ROCZNIKI HUMANISTYCZNE
Tom LXIX, zeszyt 12 – 2021
DOI: https://doi.org/10.18290/rh216912-13

TEMINA CADI SULUMUNA

A CONTEXT-BASED TRANSLATION OF CHAPTER 14 "DE VOCIBUS NATURALIBUS IN ANIMALIBUS EORUMQUE ANATOMIA" FROM THE *LIBER ANATOMICUS DE NATURA SONI ET VOCIS* OF ATHANASIUS KIRCHER'S *MUSURGIA UNIVERSALIS SIVE ARS MAGNA CONSONI ET DISSONI*

PART I

INTRODUCTION

The purpose of this article is to present a context-based approach to the translation of chapter 14 "De vocibus naturalibus in animalibus eorumque anatomia" (On the Natural Voices of Animals and their Anatomy) from the *Liber anatomicus de natura soni et vocis* (*Anatomy Book on the Nature of Sound and Voice*), that is, the first book of Athanasius Kircher's *Musurgia Universalis* published in 1650 in Rome. One could raise the question of the purposefulness of translating this chapter of *Musurgia*. For the time being, with regard to "De vocibus naturalibus…", there seem to exist as available only:

- Andreas Hirsch's abridged German translation published in 1662.
- Partial translations in the form of translated selected sentences, for example, in Joscelyn Godwin's *Athanasius Kircher's Theatre of the World with 410 Illustrations* published in London in 2009; or in Tiziana

Dr TEMINA CADI SULUMUNA – adiunkt, Uniwersytet Muzyczny Fryderyka Chopina, Katedra Teorii Muzyki; Uniwersytet Warszawski, Studium Doktoranckie w Instytucie Muzykologii; adres do korespondencji: ul. Okólnik 2, 00-368 Warszawa; e-mail: temina@wp.eu.

Dr. TEMINA CADI SULUMUNA, Assistant Professor at the Chopin University of Music, Department of Composition and Theory of Music; PhD candidate at the University of Warsaw; address for correspondence: ul. Okólnik 2, 00-368 Warszawa, Poland; e-mail: temina@wp.eu.

Pangrazi's *La "Musurgia universalis" di Athanasius Kircher: contenuti, fonti, terminologia* published the same year in Florence.

- A German translation of the whole *Musurgia* (with the transcriptions of the Latin original for books I and II) by Günter Scheibel (1940–2012), revised by Jacob Langeloh and Frank Böhling. The revision was finished in February 2018, and thus revised translation is now available on the website of the Institut für Musikwissenschaft in Leipzig. This translation bears only two annotations to chapter 14 of the *Anatomy Book on the Nature of Sound and Voice*: the first one referring to Neues Königreich (*Novum Regnum*) and the second one to Cartagena.

In the foreword to this translation we read that it is intended only as an aid in reading the original, and that translating Kircher's work is a difficult task because of him exploiting, among others, ambiguity of Latin terms:

> Wir verstehen die Übersetzung als eine Lesehilfe. Anderes ist bei diesem Text grundsätzlich nicht denkbar. Kircher war ein hervorragender Stilist, der die Stilhöhen, die Ambivalenzen und die Mehrdeutigkeiten der lateinischen Sprache virtuos zu nutzen wusste. Hierin liegt eine fundamentale Schwierigkeit, die eine Kircher-Übersetzung prinzipiell zum heiklen Unterfangen macht. (*Musurgia Universalis*)

Given the nature of the aforementioned translations and the fact that I am a professional translator, I have decided to undertake the task of doing a context-based English translation of chapter 14 "On the Natural Voices of Animals and their Anatomy" from the Latin original with its transcription[1] – a translation that would serve not only as an aid in reading the original work, but could above all comply with the requirements of a critical translation and commentary. For this reason I have tried to:

- identify persons (historical figures, mythological figures, authors), places and events;
- identify the sources of covert quotations appearing in the chapter;
- identify the probable sources influencing Kircher's assumptions;
- provide context by confronting Kircher's assumptions with those of other important figures being his contemporaries (Marin Mersenne);
- provide context by referring to ancient and medieval authorities on animal related topics;

[1] Given the limits on the maximum length, the present article does not include the transcription of the Latin original from Athanasius Kircher's *Musurgia Universalis sive Ars Magna Consoni et Dissoni*, vol. 1. The illustrations reproduced in the present article are drawn from this edition.

- provide etymological explanations and commentaries;
- provide an interdisciplinary context by confronting Kircher's assumptions based on dissections of animals with information gained from today's pertinent biological literature and recognized specialists in zoology (anatomical issues as well as the functioning of bodily organs).

Given the limits on the maximum length of the article, I have tried to lay emphasis rather on the "musical" aspect, that is, on animals' ability to make sounds, which interests me most as a musician and musicologist. However, even with regard to this aspect alone, my annotations could be enhanced. Providing context and commentaries for the sort of works as Kircher's can be a virtually endless process, and I hope to continue this task in the near future.

Since the aim is – as already mentioned – to present a context-based translation of Kircher's *On the Natural Voices of Animals and their Anatomy*, the translation is the main as well as the most extensive part of the present article. It is followed by my conclusions regarding the importance of a context-based approach.

In the translation, I have tried to reproduce as faithfully as possible Kircher's thoughts. However, in some cases it was necessary for me to focus upon the literary aspect rather than the literal one in order to make the translation understandable for the Reader. I hope that the translation reproduces the ideas and the value of the original text.

With regard to the annotations, the excerpts from Marin Mersenne's writings in French as well as their titles are presented in a modernized spelling. The same applies to *De la natural historia de las Indias* by Gonzalo Fernández de Oviedo and the title of André Thevet's work.

I would like to express my very great appreciation to: Prof. Dr. Hab. Tomasz Jeż of the University of Warsaw Institute of Musicology, Dr. Konrad Kokoszkiewicz of the University of Warsaw Institute of Classical Studies, Prof. Dr. Hab. Mikołaj Szymański of the same Institute, and Prof. Dr. Hab. Jerzy Dzik of the Department of Paleobiology and Evolution at the University of Warsaw Institute of Zoology. Finally, I extend my thanks to Maria Kościesza and Monika Malcher (MSc) of the Museum and Institute of Zoology of the Polish Academy of Sciences.

PART II

A CONTEXT-BASED TRANSLATION OF "DE VOCIBUS NATURALIBUS IN ANIMALIBUS EORUMQUE ANATOMIA"

Anatomy Book on the Nature of Sound and Voice

Chapter 14

On the natural voices of animals and their anatomy

The admirable providence of God in the creation of the animals

[God] took care of things with such an admirable intention so that people could not accuse the nature of being a stepmother in providing each thing with what belongs to it, and anyone who has explored somewhat further precisely these things – that are starting to appear both in a wonderful order of the arrangement of animal body parts and in an admirable world of senses – cannot sufficiently praise the divine goodness and Creator's majesty: so great is the order in all things, so acute is the providence, and so great is incomprehensibility in all His works. However, given that we have extensively considered the issue in the *Book 10 on the Great Art of Light and Shadow*, in part 2 on a marvelous order of things as seen through microscopes and the things recently discovered by us using microscopes, we refer the Reader to this excerpt. Therefore, here we shall consider only the nature and properties of the voice in some animals, lest it should seem that we have omitted something in our musical work.

Section 1

On the animal voices in general

There are three types of animals that can be taken into consideration: quadrupeds, birds and insects, none of which is apt to sing or talk, with the exception of some birds (that with their sweet singing caress the ears of listeners, and dazzle them with their prattle emulating the human speech).[2] For their

[2] Kircher draws a distinction between sound and voice in animals, as well as their musical abilities. Similarly, in Aristotle's *Historia animalium* I, 488a, one reads: "Some animals utter a loud cry, some are silent, and others have a voice, which in some cases may be expressed by a word, in others it cannot. There are also noisy animals and silent animals, musical and unmusical kinds, but they are

tongue does not match the larynx, and has – as it has been proven by the anatomy – no ability to pronounce vowels and consonants. It is not surprising that they lack an articulated speech. Therefore, contented with the voice given by nature the cow moos,[3] the sheep bleats, the dog barks, the horse neighs, the elephant trumpets, the lion roars, the donkey brays, the bear growls, etc. Although this sound is not the only one, nor is it *ισότονος*,[4] so as not to admit other types of sounds for expressing internal emotional states. For the dog utters a different voice while fawning on somebody, another one while it is angry, or while barking at strangers, a different one while it is encouraged to mate having been excited by a sexual stimulus. The same should be said of all other animals. And this is the language, by means of which the animals of one kind can understand each other through the most outstanding God's providence. However, this language is for us by no means perfectly understandable, unless from the external signs and effects. And the issue whether and in what manner a man can really understand the language of all animals will openly be discussed elsewhere, for it does not belong to the issue raised here.

Natural voices in animals

Animals understand each other by means of their natural voices

Section 2

On the American quadrupedal animal called the sloth and the admirable shaping of its voice

Had the music been first invented in America, I would say that it would undoubtedly have its origins in nothing else than in the voice of this amazing animal.[5] However, before we explain it, let us first outline the description of the whole animal, which was presented to me orally – the same year I write these things – by the

The description of the animal "haut"

mostly noisy about in the breeding season." The English translation is from Richard Cresswell's *Aristotle's History of Animals in Ten Books* (5).

[3] Mersenne mentions that the cow makes sound in the major tenth interval (Mersenne, *Harmonie universelle*, *Traités des consonances* Book 3, 149).

[4] Meaning 'of the same pitch'.

[5] One may read a similar statement in the chapter devoted to the sloth in *De la natural historia de las Indias* by the Spanish historian Oviedo (1478–1557), who made several trips to America where he spent, in total, more than twenty years: "Sin duda me parece que … oyendo aqueste animal el primero inventor de la música pudiera mejor fundarse para le dar principio, que por causa del mundo" (Oviedo f23r) – "Undoubtedly, it seems to me that … rather by hearing such animal [as the sloth] than by any other thing in the world, the first inventor of music might have its first principles" (my translation).

Reverend Ioannes Toro,[6] the governor of the Province of the New Kingdom in America, who had these animals, and performed lots of experiments as to their abilities and qualities. The shape and nature of this animal are unusual. It is called the sloth because of the slowness of its movement. It has the size of a cat, a hideous figure, and protruding claws in the likeness of fingers, sticking-out hair in the back of his head covering the nape, and a large, fatty stomach sweeping the soil. It never stands on its legs, and it treads so slowly that even in fifteen days it can hardly proceed by a continuous march at a distance of an arrow-length.[7] Furthermore, it is not known what the sloth eats, for one never sees it eating anything.[8]

The sloth dwells mainly in the forest canopy: ascending the tree takes him nearly two days, and he needs the same amount of time to descend.[9] Moreover, it seems that the nature equipped the animal with a double armor against wild and unfriendly animals. The first armor is in its legs, in which the nature placed so much strength that any animal caught by the sloth is held so tightly[10]

The armor of the animal against an external force

[6] The reference is to the Jesuit Juan de Toro Zapata (1597–1654), rector of the Cartagena college in the New Kingdom of Granada in northern South America.

