and the tide going in and out.

Subtitled translation from *Remaking the Yambirrpa*, The Centre for Cross-Cultural Research, 2005.

The songs are dense with meaning, combining metaphoric reference to nature in descriptions of human action. In the Midawarr season, when the fishtrap was traditionally constructed, both clouds and people would sit in lines, the people preparing to check the fishtrap for fish and the clouds brought in by the east wind, gathering on the horizon. At this time of year the sea is calm and it is a good time to hunt turtles and dugong in clear waters.

As the day went on, layer upon layer of connections was gradually revealed: songs mapping all the bays and inlets along this part of the coast alluded to an ancestral presence within the land and its environment. The hill behind the beach is the chest of the ancestral thunderman, Djambawal; the cloud that forms above the hill, is the thunderman's spear. Lajani Marika explained how the language they were using in these songs and stories would have resonance in the ancestral dimension:

The language that we are using is Nharju'yun ... (the language of the ancestors)... Our cries will be heard in the skies – rising up to the clouds above this hill and beyond. (*ibid*: 2005)

In translating the words of songs for film subtitles, Raymattja Marika told me that the language used was in fact quite special, “like Latin”, she said, and it is interesting to speculate what the function of these specialized and relatively esoteric forms might be.

Songs record both the way of the world and an ancestral presence in it. It also appears that they are felt to recreate or maintain the order in the world and the position of people within it. So there is a very real sense in which the singing of the ancestral creation of the stone fishtrap, that still exists in the form of natural rock formations, literally sings the fishtrap into being, and reaffirms its existence. As Dhuwarrwarr tells the children, the men will “... sing you through - dhurpu-yirrirrkum - from when you're sitting down to when you get up to go.” (*ibid*:2005)

It is not surprising therefore, that Larjani was able to experience this event as the accurate re-enactment of the building of a traditional stone fishtrap, even though the form of the stone structure built was modified by the particular contingencies of that day.

While we felt that what we had recorded was not the technology we had expected, we had been wrong to think that this simple technology on its own was where the Indigenous science we were looking for would be found. Instead, after getting translations of songs and instruction from Yolju elders, we found we had been given something much richer. We discovered a huge body of knowledge about this place and its environment that was embedded in a system of understandings that links ancestral forces, people and place.

What becomes clear is that the tendency to extract and isolate elements of Yolju practice as examples of Yolju science is inappropriate. Perhaps more than anything else it does Yolju knowledge a great injustice by oversimplifying it. So while it may be easy to identify examples of simple technologies and knowledge of the seasonal availability of resources as ‘Yolju science’, doing so makes this kind of knowledge seem rather facile and meager. When one starts trying to isolate fragments of the whole in order to find some accord with that body of knowledge that we find it useful to partition off and call ‘Science’, one inevitably loses sight of the complex network of connections and is left only with the fragments.

If instead, we acknowledge the whole system and attempt to comprehend something of the whole body of connections through which Yolju link their understandings of people, nature, place and Law, we will begin to appreciate the enormous complexity of this non-literate, yet amazingly robust, way of understanding, recording and living in the world.



The best way forward for studies of Indigenous knowledge systems is thus to try and see something, if only an impression, of the complexity of the whole system of understandings that knowledgeable Yolŋu take a lifetime to master.

As a whole, the system describes, in almost ecological terms, a delicate network of interrelationships that have to be actively maintained to go on working properly. And humans are not separate from this network, they are an integral part of it. They must observe their responsibilities in relation to each other and their land to ensure the continuity of order in the world and through this, of their lives and livelihood.

If we return to the two 'wishing' or 'turtle' rocks we passed on the beach during the excursion, it is clear that throwing stones onto these rocks to ensure a good catch is more akin to our ideas of superstition than to any idea of science. And yet, those turtle rock are the physical manifestation of a whole wealth of ritual and kinship connections and obligations. When I asked Raymattja Marika why people bother to make a wish at the Djambarrpuyŋu rock if it does not bring you luck, she told me that Yolŋu should always make a wish at both rocks: through this they are reminded of the importance of sharing and of the negative consequences of failing to do so.

At the end of the day participants did indeed share out the fish that had been caught in the fishtrap. They were especially careful to put aside some fish for a senior man of the Djapu clan who was unable to come on the excursion, but who, as a senior Gutharra, or sister's daughter's son, had been carefully consulted about renewing the Yambirrpa at Mirriki.

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