

LEARNTEACH

BIOPHILIA IN A SCHOOL SETTING

A KEY TO THE TEXTS FOR THE SONGAPPS

ELEMENTS IN TEACHING

SONGAPPS

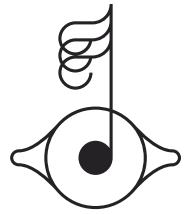


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*Ministry of Education, Science and Culture*



# LEARNTTEACH:

## Learnteach: a guide to how to use Biophilia to learn and teach



**“Welcome to Biophilia: A love for nature in all her manifestations. From the tiniest organism, to the greatest red giant floating in the farthest realm of the universe. With Biophilia comes a restless curiosity, an urge to investigate and discover the illusive places where we meet nature, where she plays on our senses with colours and forms, perfumes and smells.”**

Biophilia is much more than a collection of songs, linked by a common idea or concept. Each song is accompanied by an app, and furthermore, the whole album can be viewed as and referred to as an app or appsuite. In the face of novelty, sometimes language fails us. Referring to each item as a “song” seems to me to draw too much attention to one aspect of the work. Therefore, I propose the term “songapp”, which I will henceforth use.

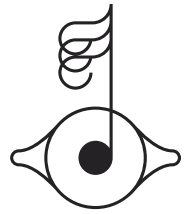
To teach is to learn twice, and when it comes to Biophilia, this is doubly true; all the songapps teach about one or more aspects of music and one or more aspects of nature. This explains the title for these guidelines: Learnteach – the experience of learning and teaching are inextricably interwoven. Learnteach contains proposals, speculations, ideas, links and connections to help bring Biophilia into a classroom or other learning contexts. Originally conceived as a work of art, the wider educational potential of Biophilia soon became apparent. Workshops for local children featured on the original Biophilia tour, and primary schools in Reykjavík have participated in experimental teaching using Biophilia with great success. The ideas, activities and methods presented here are results of this work, thought of, tried and tested by a number of creative, resourceful and dedicated teachers and experts in a variety of settings.

The human psyche, music and nature are systems that hang in a balance; a balance between order and chaos, they are borne out of the creation and release of tension. This dynamic view is powerfully presented in songapps like Virus and Mutual Core, and there is always more than meets the eye; what may appear to be harmful and bad may turn out to be a vital part of the system. Some natural systems last longer and are more regular, such as the movements of the stars, and there are also such reliable aspects to music. A piece of music, no matter how weird, will have some kind of pattern and some kind of rhythm; this is can be seen in different ways in Solstice, Moon and Crystalline. One of the serious problems we have when we face science is the question of scale, scale in space and scale in time. A normal popsong will appeal to us on our familiar human scale. Biophilia slows us down, speeds us up, takes us down to the molecular level, up to the galactic one and beyond; the microscopic is explored in Virus, the fast in Thunderbolt, the slow in Mutual Core, the planetary in Moon and Solstice and the infinity of space and time in Cosmogony.

The human mind operates in a variety of ways, verbal communication being one and visual presentation and music being others. Biophilia has a strong multisensory aspect, where visual and aural, i.e. non-verbal, communication comes to the forefront. This

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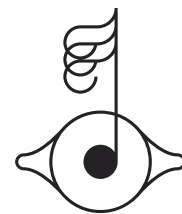


provides a welcome change from the heavily verbal focus of traditional education. It also provides a deeper level of abstraction than can often be achieved with words, and people who prefer non-verbal methods respond powerfully to the world of Biophilia.

Biophilia, restless and curious, seeks inspiration in many different places. These include the tradition of Western art music in the 20th century and other musical traditions from all over the world. An example of this is the generative music in Virus, scales in Dark Matter and rhythm in Hollow. Furthermore, the instruments – harps, hang drums and various electronic devices – do not carry the meaning and power implicit in grand pianos, violins and guitars; in a sense this music is more democratic than what we are used to.

Education, like art, music and love, is a contested field. Opposed forces collide and infectious ideas invade the core of the operation, while a huge number of people seem to enter and leave without notice like the dark matter of the universe. Biophilia forms part of one such force, or possibly maybe more an infection, a seed that may be planted, find its kin and possibly spread out through large parts of the system, meeting resistance, adapting and maybe finally metamorphosing into something unrecognisable. We'll see.

# BIOPHILIA IN A SCHOOL SETTING



There are a number of practical considerations that need to be addressed for any educational project. A very important issue is that of time. Biophilia and the approach offered here is very adaptable in this respect: from an hour spent on one songapp to a whole course stretching over months. It could form part of a programme in music, science or technology science teaching for one class, or be a thematic project for the whole school, for one day or even up to a week.