[7] Two-toed sloths are indeed very "clumsy" on the ground, where their performance is of 0.06 m/s, while in the trees they move at 0.13–0.17 m/s. A study involving putting three-toed sloths on level surfaces of various textures proves – disclaiming their descriptions as being almost "helpless" on the ground and unable to support themselves – that they can crawl perfectly well (Moraes-Barros 106; Pauli 121).

[8] The lack of information on the food of folivorous sloths made some historians and explorers refer to the indigenous peoples' belief that these animals must live off air – as in Léry's *Histoire d'un voyage* – or made them come to the same conclusion, as one may learn from Oviedo's chronicle, in which we read: "[S]e sube a la cumbre más alta de las ramas, y se está en el árbol ocho y diez y veinte días, y no se puede saber ni entender lo que come; yo le he tenido en mi casa, y lo que supe comprender de este animal, es que se debe mantener del aire: y de esta opinión mía hallé muchos en aquella tierra, porque nunca se le vido comer cosa alguna, sino volver continuamente la cabeza o boca hacia la parte que el viento viene, más a menudo que a otra parte alguna, por donde se conoce que el aire le es muy grato" (Oviedo f23r) – "[I]t ascends the top of the highest branches, and remains in the tree eight, or ten, or twenty days, and one cannot know or understand what it eats. I kept it at my place, and what I have managed to understand of this animal is that it must live off air. Many of those regions are of the same opinion, for they have never seen it eating anything, but continually turning its head or mouth toward the side from which the wind blows, more often than toward any other side, from which it may be deduced that the air pleases it" (my translation). See also Léry 168–69.

Nevertheless, in some sixteenth- and seventeenth-century writings it is mentioned that sloths live off leaves and buds, like in those of José de Anchieta, Pêro de Magalhães Gândavo, Gabriel Soares de Sousa, Georg Marcgrave (*Cartas* 119; Magalhães Gândavo 22; Sousa 236; Marcgrave and Piso 221).

[9] Two-toed sloths are typical arboreal animals, which descend to the forest floor to search for isolated feeding trees or to defecate and urinate once every 3–5(8) days (depending on the species). Three-toed sloths behave similarly (Moraes-Barros 106, 111; Pauli 121).

[10] The two-toed sloth's grip is firm thanks to its enhanced flexor musculature "to the point where a dead sloth is said to continue to hang from the branch" (Moraes-Barros 105).

that it can by no means liberate itself from the claws of the sloth which forces the animal to starve because of the long-lasting detention. Another armor is such that the sloth disturbs with its appearance the people threatening it: they refrain from molesting it, moved by the most profound compassion. Furthermore, besides tears pouring out of its eyes, the sloth strikes its spectators so strongly with its painful appearance that it easily persuades them one shouldn't trouble what the nature put before them as so defenceless and of such a miserable appearance. In order to gain experience in this issue, the previously mentioned Father managed to purchase one of these animals for the Carthaginian College of the New Kingdom of our Order. He put a long stick under the legs of the sloth, which soon grabbed it very tightly and didn't let it go. The animal thus tied up, after it had voluntarily hung, was, together with the stick, placed in a separated place between two beams. And during forty entire days the sloth remained thus hung without eating, drinking or even sleeping, with its eyes continuously staring[11] at its spectators moved to such an extent with its painful appearance that there was hardly anyone who did not feel compassion towards it. At last, after having been liberated from the long hanging, the sloth was given a dog. The poor dog, being soon grabbed by the sloth's legs, was held for four entire days so tightly that eventually exhausted, died from starvation. These are the words of the aforementioned Father.

Admirable things of the animal

Furthermore, it is said that (and we now return to the intended subject) the voice is made by the animal only at night, and is indeed extraordinary. For the sloth – with its voice characterized by a disrupted length of a single sigh, that is, a semi-pause, ascending and descending the degrees of the commonly known interval of the sixth[12] – perfectly emulates pupils chanting the first degrees of a musical scale: *ut*, *re*, *mi*, *fa*, *sol*, *la*; *la*,

[*The sloth*] *perfectly reproduces musical intervals by means of sound and voice*

[11] Two-toed sloths spend time sleeping and "resting, awake but inactive, with their eyes either closed, or open.…" In the wild, for about eleven hours, throughout most of the night, they may be awake and on the move, foraging and grooming. However, in captivity, it has been recorded that they can sleep or rest for up to twenty hours a day. Low levels of activity are also typical of three-toed sloths (see Moraes-Barros 107; Pauli 123).

[12] Another animal singing in a hexachord is a bird called by the American population the "unau" as we read in Mersenne's *Traités des consonances, des dissonances, des genres, des modes, et de la composition*: "et l'oiseau que les Américains nomment *Unau*, et que nous appellons le *Paresseux*, chante ordinairement en répétant six fois *Ha*, *ha*, *ha*, *ha*, *ha*, *ha*, au même ton de nos six notes, *La*, *sol*, *fa*, *mi*, *re*, *ut*...." (Mersenne, *Harmonie universelle*, *Traités des consonances* Book 3, 149) – "[A]nd the bird that the Americans call the *Unau*, and we call the *Lazy* usually sings repeating six times: *Ha*, *ha*, *ha*, *ha*, *ha*, *ha* at the same tone of our six notes: *la*, *sol*, *fa*, *mi*, *re*, *ut*..." (my translation).

sol, *fa*, *mi*, *re*, *ut*[13] to such an extent that the Spaniards, when they first came to these shores and heard at night this type of screams, thought that they heard people familiarized with the rules of our music. The animal is called by the inhabitants the "haut", the reason being nothing else than repeating by single degrees of the sixth interval the syllable: *ha*,[14] *ha*, *ha*, *ha*, *ha*, etc.[15] However,

[13] Kircher's description of the sloth's musical ability is similar to that which one may find in *De la natural historia de las Indias*, the difference being that in Oviedo's description the sloth sings only in a descending hexachord: "Su voz es muy diferente de todas las de todos los animales del mundo, porque de noche solamente suena, y toda ella en continuado canto, de rato en rato, cantando seis puntos, uno más alto que otro, siempre bajando, así que el más alto punto es el primero, y de aquél baja disminuyendo la voz, o menos sonando, como quien dijese, *la*, *sol*, *fa*, *mi*, *re*, *ut*; así este animal dice, *ha*, *ha*, *ha*, *ha*, *ha*, *ha*. Sin duda me parece que así como dije en el capítulo de los encubertados, que semejantes animales pudieran ser el origen o aviso para hacer las cubiertas a los caballos, así oyendo aqueste animal el primero inventor de la música pudiera mejor fundarse para le dar principio, que por causa del mundo; porque el dicho perico ligero nos enseña por sus seis puntos lo mismo que por *la*, *sol*, *fa*, *mi*, *re*, *ut* se puede entender. Tornando a la historia, digo que después que este animal ha cantado, desde a muy poco de intervalo o espacio torna a cantar lo mismo. Esto hace de noche, y jamás se oye cantar de día" (Oviedo f22v, f23r) – "It's voice is much different from all the voices of all animals of the world, for it resounds only at night, and it [the sloth] continually, from time to time, sings six notes, one higher than another, always descending, so that the highest note is the first one from which it descends diminishing the voice, or less resonating, it is as if a man says: *la*, *sol*, *fa*, *mi*, *re*, *ut*. This is how this animal says: *ha*, *ha*, *ha*, *ha*, *ha*, *ha*. Undoubtedly, it seems to me that – as I have said in the chapter on armadillos that such animals might be the origin or advice for saddling up horses – similarly, rather by hearing such animal [as the sloth] than by any other thing in the world, the first inventor of music might have its first principles; for the said sloth demonstrates to us with its six notes the same thing that one understands by *la*, *sol*, *fa*, *mi*, *re*, *ut*. Returning to the main point, I say that this animal, having sung, after a very short period of time or pause, begins to sing the same thing. It does it at night, never is it heard singing during the day" (my translation).

[14] André Thevet (1516–1590), in his *Les singularités de la France antarctique* and *La cosmographie universelle*, gave a different reason for calling the sloth *haüt* or *haüthi*: the animal owed its name to the tree called *amahut*, in which it spent its time and with the leaves which it lived off. One may find the same two names as well as the same explanation in Gessner's *Icones animalium*, in which the passage devoted to the description of the sloth is much similar to that of Thevet's (*Les singularités de la France antarctique* 100; *La cosmographie universelle* 941; Gessner 96).

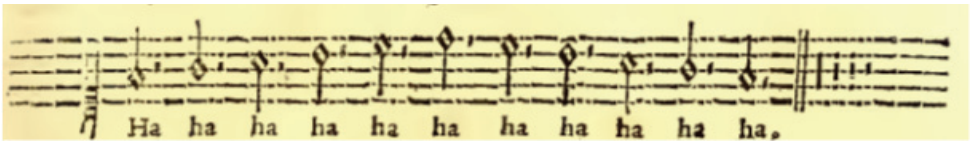
The sixteenth- and seventeenth-century historians, explorers, and naturalists cited different names of the sloth in the indigenous languages, such as *ahy*, *aig*, *hay*, *unau* (the last name being the same as that which was given by the American population – according to Mersenne – to a bird singing like the sloth in Kircher's description, that is, in a hexachord by repeating the same syllable: *ha*). See *Cartas* 119; Léry 168; Marcgrave and Piso *Historia* 222; Sousa 236.

Still nowadays the three-toed sloth is called in the indigenous Guarani language *ai's*, a name which refers to one of the soft calls this animal makes, that is, the shrill "ai, ai" sounds whistled through its nostrils; whereas the two-toed sloth is referred to as *unau*. Both genera may be called *perezoso*, which means "lazy" in Spanish, by reason of the slowness of their movement (Barnett 167; Naples 153).

