



Musical Stones

Teacher Notes

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Teacher notes by Kevin Hamel, Chris Stones
and Jamie Barnes



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Introduction

Lithophones

From early times, stoneworkers have tested blocks of stone with a sharp tap; listening for ringing sounds to check for cracks or flaws.

In many parts of the world, there are stories of ringing stones with legends attached to them, and of standing stones making unusual sounds. We don't know when people first arranged different sizes of stones to be played as musical instruments. It was certainly a very long time ago.*

The chances of making a really convincing rock instrument out of random pieces of stone are slim. The Keswick stonemason, Joseph Richardson, spent thirteen years finding and shaping enough stone to make the keys of his wonderful Rock Band. French scientist Honoré Baudre searched for years for the right piece of flint to complete his 'geological piano', even going to Canada on a fruitless search before finally discovering it closer to home.



The Cumbrian Lithophones

In 1785, Peter Crosthwaite discovered six stones around Skiddaw, all of which made remarkable sounds. Over the next six months, he collected ten more; making a tuned musical instrument by chipping away at the stones to make keys of different lengths, arranged and played like a xylophone.

Peter Crosthwaite, local guide, museum keeper, inventor and entrepreneur, was a man of many talents. His stone xylophone, with its keys made from the exceptionally hard Skiddaw hornfels, set the pattern for subsequent lithophones created by equally remarkable Cumbrians over the next hundred years.

The Cumbrian musical stones are much more than entertaining curiosities. They are astonishing musical instruments with stories to tell as old as the stones from which they are made. They provide unique insights into the geology and history of the area, reflecting the remarkable vision of their creators, and inspiring creativity.

* In Togo, sets of flat stones are laid out in order of pitch and struck with another stone in a ceremony connected with the seasons. See www.lithophones.com to discover more about musical stones in many parts of the world.

Where to find the Cumbrian Lithophones

Kendal Museum

At first glance, there are two lithophones in Kendal museum. The one situated on the ground floor is a collection of stone keys made from Brathay Group slate, probably from the Elterwater area. However, this could well be more than one instrument, judging from the number of duplicated stone keys. The keys are laid on ropes over a wooden frame.

The second instrument is situated in the Lake District Geology gallery. Made from limestone sourced from Scout Scar, there are just six stone keys laid on ropes.



Both instruments may be played by visitors to the museum using the supplied beaters.

Keswick Museum

There are three lithophones in Keswick Museum and Art Gallery:

a) The Crosthwaite Stones

The original instrument created by Peter Crosthwaite .

There are 16 hornfels keys (two octave diatonic).

The instrument is on display, but may not be played by visitors.



b) Richardson's 'Rock and Steel Band'

The massive hornfels lithophone was built by Keswick stonemason Joseph Richardson to be played with his three sons.

Later, alpine bells, tuned steel bars and bass drums were added to the instrument. The bars rest on ropes on its original substantial wooden stand.

The Richardson stones may be played by visitors using the supplied beaters.



c) The Elterwater Set

Another lithophone in the collection is known as the 'Elterwater Set'. It was made around 1830 by William Greenip, a Keswick naturalist and mineral dealer. The instrument is not currently on display.

The instrument is very like the one in Kendal Museum, made from Brathay Group Slate and probably from Elterwater.



The Ruskin Museum, Coniston

The lithophone in the Ruskin museum was commissioned by John Ruskin from William Till of Keswick. The hornfels keys rest on their original wooden frame. Although incomplete, the instrument can still make fascinating music, as international percussionist Dame Evelyn Glennie demonstrated on Radio 4.



Brantwood

The four octave state-of-the-art lithophone was recently commissioned by Leeds University. Each of its four octaves features a different local rock type, promoting interest in the landscape and geology of the Lake District as well as musical possibilities.

A smaller one octave instrument, the iRock, uses multi-media music technology to create interactive explanations of the geological properties of the rocks as they are played and user-controlled synthesisers to modulate the sounds. Both instruments may be played using supplied beaters.



Activity Notes

Stone Age

The activity provides opportunities for children to find out about the earliest inhabitants of the Lake District, and how stone tools were manufactured, traded and employed. Excellent examples of Langdale axes and information about them will be found in many Cumbrian museums

- How did people come to find the thin vein of volcanic tuff in such a remote and inaccessible place?
- How were the axes shaped and polished?
- How did the axes arrive at places as far away as the East Midlands and Northern Ireland?
- Volcanic tuff can be found in other parts of the country in places much easier to get to. Why did far away communities want axes made in the Langdales so much?
- What tasks were stone axes used for in Neolithic times?

