

## A FLUTE OR NOT A FLUTE? THAT IS THE QUESTION

*Richard Dumbrill*

### *Introduction*

In the course of the past decades the press has published quantity of sensationalist articles claiming that the 'oldest instrument, a flute,' had been excavated at location x, y or z. It follows that Wikipedia agreed with these claims and to this day writes that a number of 'flutes' dating from the European Upper Paleolithic have been discovered, all belonging to the Aurignacian culture, 43,000 to 45,000 B.P., and that they are the earliest known musical instruments (Fig.1). The entry further says that these objects provide valuable evidence of prehistoric music and demonstrate that a developed musical tradition existed from the earliest period of human presence in Europe.

*On June 25<sup>th</sup>, 2009, the BBC wrote:*

*'Odest musical instrument found*

*By Pallab Ghosh, Science correspondent, BBC News*

*Scientists in Germany have published details of flutes dating back to the time that modern humans began colonising Europe, 35,000 years ago. The flutes are the oldest musical instruments found to date. The researchers say in the Journal Nature that music was widespread in pre-historic times. Music, they suggest, may have been one of a suite of behaviours displayed by our own species which helped give them an edge over the Neanderthals. The team from Tübingen University have published details of three flutes found in the Hohle Fels cavern in southwest Germany. The cavern is already well known as a site for signs of early human efforts; in May, members of the same team unveiled a Hohle Fels find that could be the world's oldest Venus figure. The most well-preserved of the flutes is made from a vulture's wing bone, measuring 20cm long with five finger holes and two "V"-shaped notches on one end of the instrument into which the researchers assume the player blew. The archaeologists also found fragments of two other flutes*

*carved from ivory that they believe was taken from the tusks of mammoths. The find brings the total number of flutes discovered from this era to eight, four made from mammoth ivory and four made from bird bones. According to Professor Nicholas Conard of Tübingen University, this suggests that the playing of music was common as far back as 40,000 years ago when modern humans spread across Europe. "It's becoming increasingly clear that music was part of day-to-day life," he said. "Music was used in many kinds of social contexts: possibly religious, possibly recreational - much like we use music today in many kinds of settings." (Figs 2 and 3)*

*On May, 25<sup>th</sup> 2012, the BBC again:*

*'Earliest music instruments found*

*Researchers have identified what they say are the oldest-known musical instruments in the world. The flutes, made from bird bone and mammoth ivory, come from a cave in southern Germany which contains early evidence for the occupation of Europe by modern humans - Homo sapiens. Scientists used carbon dating to show that the flutes were between 42,000 and 43,000 years old. The findings are described in the Journal of Human Evolution. A team led by Prof. Tom Higham at Oxford University dated animal bones in the same ground layers as the flutes at Geissenkloesterle Cave in Germany's Swabian Jura (Fig. 1). Prof. Nick Conard, the Tübingen University researcher who identified the previous record-holder for oldest instrument in 2009, was excavator at the site. He said: "These results are consistent with a hypothesis we made several years ago that the Danube River was a key corridor for the movement of humans and technological innovations into central Europe between 40,000-45,000 years ago. "Geissenkloesterle is one of several caves in the region that has produced important examples of personal ornaments, figurative art, mythical imagery and musical instruments." Musical instruments may have been used in recreation or for religious ritual, experts say. And some researchers have argued that music may have been one of a suite of behaviours displayed by our species which helped give them an edge over the Neanderthals - who went extinct in most parts of Europe 30,000 years ago. Music could have played a role in the maintenance of larger social networks, which may have helped our species expand their territory at the expense of the more conservative Neanderthals. The researchers say the dating evidence from Geissenkloesterle suggests that modern humans entered the Upper Danube region before an extremely cold climatic phase at around 39,000-40,000 years ago. Previously, researchers had argued that modern humans initially migrated up the Danube immediately after this event. "Modern humans during [this] period were in central Europe at least 2,000-3,000 years before this climatic deterioration, when huge icebergs calved from ice sheets in the northern Atlantic and temperatures plummeted," said Prof. Higham. "The question is what effect this downturn might have had on the people in Europe at the time." The researchers also suggest that not only was music widespread much earlier than previously thought, but so was humanity's creative spirit. "The modern humans that came into our area already had a whole range of symbolic artifacts,*

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figurative art, depictions of mythological creatures, many kinds of personal ornaments and also a well-developed musical tradition," Professor Conard explained. The team argues that the emergence of art and culture so early might explain why early modern humans survived and Neanderthals, with whom they co-existed at the time, became extinct. "Music could have contributed to the maintenance of larger social networks, and thereby perhaps have helped facilitate the demographic and territorial expansion of modern humans relative to a culturally more conservative and demographically more isolated Neanderthal populations," they wrote. That is a view supported by Professor Chris Stringer, a human origins researcher at the Natural History Museum in London. "These flutes provide yet more evidence of the sophistication of the people that lived at that time and the probable behavioural and cognitive gulf between them and Neanderthals," he said. "I think the occurrence of these flutes and animal and human figurines about 40,000 years ago implies that the traditions that produced them must go back even further in the evolutionary history of modern humans - perhaps even into Africa more than 50,000 years ago. "But that evidence has still to be discovered." These flutes provide yet more evidence of the sophistication of the people that lived at that time, says Professor Chris Stringer of the Natural History Museum.

