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The Chameleon (Reptilia: Chamaeleonidae) in ancient cultures of the Mediterranean Region & Near East, amongst superstitions, myths, magic and science

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Abstract: The basis of analysis of ancient scripts, artifacts, biology, the position of chameleon in ancient cultures of the Circum-Mediterranean region and Near East is discussed. Surprisingly, the representation of such a strange and interesting animal as the chameleon, very little represented in writings and art; it is absent from myths in this region; only single artifacts are known. Based on the interdisciplinary analysis, it seems more likely that the animal acting in the biblical story of Adam and Eve and their first sin, is not a snake but rather a chameleon. It seems also that the belief about the etymology of the contemporary word “chameleon” is not an “earth lion” but rather an “invisible beast.”

Key words: Chameleon, antiquity, myth, legend, superstition, science, snake, serpent, coin, statue

INTRODUCTION

The interdisciplinary text is compiled from two perspectives: historical and cultural factography (marked with dark blue, written mainly by the first author) and the biological and linguistic comments (marked with maroon, written mainly by the second author).

The Ancient period comprises of all ancient cultures predating the middle Ages. The Classical Ancient period is centered around the Mediterranean Sea, where cultures under strong influence of Ancient Greece and Ancient Rome flourished. Beginning in the 8th century BC, from the beginning of the archaic Greek culture, reigning until 476 AD, at the fall of the Rome Empire. We concentrate here exactly on these times and in the Circum-Mediterranean and Near-Eastern cultures.

People have known chameleons since the dawn of history. They have met them in the Mediterranean, North Africa and the Middle East since the early civilizations. The unusual animal was not dangerous, but its bizarre appearance and difficult to understand characteristics (independently moving eyes, ability to color, shooting tongue) differed significantly from other creatures. Therefore, it is no wonder that from the very beginning the chameleon evoked inconsistent feelings in people.

Chameleons are lizards of the family Chamaeleonidae that are well known for many special morphological and physiological adaptations; such as laterally flattened body, pyramidal head, lungs with extensive pulmonary sacks,

prehensile tail, color change, independently movable protruding eyes, long extendable tongues, special pincer-like arrangement of the digits etc. This combination of features is really absolutely unique amongst all reptiles and even vertebrates (NECAS 1999; TOLLEY & HERREL 2014).

Chameleons were physically known by the ancient civilizations from Northern-African and Eastern Mediterranean coast by the Common Chameleon – *Chamaeleo chamaeleon* (LINNAEUS, 1758) and from the Nile delta and region along the river Nile by the African Chameleon – *Chamaeleo africanus* (LAURENTI, 1768). This is the present known range of these two species in the pertinent region. However, as the climate under which the ancient civilizations flourished was obviously different (colder, moister), then nowadays (DUGLAS & KENNET, 2006), it is not excluded that the mentioned two species have been distributed more widely and the more inland. Additionally, some chameleon species might have occurred in areas from which they are now absent and pushed by the aridisation and increase of the temperatures into their current refugees, such as potentially the Arabian Chameleon – *Chamaeleo arabicus* (MATSCHIE, 1893) along the coast of Arabian peninsula from Oman to the north, or the Indian Chameleon – *Chamaeleo zeylanicus* (LAURENTI, 1768) along the Persian coast from Pakistan westwards, both potentially reaching the ancient Mesopotamia.

the family Scincidae and “chameleon” to the family Chamaeleonidae, leaving only the remaining family of the legless lizard Anguidae unmentioned, obviously for the reason of their almost unidentifiable resemblance to snakes.

misinterpreted the use of the expression *nēšu sa qaqqari* as a poetic turn for the reptile, thus for a snake (SJÖBERG 1985).



Fig 2. Adam and Eve in the Garden of Eden; Drawing ANASTASIIA SHIRIAEVA

Quite interesting is the story at the beginning of the Bible and Torah. It is generally believed that the creature that seduced Adam and Eve in the third chapter of Genesis to eat fruit from the tree of the knowledge in the Garden of Eden was a snake (BIBLE, GN 3). After all, this animal is named in all translations of the Bible and has become a symbol of cunning and deceit.

But was the biblical seducer really a snake?

SJÖBERG first criticizes the generally accepted translation of the aforementioned EPIC OF GILGAMESH. Here, too, the treacherous creature that deprives GILGAMESH of immortality is a snake. For a creature that alienates GILGAMESH'S immortality plant, the original text uses the term *nēšu sa qaqqari*, means “lion on earth”, the Greek *χμαιλέων* – *khamailéōn*, the chameleon. According to SJÖBERG, the translators were confused when they

A similar confusion occurred also in the third chapter of Genesis, when the Hebrew expression *nah'ash*, generally denoting a reptile that hisses or whispers, was also misinterpreted and translated as a snake. And because the biblical story has its roots in Epic about GILGAMESH, SJÖBERG believes, that the chameleon is the logical conclusion.

