**Xenakis: Pithoprakta. A Phenomenological investigation by**

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*Pithoprakta* was composed in 1955-56 for 49 musicians: 46 divisi strings, 2 trombones and one percussionist, playing woodblock and xylophone­­.

For the phenomenological investigation, the authors listened to the recording of The French Radio Symphony Orchestra conducted by Maurice le Roux, duration 9’45. LP recording 1965,

reissued on CD 2001. Available on <https://www.youtube.com/watch?v=yxAakHDWjrw>

**Abstract**

After an introduction to music phenomenology and the method of experimental listening, we present the outcome of our phenomenological investigation of *Pithoprakta,* encompassing comparatively detailed descriptions and hermeneutical interpretations of the work, including prominent musical features, sonorities, densities and transformations of sound masses. A survey of the work summarizes the macroform and possible emotional interpretations of the music. A selection of quotations by Xenakis permits the suggestion of a conclusion regarding the relationship between mathematical calculations and music in *Pithoprakta.* A brief discussion points out some limitations of the investigation and suggestions for further study.

1. **Introduction**

Phenomenology is active investigation of the experienced world, realized by descriptions of the first-person experience and reﬂections on the process of experience. Phenomenology is not a finished system, but an evolving practice. Phenomenology is a style of thinking, a special type of reflection, and the means of understanding phenomenology is the practical application of phenomenology (Clifton 1983, Ihde 2007).

The background for the present investigation is the music phenomenology proposed by the musicologists Thomas Clifton and Lawrence Ferrara and the philosopher Don Ihde. These scholars have developed their theories and practice on the basis of the phenomenological philosophy of Edmund Husserl, Martin Heidegger and Maurice Merleau-Ponty.

Clifton is the enthusiastic discoverer who has applied phenomenology in a wide range of descriptions of music from Gregorian chant to twentieth century compositions. He emphasizes that all kinds of sound can be heard as music, that space, time, motion and feeling are basic constituents of music, and that musical experience is an action of the body (Clifton 1983).

Ferrara is the pragmatic researcher who, in a phenomenological description of Edgar Varese’s Poème électronique,has proposed a procedure that alternates between *Open listening* without deliberate focus, *Music-focused listening* which aims at describing particular musical features, and *Hermeneutical listening* which aims at discovering possible interpretations of the music. It is his predominant interest to uncover meaning, history and lifeworld in the music (Ferrara 1984).

Ihde is the reflecting philosopher who points out that the aim of music phenomenology is to reveal unnoticed aspects of the music and to appreciate the richness and complexity of sensory experience. This is achieved by conducting phenomenological variations, that is, varying the listener’s focus of attention in multiple ways and performing a succession of listening tasks directed by specific questions. Ihde states that music permeates and engages the experiencing body, and that the unity of the senses is primordial. He distinguishes between a first phenomenology, the phenomenology of essence, structure and presence based on Husserl, and a second phenomenology, the phenomenology of existence, history and the hermeneutical based on Heidegger (Ihde 2007, 2012). For a detailed introduction to music phenomenology, see Christensen (2012).

1. **Experimental listening**

On the basis of the theories and practice proposed by Clifton, Ferrara and Ihde, the present authors have developed the procedure named *Experimental listening*: Two music professionals listen an unlimited number of times to a piece of music, applying deliberately varied listening strategies, directed by specific questions and tasks. The goal is to provide reliable descriptions and hermeneutical interpretations of the piece (Christensen 2012, Christensen and Bjerno 2020).

In the progression of listening, we follow the rules for phenomenological investigation proposed by Ihde (2012): 1) Describe, do not explain. 2) Perform phenomenological variations. 3) Regard all experienced phenomena as equally real. 4) Include intersubjective verification.

As a preparation, the first author (EC) listened to Xenakis’s Pithoprakta 15 times in order to collect observations, possible questions and listening tasks and propose division of the piece into shorter sections in order to facilitate the process of description. Subsequently, both authors listened multiple times to the whole piece and the separate sections.