Langdale axes are heavy, extremely hard, and sometimes highly polished. Pike o' Stickle seems to have been the centre of production, with signs of debris from axe manufacture found amongst the scree. It seems that the axes were roughed out on the high fells and taken to the valley bottoms to be finished.

Different sizes of unfinished stone axes in Kendal museum resemble arrangements of Chinese musical stones of different pitches, said to be derived from early stone tools.

Echoes

Some archaeologists think that 'flutter' echoes resembling running animals were heard when the percussive sounds of making or using stone tools bounced back from surrounding rock faces. Perhaps rock paintings of animals marked the points where the 'spirit' sounds were reflected, and that these became special places. 'Flutter echo' is a distinctive ringing, as echoes bouncing backwards and forwards between hard, parallel surfaces are triggered by percussive sounds. A problem in recording studios or buildings, it is usually solved by covering one or both walls with absorbent material such as foam tiles.

The musical activities could be performed on stone instruments made by children (see Making Stone Instruments).

It would be interesting to locate and perform the music and ceremony in the outdoors where there are distinct echoes or resonances.

Underground spaces also have interesting echoes and acoustics. At Honister Slate Mine, fiddlers entertained miners during their breaks in a space called 'Fiddlers' Cavern'. During 'Slate Song': a collaborative performance at Honister Slate mine, between Soundwave, Changeling Productions, Storytree and Keswick Museum and Art Gallery (2009), Chris Stones played the Richardson musical stones, and improvised on shards of green slate found on the floor of Cathedral Cavern.

Eighteenth and early nineteenth-century tourists to the Lakes were also fascinated by echoes. They paid to hear small cannon fired, and amused themselves by counting the echoes as they reverberated from the fells. Some places gained particular reputations for their resonances, eg. the second reach of Ullswater. An original small cannon can still be found at Low Wood on Windermere.

The Sword in the Stone

The story of King Arthur and the Sword in the Stone presents opportunities for interpreting patterns carved on stones through melodies played on stones.

Mythical creatures are found portrayed on ancient stones in churches and churchyards throughout Cumbria. They intertwine impossibly to create fascinating patterns, often biting each other as if locked in a fierce struggle; a style of art known as zoomorphic.

The activity also provides opportunities for students to explore representations of myths and legends, incorporating these in their decorative schemes for a Viking sword.

At Gosforth, the famous Anglo-Scandinavian cross and other Viking stone fragments portray a number of legends, including Thor fishing for the Midgard Serpent, and Víðarr's battle with the monster Fenrir.

Children might well be acquainted with the idea of 'magic' inscriptions from *The Hobbit*. An outstandingly preserved Runic inscription can be seen on the font at Bridekirk church near Cockermouth.

Musical Activity: Making the Sword

There are opportunities to find out about Weyland, the mysterious and magical swordsmith of Viking legend.

Discuss with children whether it is possible to talk about 'warm' and 'cold' colours in music, as it is in art. What would a 'cold' sound be like? A 'warm' sound?

- Try slowly 'stirring' a cymbal with a wire brush: As the furnace heats up, try gentle rolls on the edge with very soft beaters
- Hold down 'warm' sounding clusters of notes on keyboards: start very quietly: very gradually turn up the volume to suggest the furnace heats up.
- Think of ways of suggesting reflection through music: A melody played by one player using the notes E G A G might be 'reflected' by player two as G A G E

Museum Keepers

This activity is based on an idea from Katharine Hamel's teachers pack supporting the Wordsworth Trust DVD 'Tourist Tales' for schools, children and families.

For further information, please contact k.langleyhamel@btinternet.com

The museums we know today developed from seventeenth century 'cabinets of curiosity' kept by individuals. Collections like these were deliberately eclectic. During the eighteenth century, such collections were dispersed and incorporated into emerging museums with more emphasis on analysis and classification, yet retaining a sense of the curious and wonderful. It has been suggested that Peter Crosthwaite's museum was one of the best outside London; it is interesting that exhibits from Crosthwaite's and Todhunter's museums are now in the collections of the British Museum.

The activity offers opportunities to ask questions about museums.

These might include

- How do museum collections change the way we see and understand things?
- Why are objects displayed in certain ways?
- Why are some objects included in museums and not others?

This would also provide an excellent opportunity to design and make sets of musical stones to entertain visitors!

The Cabinet of Curiosities

The Cabinet of Curiosities provides examples of themes for engaging with the Cumbrian musical stones. These may link with

- Artefacts and displays in museum collections (e.g. Fossils, Langdale Axes, The Sword in the Stone)
- History of makers and performers (e.g. Richardson's Rock Band, Rock Clock)
- Ruskin's ideas and philosophy (e.g. Factory music)
- Geology of the Lake District (e.g. Sample J4)

Strange Landscapes

The description of the imaginary Mars rock sample observes colour, texture, permeability, and hardness, commenting on the presence of finely packed particles. Striking the rock gently to test for a ringing sound produces a very unexpected effect!