Another dimension is space and facilities. Well-equipped music and science classrooms are a great bonus, preferably not too far apart. Wi-Fi and generally good Internet access is desirable, as are flexible spaces where equipment can be set up and taken down. Nevertheless, a lot can be done with very little, and many of the activities only require a bare minimum of resources.

Ideally, the teaching of Biophilia should be in the hands of music teachers and science teachers. Teachers of art, drama, dance, social sciences, religion and in a variety of other subjects could form part of the teaching teams. The interdisciplinary nature of the work is one the fascinating things about Biophilia; this is a great platform for fertile co-operation across subject lines that are not often crossed. This also has the great educational benefit of counteracting the compartmentalisation of students' minds, helping them to see and seek out connections they would otherwise have remained blind to. The ideal way to achieve this is for teachers to be together in the same space taking turns and co-operating in carrying out the activities.

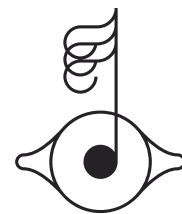
Biophilia can appeal to a wide age range. While it has mostly been used for children between 10–12, younger children will be drawn to certain aspects of Biophilia, while teenagers and adults may appreciate the emotional depth of some of the songapps better. In reality, some of the more abstract themes seem to be appropriate for graduate-level university work.

Biophilia is in some ways like a sandbox, an amazing space for learning and exploration, where all manner of adventures and creativity take place, either using only your bare hands or elaborate gadgets like shovels, plastic trucks and whatnot. To me, it seems that Biophilia offers a comparable thing for education, offering exciting democratic and creative opportunities for today's schools and educational institutions.

Evaluation of students' performance is always a challenge, and more so when the complexity and level of freedom in activities increases. Educators will find ways to approach this issue, in line with the student group involved and the time and space allotted to the project.

# A KEY TO THE TEXTS

## for the songapps



Learnteach will provide a few short texts for each songapp. The texts provide theoretical background and suggestions for teaching activities. These are the types:



**A question** that opens up the area which the songapp in play will deal with. These questions will mostly be personal and general at the same time, open and philosophical, yet accurate and obvious.



**Musical idea.** For all the songapps, there will be at least one of these.



**Natural phenomena** and scientific theories that apply. For almost all the songapps, there will be at least one of these.



**Human, emotional, psychological** themes for the songapp.



**Connections.** Some obvious, and maybe less obvious, connections between musical and natural, and possibly the human ideas in the songapp in question teased out.



**Connections of the songapp** in question with other songapps and overreaching themes of Biophilia.



**Activities:** experiments, projects, etc. For every songapp, a few of these will be provided. Here there are suggestions for methods and approaches that have been tried and tested.



**Out there:** more complex undertakings for those who want to delve deeper into the songapp dealt with, that have extra time or facilities to take things to the next level.

**Samples.** These are links to useful material connected to the songapp's themes online:



**Science sample**



**Musical Sample**



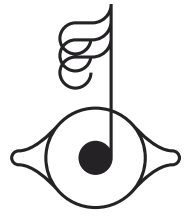
**Activity Sample**



**Human Sample**

For each song, a link to an app tutorial is provided, and here's a general overview for all the apps, by the programmer Scott Snibbe: <https://www.youtube.com/watch?v=n8c00x6d2bg>

# ELEMENTS IN TEACHING BIOPHILIA



What follows is a list of elements in teaching Biophilia. Note that not all of these approaches are always used. Some of them may not be practical for you, and very importantly, there is no rule as to the order in which they should be implemented; this depends for example on the songapp in question.

**CO-TEACHING.** Ideally, all the teachers should work together on carrying out the various activities presented.

## **AN INTRODUCTION OF THE MUSICAL / NATURAL / HUMAN THEMES.**

This could take the form of a short lecture collaborated on by the teaching team, a video on the topic, a brainstorming session, a hand-out, etc. Note that if the idea is that students discover the ideas themselves, this part could be put later in the process or might be unnecessary. The ideas in the M/N/H/C/BC texts are useful here, as are many of the videos provided as well. This is the ideal place to open the students' eyes to the connections between the musical and scientific concepts.

## **A FOCUSED MOMENT OF LISTENING TO THE SONGS OR**

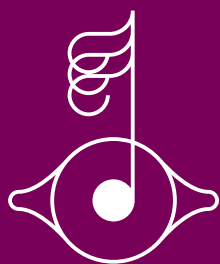
**VIEWING THE VIDEOS.** Sit still, mind your breathing and focus on the experience at hand – either directly without any preparation, or possibly with the opening question for the songapp in mind. For the more accessible songs, this might be a good way to start; for others, this could be left for later.