Xenakis has divided *Pithoprakta* in four sections, separated by silences. In the following overview, we propose the division in subsections, characterized by the predominant features heard at the beginning of a subsection:

**Sections Subsections**

Section 1 (2’14) 0’00-2’14 1a (0’45) Wooden tapping sounds 0’00-0’45

 1b (1’29) Arco strings added 0’45-2’14

Section 2 (2’23) 2’14-4’37 2a (0’16) A myriad of sounds 2’14-2’30

 2b (1’27) A broad belt of sound 2’30-3’57

 2c (0’40) Salient glissandi 3’57-4’37

Section 3 (2’37) 4’37-7’14 3a (1’36) Complex polyphony 4’37-6’13

 3b (1’01) Sharp crack, trombones added 6’13-7’14

Section 4 (2’26) 7’14-9’40 4a (0’17) Brief gestures 7’14-7’31

 4b (0’48) Polyphonic glissandi 7’31-8’19

 4c (1’21) Two sharp cracks, increasing noise 8’19-9’40

The timing of a section or a subsection includes the subsequent silence.

**2.1 Listening sessions**

We conducted three listening sessions on 20th and 22nd April and 2nd May, 2022. Each listening session had a duration of four hours. We listened to the whole piece and the sections and subsections multiple times. The first author (EC) planned and guided the progression of listening, and the second author (LCB) provided verbal descriptions and hermeneutical interpretations. EC added occasional comments. The outcome of every single listening was notated by EC and included in an edited summary.

**2.1.1 Initial open listening of the whole piece**

**LCB:** A smashing composition, displaying salient differences and contrasts. Powerful sections, quiet sections, organic sections, elegant musical forms. A variety of tempi, different degrees of transparence. A great variety of sounds from tiny drips to booms and roars. Many short sounds and many short fragments of melody and rhythm. Prominent pauses.

The initial wooden sounds set a scene and open a space. Sharp cracks appear throughout the piece. The repeated recognition of the sharp cracks ties the different sections together.

**2.1.2 Summaries of listening multiple times**

**Section one**

**Section 1a (0’45) Wooden tapping sounds (0’00-0’45)**

**Music-focused:**

Wooden sounds produced by tapping the stringed instruments with fingertips.

**Hermeneutical:**

The sound of small feet on a wooden floor. Many children enter the scene, run around like playing hide-and-seek. Later, the increasing density of sounds resembles raindrops falling on a wooden roof.

**Section 1b (1’29) Arco strings added (0’45-2’14)**

**Music-focused:**

Non-metric wooden sounds continue as a background. In the foreground, sharp arco strings begin playing brief sections of melodic-rhythmic gestures. Between these sections, the background sounds stand out, with additional pizzicato sounds.

Midway in the section the volume rises. Distinctness disappears in a complex powerful sound in motion, including ripping sounds. Four prominent sharp cracks and rumbling sounds lead to a final characteristic cluster chord.

**Hermeneutical:**

The soundscape becomes ominous. Possible foreboding of war. The children take flight. Many people in a market place express statements and dialogues.

EC: *I have not experienced associations to war, but I accept your interpretation.*

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**Section two**

**Section 2a (0’16) A myriad of sounds (2’14-2’30)**

**Music-focused:** A myriad of melodious movements and noises

**Hermeneutical:** A multitude of grasshoppers

**Section 2b (1’27) A broad belt of sounds (2’30-3’57)**

**Music-focused:** A broad belt of continuous diffuse sound at the bottom, rhythmical patterns of clear sounds at the top. Towards the end of the section the continuity disintegrates. After a sharp crack, a kaleidoscopic pattern begins expanding upwards and downwards, accumulating tension which is released in the next section.

**Hermeneutical:** Background:Lovely continuous sound, gently pulsating or breathing. Foreground: A forest with a woodpecker and bird voices, sounding rather mechanical.

**An alternative interpretation:** A pleasant soft fundament at the bottom. High sounds gather in a continuous stream, like stationary fireworks with glimpses of light, or an electric bell.