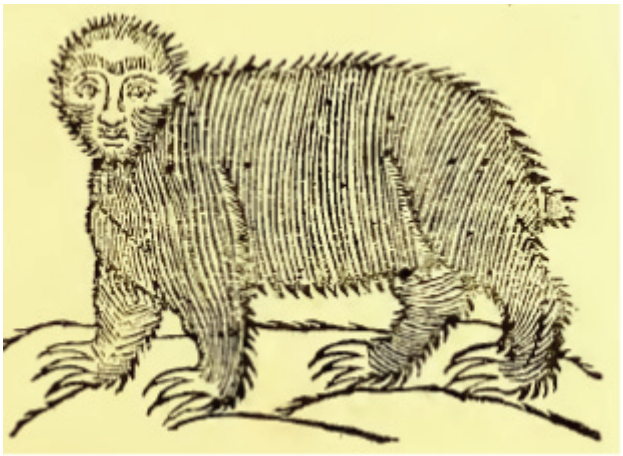
[15] As to the communication among two-toed sloths, newborns and infants are capable of loud vocalizations toward their mothers by giving a distress call in the form of short bleats (1.4 kHz) when falling or separated from their mothers. Their calls are lower pitched than the whistle of their three-toed sloth counterparts – which is shorter than one second and rises from 1.9 kHz to 2.6 kHz – as well as below the average that is characteristic of birds singing in the lower parts of the forest canopy. Adult

to better fathom the figure of the animal and his voice, I have decided to put it all here in a single illustration before the Reader's eyes.

The music of the *haut*, that is, the sloth, an American animal



The appearance of the *haut* animal



Nevertheless, it is surprising that never has any dissection of this kind of animals been carried out by anybody; for from the internal bodily structure they could easily guess its natural abilities. If it had a muzzle and teeth, if it had a stomach, I cannot understand why the nature would give it useless body parts serving for storing food.[16] But I do not doubt that, in future, our American fathers influenced by my instructions will carry out a more thorough study of this topic.

male and female two-toed sloths can only hiss during breeding, which occurs throughout the year. Adult female three-toed sloths use vocalizations to attract mates during seasonal breeding. Their adult males can be aggressive to one another by pummeling each other and emitting high-pitched calls (Moraes-Barros 110, 113–14; Pauli 123–24).

[16] Kircher's statements as to the sloth's appearance and its lack of usefulness are similar to Oviedo's: "[N]i he visto hasta ahora animal tan feo, ni que parezca ser más inútil que aqueste" (Oviedo f23r) – "So far I have never seen such an ugly animal or a creature that would seem more useless than this one" (my translation).

We will not discuss the voices of the remaining quadrupeds – for they are known everywhere – but we will direct our quill pen towards the description of the voices of some birds.

Section 3

On the voices of birds

The grey parrot, the imitator of human speech

Furthermore, among other animals, birds were given the greatest ability to sing and talk. As the elephant with its caution and memory, the deer with its fidelity, the monkey with its gesticulation, the fox with its treacherous cunningness, so the grey parrot and the nightingale, among the animals, stand out with their talking and singing. We shall first discuss the grey parrot, that is, an Indian bird. Nothing is more common than this animal which is equipped by the nature with such abilities that with its bright talent and its way of talking (that are typical of our intelligence) it does not seem so much different from a man.[17]

> *When the parrot expresses with its voice the human sounding speech*
> *Oh parrot, the light of birds, fecund delight of your master*,
> *Oh parrot, a clever imitator of the human voice.*[18]

Caelius[19] tells about a grey parrot that a noteworthy and strange event was seen in his own times: the parrot – he writes – that Ascanius,[20] a Roman cardinal, had purchased for a hundred of golden coins, pronounced the Apostles' Creed flawlessly, smoothly and very clearly, without interruption, like a human, with words fluently following each other.[21]

[17] Similarly, we read in *Il canto de gl'augelli* by Antonio Valli that the parrot is the most common bird among all birds, and one cannot find a bird similar to it, for the parrot has different colours, and displays a remarkable ability to talk. It can pronounce the words distinctly, and it often sings together with the man (Valli 23).

[18] The first line is not authentic, whereas the two other lines are from: Publius Papinius Statius, *Silvae* II, 4, 1–2. Currently, the valid version is that with *dux*, and not *lux* (Statius).

[19] The reference is to Ludovico Ricchieri (1469–1525), also known as Caelius Rhodiginus.

[20] The reference is to Ascanio Sforza (1455–1505).

[21] According to Stephano Morino's *Exercitationes de lingua primaeva eiusque appendicibus*, Ludovico Ricchieri narrates the story in his *Lectiones antiquae III*, 32. The story is also mentioned by Baldassarre Bonifacio in his *Ludicra Historia* (516).

Likewise, when Basil,[22] the Byzantine Emperor, imprisoned his son Leo[23] upon the advice of Santabareni,[24] for he allegedly had conspired against his father, and when, in addition, the whole house was resounding with moaning and sorrow due to Leo's cruel fate, and particularly when the weepers were wailing bleakly and mournfully funeral songs, a grey parrot, enclosed in a cage, while hearing more frequently and trenchantly the name of Leo together with lamentations and funeral words, learned them. As soon as Basil heard the grey parrot making human-like sounds and pronouncing the name of Leo, immediately curbing a little bit his anger, allowed his implacable attitude to somewhat diminish the roughness of his manner, fearing that generations to come would say that he had been defeated by the bird in showing mercy. He released his son from the prison, treated him better, and, eventually, on his deathbed handed over to him. At some later time, Leo would believe that his salvation had been entailed by the grey parrot's garrulousness. We encounter innumerable stories of the kind in historians' writings, which, however, I have deliberately decided to omit, lest I should go beyond the limits of the subject.

An admirable case of a grey parrot

One can raise a question of what physical ability was given to this bird to articulate words. Who – I say – has explained in the grey parrot its *χαῖρε*[25]? Undoubtedly, the admirable body structure of the animal itself and a great affinity of its bodily parts to those of a man display the conspicuous size of its head, a capacious mouth equipped with a large cavity, the mobile upper part of the bill, the prominent jaws like in humans, and a broad, thick and fleshy tongue. The grey parrot has three protuberances situated under the tongue and near its root, with which the tongue is revolved in a strange manner. The beginning of the trachea is not as in other birds, in which it equals the remaining part of the tube, but at the top, under the glottis, it is considerably broader, as I remember noticing this during the dissection. Since other

The grey parrot's vocal organ is almost similar to that of humans

[22] The reference is to Basil I (811–886), called the Macedonian.

[23] The reference is to Leo VI (866–912), called the Wise or the Philosopher.

[24] The reference is to Theodorus Santabareni. Jean Cabassut relates: "Mortuo tamen Basilio, filius eius Leo imperator cognomine Philosophus, quem nebulonis illius Theodori Santabareni dolis et calumniis in suspicionem adductum pater diu in vinculis detinuerat, hanc ultus est iniuriam in Santabarenum, quem flagro caesum et oculis orbatum in exilium trusit" (Cabassut 374–75) – "However, when Basil died, his son the emperor Leo, called the Philosopher – kept for a long time as a prisoner by his father after the suspicion had been cast upon him due to the dishonest Theodorus Santabareni's trickery and sophistry – avenged himself for this injurious treatment on Santabareni: he sent Santabareni into exile after having him whipped and having gouged his eyes out" (my translation).

[25] Meaning 'Hello!'.

birds lack these elements, with some limited exceptions, it is not strange that the grey parrot has been equipped with a gift of human speech more than others. I remember seeing partially the same structure in a magpie, hence its extraordinary garrulousness, in which it sometimes greatly surpasses even the grey parrots. I saw a magpie that had learned both to talk and sing with such fluency that if somebody did not see it, they would think it was a man's talking, according to what Martial wrote:

The magpie, the imitator of human voice

A chattering magpie, I greet you as "lord" with a clear voice.
If you did not see me, you would say I am no bird.[26]

According to Nifo,[27] magpies emulate so precisely the hunter's voice that they cheat even dogs. Pausanias himself narrates in his *Arcadia*[28] that a magpie imitated so skillfully the whimpering of an infant that it guided Hercules and helped find his son, Athenagoras.[29] The magpie can also emulate other animals' voices, as Oppian[30] relates. It lows as a calf, bleats as a sheep, whistles as a shepherd.[31]

The magpie's admirable variety and skillfulness in voice formation

[26] This comes from Marcus Valerius Martialis's *Epigrammata* (XIV, 76). The English translation is from Martial 256–57. Similarly, we read in Ovid's *Metamorphoses* (V, 294–99) about magpies reproducing human speech: "While the muse was still speaking, the sound of whirring wings was heard and words of greeting came from the high branches of the trees. Jove's daughter looked up and tried to see whence came the sound which was so clearly speech. She thought some human being spoke; but it was a bird. Nine birds, lamenting their fate, had alighted in the branches, magpies, which can imitate any sound they please." The English translation is from Ovid 258–59.

[27] The reference is probably to Agostino Nifo (1473?–1538?), also known as Augustinus Niphus.

[28] Book 8.

[29] *Description of Greece* VIII, 12: "Thirty stades farther is a plain called Alcimedon, and beyond the plain is Mount Ostracina, in which is a cave where dwelt Alcimedon, one of those called heroes. This man's daughter, Phialo, had connection, say the Phigalians, with Heracles. When Alcimedon realized that she had a child, he exposed her to perish on the mountain, and with her the baby boy she had borne, whom the Arcadians call Aechmagoras. On being exposed the babe began to cry, and a jay heard him wailing and began to imitate his cries. It happened that Heracles, passing along that road, heard the jay, and, thinking that the crying was that of a baby and not of a bird, turned straight to the voice. Recognising Phialo he loosed her from her bonds and saved the baby. Wherefore the spring hard by is named Cissa (Jay) after the bird." The English translation is from Pausanias 404–7.

[30] The reference is to Oppian of Apamea, the author of an extant poem on hunting (*Cynegetica*) and a lost poem on bird-catching (*Ixeutica)*.

[31] Similarly, we read in a paraphrase by Eutecnius the Sophist (*De Aucupio* I, XV), dated between the third and the fifth centuries CE: "Picae in vocis imitatione singularem naturam et quam diversa animalia repraesentet, quis facile dixerit? Ego aliquando garrientem picam audiens haedi vocem arbitrabar, qui a matre separatus iuxta arborem eam requireret, cui pica clamans insidebat. Et iterum edito

Furthermore, magpies like the words they pronounce. Not only do they learn, but also they like learning, deeply contemplative and in diligent pensiveness, without concealing their involvement.[32] It is all confirmed by Plutarch's words:[33] some barber – he says – had his business in front of a temple called the Square of the Greeks.[34] He kept a garrulous magpie with a remarkably sonorous voice that emulated human speech and cow sounds, as well as the sounds of musical instruments. Not compelled by anyone, but on her own accord, she tried hard to reproduce all the voices and express by singing all sonorous things. It happened one day in the vicinity that some rich man was carried in a funeral procession to the blast of many trumpets, and when in accordance with custom the procession stopped there, the trumpeters – who were applauded – extended the play, as they were told to do so. From that day on the magpie became so mute, so deprived of any voice that she did not reproduce even what she had usually considered as indispensable to signal. Everyone was surprised by her sudden silence, and different people assumed various reasons for it.[35] However, the reason being nothing else than self-improvement and the passionate desire to prepare herself in order to emulate the sounds of the trumpets, for she shone again, without, however, producing usual voices, but only the music of the trumpets, imitated so skillfully that all modulations and rhythmical proportions were expressed. The reason for the extraordinary garrulousness in the magpie being certainly nothing else than the structure of its larynx and tongue, as well as its innate and astute ability. Moreover, magpies are emulated by all the other birds that have the same structure of the vocal organ, like jackdaws and ravens, about which you should consult ornithologists who discuss the issue more thoroughly.