These discoveries, among many others triggered the publishing of a series of additional papers and books: 'Flutes Offer Clues to Stone-Age Music', by John Wilford, in the *New York Times*, (2009); a book: 'Mousterian Bone Flute and other finds from Divje Babe I (Fig. 4) Cave site in Slovenia)', Znanstvenoraziskovalni Center Sazu, Ljubljana, Slovenia', by Ivan Turk in (1997); another article, 'A Middle Palaeolithic origin of music? Using cave-bear bone accumulations to assess the Divje Babe I bone flute' by d'Errico, Francesco, Paola Villa, Ana C. Pinto Llona, and Rosa Ruiz Idarraga, in (1998), and even a 'You Tube' demonstration where the object is played:

*'Uploaded on May 4, 2010*

*Short film, full title is Playing the Neanderthal flute of Divje babe, is authored by Sašo Niskač, music is performed by Ljuben Dimkaroski, scientific adviser is Dr. Ivan Turk, archaeologist. Extraordinary find from 1995 in Divje babe cave site, western Slovenia, it is most comprehensively described in the paper at <http://www.cpa.si/tiddibab.pdf>, was met with great enthusiasm on one side and with great scepticism on the other side of the scientific audience, for details see <http://www.greenwych.ca/divje-b.htm>. Only in 2009 the dilemma if the holes in the bone were accidental or purpose-made, was finally resolved. Ljuben Dimkaroski, member of the Ljubljana Opera Orchestra for 35 years (trumpet), was given a clay replica of the flute by the curator of Slovenian National Museum on occasion of Ljuben's exhibition "Image in*

*Stone". In his dreams, about a year later, he got a clue of how to play this prehistoric instrument. The result you can see and hear by yourself, or live, performed on a concert, at <http://www.youtube.com/watch?v=38AFm-....> The movie was published here by P. Jakopin on behalf of Jožek Košir (Jozek Kosir) - with permission of the authors. [...] A remark on the music played in the film: A potpourri of fragments from compositions of various authors has been selected, to show the capabilities of the instrument, tonal range, staccato, legato, glissando ... 1. Fragment from Adagio in G Minor, Tomas Albinoni; 2. free improvisation, mocking animal voices, at the end the presentation of simultaneous sounding of two tones; 3. Ode to Joy, 9<sup>th</sup> Symphony, Ludwig van Beethoven; 4. Slovenian (Prekmurje region) etno song Vsi so venci vejli; 5. Slovenian (Koroška region) etno song Rož, Podjuna, Zila. 6. Nabucco, Giuseppe Verdi; 7. Bolero, Maurice Ravel; 8. From the new world, Antonin Dvořák.*

About the Jiahu flutes of the Henan province of China, the Brookhaven National Laboratory wrote:

*"Bone flute found in China at 9,000-year-old Neolithic site. Upton, NY - Researchers in China have uncovered what might be the oldest playable musical instrument. Their work is described in a paper published in the September 23 issue of the scientific journal Nature. Recent excavations at the early Neolithic site of Jiahu, located in Henan province, China, have yielded six complete bone flutes between 7,000 and 9,000 years old. Fragments of approximately 30 other flutes were also discovered. The flutes may be the earliest complete, playable, tightly-dated, multinote musical instruments (Fig. 5) Garman Harbottle, a chemist at the U.S. Department of Energy's Brookhaven National Laboratory and member of the Jiahu research team, helped analyze data from carbon-14 dating done in China on materials taken from the site. "Jiahu has the potential to be one of the most significant and exciting early Neolithic sites ever investigated," said Harbottle. "The carbon dating was of crucial importance to my Chinese colleagues in establishing the age of the site and the relics found within it."*

*The exquisitely-crafted flutes are all made from the ulnae, or wing bones, of the red-crowned crane (*Grus japonensis* Millen) and have five, six, seven or eight holes. The best-preserved flute has been played and tonally analyzed in tests at the Music School of the Art Institute of China. The discovery of these flutes presents a remarkable and rare opportunity for anthropologists, musicians and the general public to hear musical sounds as they were produced nine millennia ago. Two audio recordings of the flutes being played are available here: WAV file 1 (4.2 Mb), WAV file 2 (1.7 Mb).*

The British Museum Web Site has:

*"The oldest known musical instruments in western Europe appear about 35,000 years ago at the same time as fully modern people like ourselves. Cave paintings, sculpture and jewellery also date from this period. (Fig. 6)*

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Flutes carved from bone are the oldest recognizable type of instrument. The example from the rockshelter at Les Roches has two holes. It could have been blown from one end or across one of the holes. To do this one or both ends would have to be blocked with the fingers or an artificial plug such as a piece of leather. One or two notes could then be produced. They would have sounded like a whistle. The sound could have been used as a signal to keep people in contact while out hunting. They could also have been used for pleasure or in ceremonies, perhaps blown rhythmically along with drums and singing.