The aim of the activity is to encourage children to make accurate observations of rock and soil types, and to record these using appropriate language.

Which of the following do children consider more important: colour and texture or shape and size? Why?

Children can test for permeability by dropping water on stones to see whether or not it stays on the surface, and perform simple 'rubbing' tests to test for hardness. Testing stones for their ringing qualities with a sharp tap is essential for anyone making a set of musical stones!

For stones to ring, grains or crystals have to be tightly packed without spaces in between, so vibrations can pass from one to another without interruption. Cracked or loose textured stones simply make dull sounds.

Encourage children to use language imaginatively, especially where they are asked to describe the textures of rock samples. They might go on to express these as calligrams.

Children should use hand magnifiers or microscopes to look for grains, crystals or fossils to help them identify and classify rocks.

Rocks are used according to their characteristics. Sandstone is relatively soft and easily carved, and some forms can resist weathering, making it an excellent choice for building. However, because of its loose arrangement of particles, it would be a poor choice for making musical stones, unlike the interlocking crystals of Sinen Gill hornfels and Shap Blue Granite.

The iRock

The history of the area is tied in with mining and quarrying. These industries have greatly contributed to our understanding of the earth beneath our feet, and how we view the landscape.

Ruskin believed it was essential for landscape painters to have a grounding in geology if they were to paint what they saw with understanding.

As well as the four octave instrument at Brantwood, the iRock, an interactive 12 bar lithophone, was developed with the potential for stimulating inquiry into geology, landscapes and the science of sound. It incorporates igneous, sedimentary and metamorphic rocks found across Cumbria.

The iRock is made up from bars of different rock/aggregate types. These are linked to an electronic keypad controller and display screens. When a bar is struck, the characteristic vibration pattern, or 'sonic signature' is displayed visually, along with geological information, a section layer and locality.

Changing Sounds

The keypad controller of the iRock allows a number of effects like echo, reverberation etc. to be applied when striking the stone keys. Effects may differ according to the different characteristics of each rock type.

A similar approach is possible by recording pieces of slate, etc that ring on computers, and experimenting with effects available through free Audacity sound processing software.

Fossils

In *Carnival of the Animals*, Camille Saint-Saëns 'fossils' are tired old tunes, which should be buried and forgotten. The piece pokes fun at Victorian amateur fossil hunters, with the brittle sound of the xylophone imitating small hammers chipping away at cliff-side fossil beds.

Saint-Saëns was a knowledgeable and observant natural historian. His *Carnival of the Animals* is subtitled 'A Grand Zoological Fantasy', with each musical portrait reflecting the very different ways creatures move and behave. Like Ruskin, who used pastry and jam to model rock strata, and honey and toast to explain glaciation, Saint-Saëns also explained complex ideas through simple analogies. Noticing how certain fossils were found in certain rock strata, nineteenth century scientists began to work out geological timescales. The layered musical structure Saint-Saëns adopts in *Fossils* offers a simplified and fun introduction to these ideas.

Fossil Hunting Tools

Below is a list of basic fossil hunting equipment. Can children say how each item is used?

- Notebook
- Soft bristle brush
- Magnifying glass
- Hammer
- Chisel

Would rocks with fossils be good choices for musical stones?

To make ringing sounds, the grains must be tightly packed without pores or spaces so that vibrations can pass uninterrupted. Would the presence of fossils affect this?

Ruskin and Darwin

As a boy, John Ruskin visited Thomas Hutton's and Peter Crosthwaite's museums in Keswick, where he would have seen the fossil collections. Ruskin went on to collect and study fossils, and was visited at Brantwood by Charles Darwin. Darwin's radical ideas of evolution, underpinned by the fossil record, seemed to Ruskin to chip away at the bedrock of Christian belief. Ruskin wrote that his faith was 'being beaten into gold leaf' by the tapping of geologists' hammers.

Children might also find out about Adam Sedgwick. Born in Dent in 1785, he is recognised as a central figure in the development of modern Geology.

Fossil legends

Before it was realised that fossils were the remains of animals or plants that had lived millions of years ago, people thought ammonites were snake stones and belemnites thunderbolts!

Children visiting museums with fossil collections could

- Make observational drawings of fossils
- Imagine what they could be
- Write legends or stories around them

Petrified Forest

Early audiences at concerts given by the Richardson and Till families were surprised at the variety of sounds lithophones could make, and some listeners compared the more gentle, flutelike sounds produced by the stones with birdsong.