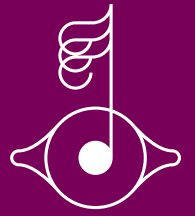
Kid-in-own-space. A significant amount of time should be devoted to allowing students to experiment with the songapps on their own with headphones, allowing individual creativity to thrive.

**PRODUCTS.** Make sure products of work can be shared; any art works, writing or songs created should have a venue for being shared with the universe.

**SOCRATIC DISCUSSION CIRCLES.** To seal and finalise the experience, a period of settling down to discuss, share, listen and digest can be valuable. The best approach here is the simple one of sitting in a circle and taking time to listen to everybody's experiences, views and thoughts. In some cases, there may be questions that will call for urgent resolution, and in others, this will be a more free flowing exchange.

hollow





What is rhythm, and what rhythms are important in your life?



Rhythm is basic to music and basic to life, and time signatures are basic to the traditional system of notation of music. Popular music is relatively monotonous with regard to rhythm, being very hooked on the 4/4 pattern. Yet there can be endless variations, and this is an aspect emphasised in this songapp. This makes the music at once less accessible and more interesting, and it draws our attention to the feeling of each rhythm and what it conveys.



Clapping various rhythms. Stand in a circle and assign 3/4, 5/4 and 7/4 to different segments of the group.



Stand in a circle and have a few empty chairs interspersed. Assign a ¼ note (a single clap) to girls, 2/8 (2 claps) notes to boys and silence to chairs. Then the group as a whole claps in a sequence starting from anywhere.



Drum ring. Sit in a circle. Experiment with allowing the rhythm to come automatically and/or play unusual rhythms. Drums and different percussion instruments can be used as an alternative to clapping in the other activities.



In Hollow, we go deep into our innermost core, and at the same time, we contemplate our origins and family trees. The video invites us through the skin, into the core of the cell to follow the rhythm of the ceaseless copying and reproduction of DNA that goes on forever. This encoded information contains information about who we are and what we will become, and it has ancient roots...the face that appears reminds us of this. All the information behind the incredible diversity that is life on Earth is written in the genes, using only bases, denoted with the letters A, C, T and G. The forces of evolution, where natural selection and the environment have combined to create life on Earth as we know it, or in a sense, written the book of life using only these four symbols!



Decide sounds or rhythms that apply to A, C, T and G. Make a circle where different students represent each sound. Note how a small change in the piece (for example, 10% can represent the difference between humans and chimpanzees) can make for a different species, and how a mistake can be interpreted as a mutation.

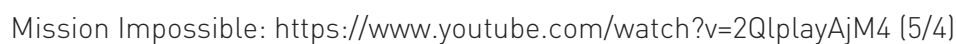
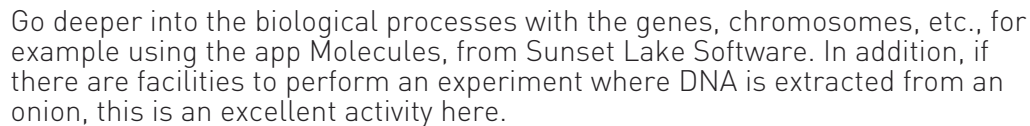
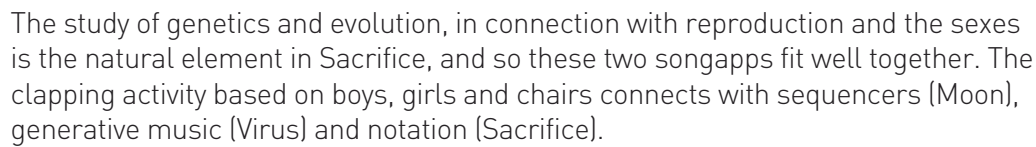


Play around with the app and then extending it to work with a drum machine and experiment with different rhythms. Brainstorm other forms of rhythms in nature, the seasons. Explore the similarities between family trees and rhythm, and consider how different families form very different rhythms even though the basic structure is the same.

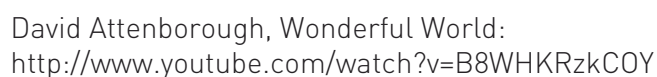
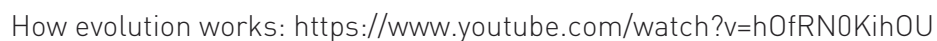


Focus on the face in video and compare to the Arcimboldo paintings (think about the connection between the components of the faces (fruit, etc.) and the person that appears). What does the face represent? Is it a ghost of some imagined ancestor? Following from this is a great question, the classic philosophical problem of nature vs. nurture – genetics vs. environment.