**Section 2c (0’40) Salient glissandi (3’57-4’37)**

**Music-focused:** Sudden strong glissandi up and down, followed by single-instrument glissandi in different registers. Pizzicati interact with the glissandi. Deep tone at the end.

**Hermeneutical:** In the last part of the section:Elegant glissando gestures and pizzicati in playful motion up and down, like a well-timed and well-balanced ballet.

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**Section three**

**Section 3a (1’36) Complex polyphony (4’37-6’13)**

**Music-focused:** A polyphony of many different string sounds. Strings struck with the bow, pizzicato, rumbling thick strings, sharp sounds, small fragments of melody and rhythm. Glimpses of regular meter. The basses indicate a tempo from the beginning.[[1]](#footnote-1)

**Hermeneutical:** Continuous commotion. The rumbling sounds seem scary. War is present or approaching. However, people live and survive in a country that is being bombed. They dance, sing, laugh and find food.

**Section 3b (1’01) Sharp crack, trombones added (6’13-7’14)**

**Music-focused:** Salient sound of two sliding trombones on a background of rapid movements of stringed instruments. Gradually, the movements condense in a regular meter and marked rhythms.

**Hermeneutical:** The sound of threatening airplanes indicates war. Subsequent shooting and the jerks of wounded bodies. After a moment of silence and another brief shooting, the section ends with the sound of tramping boots followed by silence.

EC: *I have no associations to airplanes and a battlefield. I simply hear the sliding sounds of trombones, followed by metric and rhythmic patterns. However, I can understand your experience of war.*

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**Section four**

**Section 4a (0’17) Brief gestures (7’14-7’31)**

**Music-focused:** Metric melodious pizzicati followed by sonorous deep sounds and disintegrated toneless pizzicati.

**Hermeneutical:** We both heard this brief section as a comic interlude, like a cartoon or a moment of stand-up comedy: “A group performs a clumsy movement. Met with unanimous mockery, they fumble and stumble.” We could not help laughing, presumably as a relief after listening to several serious sections.

**Section 4b (0’48) Polyphonic glissandi (7’31-8’19)**

**Music-focused:** A variety of solo glissandi and grouped glissandi interspersed with pizzicato melodies in different tempi and registers on a background of heavy sounds.

**Hermeneutical:** A beautiful dance. The gliding sounds in this section remind us of the enchanting underwater songs and dances of the seductive females, called Sirens in Greek mythology.

**Section 4c (1’21) Two sharp cracks, increasing noise (8’19-9’40)**

**Music-focused:** The gliding movements assemble in a strident multilayered sound mass. In a rising, whirling movement, the sound mass gradually dissolves, leaving sparse piercing sounds.

**Hermeneutical:**

The beautiful music is interrupted by an air-raid alert. People run away and disappear. At the end, merely extremely unpleasant high sounds are left, like glimpses of blinding light. The sounds jar on the ear and cause tortuous bodily feelings, like screeching chalk on a black board or a metal file grating your teeth.

EC: *I can accept your experience of a noisy air-raid alert in this section*, *but I do not share your feeling of tortuous sounds at the end. At the end I hear thin ephemeral sounds disappearing in open space.*

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**2.2 Additional listening**

***Task: Listen for examples of different sonorities***

**Section 1a:** The sound of tapping on wood

**Section 2b:** A field of harmony and timbre sustained by string instruments

**Section 3b:** Rapidly moving string sounds blend with the sustained interferent sound of trombones

**Section 4c:** A field of noise ranging from diffuse deep sounds to sharp high sounds

***Task: Listen for examples of transformations***

**Section 1b:** In the strings, the mode of playing gradually changes from mixed tapping, pizzicato and arco playing to complete dominance of arco playing

**Section 2c:** Massive multiple glissandi dissolve into transparent single glissandi

**Section 3b:** Non-metric sound is transformed into a regular metre

**Section 4c:** A field of noise in motion is transformed into a massive sustained noise which subsequently dissolves into ascending whirling motion

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**2.3 Final listening:**

***Describe the density or transparence of sound in each section***

**Section 1a (0’45) Wooden tapping sounds**

**LCB:** Transparent at the beginning. Groups of sounds appear gradually. The density of sounds increases, like raindrops. However, a certain degree of transparence remains. The view is not blocked.