This idea is further supported by the Bible itself when God punishes a guilty creature, “You will crawl on your stomach and eat dust all the days of your life” (BIBLE, GN 3:14). Another controversial question arises here: Why would God punish a snake who had crawled on its belly long before...?

The character of snake in this Biblical story is questionable. Amongst all snakes known to occur in the potential area of the Garden of Eden, none is known to

climb trees, on contrary, exclusively all are either terrestrial or have an affinity to water. It does not mean that under special circumstances they cannot climb a tree, but it is very unlikely and observations like that are very scarce and absolutely not typical (DISI & AL 2001). Even if a snake would be encountered on a tree (like the members of the genera *Psammophis* or *Coluber*) it would rather seek a very quick escape than give any sounds. The opposite is true for the chameleon, which spends the vast majority of its life in trees; especially in trees with flowers and fruits, which attract flying insects, building the majority of its diet. The chameleon is also one of the few reptiles in the pertinent region, if not the *only* one, which could account for the only sound mentioned – which chameleons can produce – the hissing or puffing sound of a snake (NECAS,1999). If a human would corner or even touch a chameleon on a tree, it would not flee, but it would very likely hiss (or whisper), as is described in the original text of the BIBLE and TORAH.

GENESIS (3:1) states, “Now the serpent was more crafty than any of the wild animals the Lord God had made.” The allocation of the animal to a snake is questionable, as it usually is even not explicitly said to be a snake but a “serpent.” The term “serpent” originates from the Latin word *serpens*, which is an adjective, present active participle of *serpō* (“crawl, creep”), cognating with Sanskrit सर्प (sarpá, “snake, serpent”) and Ancient Greek ἑρπετόν (herpetón, “serpent, creeping or crawling animal”).

The expression “serpent” is often used also as a noun and then translated as “snake,” but its original meaning is “a creeping animal” and can be and is interpreted in many other ways also (coluber, anguis, draco, vipera, jaculus, monster, sea monster), so not always and not explicitly a snake. The behavioral patterns, especially general locomotion of a chameleon fits much more (or at least same as) the “creeping animal” imagination, than a snake.

The Hebrew word שָׁרָפ (nah’ash) is used to identify the serpent that appears in Genesis 3:1. Its meaning is again translated as “snake, legless reptile or serpent”.

There is a debate about whether the serpent in Eden should be viewed figuratively or as a literal animal. According to one Midrashic interpretation in Rabbinic literature, the serpent represents sexual desire; another interpretation is that the snake is the “yetzer hara,” inclination to do evil, by violating the will of God. Modern Rabbinic ideas include interpreting the story as a psychological allegory where Adam represents reasoning faculties, Eve the emotional faculties, and the serpent the hedonistic sexual/physical faculties.

Moreover, the general label given to the biblical creature in question is “crafty,” sometimes the words “subtle” or “cunning” are used also. The serpent is portrayed as a deceptive creature or trickster, who promotes as good what God had forbidden and shows particular cunning in its deception. While the chameleon is notoriously known as a trickster that fools the world around it using its ability to “disappear” and become invisible (thanks to its special body

form, color change capabilities and behavioral patterns) (NECAS 1999), these characteristics seem to be attributed to the snake solely based on the Biblical tradition.

In religion, mythology, and literature, serpents and snakes often stand for fertility or a creative life force. They have also been associated with water and earth because many kinds of snakes live in the water or in holes in the ground. The ancient Chinese connected serpents with life-giving rain. Traditional beliefs in Australia, India, North America, and Africa have linked snakes with rainbows, which in turn are often related to rain and fertility. Thanks to the shedding old skin, snakes become symbols of rebirth, transformation, immortality, and healing. The ancient Greeks considered snakes sacred to Asclepius, the god of medicine. For both the Greeks and the Egyptians, the snake represented eternity. Ouroboros, the Greek symbol of eternity, consisted of a snake curled into a circle or hoop, biting its own tail. Living on and in the ground, serpents came to be considered in some religions and mythologies as guardians of the underworld, representing hidden wisdom or sacred mysteries. Snakes as symbols of death, evil, or treachery may be related to the fact that some of them are venomous and dangerous. Satan and other devils have frequently been portrayed as snakes. The Nagas of Hindu and Buddhist mythology symbolize both good and evil, hopes and fears (MYTHS AND LEGENDS). An ancient Slavonic tradition believed the snake is a protector of a household (P. NECAS, PERS. OBS.). From these other accounts it becomes obvious that the association of the snake as a trickster is present only on the base of the biblical story and nowhere else.