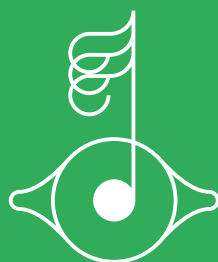




<https://www.youtube.com/watch?v=p8eLET4efoA> (Vísur Vatnsenda-Rósu) and <http://youtu.be/LBxLPiMk7rl?t=1m3s> (Hani, krummi, hundur, svín)



solstice



# Solstice



What is the difference between a monologue, a dialogue and a discussion?



The musical point in Solstice is when two different song lines are combined and form a whole. The lower line is called the bassline or counterpoint. This can take the form of a chain song, many voices played on the same instrument or on various instruments. This is an element in a large variety of music. The idea is to open up the students' eyes to the various possibilities implicit in combining different melodies or song-lines and the connection between them.



Present a text using one voice, two voices and many voices interacting in different ways. Consider the role of the chorus in ancient Greek theatre and the interaction of lead vocal and chorus in Negro spirituals, West African children's games and the vocals and the guitar in 12-bar blues.



Use the app to compose a song. Record it, try playing it on other instruments and then upload the song.



Gravity and the orbit of the earth. The third planet on the branch of the star, Earth, travels along an elliptical path, like the lyrics say, thrown into darkness and drawn into light as it spins around. Models of the solar system can be used to show this. Show a Foucault pendulum to demonstrate the rotation of the earth and gravity.



The tilt of the Earth is really a separate issue; the Earth "leans back in its seat", causing the seasons and also the difference in daylight times, keenly felt by us in the north.



Viewing the Sun and Earth as being in counterpoint to each other, possibly playing the music of the spheres. It is also interesting to think about the mix of regularity and irregularity; for example, the tilt of the Earth has consequences, yet it does seem a rather illogical thing for a respectable thing like a planet to do.



Explore models of the solar system and use light sources to see and understand the way things work.



Express the movements of the Sun, Earth, Moon and planets with the movement of students' (and teachers!) bodies.



An interesting idea in the lyrics is the idea of humans as lightbearers, and an interesting question to grapple with is what is that light? Wisdom? Morality? ...many possibilities! The radiance we receive comes from others, just as Earth receives its radiance from the sun.



The scientific content in Solstice goes very well in hand with Moon, and a station where these two astronomical songapps are presented is a good idea. Furthermore, the idea of the release and storing of tension fits well with Mutual Core.



App tutorial: <https://www.youtube.com/watch?v=Pm9g-SyvJRU>

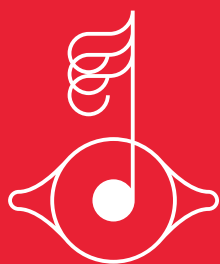


Foucault pendulum Wikipedia: [http://en.wikipedia.org/wiki/Foucault\\_pendulum](http://en.wikipedia.org/wiki/Foucault_pendulum)



Animated Bach Fugues: <http://youtu.be/ddbxFi3-U04/>, <http://youtu.be/m0HoK8yZS1c>

thunderbolt





What do you do to feel miraculous?



Arpeggios. Chords are made up of individual notes. Arpeggios are chords where we play the individual notes one after the other – usually from the lowest to the highest but sometimes in a different order. In Thunderbolt, the bass line comes from the sound produced by a Tesla coil, which is a way to create artificial lightning and the sound, or arpeggio, created is like thunder. In the app, you can create your own arpeggios and lightning shapes using your fingers.



Form a group where each member has one note, and they play an arpeggio together in different orders and at varying speeds.



Lightning occurs when there are strongly opposed electrical charges in the sky and the ground: tension builds up, and balance is restored by a current running from the sky to the ground – a current we see as lightning and which causes the sound of thunder. Lightning can also run from cloud to cloud; it can be formed in volcanic plumes and in other extreme conditions. Lightning is a very complex occurrence that only takes milliseconds to happen. The shape of the flash that we see is only a fraction of all the electrical activity taking place, with branches separating in various directions, some of them originating in the cloud and others actually in the ground. The shape of the lightning resembles what is known as a fractal shape, where the same pattern repeats itself over and over again, branching out into smaller and smaller versions of itself.