**Section 1b (1’29) Arco strings added**

Variable layers of foreground and background. A rather dense layer of wooden sounds in the low register. Pauses permit the experience of an open view. Towards the end of the section, the density increases to impenetrability.

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**Section 2a (0’16) A myriad of sounds**

Three layers: Low, middle and high sounds. Rather massive at the bottom. The top layer of sounds resembles a scrub which you can look through.

**Section 2b (1’27) A broad belt of sound**

The continuous sound constitutes a rather transparent background, like a mist.

**Section 2c (0’40) Salient glissandi**

Beginning: Rather dense sound, like broad brushstrokes. End: Extremely transparent.

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**Section 3a (1’36) Complex polyphony**

Not massive. A swarm of varied sounds, glimpses of transparence. Banks of mud at the bottom.

**Section 3b (1’01) Sharp crack, trombones added**

Beginning: Two layers: Dense sound of trombones, transparent sound above.

Middle: Pizzicati clear the space, opening a free view.

End: Long pauses of silence, plenty of empty space.

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**Section 4a (0’17) Brief gestures**

Salient quasi-melodic pizzicati and heavy bass sounds in an open space, followed by scattered pizzicati which disappear.

**Section 4b (0’48) Polyphonic glissandi**

A continuous layer of sound of variable density. The layer is not thick, but constantly blurred.

**Section 4c (1’21) Two sharp cracks, increasing noise**

Beginning: Massive noise, gradually changing towards transparence.

End: Sharp high sounds in a completely transparent space.

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1. **Brief comments on the descriptions and interpretations**

In order to underpin unbiased perception and description as far as possible, we did not acquire extensive knowledge of the work and the composer before the listening sessions. After the listening sessions, we have compared the descriptions and interpretations with the printed score.

We consider open, music-focused and hermeneutical listening equally relevant. Our listening was often open, not guided by specific questions or tasks. Multiple listening resulted in music-focused as well as hermeneutical descriptions.

Hermeneutical listening includes emotional and aesthetic responses, and the hermeneutical interpretations are related to the listener’s personal knowledge, lifeworld and previous experience. It is conspicuous that LCB was inclined to interpret the sounds of certain sections as ominous, threatening or warlike, while EC more hesitantly accepted associations to war and battlefields. The listening sessions took place in the spring of 2022 while war between Ukraine and Russia was ongoing, so associations to warlike sceneries were obvious and likely. We consider associations to war relevant, as it is well-known that Xenakis experienced alarming events of resistance and battles in Greece during WW2, when his face was wounded, and he barely survived. Xenakis mentions these circumstances in his comments on musical creation, quoted below.

We consider the variety of structure and aesthetic expression in *Pithoprakta* admirable, ranging from clarity and simplicity to complexity and ambiguity, and from beauty and elegance to massive noise. In the hermeneutical listening of *Pithoprakta*, we experience a variety of emotional impact, ranging from pleasure, delight and enchantment to anxiety, alarm and tortuous bodily feelings.

We can briefly summarize our music-focused descriptions and emotional interpretations of the subsections of *Pithoprakta* in the following overview, with corresponding score bars indicated:

**Duration Brief music-focused description Brief emotional interpretation Score bars**

1a (0’45) Wooden tapping sounds Pleasant 1-16

1b (1’29) Arco strings added Ambiguous 17-51

2a (0’16) A myriad of sounds Lively 52-59

2b (1’27) A broad belt of sound Lovely 60-104

2c (0’40) Salient glissandi Elegant 105-121

3a (1’36) Complex polyphony Ambiguous 122-170

3b (1’01) Trombones added Threatening 171-199

4a (0’17) Brief gestures Surprising 200-207

4b (0’48) Polyphonic glissandi Beautiful 208-230

4c (1’21) Increasing noise Alarming 231-267

In the score, the four sections are clearly separated by silent bars. According to our investigation, each of the sections displays a distinct character: Section one displays a contrast between simple wooden sounds and complex mixed sounds. Section two is predominantly pleasant. Section three is predominantly serious. In section four, beauty is disturbed by alarm.