The 'stone birds' activity is inspired by a belief that the keys of some Vietnamese lithophones (Dan da) dating back thousands of years are made of petrified wood. The activity makes connections with John Ruskin's admiration of skilled bird illustrators like John Gould, and his own clear and logical classification of British and visiting birds, aimed at children.

Ruskin encouraged his young pupils to study bird illustration, and to sketch birds. There are opportunities to use the collections in Cumbria's museums to sketch and find out more about birds in the Lake District, Britain and further afield.

Exploring Bird Sounds

For thousands of years, birdsong has inspired music and poetry. Words describing birdsong include twittering, trilling, whistling, rattling, fluty, mellow, sweet, shrill, liquid, warbling. Interestingly these words have also been used to describe stone music!

With its contrasting habitats of fells and coastal marshlands, the Lake District attracts a wide range of bird species, and is the perfect place to listen to bird calls and songs. Bird calls and songs have different functions, and there are astonishing differences of range and complexity between Ruskin's 'Songsters', 'Minor Warblers' and so on.

Listen to birdsongs at the British Library Sounds website:
<http://sounds.bl.uk/Environment/Listen-to-Nature/>

- Discuss with children different intentions of calls and songs (birdsongs define territory and attract mates; calls are used to indicate danger, warn off other birds, etc.)

- The two notes of the cuckoo is easy to imitate using only two pitches: try striking two stones making different sounds, or G-E on a xylophone or glockenspiel. Why do children think so many composers have included the sound of the cuckoo in their music? (its simplicity)

For thousands of years, people have copied birdsongs and calls with voices, or with whistles designed to imitate the sounds of different species. Onomatopoeic words and phrases can be helpful in imitating birdsong rhythms. The Yellowhammer, Quail and Collared Dove are easy for beginners. American and Australian birds also present interesting and unfamiliar possibilities. Choose and thoroughly master a few of these with voices before trying out the rhythms on stones or instruments to create the soundtrack for the petrified forest.

Jabberwocky

Lewis Carroll draws on onomatopoeia for his imaginary creatures in 'Jabberwocky' (Jub-jub, Band-er-SNATCH! etc). Again, children could compose a soundtrack for this strange habitat drawing on their own ideas.

Factory Music

Ruskin's belief that monotony is the enemy of creativity is further explored in the Ideas Room at Brantwood. Humming a tune on a single note is repetitive and dull. In this activity, children explore repetitive work rhythms associated with factory production lines.

What arguments could be made opposing Ruskin's point of view by factory bosses?

- As agriculture and old ways of life declined during Victorian times creating great hardship in the countryside, factories created jobs for people who might otherwise have starved
- Factory made objects could be made to exactly the right sizes and proportions every time, could be far better finished than handmade objects, and took much less time to make

Find out about working conditions in Victorian mills and factories. Draw up arguments for and against factory working, and organise a class debate.

The musical activity

The musical activity explores repeated rhythms known as ostinato rhythms from an Italian word meaning 'obstinate'. These are repeated over and over without variation. Although this sounds easy, human beings are not machines, and will make very slight variations to prevent monotony.

During the 20th century, composers drew their inspiration for new kinds of music from factories and machines, exploring repeated rhythms and note patterns.

Computer sequenced rhythms and melodies are an everyday part of modern musical production.

Some musicians believe that computers can replace human performers, as they can imitate musical instruments faithfully, repeating rhythms and melodies tirelessly without ever making a mistake.

What would Ruskin have made of this?

Additional musical activities

- Work with chime bars, xylophones, glockenspiels or metallophones
- Using notes CDEGA only, compose interlocking melodies to suggest production lines on a busy factory floor
- Explore ways of making 'machine music' using computer software

Richardson's Rock, Bell and Steel Band

Daniel Till was the manager of the water works in Keswick. He created a set of musical stones to be played by himself and his daughters. Like the Richardsons, the Till family Rock Band was extremely successful.

The Till Rock Band toured Darlington, Preston, Scarborough, York and the Isle of Man, Bath, Birmingham, Brighton and Liverpool, Llandudno and Torquay, Perth and Dundee.

In 1881, they played in the Crystal Palace (built for the Great Exhibition).

The original musicians were Daniel Till, his sons William and Daniel, and daughters Lizzie and Annie. Michael Till, a descendent of the family, tells their extraordinary story at <http://www.michaeltill.com>

This includes wonderful photographs of the Till family and the instruments they used to supplement their performances, including 'swinging harps', zither and musical glasses.

In 1895 the Till Rock Band set out to tour America. They crossed the Atlantic with their musical stones and settled in New Jersey, performing 8,000 concerts in the USA and Canada!