Rub balloons against hair and have them stick to the ceiling. Rub a stick with a cloth and let the stick set a tin can in rolling motion without ever touching it.



Líta má á brotnu hljómana sem brotamyndir og sjá þá fyrir sér á sama hátt og eldingar og appið sýnir það mjög vel. Þarna er líka um mjög sterka samskynjun að ræða; við skynjum fyrirbærin með sjón okkar og heyrn samtímis. Það er góð byrjun að horfa á myndbandið á leiðinni inn í Thunderbolt.



Arpeggios can possibly be seen as fractals and visualised in the same way as lightning, as the app shows very well. There is also a very strong synesthetic element, in the ways that the phenomena are simultaneously heard and seen; watching the video is a very good place to start your journey into Thunderbolt.



Use the app to create rhythms and songs, upload them and play them with others.



Show and explain the functioning of a Tesla coil or a Van de Graaf generator; connect this with prior knowledge of electricity, ionisation, etc.



A good example of arpeggios is church bells, and visiting a church and meeting the bell ringer to check this out might be a good activity.



Thunderbolt fits musically and scientifically very well with Mutual Core. Consider how the extremely fast action of the lightning and the slow incremental movements in the earth are comparable. Musically, Mutual Core teaches chords and Thunderbolt



Debussy "Arabesque"



Donna Summer "I Feel Love"



Bach "Prelude in C Major"



Metallica "Nothing Else Matters"



<http://indianapublicmedia.org/amomentofscience/shape-lightning-bolts/>



: Cool lightning: <https://www.youtube.com/watch?v=Jm3rHONOr9o>

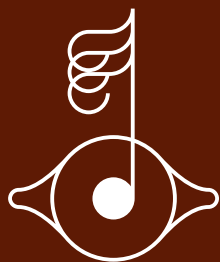


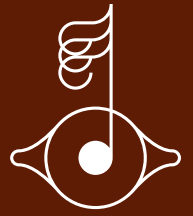
App tutorial: <https://www.youtube.com/watch?v=Ro95XXL5pBU>



Thunderbolt live: <https://www.youtube.com/watch?v=C9Scr7wcqKk>

mutual core





How do we release tension?



Chords are groups of notes that form a whole, and the sound of the chord is a result of the tension between the notes in the chord. The right tension creates the right result. Chords can also be played differently and manipulated in a variety of ways to engage different emotional qualities.



Use hand bells and make small groups represent different chords. Imagine what the notes in the chords could represent in terms of elements that created tension (characters in a play, elements in the body, and students in the class).



One of the great scientific breakthroughs of recent times is the discovery of the tectonic plates, the discovery that the crust of our planet is cracked and in motion – unlike any other planet that we know. To make things more complex, it is stratified in many layers that differ in chemical composition, strength and so forth. The Earth's crust is thus a dynamic system, where tension builds up and is resolved in different ways, the most violent ones being large earthquakes and volcanic eruptions.



The app shows Earth's strata and notes, and by manipulating the tension, you can create chords. The struggle between tension – release – harmony – balance – chaos and order is at the core here and is of course evident as an underlying theme in Biophilia as a whole. An interesting thing to consider is time scale. The movements in the earth are slow and incremental (like the fingernail growing), but other phenomena that are explored in Biophilia release tension and restore balance in no time at all, for example lightning in Thunderbolt.



Download a free seismograph app and see how it reacts to jumping up and down.

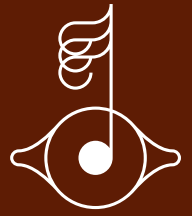


The lyrics here draw a comparison between tension in the earth to tension between lovers – who are seeking to form a mutual core. This is a very effective metaphor, and one that anyone can grasp, especially when it comes to the volcanic outbursts “you didn't know I had it in me” – meaning that conflict may be an essential part of any tension release in a relationship. This can be applied to group dynamics as well; groups can explore tensions between individuals within them and explore ways to relieve tension before they get too dramatic!



Mutual Core goes musically and scientifically hand-in-hand with Thunderbolt. A good idea is to start with Mutual Core and to move from there to Thunderbolt – from chords to broken chords. The lyrics and idea of tension, release and the similarities to love and human relationships also connect neatly with Virus, and musically speaking, they link directly to Solstice as well.