It seems relevant to point out that Xenakis would not have accepted this kind of description. He energetically refused to discuss any emotional impact of his music, as recalled by Bálint András Varga in his conversations with Xenakis (Varga 1996, pp. 137-138).

1. **Xenakis describes *Pithoprakta.***

Xenakis has provided this introduction for the 1965 recording:

*Pithoprakta* (Actions through probabilities).

Written in 1955-56 and dedicated to Hermann Scherchen who conducted its first performance in March 1957 at the Musica Viva concerts in Munich, the work is scored for 50 instruments: 46 strings, 2 trombones, 1 xylophone, 1 woodblock. The author, using the findings of probability theory, is seeking a confrontation here between continuity and discontinuity through glissandi and pizzicati, tapping with the wood of the bow *(col legno),* or very short bowstrokes, as well as striking with the hand the resonator of the stringed instruments, which are divided to the maximum. This is an approach towards “stochastic” (probabilist) music. With the glissandi which can (visually) be assimilated with straight lines, volumes of sound are created which are in constant fluctuation. With a large quantity of isolated sounds spread across the whole sound spectrum, a dense “granular effect” emerges, a real cloud of moving sound material, governed by the laws of large numbers (Laplace-Gauss, Maxwell-Boltzmann, Poisson, Pearson. Fischer). Thus, the individual sound loses its importance to the benefit of the whole, perceived as a block, in its totality. The author’s ambition is thus to discover a new “morphology” of sound, fascinating both in its abstract (probabilist theory) and concrete (sensation of hitherto unknown materials) aspects (Xenakis 1965, reissue in CD booklet 2001).

In Varga’s *Conversations with Iannis Xenakis,* the composer states that

Pithopraktais a jump into the unknown. I was guided only by my ideas about its macroform. And by the time I had written it I became conscious of the musical aspects of my experiences with nature and mass demonstrations which appeared rather unconsciously in *Metastasis.*

**Varga:** *For the listener the most immediate impression given by* Pithoprakta *is the presence of sound effects; the special ways of playing on the bodies of string instruments.*

**Xenakis:** Yes. And it’s not difficult to explain why I used them. I wrote Pithoprakta primarily for strings because it’s easier to produce mass events and various timbres with them than with many other instruments. I also needed percussion effects. Instead of calling for a great many percussion players, which would have entailed organizational and other difficulties, I used the body of the instruments. It was that noise – the cloud of percussive sounds – that I transformed gradually, using statistical methods, into musical sounds. It’s like dissolving one picture into another in film technique (Xenakis in Varga 1996, p. 75).

Scientiﬁc thought is only a means with which to realise my ideas, which are not of scientiﬁc origin. These ideas are born of intuition, some kind of vision (Xenakis in Varga 1996, p. 47).

In his book *Formalized Music* (1971), Xenakis described mass events in nature and society that led to this new kind of music:

I originated in 1954 a music constructed from the principle of indeterminism; two years later I named it “Stochastic Music” The laws of the calculus of probabilities entered composition through musical necessity.

But other paths also led to the same stochastic crossroads - first of all, natural events such as the collision of hail or rain with hard surfaces, or the song of cicadas in a summer field. These sonic events are made out of thousands of isolated sounds; this multitude of sounds, seen as a totality, is a new sonic event. This mass event is articulated and forms a plastic mold of time, which itself follows aleatory and stochastic laws. If one then wishes to form a large mass of point-notes, such as string pizzicati, one must know these mathematical laws, which, in any case, are no more than a tight and concise expression of chain of logical reasoning. Everyone has observed the sonic phenomena of a political crowd of dozens or thousands of people. The human river shouts a slogan in a uniform rhythm. Then another slogan springs from the head of the demonstration; it spreads towards the tail, replacing the first. A wave of transition thus passes from the head to the tail. The clamor fills the city and the inhibiting force of voice and rhythm reaches a climax. It is an event of great power and beauty in its ferocity. Then the impact between the demonstrators and the enemy occurs. The perfect rhythm of the last slogan breaks up in a huge cluster of chaotic shouts, which also spreads to the tail. Imagine, in addition, the reports of dozens of machine guns and the whistle of bullets adding their punctuations to this total disorder. The crowd is then rapidly dispersed, and after sonic and visual hell follows a detonating calm, full of despair, dust, and death. The statistical laws of these events, separated from their political or moral context, are the same as those of the cicadas or the rain. They are the laws of the passage from complete order to total disorder in a continuous or explosive manner. They are stochastic laws (Xenakis 1971, pp. 8-9)[[2]](#footnote-2).