Taking into consideration all these perspectives, the chameleon appears to be a much more suitable candidate for the animal – seducing Eve to act against God’s commandment – than the snake.

The story continues then with verses, clearly referable to a snake or serpent (GENESIS 3:14,15):

The Lord God said to the serpent,
“Because you have done this,
Cursed are you more than all cattle,
And more than every beast of the field;
On your belly you will go,
And dust you will eat
All the days of your life;
And I will put enmity
Between you and the woman,
And between your seed and her seed;
He shall bruise you on the head,
And you shall bruise him on the heel.”

The question is, why should the snake be punished for an act made by another animal? Chameleons are notoriously known as animals that fool everyone; this is one of the unexplained details to which such a monumental story then pays no attention. The next interesting question to be raised is, why should a snake be cursed to do something already in its nature (namely to go “on your belly”)? It remains unclear whether the message was meant to be a collective sentence

and punishment for all snakes, or just for this very individual. Both concepts of collective guilt and benefit, as well as individual responsibility, are commonly used throughout all holy scripts. What God tells the serpent perhaps implies that before the event, this animal had legs. From an evolutionary point of view, snakes actually originate from ancestors with limbs, and the remnants of pelvis and limbs are identifiable on the skeleton of snakes both from fossil records as well on current ones (GARBEROGLIO & AL. 2019). Was it possible for the ancient cultures to know snakes had remnants of legs? Being considered unclean and therefore inedible, the anatomy of snakes was very likely not well known. Interestingly enough, there are little skinks living in the pertinent region, such as *Ophiomorus persicus* (STEINDACHNER 1867) and related species, widespread in Persia and Near East; or *Chalcides sepsoides* (AUDOUIN 1829) widespread in Palestine, which all look like small snakes with tiny limbs.

In the Jewish tradition, the chameleon is considered a creature, capable of living from breathing air only. The rationale of this myth comes probably from his ability to inflate the body and hiss, combined with the ability of long fasting (HIRSCH & HYVERNAT 1906).

The Chameleon is also present in the compilation of rabbinic discussions – in the BABYLONIAN TALMUD, TALMUD BAVLI. This Talmud was completed only around the year 500 AD in text and the final design was made in the beginning of 8th century AD, it means in the early medieval period, its oral version, however, originates deep in the Ancient Period (BRITISH LIBRARY 2020).

First note on the chameleon in the is mentioned in LEVITICUS: „Mishna: One who catches or wounds any one of the eight kinds of reptiles enumerated in the Scriptures (the weasel, the mouse, the tortoise, the hedgehog, the chameleon, the lizard, the snail and the mole) is culpable; one who wounds worms or any other kind of reptiles (not enumerated above) is free. One who catches them for a purpose is culpable; he who does so without the intention (to use them) is free. He who catches such animals or birds as are within his domain is free, he who wounds them is culpable.“ (THE BABYLONIAN TALMUD 8st century ADa).

The second note is a story, told by the Noah's son Shem. Chameleon was one of the animals, saved from the great flooding in Noah's Arch, there was however a problem with its food:

„We had great trouble in the ark to feed all the animals. The creature whose habit it is to eat in the daytime we had to feed in the day, and those whose habit it is to eat in the night, we have to feed in the night. A chameleon, my father did not know what its food is. It happened one day that he cut a pomegranate and a worm fell out of it, and the above consumed it, and from that time prepared its food from the worms found in rotten apples.“ (THE BABYLONIAN TALMUD 8st century ADb).

The story is in accordance with the commands concerning animals from the BIBLE. They should be treated

with respect and kindness; they should be observed, and their needs should be fulfilled. Until Noah observed the chameleon, he didn't know how to feed him properly. But then he learned, and the chameleon was no longer hungry.

For the ancient Greeks and Romans, the chameleon was a repulsive creature, but at the same time it had many wonderful, sometimes bizarre qualities.

The historian PLUTARCH used the chameleon and his lightning conversion capability to describe the negative qualities of the warlord ALCIBIADES – an all-capable defector of the bloody Peloponnese War – when he said the defector would be, “Assuming more violent changes than the chameleon. That animal, however, as it is said, is utterly unable to assume one color, namely, white; but ALCIBIADES could associate with good and bad alike and found naught that he could not imitate and practice” (PLUTARCH, 46-119/127 AD).

The Common Chameleons (*Chamaeleo chamaeleon*) use color change for many reasons, especially when thermoregulating while overheated, and can produce even white or whitish colors. Many other chameleon species can produce pure white areas on their skin such as *Bradypodion thamnobates* (RAW 1976), *Archaius tigris* (KUHLE, 1820), *Furcifer pardalis* (CUVIER, 1826) etc. (NECAS 1999).