The flute from La Roque is more complex, with five holes on the front and two on the back. With the top end blocked except for a small airway it could have been played like a modern recorder. It is similar to 30,000 year-old flutes made on swan wing bones that have been found at Isturitz, France. However, the rockshelter at La Roque contained 30,000 year-old deposits which had been disturbed more recently in the Middle Ages. As a result its age is uncertain.'



Fig. 1. Aurignacian 'flute' made from an animal bone, Geissenklösterle (Swabia).



Fig. 2. Hohle Fels 'flutes'.



Fig. 3. Hohle Fels 'flutes', one of them made from mammoth ivory.



Fig. 4. The Divje Babe 'flute'.



Fig. 5. The Jiahu 'flutes'.

*Extraordinary assumptions*

The comments and articles written about these examples from Geissenklösterle, Hohle Fels, Divje Babe, Jiahu and from the Dordogne - although the oldest separated by about 40,000 years from the most recent - are similar. They all claim that the objects are: a) flutes; b) that they are the oldest instruments ever found; c) that they are the oldest playable instruments ever discovered and c) that they all attest of a high level of musical practice, or words to that effect.

The phantasmagorical recording of the Divje Babe example, with the anachronic playing, to say the least, of some well-known melodies was meant to infer, preposterously, that these flutes were designed to play equal temperament diatonic scales, equating to what is used in our modern music. This is absurd, needless to say.

At this point may I remind the reader of Hoffnung's<sup>1</sup> wonderful recordings where a hose-pipe fitted with a funnel at one end and a mouth-piece at the other, was blown to play Leopold Mozart's horn concerto. Nevertheless, neither hose-pipe, nor funnel would suggest that either of these implements had anything to do with a french horn, and that therefore a coiled hose-pipe fitted with a funnel is not necessarily a french horn, and that, reciprocally a french horn is not necessarily a coiled hose-pipe fitted with a funnel. The subjective assessment of the iconography sometimes leads to the flawed interpretation of vertical lines as being vertical looms, should the expert be a textile specialist, while a musicologist might think that these lines are the strings of a harp, or of a lyre<sup>2</sup>.

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### *Rational hypotheses*

A tube, whether made of bone, of ivory tusks, of whatever material, with holes drilled in it, is just a tube with holes. There needs to be a scrupulous assessment of the object to determine if it had had a precise purpose, one of which that it could have been a flute.

Yet a tube with holes in it could also be a pipe. There are two principal types of sound producing tubes: flute pipes and reed pipes, distinction which has not been entertained in any article about the objects under scrutiny, as far as we know<sup>3</sup>.

Thus in the absence of a complete object where a 'blow-end' can be identified, beyond doubt, it is impossible to say that it was a flute, a pipe or just a tube with holes, the function of which remaining open to a series of interpretations, ranging from the reasonable to the absurd.

Having identified the object as a sound-producing device, flute pipe, reed pipe, or other? it remains that its usage as a musical instrument cannot yet be ascertained. The implement might have been a duct whistle, or bone lure, used to attract birds prior to their hunting<sup>4</sup>; it could also have been a signaling or a messaging device with no musical destiny whatsoever.

An important part for the identification of aerophones lies in the iconography. The analysis of petroglyphs at La Cieneguilla in New Mexico<sup>5</sup> is unequivocal. (Fig. 7) There we have a scene where males hunt birds with the arrows of their bows, to the sound of long duct lures which they appear to be blowing. The apparent hunters' erection would symbolise their excitement, or might it have been that this hunt was associated to some sexual ritual



Fig. 7. Petroglyph representing a bird hunt scene. Here, they are attracted by the sound of long lure pipes and hunted with arrows of bows. La Cieneguilla, New Mexico.

the signification of which eluding us from so far away.

Petroglyphs<sup>6</sup> where birds and pipes appear in conjunction, positively identify these pipes as long lures. In the history of man's evolution, it is possible that prior to becoming instruments, *per se*, these lures would have been implements which in the course of time would have evolved into implement-instruments before being raised to the status of musical instruments when they were crafted, exclusively for musical purposes, and not as implements occasionally used as instruments.