An attention-worthy case of a magpie

mugitu vitulum referebat; deinde ovis instar balabat; postremo fistulam sive sibilum pastoris imitabatur, quo ille post pascua oves ad potum ducit" (Eutecnius 325) – "Who would easily say that the magpie is endowed with an unusual ability to imitate voices and how well it emulates different animals? Hearing once a magpie chattering, I thought it was a voice of a young goat, which separated from its mother was trying to find her near a tree on which [as it turned out] was seated a magpie uttering a loud noise. Next, the magpie reproduced a calf's bellowing, then she bleated as a sheep; lastly she imitated a shepherd's pipe, that is, the whistling by means of which he leads his sheep to drink after grazing" (my translation).

[32] Cf. *C. Plini Secundi* X, 118.

[33] See Plutarch's *De sollertia animalium* 19 in his *Moralia*. He writes that he heard the story from many Greeks and Romans who were eye-witnesses.

[34] In Rome.

[35] Indeed, we read in Plutarch: "Some suspected that she had been poisoned by rival bird-trainers, but most conjectured that the trumpets had blasted her hearing and that her voice had been simultaneously extinguished." The English translation is from *Plutarch's Moralia* 402–3.

Section 4

On the nightingale

The nature rightly exhibited the idea of all music in the nightingale[36] so as to make music teachers learn how a perfect theory of singing should be organized and what melodies should be produced in the throat. The nightingale is not less eager to demonstrate to listeners the sweetness of its sound than the peacock to show the beauty of its tail. This bird is not only *φιλόμουσος*[37] but also *φιλόδοξος*,[38] for in solitude singing a simple melody only for herself, she sings it without adornments, or sings in order to exercise. However, should the nightingale encounter close listeners, she will reproduce numerous sounds displaying the richness of her voice with a remarkable variety.[39] For the nightingale monotonously reproduces melodious sounds for long periods of time, or modulates them; in a while she sings more delicately and for a short time, or hurls and makes her voice move very quickly; then she strains her voice or relaxes it; she sings some sequences as long as heroic verse, while others short – like a Sapphic verse, and occasionally very short – like an Adonic verse; she knows even musical tricks and scales. Furthermore, the young learn between themselves and try to emulate what they hear from the elder: just like a pupil who listens to his teacher with particular attention, and one can see that the teacher finds fault with [the pupil's performance] and corrects him. Who could not marvel enough that such a powerful voice is in such a small body? Such strong a spirit? The voice in a nightingale's throat can be continued by an uninterrupted breath for a longer time, or it can be changed through the modulation of a breath; it may be divided by short breaths, or combined into complex sequences, and then

The ambitious and enamored of praises nightingale's nature

Praise for the nightingale and the remarkable variety of her voices

[36] Since ancient times the nightingale has been regarded as having the most beautiful voice. One can read in Claudius Aelianus's (also known as Aelian) *De natura animalium* I, 43: "The nightingale has the clearest and most tuneful voice of all the birds, and lonely places are full of its melody." The English translation is from *Aelian's On the Nature of Animals* 16.

[37] Meaning 'showing a liking for music'.

[38] Meaning 'having a liking for fame'.

[39] In this excerpt Kircher clearly refers to the description of the nightingale in Claudius Aelianus's *De natura animalium* V, 38: "Charmidem Massiliensem audio dicentem, non modo musicae perstudiosam esse lusciniam, verum gloriae etiam cupidam. Cum enim in deserta solitudine sibi tantum canit, tum simplicem cantum et minime elaboratum edit; cum autem captiva tenetur, et non caret auditoribus, cantum variat, eumque molliter inflectit." The Latin translation is from *De natura animalium Claudii Aeliani*, http://penelope.uchicago.edu/Thayer/L/Roman/Texts/Aelian/de_Natura_Animalium/5*.html.

announced during a pause, or suddenly lowered. Sometimes the nightingale murmurs to herself, or reproduces a clear, low or high sound, often repetitive and continuous; and, when she feels like it, her sound is vibrant and the highest one, or sung in the middle register, or is the lowest one. To put it briefly, in such a narrow throat the nightingale reproduces anything what man's art has invented with so many sophisticated pipes. As if that were not enough, each nightingale can sing more melodies, and it does not happen that all nightingales sing the same melodies, but each nightingale has her own melodies. Nightingales rival with each other, and a passionate dispute openly arises, that ends a nightingale's life with death, the breath being exhausted first than the desire for singing.[40] The nightingale can rightly be called the epitome of all harmonic singing.

However, let us return to our intended subject. Given that I used to observe with great astonishment the bird's extraordinary ability to modulate her voice, I had the strongest desire not only to transcribe into musical notes these remarkable cadences, but also to describe the anatomy of this little bird, so as to make more clear the cause for such modulations. I have done both, for we will soon see that I have assigned to a musical scale the cadences of the songs heard from the bills of the singing nightingales, and I took great care for the dissection to be carried out in my presence by Johannes Trullius,[41] a great anatomist, so as to carefully observe the individual parts of the larynx.

The anatomy of the nightingale

First, we observed a very short tongue, and a strangely fibrous and fleshy larynx, whereas other parts did not differ from the anatomy of other birds. Therefore, I deduced that all the variety of voices came from innumerable fibers, with which the glottis was squeezed, or loosened, extended in both directions, or contracted, and bent in every direction, while the tongue articulated, like a plectrum, individual voices. Therefore I inferred that these guttural diminutions – which eunuchs produce in their throats, called the trills – performed not with the tongue, but with the glottis itself, were nothing other than a throat tremor produced in the opening of the glottis through exhaled air. I have decided to focus on the presentation of the musical voices of the majority of birds that demonstrate their musical ability, as seen through my own experience and observation,[42] so as to describe briefly many things for

[40] Kircher's first paragraph is to a large extent a paraphrase of Pliny the Elder's passage on the nightingale. Cf. *C. Plini Secundi* X, 81–83.

[41] The reference is to Giovanni Trulli (1598–1661), a papal surgeon.

[42] Musical transcriptions of bird sounds are presented in plate III in Kircher's *Liber anatomicus de natura soni et vocis* included in the present article.

the Reader's curiosity, and so as not to be accused of having omitted anything from interesting things.

What is "glottismus"?

Therefore, firstly, so as to demonstrate more precisely individual twittering, trills, or smaller note values in hissing (which from now on we will call the *glottismi*,[43] for they are produced by the glottis) in accordance with their duration, I took a foot-and-a-half-long string that precisely represented with its back and forth vibration the pulse of a healthy human, and with it I measured the time, that is, the duration in *glottismi* of a nightingale. Furthermore, I assigned to an average measure of musical time (commonly called the bar, and by the Italians – *battuta*) single pairs of the back and forth movement, so that a *diadromus* of a cord, or the back and forth vibration, represents the arsis, and the other one – the thesis. With the utmost care, I began my observation early in the morning in an appropriate place and I discovered that nightingales organized their twittering *glottismi* at times by *semiminimae*, at times by *fusae*, and occasionally by *semifusae*. And when they adorned smaller *glottismi*, that the Italians call the *trilli*, they performed them with such a great speed that they could not be written down with *semifusae*, for they are too slow; hence, *trifusae* and *quadrifusae* had to be used to express the properties of the modulation (that is, of which 32, or 64 compose one measure). But, as I have noticed that these *glottismi* were numerous, I deem it right to name those that are very pure and produced with a clear and sonorous voice *pigolismi*,[44] those performed by murmuring – *teretismi*;[45] and those *glottismi* which are performed within a range of the same interval and continued with an interrupted voice – *glazismi*.[46] With these three terms we cover all remaining types of *glottisimi* and their differences. However, I thought it fit to represent these types on the plate III[47] so that one would not think that, while serving the Reader's curiosity, we omitted something. These are the *glottisimi* demonstrated by the nightingale, apart from which, undoubtedly, exist other *glottisimi*, that I have not managed to notice, and which would not exist, if we took into

An experiment carried out by the author on a nightingale

What is "pigolismus"?

What is "glazismus"?

[43] Ionic *γλῶσσα* (in Attic dialect: *γλῶττα*) means 'tongue', *γλωσσός* – 'talking, chattering', *γλωσσώδης* – 'talkative, babbling'. See *A Greek-English Lexicon* 353.

[44] The etymology of the term is unclear.

[45] Greek *τερετίζω* means 'tune' (*A Greek-English Lexicon* 1776).

[46] Greek γλάζω means 'sing, noise' (Macbain 195).

[47] In the present article plate III is reproduced before plate II due to the order of issues raised by Kircher.

account the voice modulation. Nevertheless, they are countless, if we consider the mixing of voices; for nightingales demonstrate these *glottisimi* by single degrees of the double octave interval with a remarkable skillfulness, then they combine *pigolismi* with *glazismi*, and variously mix the latter with *teretismi*; hence, the infinite variety of modulations in singing. Therefore, whoever learns to emulate nightingales' twittering and to express perfectly these changes in notes, let them know that they will perfectly imitate also the melodies of all singing birds[48] in accordance with all rhythms and tempi.