App tutorial: <https://www.youtube.com/watch?v=a0WpVV8KrWM>



Movement of plates: <https://www.youtube.com/watch?v=uGcDed4xVD4>

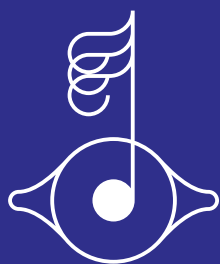


Seismograph:  
<https://itunes.apple.com/us/app/hamm-seismograph/id704450894?mt=8>



Google Earth: <https://www.google.com/earth/>

noon





How do you feel when you make mistakes, and how do you get over it?



The musical theme of Moon is sequencers and sequences or patterns in music. The obvious example of a sequencer is a drum machine where you program certain rhythmic patterns into the machine and then it delivers them. Modern sequencers can, of course, produce any type of music, and a variety of programs and apps are available to do so. An important note here is that when using a sequencer, the composer is in complete control, in contrast to generative music, which is dealt with in Virus.



Listen to the song in a very quiet atmosphere, starting with a short meditation, with everyone closing their eyes, guiding attention to certain parts of the lyrics or music.



A good way to start discussing the lunar cycle is to get everyone to look at the moon that night, and see if they can explain why it looks the way it looks in the next session when you dive into Moon. The lunar cycle can then be demonstrated using available or homemade models, similar to the process in Solstice. The tides are also a sequence or pattern influenced by the moon. Then there are sequences and cycles in the body, the hormonal system and menstruation, digestion and respiration. Furthermore, you can explore cycles in the whole ecosystem and actually the whole universe.



Make a group form a human sequencer, where each student has a note/sound, either to play or sing. Create a scheme with eight squares, where each square is assigned a sound, and then students get squares assigned and play the piece as a loop.



The way the song is organised and the way it is presented in the app shows how the sequences of music mirror and can be compared with sequences such as the lunar cycle and menstruation. An interesting question is to discuss the myth of the moon's influence over us, yet be careful not to instil any misconceptions, as such a link has not been proven to exist.



Make a necklace of pearls that acts like a sequencer, where the shapes or colours of the pearls represent notes or sounds, so the necklace is a piece of music and the piece is a necklace, an example of the multisensory aspect of Biophilia.



Represent the movement of the moon and the earth, and possibly the tides through movement of students' bodies.



The moon as symbol for renewal, in a positive and negative sense. The moon dies and then comes back again. Think about mistakes on a personal level connecting to the opening question, as well as how and why people engage in dangerous activities that are life threatening and seem to get something out of it.



Links to other songapps: Moon and Solstice go well together. In addition, the musical themes in Virus and Moon have some common ground; it's good to do Moon before Virus. The idea of the sequencer and generative music are modern concepts that can open up questions related to modern and contemporary art. Check out online poetry generators and similar ideas in other fields. Question the role of the artist, the idea of genius, etc.



Music video: <https://www.youtube.com/watch?v=br2s0xJyFEM>



App guide: <https://www.youtube.com/watch?v=SlclXmP9USU>

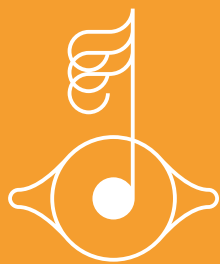


Þórunn Árnadóttir's bead clock:  
<http://www.thorunndesign.com/124647/1239051/gallery/sasa-clock>



Tides: <https://www.youtube.com/watch?v=u3LtEF9WPt4>

•rystalline





How do you choose to do one thing rather than another, when you study, in life generally and when you are creating?



Song structure is the theme of Crystalline, and structures of all kinds, shapes and sizes are one of the strong underlying themes of Biophilia in general. Structure is a basic element of music, from the simplest folk song to the Beethoven's Ninth Symphony. Students are familiar with songs with verse-chorus alteration, but terms like intro, bridge and outro will not be difficult for them to grasp.



Create a circle dance based on a song, where the movements in the dance correspond to a certain part of the song.



Formation of crystals. Crystals are solids where the molecules and other chemical constituents of a substance form a regular pattern, from microscopic to macroscopic levels. Well-known crystals are salt, snowflakes and diamonds.



Students compose songs and take turns to create different parts. Make sure that the song has distinct parts that are repeated in some fashion.



Students pick songs (for example from Eurovision), analyse their structure, make spatial representations of each part and assemble them as crystals, photograph them and upload them. Play the different sections out of order and discuss the result.



Differences and similarities between crystals and songs. Roles of different parts, is it important that traditionally, music is written in 2D? What about the element of time? Is music solid, liquid or gaseous?



Cosmogony is a good example of verse-chorus interaction. Both lyrically and sonically, the chorus opens the song up.