In his book *Musique. Architecture,* Xenakis states that

 Finally, the instinct and the subjective choice are the only guarantees of the value of a work

 (Xenakis 1976, p. 19).

**4.1 The relationship between mathematical calculations and music**

On the basis of the statements by Xenakis quoted above, we suggest the following conclusion:

Xenakis’s application of mathematical calculations to construct a large variety of sound masses is omnipresent and conspicuous. However, his use of calculations is a tool, but not a goal. Xenakis possessed knowledge of different theories of probability and the corresponding statistical methods, and he was able to choose between these methods in order to calculate and create sound masses that display a variety of structures, sonorities, densities and transformations. Thus, the mathematical calculations of probabilities served the goal of realizing Xenakis’s intuitive vision of the macroform and variability of *Pithoprakta.*

1. **Brief discussion**

We consider the outcome of our investigation to be a description and interpretation of *Pithoprakta* that is representative, but not exhaustive. We have listened for the characteristic features of sound as well as the sonorities, transformations and densities of sound masses. Each of these fields could be described in more detail, in particular the sonorities and transformations. Furthermore, it would be possible to continue the investigation by conducting further specific listening tasks, such as listening for foreground and background, registers, layers and surfaces of sound, brightness and darkness, tension and directionality.

The music-focused descriptions are summaries of multiple detailed descriptions provided by LCB, notated and subsequently edited by EC and finally commented by LCB. This process implies intersubjective verification, so that the descriptions represent the consensus of both authors.

Hermeneutical interpretations may not imply a consensus. They are influenced by a listener’s personality, background, experience, history and context. Throughout our listening sessions, we noticed individual differences in the experience of potentially threatening, warlike and disturbing sounds. We consider such differences inevitable and valuable, and have briefly commented on our different experiences. We suggest that it is important to respect and discuss variability and disagreement in the experience and interpretation of music.

The recording of *Pithoprakta* by The French Radio Symphony Orchestra conducted by Maurice le Roux is the basis of our investigation, and we consider it the original version of the work. Other recordings of this work display marked differences in tempo, sound, volume, timbre, balance and phrasing. It is likely that investigations of these recordings will result in considerable differences in music-focused descriptions as well as hermeneutical interpretations. To facilitate comparisons, we add links to four different recordings.

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**Links to available recordings**

The French Radio Symphony Orchestra conducted by Maurice le Roux (1965), duration 9’45.

With score display

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

Luxembourg Philharmonic Orchestra conducted by Arturo Tamayo (2008), duration 10’30.

With graphic score animation

 <https://www.youtube.com/watch?v=nvH2KYYJg-o>

New York Philharmonic Orchestra conducted by Leonard Bernstein (1964), duration 8’30.

With an introduction by Leonard Bernstein

<https://www.youtube.com/watch?v=LfH74hlhKp0>

Buffalo Philharmonic Orchestra conducted by Lukas Foss (1968), duration 8’30.

LP recording

<https://www.youtube.com/watch?v=AE1M2iwjTsM>

‘’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’’

1. In the printed score, the composer describes the complex section 3a as a nebula of sounds, in which specific galactic configurations of notes must be put in relief (Score bars 122-170). [↑](#footnote-ref-1)
2. Supplement: Xenakis has presented an introduction to probability and music in an interview in English with German subtitles. <https://www.youtube.com/watch?v=j4nj2nklbts> [↑](#footnote-ref-2)