Ample information about the chameleon can be found in the work “Naturalis historia,” by Roman natural scientist GAIUS PLINIUS SECUNDUS, also known as PLINIUS MAIOR (23-79 AD). While ARISTOTLE'S scientific description of the chameleon (see later) was taken over in Book 28, in Book 29 (PLINIUS), he often presents funny "facts". He refers to the writings of the Greek philosopher DEMOCRITUS OF ABDERA (460 - 370 BC), “Of the Power and Nature of Chameleons” (KITCHELL 2014), who, though, "... in fact, has no amusement, revealing as it does, and exposing the lies and frivolities of the Greeks.”

According to PLINIUS, the Greeks believed that if a hawk would fly over a chameleon, it would fall dead to the ground. Moreover, the chameleon has the power to attract and leave it as prey to other animals.

Chameleons consider smaller birds as potential prey and big birds as predators. They can shoot smaller birds right out of the air with their tongues, to swallow and kill for a quick meal (NECAS & MISKUFF 2019). On the other hand, chameleons are in fact so afraid at the sight of a big bird, they will often express a shock reaction by falling “dead” after such encounter (NECAS 1999). It is possible to see a bird falling dead because of a chameleon's trickery – as the chameleon can indeed cause this – but not in the case of larger birds like hawks. If a bird of prey, using its fabulous eyesight, spots a chameleon on a tree, it will try to hunt for it. The males of many chameleon species expose themselves throughout the canopy to watch over their territories, risking being visible to birds high overhead. The bird can therefore descend down trying to hunt for the chameleon, in which the lizard (with excellent eyesight) would very likely notice the incoming attack and perch itself on the opposite side of

branch (known as “shadowing”). The bird would then land and search for the prey – being so focused on the hunt, it might not notice other dangers in the form of some big cat or other predator, for example. It can be noted by the observer, the bird being attracted by the chameleon and eaten by some other animal, as the text says.

Also, very bizarre are other statements that PLINIUS, he says, do not believe too much, yet he cites them in detail. Here we extract some to comment:

- Chameleon head burned on oak wood or tiles in the house can summon a storm.
- The right eye, taken from a live animal applied with goat's milk, removes diseases of (crystalline) tissue plague in the eyes.
- If a live chameleon is present in the house, it will facilitate childbirth, but it must not be retrieved from the outside.
- Rubbing the feet with ash from the left foot of a chameleon mixed with pig milk will cause gout.

While the association of the healing powers of the parts of a chameleon's body is a bit obscure and difficult to interpret. Rather than having potential to work through a placebo effect, there is a strange association with a gout. Chameleons are quite often known to develop this metabolic disorder in captivity, but it has been observed also on wild specimens (NECAS 1999, PERS. OBS.). Also, when on ground, chameleons often move in a very strange way, like a shaking leaf in the wind – laying the foot on the ground several times before stepping on it – which might actually resemble the staggered gait of a human walking during a gout attack, as it is very painful and might force the person to step several times with the same leg. Whether there is an association, or it is just coincidence, is hard to judge.

The following is an enumeration of many magical obscure practices, the culmination of which is that if the left foot of a chameleon is burned in a furnace with a plant called chamæleon-plant, the ash is poured into a clay ball and placed in a wooden container. A person holding it in hand will become invisible (PLINIUS; GASPAROV 2004).

This practice refers definitely to the ability of chameleon to blend with the environment and become “invisible” and tries to lend this superpower from the chameleon in a magical way doubling the effect through using the animal itself and a plant of the same name. The chameleon plant in fact exists, it is a Bugle or Common Bugleweed - *Ajuga reptans* L., an herbaceous perennial plant species native to the northern Mediterranean region to eastern Europe to Iran. It belongs to the Mint family Lamiaceae, has beautiful blue flowers and is known to be toxic, potentially fatal – it contains narcotic hallucinogenic alkaloids and iridoids, though is also used for medicinal purposes as a tea as analgesic, cardio, healing, astringent and laxative (ANONYMOUS 2020B).