Fig. 8. Petroglyph representing a hunter luring a bird with a long lure pipe. La Cieneguilla, New Mexico.



Fig. 9, 10 and 11. Three bone duct flutes, 14, 15 and 16<sup>th</sup> centuries A.D., from Alkmaar, Leeuwarden and Loevestein Castle in the Netherlands.

### *Pipe Organology*

Bones, used for the facture of flute pipes or reed pipes, are certainly one of the less appropriate materials because of both their internal and external irregularities. Therefore this choice infers that prehistoric makers would not have had any notion of instrumental making. They would have painstakingly drilled holes, empirically, and satisfied themselves with whatever scale they might have produced, a dimension that they would not have been able to anticipate.

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The making of pipes with a pre-determined scale, thousands of years ago, would have required essential basic parameters. Firstly the bore of the object would have needed to be regular. (The bore is the internal and longitudinal drilling of the item.) Secondly, the position and size of the holes would have required precise calculations. These calculations and technology were not available 40,000; 20,000; 10,000; 5,000 and even 1000 years B.P. (The Sumerians understood this problem very well, much later, around 2,600 B.C. The only surviving set of pipes<sup>7</sup> that they manufactured was made from a rolled sheet of silver, which was the most practical manner for the production of an even bore.)

It must be made clear that any attempt at reconstructing a scale from the size and positioning of holes on a prehistoric bone flute is both a pointless and a misguided exercise. However, the recording and subsequent analyses of the sounds the object produces, in the case it is complete, could lead to an appreciation of the pitches it would have given. However, we are confident that each pipe excavated, whether reed of flute, would have generated its own pitch set and would not give a 'standard' prehistoric scale, which, in any case would certainly not have been diatonic, Pythagorean, or of an equal temperament tuning.

Most recordings made, of original or replicated pipes, as heard on You Tube and elsewhere, reveal modern scales playing modern tunes. However, these interpretations involve the artificiality of 'acrobatic' fingerings, to satisfy the hypothesis, and therefore have no value whatsoever.

Since the pitch set generated from each pipe would have been different from others, it becomes obvious that these 'instruments' would have been played individually and never along with others, monophonically, heterophonically or polyphonically. But who knows?

We should therefore refrain from false hypotheses leading to absurd reasonings such as: 'although the holes produce an unqualifiable scale, they intended it to be diatonic and therefore their system was diatonic', promoted by too many misguided musicologists<sup>8</sup>.

These bone ducts have survived the aggression of time because of their nature. Emptied of their

marrow, they survived thousands of years longer.

It is postulated that in all societies, however primitive, implements were produced from materials which were naturally shaped for their purpose. A calabash, or gourd, cut in two, provided excellent vessels; shells were ideal for scooping food; stones were good killing weapons, and elderberry branches, which are mainly straight with an almost perfect bore, made ideal pipes once emptied of their soft pith. To this day, branches from the elder are still used to make the *fujara*, *koncovka* and other uniquely Slovakian flutes<sup>9</sup>. Similar musical instruments such as the *furulya* (recorder) are also made of elderberry (*Sambucus nigra*) in Hungary and other parts of Eastern Europe.

Therefore, it is highly probable that elderberry branches would have been the favoured material for the making of prehistoric pipes. In this case, we might expect some kind of 'standardization' of hole size and positioning, should the making of the pipes be the work of one specialized individual. However, this would have involved a conscious intention for the production of a pitch set common to a group of individuals, the intellectual conceptualisation of which being far from tangible without common metrology. Yet this metrology would have come from the morphology of man's own hand which naturally resting on the pipe's length would have determined the positioning (if not the size) of the holes.

However, another concept is required in support of this hypothesis: what would have prompted man to drill holes on pipes when a simpler conjunction of tubes would produce what Greek antiquity would call 'syrinx' and 'pan-pipes'. Syrinx (Greek Σὺριγξ) was a nymph known for her chastity (Fig. 12). Chased by the amorous Greek god Pan, she ran to a river and asked for nymphs' help. She was turned into hollow water reeds (*arundo donax*) sounding at the god's frustrated breath. Pan cut the reeds to fashion the first set of pipes henceforth known as syrinxes.

#### *Comparative organology*

The dating of rock art is a hazardous mine-field. Petroglyphs are graffiti the age of which remains conjectural without contextual evidence. However while pipes are frequently seen, string instruments

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of the bow-harp type appear only around 8,000, B.P. Reasons for this may be that pipes in glyptic art related to the hunt which might have been a more important matter to etch on stone, while the playing of a bow-harp might not have been a priority. A second hypothesis is that petroglyphs showing pipes might be more recent than initially thought. Additionally, the etching of hunting bows is mostly contemporaneous with the first occurrences of bow-harps, as clearly seen at the site of Çatalhöyük in Turkey and date from about 8,000 B.P. (Fig. 13)



Fig. 12. Pan chasing Syrinx. Drawing by Anne-Louis Girodet de Roussy-Trioson, 1826.



