

# Musical Tradition in Megalithic Site of Indonesian Gunung Padang?

**Rolan Mauludy Dahlan**

Dept. Computational Sociology

Bandung Fe Institute

e-mail: rmd@compsoc.bandungfe.net

**Hokky Situngkir**

Dept. Computational Sociology

Bandung Fe Institute

e-mail: hs@compsoc.bandungfe.net

## Abstract

The paper reports a possibilities of musical traditions of ancient civilization who built the sites discovered in Gunung Padang, West Java, Indonesia. Particular group of the stones in the megalithic site happens to have relatively high frequency that might have correspondence with standard western musical scale. From the samples recorded at the site, we do the power spectral analysis to have the dominant frequency within the audio and mapped the result to MIDI numbers. We showed that the obtained four notes interestingly have particular places in modern musical scale.

**Keywords:** stone-age, megalithic sites, Cianjur, Indonesia.

## 1. About Gunung Padang Megalithic Site

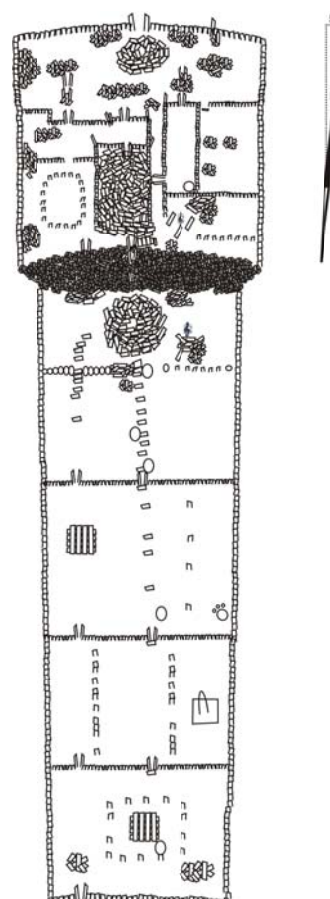
Our understanding to the evolution of music could lead us to the important explanation of the development of general human civilization. This is related to the structure of the acoustic-communication signalling, the cognitive capacity to design and acquisition of instruments, localization and lateralization of the brain function, melody and the rhythm while speaking, symbolic gesturing, and the manipulation of emotions through sounds, aesthetical expressions, etc. [3]. Some works related to this has been shown by legor Reiznikoff and Michel Dauvois with some hypothesis of the importance of music and songs in Paleolithic civilization [5, 6].



**Fig. 1** The location of the Gunung Padang Site

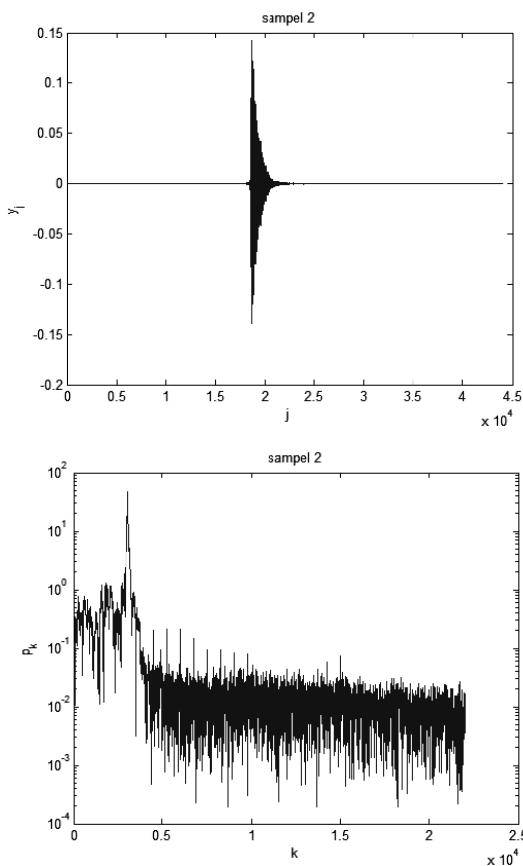
The megalithic site of Indonesian Gunung Padang is located in the District of Cianjur, West Java, Indonesia and estimated to be built around 2500-1500 B.C. [1]. It has enrich Indonesian pre-historic archaeological case of study since 1979 when it was discovered. The site happens to be an ancient terraced building with 3,132.15 m<sup>2</sup> area. There were not many notes regarding to the

megalithic site while and yet the glance view of the archaeological site is can potentially gives further understandings about ancient Indonesian people.