Unfortunately, the original work of DEMOCRITUS has not been well preserved to this day. Its existence, however, is indirectly confirmed by another Roman naturalist AULUS

GELLIUS, when PLINIUS was criticized for citing DEMOCRITUS (HOWLEY 2014). The entire text of PLINIUS reads like this:

“To these animals we shall annex some others that are equally foreign, and very similar in their properties. To begin then with the chameleon, which Democritus has considered worthy to be made the subject of an especial work, and each part of which has been consecrated to some particular purpose. This book, in fact, has afforded me no small amusement, revealing as it does, and exposing the lies and frivolities of the Greeks. In size, the chameleon resembles the crocodile last mentioned, and only differs from it in having the back-bone arched at a more acute angle, and a larger tail. There is no animal, it is thought, more timid than this, a fact to which it owes its repeated changes of color. It has a peculiar ascendancy over the hawk tribe; for, according to report, it has the power of attracting those birds, when flying above it, and then leaving them a voluntary prey for other animals. Democritus asserts that if the head and neck of a chamæleon are burnt in a fire made with logs of oak, it will be productive of a storm attended with rain and thunder; a result equally produced by burning the liver upon the tiles of a house. As to the rest of the magical virtues which he ascribes to this animal, we shall forbear to mention them, although we look upon them as unfounded; except, indeed, in some few instances where their very ridiculousness sufficiently refutes his assertions. The right eye, he says, taken from the living animal and applied with goats' milk, removes diseases of the crystalline humours of the eyes; and the tongue, attached to the body as an amulet, is an effectual preservative against the perils of child-birth. He asserts also that the animal itself will facilitate parturition, if in the house at the moment; but if, on the other hand, it is brought from elsewhere, the consequences, he says, will be most dangerous. The tongue, he tells us, if taken from the animal alive, will ensure a favorable result to suits at law; and the heart, attached to the body with black wool of the first shearing, is a good preservative against the attacks of quartan fever. He states also that the right fore-paw, attached to the left arm in the skin of the hyena, is a most effectual preservative against robberies and alarms at night; that the pap on the right side is a preventive of fright and panics; that the left foot is sometimes burnt in a furnace with the plant which also has the name of "chamæleon," and is then made up, with some unguent, into lozenges; and that these lozenges, kept in a wooden vessel, have the effect, if we choose to believe him, of making their owner invisible to others; that the possession, also, of the right shoulder of this animal will ensure victory over all adversaries or enemies, provided always the party throws the sinews of the shoulder upon the ground and treads them under foot. As to the left shoulder of the chamæleon, I should be quite ashamed to say to what monstrous purposes Democritus devotes it; how that dreams may be produced by the agency thereof, and transferred to any

person we may think proper; how that these dreams may be dispelled by the employment of the right foot; and how that lethargy, which has been produced by the right foot of this animal, may be removed by the agency of the left side. So, too, headache, he tells us, may be cured by sprinkling wine upon the head, in which either flank of a chameleon has been macerated. If the feet are rubbed with the ashes of the left thigh or foot, mixed with sow's milk, gout, he says, will be the result. It is pretty generally believed, however, that cataract and diseases of the crystalline humours of the eyes may be cured by anointing those organs with the gall for three consecutive days; that serpents may be put to flight by dropping some of it into the fire; that weasels may be attracted by water into which it has been thrown; and that, applied to the body, it acts as a depilatory. The liver, they say, applied with the lungs of a bramble-frog, is productive of a similar effect: in addition to which, we are told that the liver counteracts the effects of philtres; that persons are cured of melancholy by drinking from the warm skin of a chamæleon the juice of the plant known by that name; and that if the intestines of the animal and their contents – we should bear in mind that in reality the animal lives without food – are mixed with apes' urine, and the doors of an enemy are besmeared with the mixture, he will, through its agency, become the object of universal hatred. We are told, too, that by the agency of the tail, the course of rivers and torrents may be stopped, and serpents struck with torpor; that the tail, prepared with cedar and myrrh, and tied to a double branch of the date-palm, will divide waters that are smitten therewith, and so disclose everything that lies at the bottom and I only wish that Democritus himself had been touched up with this branch of palm, seeing that, as he tells us, it has the property of putting an end to immoderate garrulity. It is quite evident that this philosopher, a man who has shown himself so sagacious in other respects, and so useful to his fellow-men, has been led away, in this instance, by too earnest a desire to promote the welfare of mankind.”

Another Roman who mentions the breathtaking abilities of a chameleon is ALEXANDER OF MYNDUS (1st century AD). He claims that the snake cannot eat the chameleon because the chameleon has too thick of skin. Even more interesting, if a snake wants to eat a chameleon, the chameleon will grab a stick, which in turn defies the mouth of the snake, thus rescuing itself (KITCHELL 2014).

This writing is referring to some very interesting biological aspects. Indeed, the skin of the chameleon is surprisingly resistant environmental influences; it is not overly thick but is highly resistant to perforation and is not permeable to water in either direction (TOLLEY & HERREL 2014; P. NECAS, PERS. OBS.). To see a chameleon injured by a snake is a real rarity; with the exception of the big venomous snakes of sub-Saharan Africa like mambas of the genus *Dendroaspis* or boomslangs – *Dyspholidus typus* (SMITH, 1828), which possess very sharp needle-like fangs.