Although after five years three family members returned to the Lake District, William and his three daughters Esther, Mildred and Greta continued in the United States.

Travelling Band

The travels of the Richardson and Till families provide an excellent focus for studying the impact of changes in transport during Victorian times. Performing in the early 1840s, The Richardson family would have encountered more obstacles than the Tills; until the opening of the Cockermouth, Keswick and Penrith railway (1865), there was no railway line serving Keswick. Although a number of lines were planned during the railway mania of 1845, none were actually built.

The first official concerts given by the Richardsons were in Whitehaven in November 1840. They packed their musical stones into specially constructed crates, and the wooden frame split into sections for transportation, travelled by horse and cart from Keswick to Whitehaven along the turnpike roads. As their next performance was in Liverpool a few days later, it is likely they would have taken the steam packet from Whitehaven to Liverpool.

The Richardsons would have needed to hire horses and carts to travel between railway stations by road during the early 1840s. By 1847, the railway system was so well established that most towns could be reached through connecting lines. By the time the Till family began touring at the beginning of the 1880s, roads had continued to improve and Keswick was connected by the Railway network.

The Richardsons failed to travel to America in 1849 due to Robert Richardson's death but the Tills successfully crossed the Atlantic in 1895. Children could research how transatlantic crossings had improved during this time.

Willow Pattern

Peter Crosthwaite made the first Cumbrian lithophone based on the xylophone layout. As xylophones were very unusual in Europe, Crosthwaite probably modelled his lithophone on Far Eastern bronze instruments used to accompany musical theatre. He may well have heard performances during his time as commander of a gunboat patrolling the South China seas.

Wayang is traditional Javanese entertainment incorporating shadow puppetry, music and story. The story of the Cumbrian musical stones has been interpreted through Wayang, combining puppetry and Cumbrian folk tales and accompanied by bronze gamelan and the Richardson stones.

- See The Musical Stonemason: A Cumbrian Wayang at <http://www.myspace.com/musicalstones/blog/347362612>

The Willow Pattern story is widely used across Primary Schools when addressing Myths and Legends. It is not generally realised that the story, while sharing features of Chinese legends, actually derives from stories and rhymes made up in the British potteries!

Popular activities can include children making up their own 'story plates', and developing their own interpretations of the story using music and drama.

Cumbria Music Service have developed a KS2 Wider Opportunities percussion unit based around the Willow Pattern story.

There are many different versions of the Willow Pattern story. Two can be found at The Story of Blue Willow <http://www.angelfire.com/mt/bevspace/page5.html>

The following rhyme also originated in the Potteries

*Two pigeons flying high
Chinese vessel sailing by
Weeping willow hanging o'er
Bridge with three men if not four*

*Chinese temples there they stand,
Seem to take up all the land!
Apple trees with apples on
Pretty fence to end my song.*

In January 2008 six Carlisle primary schools met with the Jin Kun Chinese Opera company.

Some children worked with the performers, learning to sing and move in special ways. Others worked with the musicians, learning how Chinese opera orchestras work closely with singers and actors. Chinese opera tells stories through singing, acting and movement. Artists learn to control hands, eyes, body and feet in special ways. Some performers are very skilled in martial arts.

See: Allan Drummond (1992) The Willow Pattern Story North-South Books

Short Ride in a Fast Machine

John Adams is part of a group of composers known as the minimalists. Minimalist music explores repeated, slowly changing musical ideas played against a steady pulse. This creates a hypnotic effect.

The composer Brian Dewan reflects minimalist ideas in his compositions for the Richardson musical stones (Geophony: The Musical Stones of Skiddaw: CD available from Keswick museum and Art Gallery).

Listen to Two Note Toggle. As the title suggests, this begins with just two notes, and sounds like busy machinery.

The Carl Orff percussion instruments in most primary schools ideally lend themselves to exploring and developing minimalist composition.

Ruskin Museum and Donald Campbell

The Ruskin Museum has a new extension, The Bluebird Wing, purpose-built in order to house and display Bluebird K7, once the hydroplane's conservation rebuild has been completed.

The Bluebird Wing contains a great deal of memorabilia, including helmets and overalls, relating to Donald Campbell's exploits in Bluebird K4 and Bluebird K7 on Coniston Water and elsewhere.

There is material relating to his World Land Speed Record attempts, and some material concerning Sir Malcolm Campbell's record on Coniston Water in 1939, and his unsuccessful return in 1947.

The story is told via touchscreen interactives and a large screen presentation.

Rock Clock

This activity, based on clock chimes, uses numbers to represent musical pitches. In China, the system is known as jianpu, and goes back to the Tang dynasty.