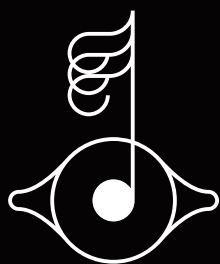


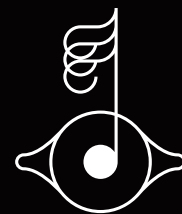
App tutorial: <https://www.youtube.com/watch?v=EzfzXNssNns>



Growing salt crystals: <https://www.youtube.com/watch?v=QwiPpIYoH7Q>

dark matter





Why do we react differently to different musical scales, and why do scales have different emotional impacts?



Major and minor scales. An introduction to major and minor scales is important, and then you can get to know alternative scales in the app.



Consider singing without lyrics. This phenomenon is a common feature in music, for example when voices replace instruments in a cappella music, in scat and phenomena like the Hopelandic of Sigur Rós. In these cases, the human voice becomes like an instrument, and there could be a variety of artistic and musical reasons for employing this feature.



Atonal and arrhythmic music. Discuss art music in the 20th century and music from other cultures.



Listen to pieces of music using different scales and have students guess where they are from (Asian scales for example).



Dark matter, matter that is only known by its gravitational effects on other phenomena, but cannot be seen, heard, felt or accessed in any other way, yet 84.5% of the known universe is hypothesised to consist of dark matter.



Sing songs that you know in a made up language. How far can you get from your own language and languages that you know?



Think about how people sing when they are alone and sing to themselves, what music comes out of that. Have students think about this themselves, and experiment, ask others and observe.



The teacher lights a candle. After a short while, students are asked to close their eyes and cover their ears. The teacher blows out the candle. What happened? How can the students assert that the teacher blew out the candle? What else could have happened? This becomes an illustration of a basic element of scientific methodology, i.e. discovering things of which we only have indirect evidence.



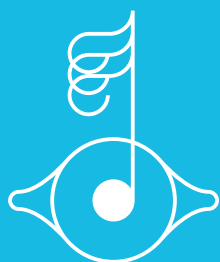
App tutorial: <https://www.youtube.com/watch?v=wWgn7FdBKDE>



Sigur Rós performing Ólsen Ólsen (in Vonlenska):  
<https://www.youtube.com/watch?v=8LeQN249Jqw>



sacrifice





What would you sacrifice yourself for, and why?



Musical notation. Western musical notation has dominated the way music has been presented for a very long time. The way things are written down and presented may influence outcomes. There are numerous other ways to present music, and the app for Sacrifice provides an idea of this.



Students invent their own system of notation, using for example, found items in nature, such as stones and leaves, deciding how different things represent different sounds.



The lyrics are a straightforward appeal to a man to understand that a woman has sacrificed herself for him and to appreciate this and how such appreciation may bring her joy. A criticism might be that it seems like the woman is completely dependent on the man and that anything she can get back has to come from him.



Compose songs using the app and record them. Use those compositions and play them on other instruments.



Human sperm and eggs have 23 chromosomes, 22 of which are common to both sexes. The remaining chromosome is called the sex chromosome because of its role in sex determination. Eggs always have the same sex chromosome, labelled X. Usually, half of the sperm also have the X chromosome, while the rest have a Y chromosome. At fertilisation, the sperm and egg fuse to form the first embryonic cell, usually with 46 chromosomes, either XX female or XY male, depending on whether the sperm carried an X or a Y chromosome. Sexual reproduction is one of the greatest mysteries of evolution. Sexual reproduction promotes diversity, making for better responses to environmental pressures. Sexually reproducing animals, like humans, spend enormous amounts of energy on reproduction, choosing mates and rearing their young, and the sexes are involved in a variety of co-operation and competition.



Study examples of different roles for the sexes and reproductive behaviour in various species (for example spiders, bonobo apes, rabbits).



Create a pool of tickets labelled X, one per student, and then a pool of tickets with half Xs and half Ys. Every student draws one X and then one of the other and then that determines who is male and who is female!



The domination of Western notation and western musical styles in general can be seen as being similar to the domination of men over women, for example in the way the notes are laid out on the keyboard of the piano; here the notion of patriarchy could be introduced. Consider how the variety found in various organisms' gender roles can be likened to musical diversity. Musical notation is also a code, just like the X and Y sex determinants!



Discuss the question in circles. What are students ready to sacrifice? Their time? Their mobile phones? Their friendship?



Check out different ways to write music, investigating Theresa Sauers' notation project, systems from other cultures and modern composers. Develop your own.



Using the app to create music goes very well with the Solstice app, Thunderbolt and Moon.



The lyrics and the power relationships between the sexes form excellent grounds for Socratic circle discussions.