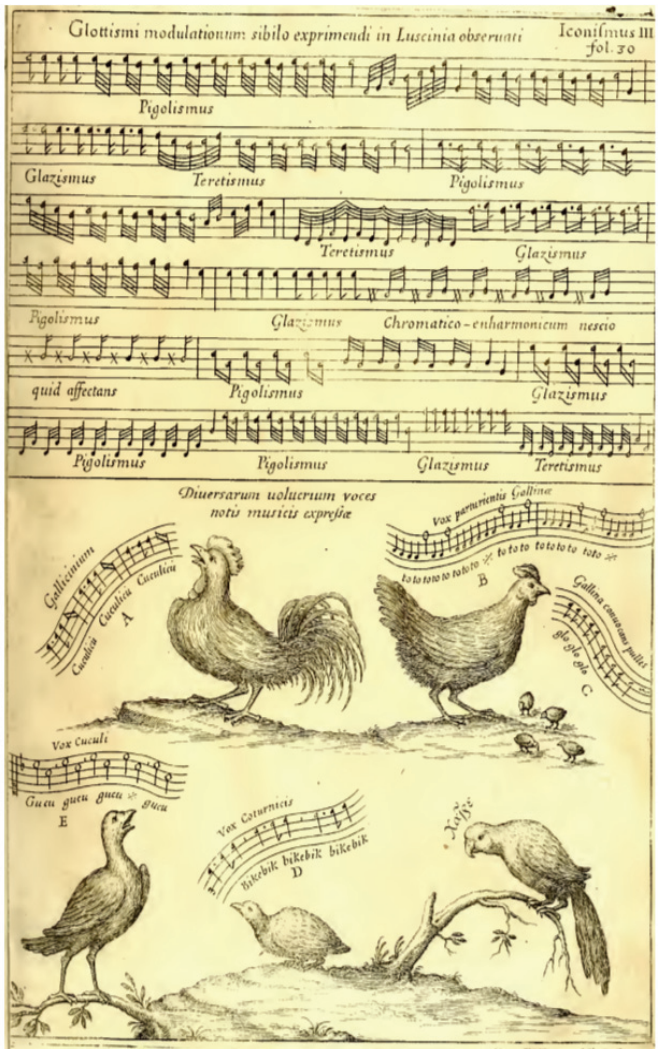
CONCLUSIONS

It is clear, from what has been said, that the tremor of the glottis – with which the nightingale amuses itself while producing this type of *pigolismi* and *teretismi* – is decidedly of the highest frequency, and it equals (as I have learned also through an experiment) the vibration of a string tightened by a one-pound weight, the length of which was one pace, and the thickness of which was approximately that of a blade of straw. The string would almost infinitely vibrate in one second after being struck. You will see that the glottis, while producing *pigolismi* or *teretismi*, vibrates as many times as the string, which openly reveals quite admirable God's providence in giving to this little animal – destined for the pleasure of a man's mind – such a high level of musical ability that not only in producing cadences does it surpass in swiftness all possibilities of a musical instrument composed of pipes, but also, making use of its ability, it mocks at the practice of all musicians. For not only does the nightingale remarkably imitate the diatonic type of singing, but also the chromatic and enharmonic ones, as can be seen in the third *glotissimus*. No instrument can produce the chromatic-enharmonic degrees more precisely than the nightingale with its throat. And I do not doubt that also this little bird,

[48] Both terms: *philomela* and *luscinia* mean 'nightingale', the former being used in a poetic language, whereas the latter – in prose. Therefore, should the literal meaning of Kircher's words be taken into consideration, the sentence would be deprived of sense ("[W]hoever learns to emulate nightingales' twittering and to express perfectly these changes in notes, let them know that they will perfectly imitate also the melodies of nightingales in accordance with all rhythms and tempi"). However, the sentence makes a perfect sense, if we assume that Kircher under the term *philomelae* takes into consideration not only nightingales, but all singing birds. In that case, Kircher plays here with the etymology and understands *philomela* as consisting of *φίλος* and *μέλος*, meaning 'having a liking for singing'. However, such etymology is not correct, for in the term *philomela* the vowel "e" is long (*φίλος* + *μῆλον*), hence the correct meaning is: 'having a liking for apples'. I thank Dr Konrad Kokoszkiewicz for this remark.

because of the suitable structure of its vocal organ, would be very capable of human speech, if there were a teacher who could perfectly express phones and syllables by hissing. And what Aldrovandus[49] says about three nightingales conversing with each other by day, and gabbing by night at an inn in the town of Agosta, many consider as made up, or believe that, surely, this could have happened only because of a stupendous fraud, or through the intervention of a demon. However, what we think about it, we deem it more suitably to tell in the next section.

Nightingales talking with a human voice



[49] The reference is to Ulisse Aldrovandi (1522–1605), an author of ornithological treatises.

Section 5

On the voices of the remaining birds

Let me just add here something worthy of attention, to which I would never have given credence, had I not been convinced by my own experience of its veracity. The facts are as follows: in Rome, at the famous monastery of the Order of Preachers, we can encounter the Very Reverend Magister Damian Fonseca the Portuguese, a man of great knowledge and authority, who, in his museum, keeps a caged bird of the family of *Alaudidae* called the *Gallandra*, so skillfully taught by the friars of the mentioned order that not only can she pronounce the Litanies of Saints nearly with a human voice, but also she can say many other things that one cannot observe without amazement. In the beginning, when the Reverend abbot of Santa Prassede, Didacus de Franchis, a man with a thorough knowledge of every discipline, had informed me about this phenomenon, I had not been convinced at all to give credence to what had been said for not having witnessed such a phenomenon with my own ears. Therefore, on March 16, 1648, accompanied by the said abbot and the Reverend Iacobus Viva,[50] an eminent mathematician of our Society, I entered the cell of the mentioned father, and while we were waiting in silence and with great attention for what was going to happen, eventually, the bird in question after very sweet cantillations and fairly numerous and various murmurs began pronouncing intelligibly and distinctly the names of the Saints in Italian, at one time adding these words: *ora pro nobis*, at another the words: *Iesus Christus Crucifixus*, then adding others and others; up to 70 different names so marvelously pronounced that nobody could believe that what they perceived as having been said by a human tongue was bird's. And although I remember reading many exotic things about different birds emulating the human voice – as already mentioned – I do not recall having read in any writings of historians that they had noticed something similar in *Calandra.*[51] Therefore, I infer that nightingales are not as untalented for both singing and articulating the speech as many believe; all the more so for the story about conversing nightingales at an inn in the town of Agosta – as states Aldrovandus – is not so outright αδύνατον[52] that someone may not believe it. On the contrary, I have no doubts that all birds endowed by nature with a melodious manner of singing, are also capable of reproducing the human voice.

[50] The reference is to the Swiss Jesuit Jacques Viva (1605–1650), who wrote the preface to Kircher's *Musurgia Universalis*.

[51] The reference is to the mentioned *gallandra*.

[52] Meaning 'impossible'.

The goldcrest follows the nightingale most closely, for she adopts some cadences in *glottismi* from the nightingale, even though she performs them less skillfully and not so fast. *Glottismi* are also executed – but always in the same manner – by the chaffinch, goldfinch, tit, flamingo, robin, skylark, and whichever existing singing birds, none of which, however, can reach the same variety in modulation as the nightingale.

Although other birds have a sonorous voice – as, for instance, the rooster, hen, cuckoo, swallow, hoopoe, tawny owl, quail, and the like – it is not, however, adorned with any types of the aforementioned *glottisimi*; for their voice with absolute certainty was not destined for the delight of humans. They produce only the voice that suffices for expressing their emotional states. I thought that I would not stray from the subject, if I discussed here the voices of some of them from a musical point of view.

And particularly the rooster produces different voices:[53] a specific voice when he is seized by jealousy, another one when he inseminates hens, or when he indicates the time – and this is the typical voice of the rooster, that is why it is called the *gallicinium.*[54] He modulates his voice almost in the same way as indicated by the A notes in the plate III, where the last note in the [*gallicinium*] is not of the same pitch as the previous one, but is a note immediately lowered by the interval of the third or the interval of the fourth.

The hen produces various voices in a similar way, for she screams differently when calling her chicks, differently when she is about to lay an egg, or when she is irritated, etc. While laying an egg, she performs a skip of a sixth from a unison, as shown by the B notes in the plate III. In the mentioned illustration, the C notes indicate the voice of a hen calling her chicks.

The quail always continually repeats a sequence of *pigolismi* instead of singing, as demonstrated by the D notes in the plate III.

The cuckoo – the name coming from the voice she produces – always cuckoos with a two-syllable word, not in unison but in an interval of the pure minor third[55] as indicated by the notes E in the plate III.

---

[53] According to ancient authors, lions and basilisks dread roosters' sound. One can read in Claudius Aelianus's *De natura animalium* III, 31: "At the sound of a rooster, a basilisk will go into convulsions and then die. This is why travelers in Libya, a place that breeds many monsters, carry roosters for protection against the terrible things that can happen to them there." The English translation is from *Aelian's On the Nature of Animals* 41.

[54] The term *gallicinium* 'rooster's crowing' combines two terms: *gallus* 'rooster' and *canere* 'to sing' (*A Greek-English Lexicon* 753).

[55] Also Marin Mersenne mentions that the cuckoo sings in an interval of the minor third (Mersenne, *Harmonie universelle*, *Traités des consonances* Book 3, 149.

The singing of all animals could be expressed in the same manner, if someone had enough time to observe how particular birds manage to articulate voices. Then they will discover in each bird a certain manner of moving its voice, completely distinct from that in other birds; and therefore swallows, hoopoes, fieldfares, partridges, sparrows, magpies, geese, starlings produce voices proper to them.[56]

The natural voices of birds

The Goldcrest, bee-eater, and swallow with a red breast, tend to chirp similar songs.[57]

Among all the birds, the blackbird best expresses harmonic modulations: what the parrot, magpie, raven, jackdaw are able to do in producing a human-like voice, what the nightingale and other singing birds can do in expressing *glottissimi*, the blackbird, among all other birds, is also able to produce, particularly if she is being taught by a skillful teacher guiding her. For hardly any type of song is so varied that the blackbird cannot learn it by producing particular notes so precisely that it does not err even in a smallest semitone. Furthermore, there are other birds to which ancient people ascribe great skill in singing, among which the swan is the first to come to mind.[58] Rumour has it that swans sing very sweet at the moment of their sudden death. Therefore, the swan song was celebrated in the works of ancient poets and orators. And if we observe

The blackbird, an excellent singer

Can the swan sing?

[56] Kircher uses partly onomatopoeic words, those of Greek origin, and words whose etymology is not clear: *pupizare*, *kichlizare*, *titibizare*, *struthissare*, *kittabizare*, *gratitare*, *psitare*.

[57] Riese edited the excerpt as follows: "Regulus atque merops et rubro pectore procne / Consimili modulo zinzilulare sciunt" (Riese, 762 43ff).