However, they do not inhabit the region of our interest. Moreover, the chameleon, if approached by a snake while sitting in a bush, often plays the “shadowing game,” meaning it turns always to the opposite side of the stick so that the snake cannot attack it. Even if it tries, access to the chameleon is blocked by the branch and the snake might just end up with a piece of wood in its mouth (NECAS IN PREP, PERS.OBS.).

ARTEMIDORUS DALDIANUS (2nd century BC), a Greek diviner and author of many writings on divination and magic, warns in the second book of the five-volume *Oneirocritica* that “To a dream of a chameleon was inauspicious” (KITCHELL 2014).

The boundary between superstitions, magic and legends was very thin in the ancient world. It didn't matter at what time the scholar lived, but how he approached the world and solving problems.

A shining example in this respect is the Greek philosopher ARISTOTLE (384 - 322 BC), the most prominent pupil of PLATO and the teacher of ALEXANDER THE GREAT. In his work *Historia Animalium*, or “The History of Animals,” he devoted a whole chapter to chameleons (ARISTOTLE; The Internet Classics Archive).

ARISTOTLE'S description of the chameleon, though we may find it a little odd today, adheres to the facts available to him at the time. Although ARISTOTLE lived four centuries earlier than PLINIUS, we do not find references to any magical rituals in his work, only a factual description of the chameleon's anatomy. From ARISTOTLE'S writing, it is obvious that the chameleon was not only observed but also dissected:

“The chameleon resembles the lizard in the general configuration of its body, but the ribs stretch downwards and meet together under the belly as the case with fish, and the spine sticks up with the fish. Its face resembles that of the baboon. Its tail is precisely long, terminates in a sharp point, and is for the most part coiled up, like a strap of leather. It stands higher off the ground than the lizard, but the flexure of the legs is the same in both creatures. Each of its feet is divided into two parts, which bear the same relation to one another that the thumb and the rest of the hand bear to one another in man. Each of these parts is for a short distance divided after a fashion into toes; on the front feet the inside part is divided into three and the outside into two, on the hind feet the inside part into two and the outside into three; it has claws also on these parts resembling those of birds of prey. Its body is rough all over, like that of the crocodile. Its eyes are situated in a hollow recess, and are very large and round, and are enveloped in a skin resembling that covers the entire body; and in the middle and slight aperture is left for vision, through which the animal sees, for it never covers up this aperture with the cutaneous envelope. It keeps twisting its eyes round and shifting its line of vision in every direction, and thus contrives to get a sight of any object that it wants to see. The change in color takes place when it is inflated with

air; it is then black, not unlike the crocodile, or green like the lizard but black-spotted like the pard. This change of color takes place over the whole body of alike, for the eyes and the tail come alike under its influence. In its movements it is very sluggish, like the tortoise. It assumes a greenish hue in dying and retains this hue after death. It resembles the lizard in the position of the oesophagus and the windpipe. It has no flesh anywhere except a few scraps of flesh on the head and on the jaws and near the root of the tail. It has blood only round the heart, the eyes, the region above the heart, and all the veins extending from these parts; And in all these there is little blood after all. The brain is situated above the eyes but connected with them. When the outer skin is drawn aside from the eye, something is found surrounding the eye, which gleams through a thin ring of copper. Membranes extend well over the entire frame, numerous and strong, and surpassing in respect of the number and relative strength of those found in any other animal. After being cut open along its entire length it continues to breathe for a significant time; a very slight motion goes on in the region of the heart, and while the contraction is especially manifested in the neighborhood of the ribs, and similar motion is more or less discernible over the whole body. It has no spleen visible. It hibernates, like the lizard.”

The description of chameleon’s anatomy by ARISTOTLE is so precise, that outside the expressions relevant to his epoch, there is hardly anything to comment on besides the preciseness and detailed overview of other animals’ anatomy, attributing to this work the label “comparative anatomy.”

To the honor of PLINIUS MAIOR, however, it should be added that Aristotle’s literal description of the chameleon has been included in Book 8 of Chapter 51 of his work. Only then, in Book 28, he dealt in detail with the aforementioned magical rituals (PLINIUS).

The Roman poet PUBLIUS OVIDIUS NASO (43 BC - 17 AD) writes about the chameleon in his collection of poems „Methamorphosis“ the following: „And the chameleon, little creature whose food is wind and air, takes on a color of anything its rests on.“ (OVIDIUS 1st century BC – 1st century AD). He makes the interpretation of the already mentioned belief, the chameleon lives just from breathing the air. He also mentioned the wrong assumption that the chameleon adapts the color of the underlying objects, which it walks over.