Fig. 13. Dance scene with bow-harps. Çatalhöyük.

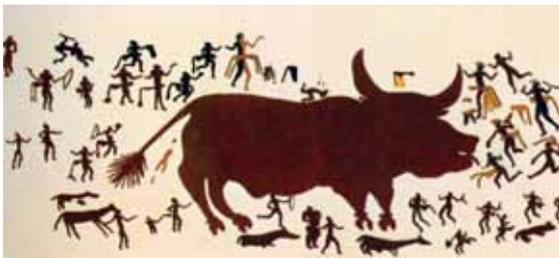


Fig. 14. Dance scene with bow-harps. Çatalhöyük.

In the 2011 Volume of ICONEA, I wrote about the possibility of a shared metrology between pipes and the tube-zither, forerunner of the long neck lute:

*'The simplest form of tube-zither would consist of a cane, probably arundo donax, cut to an appropriate size, about 60 centimetres long with a diameter of about 2 centimetres. A string of gut, vegetal or animal hair fibre would be stretched from one end to the other and attached with a knot inserted into a thin slit, at each end. An archaic form of bridge would be placed where suitable and would add tension to the string. [...] The longer the speaking length of the string, the smaller would have been the intervals, in a comfortable finger position. It is very probable that earlier instruments were short or that the bridge was placed near the middle of the instrument to allow for larger intervals with a suitable finger position. The ideal speaking length would be about 30 centimetres as this would allow for playing a fourth, a fifth and smaller tone and semitone intervals. [...] For most of my career [we] have advocated that Neanderthalian and later holed pipe flutes could not have played any predetermined scale on the basis of absence of numeracy. Indeed I wrote and taught that without ratios, the calculation of hole positions was impossible. Neanderthals, later Cro-Magnons, Jiahu Chinese and others might have drilled holes on their pipes but the scales produced would have been aleatory. With [our] own hypothesis of the tube-zither, [we] have proved [our]self wrong. The position of the fingers on the tube-zither string define the position of holes on the pipe flute. (Fig. 15) [...] The pipe was cut at the level of the bridge since this is what defined its speaking length. This is where the pipe was blown. Obviously the pipe flute would not have been tuned at the same pitch as the tube-zither but most importantly, the interval ratios would have been the same in both instruments. Then the tube-zither might have been tuned to the pipe, as the pipe could not be tuned to the zither. The problem was solved. This explanation might provide an explanation, never explored before, on how the earliest pipe flutes such as the Jiahu models might have been drilled and produced coherent and predetermined scales. Therefore it can be hypothesized that tube-zithers might have been much older than initially thought.'*



Fig. 15. Note that the finger positions on the tube-zither, generating an approximate diatonic scale, equate to the position of the holes drilled in the tin-whistle and that the labium of the whistle which defines the speaking length of the whistle is also in alignment with the bridge of the tube-zither which also defines the speaking length of the string with which it is fitted.

### Dating Music

Most of the commentaries about prehistoric 'flutes' have also claimed that they were the oldest instruments (ever found):

*'The date and origin of the first device of disputed status as a musical instrument dates back as far as 67,000 years old. In July 1995, Slovenian archaeologist Ivan Turk discovered a bone carving in the northwest region of Slovenia. The carving, named the Divje Babe flute, features four holes that Canadian musicologist Bob Fink determined could have been used to play four notes of a diatonic scale. Researchers estimate the flute's age to be 67,000 years old, making it the oldest known musical instrument and the only musical instrument associated with the Neanderthal culture.'* <http://www.smashinglists.com/10-earliest-known-musical-instruments/>

and:

**'Researchers have identified what they say are the oldest-known musical instruments in the world.** The flutes, made from bird bone and mammoth ivory, come from a cave in southern Germany which contains early evidence for the occupation of Europe by modern humans - *Homo sapiens*. Scientists used carbon dating to show that the flutes were between 42,000 and 43,000 years old.' <http://www.dhushara.com/Biocrisis/12/Sept/ancientFlutes.pdf>

and:

**'Neanderthal flute: Oldest Musical Instrument's 4 Notes Matches 4 of Do, Re, Mi Scale.'** <https://at37.wordpress.com/2013/01/22/37-neanderthal-bone-flute-do-re-mi-fa/>, etc.

These claims, which are unfounded, reveal both mediocre ethnology and musicology from their authors, as man did not 'invent' music, but invented music theory; he did not 'invent' oral communication, but invented language and script; did not 'invent' copulation, but invented love; did not invent eating, but invented cooking; did not invent fear, but invented religion, etc. Music appeared with man 'himself' and musical instruments are nothing but an extension 'his self'.