[58] Indeed, we read in Aristotle's *Historia animalium* (IX, 615b): "Swans have the power of song, especially when near the end of their life; for they then fly out to sea, and some persons, sailing near the coast of Libya, have met many of them in the sea singing a mournful song, and have afterwards seen some of them die." Aelianus explicitly refers to this Aristotelian passage in his *De natura animalium* X, 36. Furthermore, he makes explicit reference to the passage on Hyperboreans' worship of Apollo on the island of Helixoia – for which swans were of great importance – from *On the Hyperboreans* by Hecataeus of Abdera. One reads in *De natura animalium* XI, 1 as follows: "So when at the customary time they perform the established ritual of the aforesaid god there swoop down from what are called the Rhipaean mountains Swans in clouds, past numbering, and after they have circled round the temple as though they were purifying it by their flight, they descend into the precinct of the temple, an area of immense size and of surpassing beauty. Now whenever the singers sing their hymns to the god and the harpers accompany the chorus with their harmonious music, thereupon the Swans also with one accord join in the chant and never once do they sing a discordant note or out of tune, but as though they had been given the key by the conductor they chant in unison with the natives who are skilled in the sacred melodies. Then when the hymn is finished the aforesaid winged choristers, so to call them, after their customary service in honour of the god and after singing and celebrating his praises all through the day, depart." These English translations are from *Aristotle's History of Animals in Ten Books* (244); Aelian 357–59.

the vocal organ of the swan, we will see with absolute certainty that it is more bizarre than any organ in all other animals. For one can see that the trachea, extending in the shape of a flexible spiral tube, is inserted into the sternum, and located in a hollow cavity, from where it emerges in order to be conducted around in a shape of yet another ring, and eventually enters the lungs in a form of a two-pronged canal. Such an extraordinary tracheal structure reveals something divine in voice formation. However, those who know the hidden plan of nature in the structure of organs, will easily see that the passages of this kind in the trachea are given not for music's sake, but for other purposes. Since the swan acts as an excellent diver, and from time to time is occupied under the water for many hours digging in the mud and searching for necessary food, first it needed a long trachea according to the length of its neck. But because that was not enough, the nature inserted a hollow sternal canal, so that the air necessary for breathing could be contained there, as if in a bag, and so that the swan would not be forced to emerge leaving the food behind. This remarkable trachea was given by nature, so that in it, as in a bellows, the swan could store indispensable air, which can be observed in all birds catching fish and in all diving birds.[59] If such a trachea was given to the swan for music's sake, it is obviously strange that nowhere and never has such an exceptional concert given by swans been witnessed in our times. Therefore, I find this swan song to be fabulous and introduced by the poets writing about nymphs, who – because of their white colour – were called by them the swans. For not always the nature endows animals with the vocal organ to beautifully shape the voice, but for other uses which are necessary for an animal to live, as demonstrated in this organ of the swan. Otherwise, the hog, that was endowed by nature with an absolutely beautiful larynx, would sing best and most sweet of all the animals, which is ridiculous, not to say stupid, to think so.

The anatomy of the swan

Why did nature give such a long trachea to the swan?

[59] Kircher is mistaken, for air is not stored in the trachea, but in the air sacs that are connected to the lungs. The trachea serves for producing sound, and its length is related to the pitch of sounds. I thank Professor Jerzy Dzik for this remark.

Section 6

On the voices of some insects, like frogs,[60] *cicadas, grasshoppers and crickets*

Also insects have their own voices, deliberately and fairly given to them by the smart nature so that they can function properly. Who does not know the hiss of snakes? The basilisk's hiss is, if one were to believe Pliny's[61] words, so terrible that all animals, terrified, run away.[62] But putting aside these examples, we have decided to explain here only two types of voices, which quite astonish the listeners, and these are: the croaking of frogs and the chirping of cicadas, grasshoppers, and crickets. It is beyond any doubt that I have not omitted any experiment in order to discover the cause of such a mysterious voice. I had decided to elaborate a perfect anatomy of these animals, by means of which, eventually, my wishes were completely fulfilled, for I quickly gained, through a thorough and visual observation, the knowledge of the things about which I had had doubts in the beginning.

The basilisk's hiss

Section 7

On the cause of the frog's croaking

How do frogs produce a croak (called the ribbit)? Neither was Aristotle sure.[63] However, it is certain that the frog does not produce voice with the glottis,[64] but with another bodily part, whose anatomy we will present first in order to gain knowledge of it, and

The croaking of the frog

[60] Kircher made a mistake in the title of the section. It is highly probable that he inserted the reference about the frogs after writing down the title. In Aristotle's classification frogs are classified as tetrapods (*Historia animalium* II, 506a). I thank Professor Mikołaj Szymański for this remark.

[61] The reference is to Pliny the Elder.

[62] See *C. Plini Secundi* VIII, 78. Similarly we read in Claudius Aelianus's *De natura animalium* II, 7. Not only the sound produced by the basilisk, but also its breath was believed to be horrible. One can read in an early Christian text *Physiologus*, dating from somewhere between the second and fourth centuries CE, that the basilisk withers the thicket with its breath; or in Claudius Aelianus's *De natura animalium* II, 5: "The basilisk is not very large, but even the largest snake shrinks from it at the mere smell of its breath. If a man is holding a stick and the basilisk bites it, the man will die" (the English translation is from *Aelian's On the Nature of Animals* 21).

[63] In Aristotle's *Historia animalium* IV, 536a, we read: "The tongue of a frog is peculiar, for the fore-part of it is fixed, like that of a fish; but the part near the pharynx is free and folded up. With this it utters its peculiar sound. The male frogs make a croaking in the water when they invite the females to coition.… The frog croaks by making its lower jaw of equal length, and stretching the upper one above the water. Their eyes appear like lights, their cheeks being swelled out with the vehemence of their croaking; for their copulation is generally performed in the night" (the English translation is from *Aristotle's History of Animals in Ten Books* 96).

[64] Kircher is mistaken for frogs do produce sound with a structure analogous to the mammalian glottis: air passes back and forth over the vocal folds stimulating vibrations. I thank Professor Jerzy Dzik for this remark.

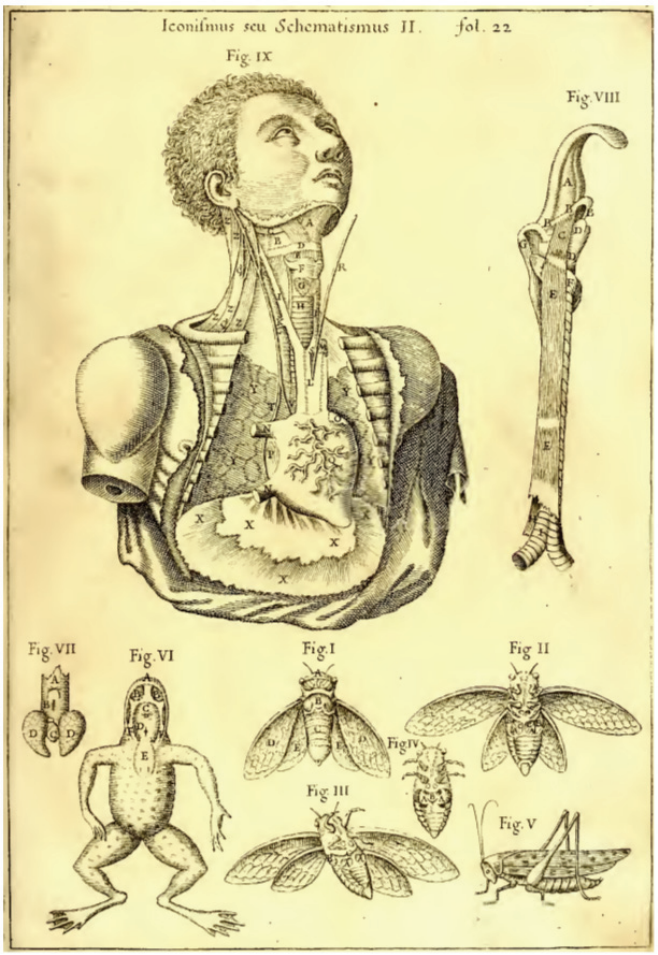
so that the curious Reader may learn how ingenious, clever and brilliant the nature is in creating animals and how wonderfully she acted in combining all these parts, both in the mentioned animals and, particularly, in the structure of the frog's organ, in which something divine appears.

The anatomy of the frog

Therefore, first look at the figure IV [sic][65] plate II, in which you will notice a tongue, split towards the throat. One can see that, on the outside close to the lip, the tongue is immovable. The slit of the larynx, difficult to find because of its narrowness, practically escapes from one's eyes. A designates the superior and medial parts of the frog's jaw, BB are cavities in which lie two oval-shaped eyes like two large excrescences, C – there follows an opening designating the beginning of the gullet, and then a cavity, that is, the organ serving for croaking. D shows the larynx, near which is situated slightly below another opening, quite similar to the previous one, in the shape of a slit. E is the skin, which covered the body of the tongue when it was naturally located inside. Now – with the tongue unattached inside and intentionally inverted – the skin is torn off so as to make visible the slit, the shape of the tongue, its size and location.[66] FF represent the lower jaw.

[65] In Kircher's plate II, the described frog's anatomy is marked with the number VI.

[66] To grasp the sense of the Latin original sentence, it is necessary to add a verb being a predicate for cutis: "E cutis quae contegebat corpus linguae, quando intus naturaliter collocata erat, nunc autem, interius solubili existente ac studio inversa, [est revulsa], tum ut rimula, tum ut linguae figura, magnitudo, et positio innotesceret." I thank Professor Mikołaj Szymański for this remark.



In the seventh picture [plate II] you can see the swollen lungs, filled with air, by which this species is distinguished, and which have the same look as the marble stones endowed with various spots and colours. A is a membranous part covering the parts of the mouth; B is the glottis, that is, the main part or the slit of the larynx; C represents a little body, evidently a heart, as DD represent the lungs.

Having explained this, I conclude that the croaking is produced by the lower lip of the jaw, while the upper jaw remains immovable. Once the frog absorbs a small amount of water in her throat, air expelled from the lungs – trying to pass through water received in the cavity C, then springing more violently out from the slit D and

How is the frog's croak produced?

making the water move quickly, while the lungs work more intensely – eventually produces what we hear as a croak. Therefore, the sound is not made with the glottis like in other animals, but with the impetus of air expelled from the lungs by the glottis and pressing water. The same usually happens in organ pipes put in the water and blown into with great force, with which we produce bird songs. For we do not notice any muscles of the glottis capable of forming a voice, as is the case in other animals. Therefore, we infer that the croaking is not a voice but a sound[67] caused by a blast of air expelled into the water collected inside the frog's throat. We caused that sound in a recently dead frog by placing a pipe between the ribs and inserting it into the trachea, then violently blowing into the water contained in the gullet. We have decided to describe it here more conscientiously to eliminate this common misbelief of those who thought very recklessly that the frog's croaking was made by the glottis and the larynx. For the croaking is not produced differently than we have said.

What's the purpose of the frog's croaking?

One may then rightly puzzle over a particular purpose for which the sound was created by nature. Therefore, I say that the croaking was created for the use and great benefit of the animal. Since the frog dwells as often as possible under water, she needs as much air as possible (as sufficiently proven by swollen and gigantic lungs). Nature gave her this cavity in the throat so that water collected in there could hold the air contained in the lungs. As she has no epiglottis preventing the air collected in the lungs – as is the case in an inflated and open bladder – from escaping all at once, nature decided that the water collected in the gullet should fulfil the role of the epiglottis by holding air inside [the lungs], and, during croaking, by partly releasing the air contained inside and partly letting new air in.