Performances of clock chimes on musical stones seem to have been very popular with audiences at Till concerts.

Composing an effective clock chime can present quite a challenge, especially where only a limited range of tones are available, as with the Westminster chimes.

Stone Circles

Activity One

The activity encourages children to use man made features in the landscape to determine the shape of a melody. It makes connections between

- The height of the stones and musical pitch
- Spaces between the stones and musical rhythm

Similar musical outcomes may be achieved by interpreting the rise and fall of the surrounding fells.

Activity Two

- Consider ways of developing the activity through dance.
- Listen to A Night on a Bare Mountain by Modest Mussorgsky

Castlerigg was a favourite destination for early tourists to the Lake District.

The dramatic interpretation featured on the activity sheet is from Thomas Allom's 1830 Views of Cumberland and Westmorland (1830).

Children can compare and discuss different ways artists and photographers have portrayed Castlerigg from the eighteenth century to the present day.

Lithophone Techniques

Playing Musical Stones

Lithophones belong to a family of musical instruments called 'pitched' or 'tuned' percussion. The Cumbrian lithophones share features with other pitched percussion instruments like the xylophone, glockenspiel and marimba, including suspended tuned keys or bars that are struck with some kind of beater or mallet.

However, there are differences between the older Cumbrian lithophones and other pitched percussion instruments that influence how they are played. These include the irregular sizes and shapes of individual stone keys, caused by the peculiar densities and structures of the material from which they are made. This means that more care is needed in setting up Cumbrian lithophones to achieve the best musical results.

Resonators

Cumbrian lithophones traditionally rested on a cord or rope above a simple sounding board or 'box' resonator. Many of these historic resonators are not ideal, occasionally impeding the vibration of individual stones, and deadening the sound. Usually, when these stones are lifted off the resonator and struck, they ring perfectly clearly.

The problem is connected to the point of contact between the resonator and the individual stone. Any key on a pitched percussion instrument must vibrate freely in order to sound effectively. However, there are two areas on any key which do not need to vibrate, known as 'nodal' points. These are the only points where the key can be suspended. On most pitched percussion keys, these nodal points can be predicted with scientific accuracy based on their size and shape. However, the irregular stone keys of the historic Cumbrian lithophones make this difficult (see above).

Before playing the lithophone, it is important to make sure that each key rings clearly. This is done by finding the nodal points for each individual key in turn, moving them to the best sounding position on the resonator.

With the historic resonators, where keys are not fixed in position, this is best done by trial and error, striking a stone and moving it fractionally backwards and forwards on the resonator until it rings freely (or as freely as possible).

This is worth doing every time the instrument is to be played as the keys will move during performance.

Keys played away from their original resonators can be rested on a length of rope or plastic piping on a table top. This enables the rope or tubing to be easily moved into position underneath the nodal points of each stone.

Beaters

As with any percussion instrument, the quality and character of the sound produced depends much on choosing the right beaters.

Historically, the beaters used with Cumbrian lithophones varied greatly from instrument to instrument and from player to player. The beaters preserved alongside the Musical Stones of Skiddaw range from a highly unusual T-shaped beater with padded ends to extremely heavy hard-wood beaters. Perhaps all of these different beaters would have been used to create contrasting effects within a single performance, or perhaps different beaters would have been favoured by different players.

As lithophones are uncommon musical instruments, there are no modern beaters produced specifically for these instruments.

Players must choose from a range of percussion beaters produced for use with other pitched percussion instruments. These range from very hard ceramic beaters intended for glockenspiels, to soft padded marimba beaters with a whole range of options in between.

All can be used successfully with Cumbrian lithophones by experienced players, and all produce different effects. Generally, the harder the beater, the stronger the attack and the more percussive the effect. Softer beaters produce a less percussive sound with a weaker attack, but a richer tone. However, higher pitched musical stones may not sound effectively with very soft beaters.

Schools quality hard rubber beaters work well as a middle option with all the historic Cumbrian lithophones.

When playing pitched percussion instruments, professional percussionists hold at least two beaters in each hand. This enables them to play faster, to span the instrument more easily, and to play complex chords and harmonies. This technique requires lots of practice and is beyond the reach of beginners.

Furthermore, the smooth execution of this playing technique relies on the regularity of the keys of the instrument, which as we know is not a feature of the older lithophones. However, this is perfectly possible on the state-of-the-art Brantwood instrument.

As most Cumbrian lithophones were intended to be played by more than one player, usually between two and three, players only needed to hold one beater in each hand. This is exactly what can be seen in contemporary pictures of the Richardson and Till families playing their instruments, and this would be the recommended technique to be adopted by beginners.