Prior to the advent of sophisticated instruments such as harps, pipes and drums, man would have used his own body with the clapping of hands, for example, to accompany his primeval melodies. He would have used stones as proto-percussion/idiophonic implements, and when he went hunting, much later in the course of his evolution, he would have used his bow as a seminal harp.

### The absurdity of a universal diatonic scale

There are extraordinary statements about the universality of a diatonic scale such as:

*'Neanderthal notes: **Did ancient humans play modern scales?** Julie Andrews made the do-re-mi scale famous by cleverly teaching it to her spoiled young charges, but Neanderthals may have been better students. A recent analysis of what may be the world's oldest known musical instrument, a flute-like piece of bone found at a **Neanderthal hunting camp, suggests that more than 43,000 years ago the foothills of the Slovenian Alps may have been alive with the sound of music based on that very same scale.**'* and:

*[...] the Neanderthal flute-maker didn't want a single tone or a sliding "siren-like" kind of sound; so he/she put in holes so that step-wise discreet or separate notes could be created. That's the dividing of the continuum of sound into scales, just like us. But the holes were not acceptable to this Neanderthal if they produced just any old notes (as equidistant holes would produce). When we look at history, such a scale would be, and it seems, was felt, to be "out of tune" in most human musical cultures. [...] The reasons for this are profusely examined in [Fink's] book on music's origins (The Origin of Music). Therefore, the holes (likely) were made with the goal in mind of producing some kind of non-equal scale or set of notes. A large number of different scales made from such non-equally divided hole-spacings are possible -- but earlier research that [Fink] and others have published over the years indicates that there are reasons based in acoustics and ratios (of vibrations) to conclude that **the likeliest scales to be "sought" with such unequal hole-spacings are pentatonic or diatonic scales.** Suffice it to say these scales are overwhelmingly parallel to the acoustic "overtone series" and several other acoustic properties -- yet the scales were produced by ancient people with no knowledge of acoustic facts or properties -- other than the responses of their ears. **So, therefore, if the Neanderthal is going to go for an unequal scale, it "probably" would be one of those two types (pentatonic and/or diatonic).***

Since human vocal folds can produce all the sounds of the spectrum to which he is restricted - an average of two octaves - and since man cannot (without specific training) sing two pitches at the same time, it follows that the notion of dissonance is one which was unknown to him. It is only when two (or more) sounds are played simultaneously that vertical dissonance can happen. This phenomenon appears very recently in the history of music development, around the 9-10<sup>th</sup> century A.D. On the other hand, horizontal dissonance is more difficult to locate in the flow of a melody. However, it becomes indispensable, much later, during the creative process, in order to generate

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melodic contrasts and emphasis. It is a resolved dissonance which makes music interesting. Horizontal dissonance was not to be proscribed, but appropriately used.

Furthermore, since the vocal folds can produce any sound within their ambitus, it follows that the cochlea of the inner ear can also hear all the sounds that the voice can generate, it goes without saying. Physically this organ does show that it has any predilection for consonance. There are some physiological hints as to consonantal preferences but these are the consequence of acculturation on which a variety of sounds depend, but to say, for instance, that in Africa, today, 60% of the music is diatonic, blindly ignores acculturation.

There is no such thing as a universal diatonic scale because it is the consequence of theoretical constructions born from numeracy, much later. The premise of diatonic universality on the pedestal of natural harmonics or on the cycle of fifths is flawed. The diatonic scale is alien to just harmonics as it is alien to the cycle of fifths since multiples of just fifths, never amount to an octave, or of its multiples.

### *The Jiahu bone flutes*

Dating from in between 7,000 to 5,700 B.C., these are the only objects which could reasonably be qualified as pipes as they are relatively intact. It is not clear if they were either flute or reed-pipes. It is also impossible to determine any scale from the position of the holes. Only their playing would produce some appreciable data.

### *Conclusions*

The various objects we have examined for the purpose of this short article seem to place themselves in two categories. The first group includes pipes dating from up to the sixth or fifth millennium B.C., and the second after this period. The first group includes pipes which cannot reasonably be classified as musical instruments but rather as lures which would have been used either for hunting birds or for signaling/messaging purposes. The second group, of which the Jiahu pipes belong attest of a more complex design which would have evolved from implement to instrument. This period also attests of the first

parietal representations of bow-harps.

It might be possible to derive that the transition from implement to instrument would have taken place around the sixth millennium B.C.

With regard the scaling of the second group, we would advance that it might have been diverse, but certainly not diatonic for reasons that have been discussed above.

### Notes

1. The Hoffnung Music Festivals were a series of three humorous classical music festivals held in Royal Festival Hall, London in 1956, 1958 and 1961 (and a reprise in 1988). They were created by cartoonist and amateur tuba player Gerard Hoffnung.