[67] It is worthy of note that Marin Mersenne, Kircher's contemporary, bases his differentiation of voice from sound on the animal's intention. In his *Traités de la voix et des chants* we read: "[Q]uand l'animal fait quelque son sans cette intention, il ne mértie pas le nom de voix, encore qu'il le fasse avec les instruments de la voix: et si l'animal a intention de signifier quelque chose par d'autres sons que par la voix, on les appelle signes, et non voix: néanmoins ils peuvent être appellés voix à cause de cette intention: de là vient qu'on dit qu'un muet parle par signes.…" (Mersenne, *Harmonie universelle*, *Traités de la Voix* Book 1, 7) – "[W]hen the animal makes sound without such intention, it does not deserve the name of 'voice'; even if it makes sound using the vocal organs: and if the animal intends to signify something with sounds other than voice, we speak of 'signs', and not of 'voice'. Nevertheless, the signs can be called the 'voice' because of this intention. Therefore, we say that the mute person speaks by means of signs…" (my translation).

Section 8

On the voice of cicadas, grasshoppers and crickets

The body structure of crickets

Another difficulty exists in finding out the cause of the voice in cicadas and crickets, which we could not fathom by any means without previous dissection. For definitely the marvelous cleverness of a shrewd nature is hidden there: it[68] has a double tympanum under a double, looking like a covered-with-a-scale thorax. The thorax and the abdomen are hollowed-out in the shape of a large cavity, whose the upper part – encircled by a yellow membrane just like a vault – collects sound. This sound flows into a large vault through vibrating air. Very tough membranes, which are situated laterally, hit the air, and it seems that they may very well be compared with plates or brass sheets, because these sheets, once moved, make almost very similar sound. These membranes are protected by their crust, so that they are not completely closed, but there is a free access of air, and they are freely vibrated by two very strong muscles attached to a bone that encircles the upper part of the abdomen. But we will explain this in the anatomical illustrations I, II, III, and IV of the plate II.

The first illustration represents the cicada's entire small body, where A is the cicada's head; B is the thorax, that is, the medial part of the abdomen; C is the entire abdomen, DD refer to bigger wings, and EE to smaller wings.

Although the bodily parts of the animal can hardly be dissected without being damaged, even if due care is exercised, because of the tininess and delicate structure of the body, they were represented with the utmost conscientiousness, so that particular parts without any difficulty could be differentiated, as shown in figure II, where AA are a double tympanum hidden under a double scale. B designates a double cavity in which fine membranes are hidden, with which the buzzing, that is, the sound is made. C is the vault, that is, an arched roof of the cavity, in which enclosed and compressed air resonates.

So that the organs creating the buzzing would be more visible, we included the figure III, in which AA show the cavity. B is a membrane in the form of a plate, the creator of sound.

C is a yellow membrane closing the vault in the upper part, after the disruption of which the sound disappears. But it is even better shown in the figure IV, when the animal stimulates the membranes to make sound, while B shows the vault.

[68] The note in the margin indicates that the following description concerns crickets. However, it concerns cicadas, for they make sound with special organs inside their bodies, while crickets and grasshoppers produce sound with the basal part of their front wings. I thank Professor Jerzy Dzik for this remark.

The cause of sound in crickets

We have seen the anatomy. Now is the time to explain the creation of sound. In this huge organization of organs, one has to take into consideration particularly those by means of which the buzzing, that is, the sharpest sound is produced by this type of insect. And these are: a double tympanum hidden under a double scale, a double cavity and the vault, to which the plates, that is, membranes extend. Therefore, I say that this type of animal, during the most intense heat waves (for it does not sing in any other season than summer), needs colder air, and therefore when it strikes very tough membranes located inside the tympanum, it agitates the air just as with a winnowing shovel, and violently pushing the air towards the membrane in the form of a plate – designated with the letter B in figure II – produces sound. Then, the air is directed to a hollowed-out place, that is, the cavity or the vault, encircled by the yellow membrane in the form of a plate. There, because of the hollowed-out shape of the place (as is the case with a struck military drum, whose cavity is full of air), the sound, which is a shrill one, is produced. The vibrating membranes are not completely closed with a crust, with which they are covered, but there always exists free access of air. Nature has therefore endowed the animal with two muscles to vibrate the membranes with a conscious movement and to wave them. The air, thus strongly agitated and pushed onto another yellow membrane extended before the vault and struck inside the cavity, eventually creates sound. The said membrane is so capable of making sound that even separated from the rest of the body produces sound, having been struck. The vault, consisting of a very dry and bone-like substance of the animal, can easily create this sound. These are then the genuine reasons of the voice formation in crickets: the creative reason, that is, the animal itself; the formal one – the plates with the vault; the material reason – the compressed air; and the intentional one – cooling off in the animal, or even, due to the sound, the escape of the stalking birds subdued by some hidden force.

It is therefore obvious how false are the opinions of those who believe the buzzing of the animal is produced with the mouth. Also err those who think that the sound is made only with the buzzing of the wings, as is the case in grasshoppers. However, the ones who desire to better fathom the issue, let them perform experiments during a live dissection, which is easy, then they will know that it is indeed true.

The voice of grasshoppers

Grasshoppers produce this type of sound with their wings, in such a way that the wings situated one on top of another are moved. The one on the top has underneath a tough, blackish body located crossways. The lower wing has a small body of the same

substance situated on the edge itself and on top, to which a beautiful tympanum is adjacent, and with the mutual friction [of these elements] the buzzing (even in the dead ones through touching with a stylus) is produced. Such buzzing is considerably stronger in a living grasshopper for more air is intercepted there. Rigid wings push the vibrating air onto the membrane, hence the sound in the tympanum, see figures II and V in plate II.

Two species of crickets

There exist two species of crickets: some are field crickets, and the other ones are house crickets, the latter being known to dwell near a hypocaust, in kitchens and fireplaces. However, the two species make sound almost in the same manner as grasshoppers. For this reason we have decided not to dwell upon them any longer.

PART III

CONCLUSIONS

Why is a context-based approach to the translation important? Having translated into English chapter 14 “On the Natural Voices of Animals and their Anatomy” from the *Anatomy Book on the Nature of Sound and Voice* of Kircher’s *Musurgia Universalis*, I conclude that examining the context is essential for a translator to achieve both clarity and quality as well as – given that some passages of this source text are not stylistically correct – to avoid significant interpretative errors. For example, we read in the chapter:

> Simili ratione cum Basilius Orientis Imperator Leonem filium in carcerem, quasi insidias patri texentem suasu Santabareni coniiceret, atque adeo domus universa planctu luctuque ob hanc acerbam Leonis sortem, praeficabus etiam naenias quasdam lugubriter occinentibus perstreperet: psittacus caveae insclusus dum frequentius ingeminari audit expressum etiam Leonis nomen, una cum threnis et lugubribus verbis, id didicit. (Kircher 27)

The syntax of this sentence is not correct, for it does not say clearly whether Basil, the Byzantine Emperor, imprisoned his son Leo upon the advice of Santabareni, or whether Leo allegedly conspired against his father upon the advice of Santabareni. To dispel the doubt, and therefore be able to translate the sentence properly, I had to draw upon another source. The needed information is provided by Jean Cabassut’s *Notitia conciliorum sanctae ecclesiae, in qua elucidantur exactissime tum sacri canones, tum veteres novique Ecclesiae*

ritus, tum praecipuae partes ecclesiasticae historiae published in 1669, where we read:

> Mortuo tamen Basilio, filius eius Leo imperator cognomine Philosophus, quem nebulonis illius Theodori Santabareni dolis et calumniis in suspicionem adductum pater diu in vinculis detinuerat, hanc ultus est iniuriam in Santabarenum, quem flagro caesum et oculis orbatum in exilium trusit. (374–75)

It is now clear that the Emperor imprisoned Leo upon the advice of Santabareni who had resorted to trickery and sophistry. Another example of the same kind is the following sentence: "Pausanias quoque in *Arcadicis* picam refert infantis vagitum tam dextre expressisse, ut Herculi dux fuerit, et cuasa inventi filii Athenagorae" (Kircher 28). It is not clear whether it was Athenagoras's infant, or whether the infant's name was Athenagoras. In this case, the task is less difficult, as Kircher explicitly refers to Pausanias's *Arcadia* – the eighth book in *Description of Greece*, from which we gain the information about the infant's parents and his name. Also, we find the confirmation of Kircher's words as to the disappearance of the child and the way in which he was found. Here's the relevant excerpt:

> Thirty stades farther is a plain called Alcimedon, and beyond the plain is Mount Ostracina, in which is a cave where dwelt Alcimedon, one of those called heroes. This man's daughter, Phialo, had connection, say the Phigalians, with Heracles. When Alcimedon realized that she had a child, he exposed her to perish on the mountain, and with her the baby boy she had borne, whom the Arcadians call Aechmagoras. On being exposed the babe began to cry, and a jay heard him wailing and began to imitate his cries. It happened that Heracles, passing along that road, heard the jay, and, thinking that the crying was that of a baby and not of a bird, turned straight to the voice. Recognising Phialo he loosed her from her bonds and saved the baby. Wherefore the spring hard by is named Cissa (Jay) after the bird. (Pausanias 404–7)

Now, there is no room for interpretative error.

Given that Kircher not only focuses on sounds and voices of animals, but also on purely zoological issues, like the animal anatomy or the animal classification, I deemed necessary to provide the relevant context by gaining suitable information from today's biological literature and recognized specialists in zoology. This helped me draw a line between Kircher's thoughts and my critical thinking. Let me give Kircher's following sentence, concerning the function of the swan's trachea, as an example: "[E]st itaque tam prodigiosa trachea a natura data, ut in ea veluti in utero quodam, necessarium secum aerem deportaret" (Kircher 32). Having consulted Professor Jerzy Dzik at the

Department of Paleobiology and Evolution at the University of Warsaw Institute of Zoology, I gained the needed information and therefore could write the annotation: “Kircher is mistaken, for air is not stored in the trachea, but in the air sacs that are connected to the lungs. The trachea serves for producing sound, and its length is related to the pitch of sounds.” By introducing such a remark I show to the Reader of my translation that I did not err while translating the sentence. In my belief, this remark is all the more needed, since it is known that Kircher took part in animal dissections, and so it is logical that the Reader would think that the translator was incompetent. The Reader could think likewise if the translator left without any annotation the title of the sixth section: “De insectorum quorundam vocibus uti de ranis, cicadis, locustis, grillis.” On consulting Professor Jerzy Dzik and Professor Mikołaj Szymański, I gathered the information that most probably it is simply a mistake on Kircher’s part. Therefore, I could write a pertinent annotation to this title.