Chameleons do NOT use their ability of active color change to “blend” with their environment, it is a common myth. The public believes, chameleon use their ability to change color for blending with the environment and they do in color and pattern. They are often given as a textbook example of this phenomenon and kids are taught this at school. The truth is that this is a misconception. Instead for making them invisible with color change, they use this ability on contrary to become even more visible than normally.

Chameleons primarily use their ability to actively change colors for the following mechanisms:

1. Intraspecific communication

Colors and patterns are the language of chameleons, due to the fact the vision is their primary sense, they can express excitement, rivalry, surrender, gravity, submission, receptivity, etc.

2. Interspecific recognition

Females tell based on colors and patterns the belonging to the same/different species of the approaching male.

3. Thermoregulation

Light colors reflect the sun IR beams and cool down the bodies, dark colors foster heat intake.

4. Other mechanisms

The color pattern is also influenced by the: health state, nutritional state, hunting, rest, sleep, etc.

Chameleons adapt very rarely by their color and pattern to the environment, there are only a few documented cases when this happens (eg. in the genus *Rhampholeon*), but they are rather an exception and not a rule. The fact that that chameleons often look similar to their environment, is not the result of an active color change, but a long-term evolutionary adaptation to the environment in which they live and in which it is beneficial for them to be “invisible” (NECAS 1999).

Very interesting is the observation of Roman philosopher LUCIUS ANNAEUS SENECA (4 BC - 65 AD); he was the first to ponder the way in which chameleons change colors. By a purely logical reasoning, he connected the coloring to the refraction of light.

“Seneca offers some thoughts on the mechanism by which animals like the chameleon change color and offer an opinion that may be related to the refraction of the light” (KITCHELL 2014; SENECA, L.A.).

This brilliant philosophic (not biological) conclusion precedes the science by two millennia! It was for long believed, that the color change in chameleons happens based on differently colored pigment granules by their dispersion or aggregation in specialized cells called chromatophores (NECAS 1999). This is true just only for melanin in melanocytes, but the rest of the color change happens in two superposed layers of iridophores, that contain nanocrystals of guanine, which can, based on tuning of a lattice of these nanocrystals, reflect light of different wavelengths – thus creating colors. This mechanism has been discovered only recently, in 2015 by THEYSSIER & AL.

CLAUDIUS AELIANUS (175-235 AD), a Roman writer and philosopher, discusses in his work “De Natura Animalium” a chameleon changing color before the eyes of an observer, “...And appears different, like an actor who puts on another mask or another garment” (CLAUDIUS AELIANUS). He postulates the nature that created such a creature is called a witch. He then quotes ALEXANDER OF MYNDUS (1st century AD), mentioning his description of a chameleon defending himself with a stick against a snake and adds: “Chameleon annoys snakes and makes them go

hungry in this way." Moreover, the chameleon has so tight skin that it "Cares not at all for the fangs of the snake" (CLAUDIUS AELIANUS).

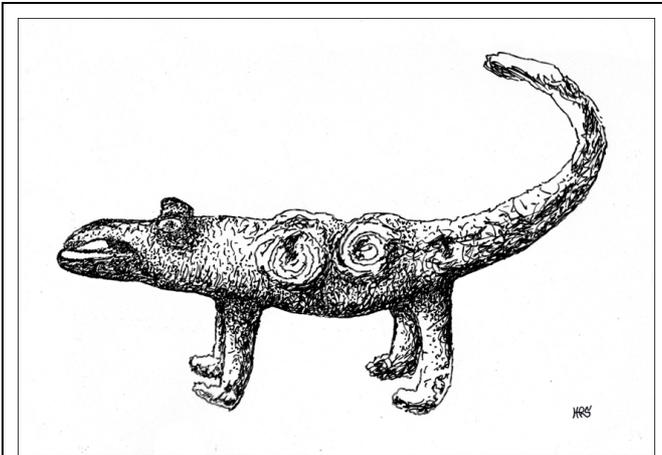


Fig 3. Bronze statue of a chameleon from the Roman Empire, Museo Nacional Arqueológico de Tarragona; Drawing VLADIMÍR HRUŠA

One of ARISTOTLE'S disciples wore the name CHAMAELEON (350-275 BC). However, despite his name, he did not care about nature. He wrote works on ancient Greek poems and, among other things, had a dispute with another Greek philosopher HERACLEIDES PONTICUS (390-310 BC), accusing him of stealing his work about HOMER. CHAMAELEON'S works have not been preserved, known only from the references of other ancient authors and a few fragments (MARTANO, MATELLI & MIRHADY 2012).

CHAMELEONS IN ART

We would like to introduce a wide range of images of a chameleon from antiquity, but in this respect, we came across a "blind spot". Although ancient legends and serious writings of naturalists and philosophers mention the chameleon, it seems as if it did not exist for the artist. Likewise, the chameleon does not appear in any ancient myth. The only artifacts that we managed to find in the resources available to us are two small objects.