They included works such as Haydn's Surprise Symphony 'with extra surprises' added by Donald Swann, an 'excerpt from Belshazzar's Feast', with full orchestra and chorus conducted by William Walton himself (with a fly swat), which turned out to consist of just a single chord with the word 'Slain!', and humorous works specially commissioned from well-known composers of the day. The authors attended the 1988 reprise: On February 12 & 13, 1988 two reprise concerts were performed and recorded at the Royal Festival Hall (released by Decca). The program, performed by the Philharmonia Orchestra conducted by Tom Bergman, consisted of highlights from previous Hoffnung Festivals, including:

- A Hoffnung Festival Fanfare (1956)
- A Grand, Grand Overture (1956)
- Concerto for Hosepipe & Orchestra (1956)
- Ballad of County Down (1961)
- The Tay Whale (1958)
- Leonora Overture (1961)
- Lochinvar (1956)
- Concerto Popolare (1956)
- Metamorphosis on a Bedtime Theme (1958)
- Haydn's Surprise Symphony (1956)

There were also a few new pieces to keep the audience on their toes: Quasimodo e Giulietta, The Heaving Bagpipe, Concerto d'Amore (for two violinists and one violin), and others. Many distinguished guests appeared, including Donald Swann, Gerard Hoffnung's widow and daughter, [and the Princess of Wales] as well as the present author. [http://en.wikipedia.org/wiki/Hoffnung\\_Music\\_Festival](http://en.wikipedia.org/wiki/Hoffnung_Music_Festival)

2. Pierre Amiet, La Glyptique mesopotamienne archaïque.



3. See the Horbostel-Sachs Musical instrument classification.

<http://en.wikipedia.org/wiki/Hornbostel%E2%80%93Sachs>

4. Tamboer, A., Plover Calls in the Netherlands, *Orient-Archäologie*, Band 15. Ellen Hickmann/Ricardo Eichmann (Hrsg.) *Studien zur Musikarchäologie IV*. (2004), pp. 181-92.

5. Gough, G., Sacred Landscape and Native American Rock Art - Part II. *Utah Rock Art, Volume XXVII*, (2009), pp. 35-48.

6. <http://bancroft.berkeley.edu/collections/rockart.html>

7. Lawergren, B., Extant Silver Pipes from Ur, 2450 B.C., *Studien zur Musik Archäologie II*, (2000)

8. Bob Fink, <http://www.greenwych.ca/fl-compl.htm>

Bob Fink links his assumption that prehistoric music was diatonic, to Professor Kilmer's misguided postulation that - Babylonian music was also diatonic, and since 4,000 years old music was diatonic, then prehistoric would too be diatonic - There is no evidence for this and had Kilmer researched the subject in depth, she would have realised that her deductions were hastily made, to say the least, and in turn have misguided hundreds of students and scholars who now follow her position...

9. The fujara originated in central Slovakia as a large sophisticated folk shepherd's overtone fipple flute of unique design. It is technically a contrabass in the tabor pipe class. Ranging from 160 to 200 cm long (5'3" - 6'6") [2] and tuned in A, G, and F. It has three tone holes located on the lower part of the main body. The sound is produced by a fipple at the upper end of the main body of the fujara. The air is led to the fipple through a smaller parallel pipe, called *vzduchovod* in Slovak (meaning 'air channel'), mounted on the main body of the instrument. While it is possible to play the fundamental frequency on fujaras, the normal playing technique is based on overblowing the instrument. Because of its aspect ratio (great length versus small internal diameter), the overtones created permit one to play a diatonic scale using only the three tone holes. The fujara is played standing, with the instrument held vertically, usually braced against the right thigh. The *Koncovka* is a Slovak duct-blown overtone fipple flute without finger holes, traditionally played by shepherds. The *koncovka* is played by closing and opening the bottom hole of the flute. By increasing the air speed, two different harmonic series of notes can be played with the end either open or closed. Traditional *koncovka* melodies use the partial Lydian scale available on this instrument.

### *Postscript*

Concluding this paper, I was informed that another written by Cajus G. Dietrich entitled 'Neanderthal bone flutes: *simply products of Ice Age spotted hyena scavenging activities on cave bear cubs in European cave bear dens*', published by [rso.royalsocietypublishing.org](http://rso.royalsocietypublishing.org), confirmed my hypothesis that Neanderthals never produced any type of musical pipes. The so-called Neanderthal flutes from the Potočka Zijalka Jama Cave (Potok Cave), excavated in the 1920s, were certainly neither flutes, nor man-made. It was further advanced that these bones were not Neanderthal but dated from the Aurignacian Late Palaeolithic (Middle Palaeolithic) and that

therefore the site was occupied by Cro-Magnon humans and certainly not Neanderthals.