App tutorial: <https://www.youtube.com/watch?v=Mn3dNe7JXUI>

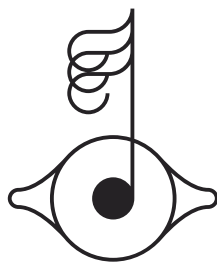


Theresa Sauers' notation project: <http://www.notations21.net/>



Ligeti, experimental music: [https://www.youtube.com/watch?v=71hNL\\_skTZQ](https://www.youtube.com/watch?v=71hNL_skTZQ)

• o s m o g o n y



# cosmogony



Where does it all come from? How was the universe created?



The lyrics are the focus here. The lyrics to Cosmogony follow a traditional verse-chorus structure, each verse relating one creation myth.



Research where the myths in the lyrics come from. Add verses with other creation myths you may know or discover.



The Big Bang theory. Discuss and explain how the universe is expanding and why this is currently the strongest scientific candidate for an explanation. Address the problem of how there is no way in which we can say anything about “before the Big Bang”.



A creation myth is often very important to a religion or a system of ideas. Some systems do not include a creation myth but simply assume that reality has always been there and will always be there. Does it make a difference, for example concerning our perception of time?



Lyrics are created and come into being somehow. Discuss different ways in which lyrics come about and are structured. Personal experience, science, and also “found” lyrics, for example the Beatles “Being for the Benefit of Mr. Kite?”.



There are connections with dark matter, seeing how most of what came to be in the Big Bang is actually dark matter. Cosmogony has an interesting structure; the chorus lifts it up, so it can serve as a good example when talking about song structure in Crystalline.



Go into the finer points of the complicated physics surrounding the Big Bang, relativity, quantum theory, string theory and the like.

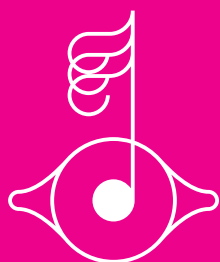


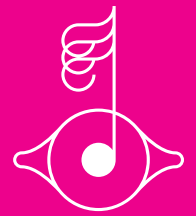
A workshop in making lyrics / poetry / short plays using different approaches.



App tutorial: <https://www.youtube.com/watch?v=3dIRg6lM4mQ>

virus





What's the difference between competition and co-operation? Which do you like better?



In this songapp, we are dealing with an aspect of very modern music, mostly electronic but not necessarily so. This approach to music is in many ways different from things dealt with in the other songapps, such as chords, rhythm and the like. Here we look more closely at what lies behind the music and how to view the creative process. In generative music, the composer lays down rules whereby the music will be created and the system then produces music depending on some parameters that have been set. Pioneers of generative music are composers like Stockhausen and John Cage, and more recently Brian Eno. A very interesting question is whether or not generative music is music or not.



Another musical aspect here is the question of arrangement. In the arrangement of Virus, the Hang drum represents the cell, and the gameleste which plays according to a program based on certain rules and is therefore generative (but is it generative once it has been recorded?), and as the song goes on, one part takes over, i.e. the gameleste. This neatly demonstrates how arrangements can work and can support the underlying theme or message of a musical piece.



The group creates a simple system to produce generative music. For example, they could decide on certain notes/sounds for specific letters and then turn the pages of a book where letter number seven on each page decides what will be played. Alternatives: composing according to outcomes of dice throws or one of the following:

- colours of cars passing by a window
- what is included in students' lunchboxes
- birthdays of students (and teacher)



The video and the app represent the way viruses invade a cell and destroy its core to produce new viruses. This demonstrates the basic MO of viruses, and we see it mostly as a negative thing. However, the connection between cell and the virus can also be seen as a kind of symbiosis where two organisms live off each other. The exact manner in which viruses form a part of the chain of life is unknown, yet it seems unlikely that such a common thing should be entirely evil. The vast majority of viruses are completely harmless, and little is known about them. Fungi are another example of symbiosis where the benefits to both parties are known. Common mushrooms as well as the lichen of the tundra in Iceland and elsewhere in the Arctic are good examples of this.



Co-operation vs. competition, for example in sports: a team co-operates, yet there is also competition within the team.



App tutorial: <https://www.youtube.com/watch?v=qQl5LWlf6C0>



Peter Vogel, Sound Wall: <http://vimeo.com/19780802>



Lou Reed, Walk on the Wild Side (arrangement where one part takes over):  
<https://www.youtube.com/watch?v=0KaWS0IASWc>



Listen to Wikipedia: <http://listen.hatnote.com/>