The National Archaeological Museum of Tarragona (Spain) houses a bronze statue of a chameleon from the Roman Empire. With dimensions of 5 x 8.2 x 1.5 cm, however, it is quite a small work (MUSEO NACIONAL ARQUEOLOGICO DE TARRAGONA 2020).

In North African Cyrenaica (present-day Libya) silver coins were minted in the years 431-321 BC (BIBLIOTHEQUE NATIONALE DE FRANCE 2020), the reverse side of which, together with the magical and medicinal plant *Silphium* (used in ancient times as contraceptive and for abortion), depicted a chameleon as a creature that enhanced its power. But even here, it is barely recognizable. His presence reveals a large eye protruding from a confusing background (BIBLIOTHEQUE NATIONALE DE FRANCE 2020).

The mysterious plant *Silphium* is mentioned by PLINIUS MAIOR (Book XIX, Chapter 15). It was endemic in the Cyrenaica region, and in ancient times it was a highly sought-after plant for its strong therapeutic and aphrodisiac effects. It is still not clear what kind of plant it was, nor are there exact reasons for its disappearance. PLINIUS states that in his time (second half of the 1st century AD) it no longer grew in Cyrenaica. The last stem of *Silphium* found was presented to the Emperor NERO (37-68 AD),

"The juice of this plant is called "laser", and it is greatly vogue for medicinal as well as other purposes, being sold at the same rate as silver. For these many years past, however, it has not been found in Cyrenaica..."

Within the memory of the present generation, a single stalk is all that has ever been found there, and that was sent as a curiosity to the Emperor Nero."

The importance of *Silphium* is illustrated by the fact that its image was minted on coins; the obverse side of the coin held the head of Zeus Ammon; the reverse side depicts the so-called triple *Silphium*, together with animals that enhance its strength: an owl, a gazelle, a lion, an eagle holding a snake in its beak, a crab, a dolphin... the chameleon - sometimes neglected - was included in Cyrenaica into the society of animals, which were much more important in the ancient world and its mythology (BIBLIOTHEQUE NATIONALE DE FRANCE 2020).

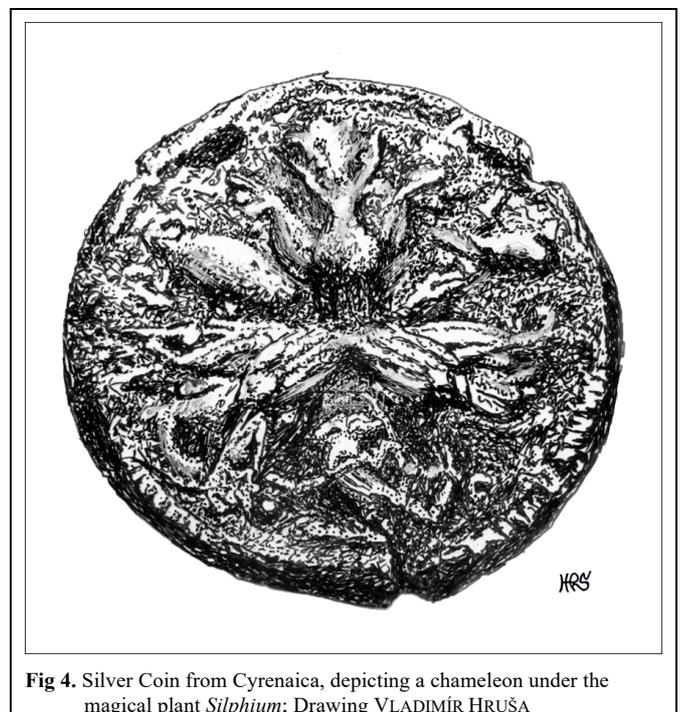


Fig 4. Silver Coin from Cyrenaica, depicting a chameleon under the magical plant *Silphium*; Drawing VLADIMÍR HRUŠA

CHAMELEONS IN MYTHOLOGY

Interestingly, although the “bestiary” of ancient myths is extremely varied, there is no place for the chameleon. It is hard to say why the Greeks did not include it in their mythology. Perhaps, with his qualities, he was so far beyond other creatures that he was simply incomprehensible to practically based Greeks.

Greek ceramics or frescoes depict animals with which the Greeks were either in everyday contact or performed in their mythology. But the chameleon, able to blend in perfectly with the surroundings, seemed to have disappeared in front of ancient artists. Maybe, the chameleon wished to remain unseen and therefore, simply we cannot see him...

The chameleon is truly the “invisible beast” and not the “earth lion”

...What do you say?

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