### *This article concludes with these words:*

*The 'cave bear cub femora with holes' are, in all cases, neither instruments nor human made at all. All cave bear pseudo-bone flutes are not dated to Neanderthal Middle Palaeolithic Mousterian layers, but instead, if possible to date, to Late Palaeolithic, Aurignacian/Gravettian layers. There, where they are dated absolutely (Divje Babe Cave 1) are without archaeological context at all, and simply of cave bear den use during the MIS 3-5d. At these times, different cave bear subspecies *Ursus spelaeus subsp. eremus* (smallest cave bear) and *spelaeus* (i.e. Neanderthal times) and *U. ingressus* (largest cave bear, i.e. Aurignacian/Gravettian times) used caves all over Europe for cub raising and hibernation. All the large carnivore punctured cave bear cub femora (and other punctured bones) appear always in small to large cave bear den cave/cave entrance contexts. This sometimes overlaps with hyena dens and human camp sites at cave entrances only, where cave bear den, carnivore den and human remains are even mixed up (partly separated in layers), all over Europe due to competition for and seasonal use of cave entrances/rock shelters. The cave bear bones with round-oval, larger puncture marks can be well attributed solely to the main cave bear scavenger of Europe - the Ice Age spotted hyena *Crocota crocuta spelaea*. This main Late Pleistocene bone destructor in Europe is known recently with more than 150 den sites (95% are cave sites) all over Europe. At cave bear dens hyenas left, by periodic scavenging, up to 20% of damaged bones, whereas also lions (cave bear killers), leopards and wolves played a larger role in the cave bear hunting/scavenging, even deep in caves. Those indeed also left, in some cases, round-oval, larger punctures in cave bear bones, but with their canines only in soft spongiosa (pelvis, vertebrae), and never in any bone shaft compacta. Neither carnivores nor cave bears (herbivorous) used their canine teeth to crush longbones, or any other bones. Therefore, all other top predators - except hyenas - can be excluded, at least for the round-oval punctures in cave bear longbone shafts. Only hyenas have developed a carcass destruction and butchery strategy, also for cave bears. This strategy is demonstrated, herein in detail, on cave bear femora destruction (especially material from Weiße Kuhle Cave, Germany), which is presented in three stages and for different aged individuals - cubs (less than 1 year), subadults (1-2 years) and adults. Cub bones are 'soft' and thin-walled in the bone shaft compacta, which increases in subadults to adults. This explains why puncture marks are found only in cub (less 1 year) femora, and partly in subadults, whereas they are absent completely in adults, because hyenas cracked those bones into pieces with the premolar triangle teeth (i.e. bone crushing teeth) for access to the bone marrow and easier swallowing of those pieces for the bone collagen use. Hyenas left, therefore, 'pseudo-bone flutes' during the Late Middle to Late Pleistocene all over Europe in cave bear dens, and on different cave bear species/subspecies. This is known due to lack of breakage on most of the cave bear cub femora, which generally show additional diagonal zigzag*

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*margins (from chewing joints by scissor teeth of hyenas) or have triangular or smaller scratch tooth marks. This even allows reconstruction, in some cases in detail, the tooth mark of the upper and lower jaw teeth of hyenas - the last tooth mark of the premolar bone crushing triangle of the powerful jaws of the last hyenas of Europe. Finally, some flakes and refitted cub femora, both with tooth mark holes, prove the bone cracking activities at cave sites.*

This magisterial article, supports my assumptions, from a different angle, and will put an end, it is hoped, to sensationalist publications, the latest of which from Dr Lana Neal: 'The Earliest Instrument: *Ritual Power and fertility Magic of the flute in Upper Palaeolithic Culture*' just published by the Pendragon Press, NY, USA.

*This book is described as:*

*[an investigation of] the earliest known musical instruments within the larger cultural context. Upper Paleolithic flutes are the oldest musical instruments that have survived in the archeological record. The significance of this study lies in the synthesis of various methodologies and sources of evidence to gain an understanding of the place of the instruments in Upper Paleolithic culture. It is a comprehensive investigation of the artifacts and their ritual and social functions.*

*Upper Paleolithic flutes have been discovered at archeological sites dating from approximately 43,000 to 12,000 years ago. Although humans were most likely creating music prior to this time, the people who entered Europe approximately 43,000 years ago began to create musical instruments that have survived to the present day. Analysis of the artifacts is followed by examination of the archeological contexts, parietal and mobiliary art as it relates to sonic expression, ethnographic examples, and the instrument as it appears in various mythological systems around the world.*

*These instruments were powerful symbols essential to the expression of the most fundamental aspects of life and death. They were symbols of life and thus intrinsically linked to human fertility as well as the fecundity of plants and animals. The flutes were associated with the cycle of life and death and marked important points in this cycle. This investigation provides a new level of insight into the function of music in human culture.*