**Fig. 2** Bird's eye-view sketches of the Site with the G-key symbol showed the place of the group of stones that possibly used as musical instruments.

We found that some groups of the stones located as presented in figure 2 could be regarded as ancient musical instruments as the hit to the stones produces notes that would be elaborated in this short report. The stones are in dimensions of approximately 200 x 25 x 25 cm<sup>3</sup> and they are grouped within the sites. As far as we know, this is the first observation that conjectured possibilities that the civilization built the megalithic sites have recognized music or produced sounds as part of aesthetics in the ancient culture. More comprehensive observation as further works are needed though to re-check any claims made by our findings. A visualization of the site can be accessed online<sup>1</sup>.



**Fig. 3** A waveform of a sample audio (*above*) and its respective power spectral density (*below*).

## 2. Analysis of the sounds produced by the stones

Sounds are produced by hitting the stones in its upper and long side and recorded by the standard recording devices. The obtained sampled then analyzed by using the Fast Fourier Transform analysis that model the waveform in its time-domain  $y_j$  of

$$y_j = \frac{1}{N} \sum_{k=1}^N c_k \exp \left[ 2\pi i \frac{j-1}{N} (k-1) \right] \quad (1)$$

into the respective frequency domain,  $c_k$  [6.7]. Thus, we have the frequency-based measurement of

$$p_k = F [c_k] \quad (2)$$

From numbers of produced sounds, we found that there are at least four states of audible frequency that can be recognized as ‘musical’ pitches. From the yielded spectrogram [2] it is intuitively we can say that the sounds have the same timbre – a thing that can give us conjecture that it is from peer instruments.

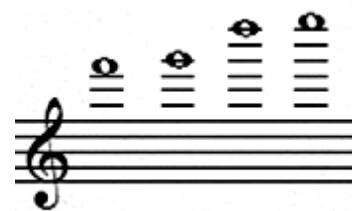
From the yielded power spectral analysis, we could correspond the dominant frequency to the MIDI scale as a standard computational music notation, follows

$$k \Big|_{\max(p_k)} \rightarrow \theta_{MIDI} \quad (3)$$

Thus we can map the recognized frequencies (presented in table 1) into the standard musical notation as shown in figure 4.

**Table 1**

The cleaned audio and the conjectured frequencies	
Produced Sounds	Frequency (kHz)
1	2.683
2	3.077
3	4.588
4	5.171



**Fig. 4** The map of the frequencies to the western musical scale shows pitches of  $f''' - g''' - d''' - a'''$

From the correspondence of the frequency to the MIDI-mapper, apparently we can have the pitches of  $f''' - g''' - d''' - a'''$ . This is an interesting findings and more comprehensive studies and observations (e.g. excavating the site in search for any musical stones still piled underground) might lead us to reveal the musical tradition of the megalithic society and the evolution of

<sup>1</sup> URL: <http://youtube.com/watch?v=OmAPY8eStmM>.

musical instruments in general as well. The sampled cleaned raw audio files<sup>2</sup> and the reproduction<sup>3</sup> within the respective MIDI mapper are available online.

### 3. Discussions & Concluding Remarks

Our observation has given conjecture that it is possible that the stone-age civilization has already a musical tradition. This is obvious since while we see the cognitive development of human being evolves gradually, there should be a phase between the time of screaming [4] and Sumerian harps and lyres [8] or the Chinese bone-whistling [9] where the civilization produce music by simpler instruments. Our findings in this megalithic sites might lead us to an interesting candidate for this: the made-of-stone musical instruments.

Regarding to the sizes of the ancient musical instruments, it is interesting to propose that there should be a team as a scenario play them. This is apparently interesting as we could see an aesthetic based working team in the stone age. A lot of more conjectures that might enrich our understanding is awaited for further observation at the site.

### Acknowledgement

Authors thank IACI explorers for field trips and BFI colleagues for discussions.

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<sup>2</sup> <http://www.geocities.com/quicchote/sampel.mp3>

<sup>3</sup> <http://www.geocities.com/quicchote/rekon.mp3>