Furthermore, the context-based approach to the translation of Kircher’s “On the Natural Voices of Animals and their Anatomy” enabled me to discover a number of covert quotations in this chapter, among the sources of which one may find: Pliny the Elder’s *Naturalis historia*, Claudius Aelianus’s *De natura animalium*, Antonio Valli’s *Il canto de gl’augelli*.

Finally, I have decided on a context-based translation, so that it would not be “only a translation”. My aim is to provide the Reader with additional information contained in annotations in order to shed light on and comment upon the issues raised by Kircher. I hope that the provided context will be useful for the Reader.

BIBLIOGRAPHY

PRIMARY SOURCES

Aelian. *On the Characteristics of Animals.* Translated by A. F. Scholfield, vol. 2, William Heinemann, 1959.

Aelian’s On the Nature of Animals. Translated by Gregory McNamee. Trinity UP, 2011.

Aristotle’s History of Animals in Ten Books. Translated by Richard Cresswell, London, George Bell & Sons, 1883.

Bonifacio, Baldassarre. *Ludicra Historia.* Venice, 1652.

C. Plini Secundi Naturalis historiae. Edited by Karl Mayhoff et al., Leipzig, 1875–1906, www.penelope.uchicago.edu/Thayer/L/Roman/Texts/Pliny_the_Elder/8*.html. Accessed 26 Aug. 2018.

Cabassut, Jean. *Notitia conciliorum sanctae ecclesiae, in qua elucidantur exactissime tum sacri canones, tum veteres novique ecclesiae ritus, tum praecipuae partes ecclesiasticae historiae.* Venetiis, apud Paulum Balleonium, 1669.

Cartas, informações, fragmentos históricos e sermões do Padre Joseph de Anchieta, S.J. (1554–1594). Cartas Jesuíticas III. Civilização Brasileira S.A.,1933.

De natura animalium Claudii Aeliani. Translated by Friedrich Jacobs, Jena, Frommann, 1832, http://penelope.uchicago.edu/Thayer/L/Roman/Texts/Aelian/de_Natura_Animalium/5*.html. Accessed 26 Aug. 2018.

Eutecnius. *Paraphrasis Oppiani vel potius Dionysii Librorum de Aucupio*. Interprete Conrado Gesnero, Argentorati, 1776.

Fizjolog. Translation, introduction and comment by Katarzyna Jażdżewska, Prószyński i S-ka, 2003.

Gessner, Conrad. *Icones animalium*. 2nd ed, Tiguri, Christopher Froschoverus, 1560.

Kircher, Athanasius. *Musurgia universalis*. Translated by Andreas Hirsch, edited by Melanie Wald, Bärenreiter, 2006.

Kircher, Athanasius. *Musurgia Universalis sive Ars Magna Consoni et Dissoni*, vol. 1, Romae, Ex Typographia Haeredum Francisci Corbelletti, 1650.

Kircher, Athanasius. *Musurgia Universalis sive Ars Magna Consoni et Dissoni*. Translated into German by Günter Scheibel, revised by Jacob Langeloh and Frank Böhling, edited by Markus Engelhardt and Christoph Hust, www.hmt-leipzig.de/de/home/fachrichtungen/institut-fuer-musikwissenschaft/forschung/musurgia-universalis. Accessed 26 Aug. 2018.

Léry, Jean de. *Histoire d'un voyage fait en la terre du Brésil, dite Amérique*. 5th ed., Genève, Jean Vignon, 1611.

Magalhães Gândavo, Pêro de. *História da Província Santa Cruz a que vulgarmente chamamos Brasil*. Lisbon, 1576.

Marcgrave, Georg, and Willem Piso. *Historia Naturalis Brasiliae*. Lugdun, Batavorum, apud Franciscus Hackium, and Amstelodami, apud Lud. Elzevirium,1648.

Martial. *Epigrams*. Edited and translated by D. R. Shackleton Bailey, vol. 3, Harvard UP, 1993.

Mersenne, Marin. *Harmonie universelle contenant la théorie et la pratique de la musique*…. Edited by Sébastien Cramoisy, Paris, 1636.

Morino, Stephano. *Exercitationes de lingua primaeva eiusque appendicibus*, Ultrajecti, apud Gulielmum Broedelet, 1694.

Ovid. *Metamorphoses*. Translated by Frank Justus Miller, vol. 1, William Heinemann, 1928.

Oviedo, Gonzalo Fernández de. *De la natural historia de las Indias*, Toledo, Remo[n] de Petras, 1526.

Pausanias. *Description of Greece*. Translated by W. H. S. Jones, vol. 3, Harvard UP, 1977.

Plutarch's Moralia. Translated by Harold Cherniss and William C. Helmbold. William Heinemann Ltd., 1957.

Riese, Alexander, editor. *Anthologia Latina sive poesis latinae supplementum*. Lipsiae, typis B.G. Teubneri, 1869.

Sousa, Gabriel Soares de. *Tratado descriptivo do Brasil em 1587*. Rio de Janeiro, João Ignacio da Silva, 1879.

Statius. *Silvae*. Edited by Aldo Marastoni, Teubner, 1970.

Thevet, André. *La cosmographie universelle*, vol. 2, Paris, chez Guillaume Chaudière,1575.

Thevet, André. *Les singularités de la France antarctique, autrement nommée Amérique.* Paris, chez les héritiers de Maurice de la Porte, 1558.

Valli, Antonio. *Il canto de gl'augelli, opera nova di Antonio Valli da Todi, dove si dichiara la natura di sessanta sorte di ucelli, che cantano per esperienza, e diligenza fatta più volte. Con il modo di pigliarli con facilità, & allevarli, cibarli, domesticarli, ammaestrarli ... Con le loro figure, & vinti sorte di caccie, cauate dal naturale da Antonio Tempesti*.... Roma, per gli Heredi di Nicolò Mutij, 1601.

SECONDARY SOURCES

A Greek-English Lexicon. Compiled by Henry George Liddell and Robert Scott, revised and augmented by Henry Stuart Jones. Clarendon Press, 1996.

Barnett, Adrian A. "Three-toed tree sloths (Bradypodidae)." *Grzimek's Animal Life Encyclopedia*. 2nd ed., vol. 13, *Mammals II*, edited by Devra G. Kleiman et al., Gale, 2004, pp. 161–169.

Godwin, Joscelyn. *Athanasius Kircher's Theatre of the World with 410 Illustrations*. Thames & Hudson, 2009.

Macbain, Alexander. *An Etymological Dictionary of the Gaelic Language*. Eneas Mackay, 1911.

Moraes-Barros, N. "Family Megalonychidae (two-toed sloths)." *Handbook of the Mammals of the World*, vol. 8, *Insectivores, Sloths and Colugos*, edited by Don E. Wilson and Russell A. Mittermeier, Lynx Edicions, 2018, pp. 104–117.

Naples, Virginia L. "Xenarthra (sloths, anteaters, and armadillos)." *Grzimek's Animal Life Encyclopedia*. 2nd ed., vol. 13, *Mammals II*, edited by Devra G. Kleiman et al., Gale, 2004, 147–154.

Pangrazi, Tiziana. *La* "*Musurgia universalis" di Athanasius Kircher: contenuti, fonti, terminologia*. L. S. Olschki, 2009.

Pauli, J. N. "Family Bradypodidae (three-toed sloths)." *Handbook of the Mammals of the World*, vol. 8, *Insectivores, Sloths and Colugos*, edited by Don E. Wilson and Russell A. Mittermeier, Lynx Edicions, 2018, pp. 118–132.

TŁUMACZENIE KONTEKSTOWE 14 ROZDZIAŁU "DE VOCIBUS NATURALIBUS IN ANIMALIBUS EORUMQUE ANATOMIA" Z *LIBER ANATOMICUS DE NATURA SONI ET VOCIS* ZAWARTEGO W *MUSURGIA UNIVERSALIS SIVE ARS MAGNA CONSONI ET DISSONI* ATHANASIUSA KIRCHERA

S t r e s z c z e n i e

Celem autorki artykułu jest dokonanie tłumaczenia kontekstowego na język angielski rozdziału 14 pt. „De vocibus naturalibus in animalibus eorumque anatomia" z *Liber anatomicus de natura soni et vocis Athanasiusa Kirchera Musurgii Universalis sive Ars Magna Consoni et Dissoni* wydanej w 1650 w Rzymie. Artykuł składa się z trzech sekcji. Pierwsza objaśnia przyczyny konieczności i przydatności powstania tłumaczenia kontekstowego wspomnianego rozdziału. Druga sekcja jest najbardziej rozbudowana i prezentuje tłumaczenie opatrzone licznymi komentarzami. W trzeciej sekcji wyłożone zostały konkluzje autorki odnośnie do wagi tego rodzaju tłumaczenia tekstu Kirchera. Przestudiowanie kontekstu okazało się nieodzowne w celu osiągnięcia jasności i jakości w tłumaczeniu, uniknięcia znaczących błędów interpretacyjnych,

odróżnienia własnych stwierdzeń Kirchera od licznych kryptocytatów, a także dostarczenia Czytelnikowi dodatkowych informacji w przypisach objaśniających i komentujących zagadnienia poruszane przez Kirchera.

Słowa kluczowe: *Musurgia Universalis* Athanasiusa Kirchera; tłumaczenie kontekstowe; natura dźwięku; natura głosu; zoomuzykologia; zootomia.

A CONTEXT-BASED TRANSLATION OF CHAPTER 14 "DE VOCIBUS NATURALIBUS IN ANIMALIBUS EORUMQUE ANATOMIA" FROM THE *LIBER ANATOMICUS DE NATURA SONI ET VOCIS* OF ATHANASIUS KIRCHER'S *MUSURGIA UNIVERSALIS SIVE ARS MAGNA CONSONI ET DISSONI*

Summary

The author's aim is to present a context-based English translation of chapter 14 titled "De vocibus naturalibus in animalibus eorumque anatomia", from the *Liber anatomicus de natura soni et vocis* of Athanasius Kircher's *Musurgia Universalis sive Ars Magna Consoni et Dissoni* published in 1650 in Rome. The article is divided into three parts. The first one (introduction) states the reasons for doing a context-based translation of the chapter. The second part forms the main and most extensive part because it presents the translation itself, along with annotations. In the third part, emphasis is laid on the author's conclusions regarding the importance of a context-based approach to the translation of Kircher's text. An examination of the context proved to be essential for achieving both clarity and quality in the translation, avoiding significant interpretative errors, distinguishing between Kircher's own statements and covert quotations, and providing the reader with additional information contained in the annotations, which shed light on, and comment upon, the issues raised by Kircher himself.

Keywords: Athanasius Kircher's *Musurgia Universalis*; context-based approach to translation; nature of sound; nature of voice; zoomusicology; zootomy.