As with xylophones and glockenspiels, the beaters are best used alternately during playing.

Extended Techniques

Interesting and unusual musical effects can be created with Cumbrian lithophones by playing the stones in unconventional ways. In contemporary music these are known as 'extended' techniques, and the irregularity of the stone keys makes these particularly effective. In general it is a good idea to experiment with individual instruments to find out what effects can be successfully produced, but the advice and permission of curatorial staff must always be sought in advance.

Any technique likely to exert abnormal forces on the stones must be avoided due to the risk of damaging the instrument.

A very effective extended lithophone technique involves scraping the keys with the finger tips. This is particularly successful on instruments where the keys do not have a regular surface, such as the Musical Stones of Skiddaw, each stone producing its own unique sound. Other techniques include tapping the stones with finger tips to produce the sound of distant rainfall, or beating them with the flat of your hand to create a soft percussive effect.

Remember...

Although the lithophones are made to be played, they should be treated with care and respect. Use only the range of supplied beaters, which may vary from instrument to instrument, according to the differing sound properties of the rocks used, and differences in how instruments are set up. Although Skiddaw hornfels is particularly tough, and can be played with hard rubber mallets without damage, softer beaters should be used with care when playing brittle rock types featured on the Brantwood instruments.

IF IN DOUBT, ASK!

Make Musical Stones

Musical Stones?

String instruments make sounds

when a tight string is plucked or scraped

Wind instruments make sounds

by blowing into/across the top of a tube to make the air vibrate inside

Percussion instruments make sounds

by hitting, tapping or scraping surfaces to make them vibrate

Sort percussion instruments according to the way they are played (tapped/scraped/shaken)

This activity also provides opportunities to talk about and experiment with ways of getting the best sounds from instruments (instrumental technique)

Sort percussion instruments by the materials they are made from

Metal

Wood*

Skin

* Modern materials may be used in place of wood: e.g. plastic for castanets, fibreglass in place of wooden xylophone bars

Can musical instruments be made from glass?*

Possible suggestions include 'bottle xylophones'. NB: identical bottles should be chosen

Research other glass instruments on the internet: Benjamin Franklin's glass 'armonica' /musical glasses played by Till family

Could glass instruments be a problem?

Crystal musical glasses of different sizes and thicknesses tuned with water and played by rubbing a moistened finger around the rim are highly dangerous!

'Crystalphones' with flat glass bars arranged like a xylophone are possible, but brittle and liable to shatter.

Can musical instruments be made from stone?

Pick up stones and small pebbles. Make sounds by

a) tapping or scraping . Can stones be played like castanets?

b) filling containers with different sizes of pebbles to make rattles or shakers

Do stones make long or short sounds when they are struck?

Do different rock types make different sounds?

Would stone be a good material for making musical instruments? Why?

Stone seems an odd choice for making musical instruments because it can be brittle, difficult to work, and is heavy.

Xylophones, Metallophones and Lithophones

Percussion instruments with horizontally arranged keys like the xylophone are found in many parts of the world.

Schools' glockenspiels and metallophones follow this pattern, as do the Cumbrian lithophones (musical stones).

Schools' instruments can help with understanding aspects of science underpinning the Cumbrian lithophones.

Examine pitched percussion instruments found in school. What materials are the keys (bars) made from?

Keys of xylophones are made from hardwood (or a synthetic substitute like fibreglass), glockenspiels, or metallophones from steel or alloy.

Other materials can be used for keys, like plastic piping cut to different lengths.

Arrange a set of plastic 'boomwackers' xylophone-style on a soft surface. Play with hard plastic or wooden beaters.

Ask children to play the lowest note of a xylophone, followed by the highest note.

What is the connection between the length of a key and its pitch? Can they relate this to other musical instruments, like the violin?

Remove the bars from the xylophone.

Arrange and play them on a hard surface.

Now arrange and play the bars on a soft surface.

Compare differences in sound, and suggest reasons for this.

What materials do the xylophone and lithophone keys rest on?

Individual rubber supports or lengths of rubber tubing allow the bars to vibrate freely when struck while securing the key in place. The keys of the Victorian Cumbrian lithophones rested on rope.

Why are holes drilled in the keys?

Two holes are drilled through xylophone keys near either end so pins or a cord can pass through, securing the keys while allowing them to vibrate freely when struck with a beater.

Unless these holes are drilled in exactly the right places, the keys will not vibrate as they should. On some instruments like the orchestral xylophone, vibraphone and Indonesia Gender, a cord threaded through holes drilled in the keys allows them to be suspended over the frame of the instrument.

After playing, the keys can be lifted off the instrument and rolled up for easy storage.

The stone keys of the early Cumbrian lithophones are not drilled, but simply rest on rope or straw supports over a soundbox. There is no need to drill and secure the stones, as their weight keeps them in place.

How are the keys of a stone lithophone tuned?

In Ancient China, suspended stone slabs stones were tuned by grinding the faces to lower the pitch (making them thinner) and grinding the ends to raise the pitch (making them shorter).

Finding pieces of hornfels that made a musical ring and were ideal thicknesses and sizes to make stone keys that could be tuned correctly was a challenge for the early Cumbrian lithophone makers.

The length of the largest stone of the enormous Richardson instrument is 1.03m with a width of only 8cm. The smallest is just 18.5cm long and 6cm wide (source Smith, A. and Yardley, B. Proceedings of the Cumberland Geological Society Volume 7 part 3).

<http://www.leeds.ac.uk/ruskinrocks/relevant-articiles.htm>

Making Stone Instruments

Simple stone chimes and basic xylophone-pattern instruments can be made from stone.

However, stone is a heavy and brittle material, and children making or playing musical instruments from stone should be carefully supervised, and a full risk assessment carried out.

CAUTION: Children should not attempt to shape, drill or tune stones under any circumstances.

Stone Chimes

Stone chimes are found in many parts of the world. They are normally hung from wooden frames by cords or ropes, and vary considerably in size. In Ethiopia, one or two stone bells are suspended from a wooden frame with ropes and struck with a small stone (Lake Tana, monastery). These can be seen on YouTube.

In Ancient China, sets of between 16 and 24 musical stones were the most important instruments in Imperial orchestras. These were often made from precious stones like jade.

Stone Wind Chimes

Make stone wind chimes from small flat pieces of stone tied with nylon thread. These can be hung from a frame or old clothes hanger. Ensure threads are different lengths, and that the stones will collide with each other as the wind moves them.

Stone Bells

Rock bells and chimes are hung from substantial timber frames as the weight of a set of musical stones can be considerable.

Do not suspend larger pieces of stone from homemade or improvised mounts. These would need specialist drilling and would need to be hung from expertly constructed supports.

Even with small pieces of stone used for simple stone instruments ensure that any supports, cord or thread used to suspend them are strong enough to support their weight.

Test likely pieces of stone by laying them on straw, foam or any similar soft material. Tap each smartly with a small piece of stone to listen for a ringing sound. Reject any stones that make a dead sound.

Next, tap each of the likely stones and try arranging them according to those that make lower and higher pitches.

Can children find connections between the thicknesses and length of the pieces of stone and their pitch?

Nylon thread or twine should be looped and tied around each stone, and the stones hung from a convenient tree branch, or suspended from a suitable and stable improvised frame.

Make sure that the suspended stones can vibrate freely when struck with a small stone.

Slate Lithophone

The popular choice of stone for Cumbrian lithophones was hornfels, a hard compact, fine grained metamorphic rock hardened by the action of terrific temperatures on clay, 500 million years ago. Because of the exceptional circumstances in its formation, Hornfels is rare. However, suitable pieces of slate are easily found and will give very good results.

Test and compare pieces of slate for sound (see above).

Can children arrange these in order of pitch low – high?

Although Peter Crosthwaite claimed to have found six pieces of hornfels all perfectly in tune with the first six notes of a major scale, you won't be so lucky. In any case, a more interesting option is for children to create their own unique musical scales from unworked pieces of slate.

Next, find best places to suspend the stone keys (where vibration is least affected). On wood and metal tuned percussion instruments these are called nodal points, where holes are usually drilled for suspending the keys. They are the places which do not vibrate when the key is struck.

To demonstrate this on a xylophone, pile a small heap of salt in the middle of the bar, and tap it repeatedly. The nodal points are where the salt gathers.

However, because of the irregular size and shape of the stones you will be using, these points are best found by trial and error.

Take two pieces of rope, or two pieces of wood padded with a soft material like cloth or split foam pipe lagging, positioning them so that the slate keys are able to rest at both ends.

Strike each bar repeatedly and move the rope/padded supports until the clearest sound is achieved.

Using chalk, mark the contact points on the surface of the stone. Of course, the keys will tend to move out of position when struck with a beater.

Think of ways of suspending the notes with string or twine on a simple framework.

See the interactive lithophone at <http://www.lithophones.com>

Next, make a simple resonator by suspending the bars over a large empty plastic box, or cut plastic pipes (about the same diameter as boomwhackers) and fix under each note.

Beaters can be made from rubber band balls, or champagne corks covered with wool or felt.

Use a ¼ inch dowel for beaters.

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