Neutrosophic Evolution as extension of Darwin's Evolution

The Cave Case

Text and pics by Florentin Smarandache

Neutrosophic Evolution as extension of Darwin's Evolution

During the process of adaptation of a being (plant, animal, or human), to a new environment or conditions, the being partially evolves, partially devolves (degenerates), and partially is indeterminate i.e. neither evolving nor devolving, therefore unchanged (neutral), or the change is unclear, ambiguous, vague, as in neutrosophic logic.

Thank to adaptation, one therefore has: evolution, involution, and indeterminacy (or neutrality), each one of these three neutrosophic components in some degree.

The degrees of evolution /indeterminacy/involution are referred to both: the structure of the being (its body parts), and functionality of the being (functionality of each part, or inter-functionality of the parts among each other, or functionality of the being as a whole).

We therefore introduced for the first time the Neutrosophic Theory of Evolution, Involution, and Indeterminacy (or Neutrality) [1].

[1] Florentin Smarandache: **Introducing a Theory of Neutrosophic Evolution: Degrees of Evolution, Indeterminacy, and Involution**. *Progress in Physics*, Volume 13 (2017) Issue 2 (April), 130-135

Neutrosophic Evolution as extension of Darwin's Evolution

The Cave Case

- **Text and pics by Florentin Smarandache**
- **New evidences for the Theory of Neutrosophic Evolution: Degrees of Evolution, Indeterminacy, and Involution**

This photoalbum - presenting images from the caves I visited in the Southwestern United States - wants to popularize this theory, offering new evidences in favor of it, extracted from biospeleology.

Kalendarium Publishing House

Oneștilor str., Oradea, Romania

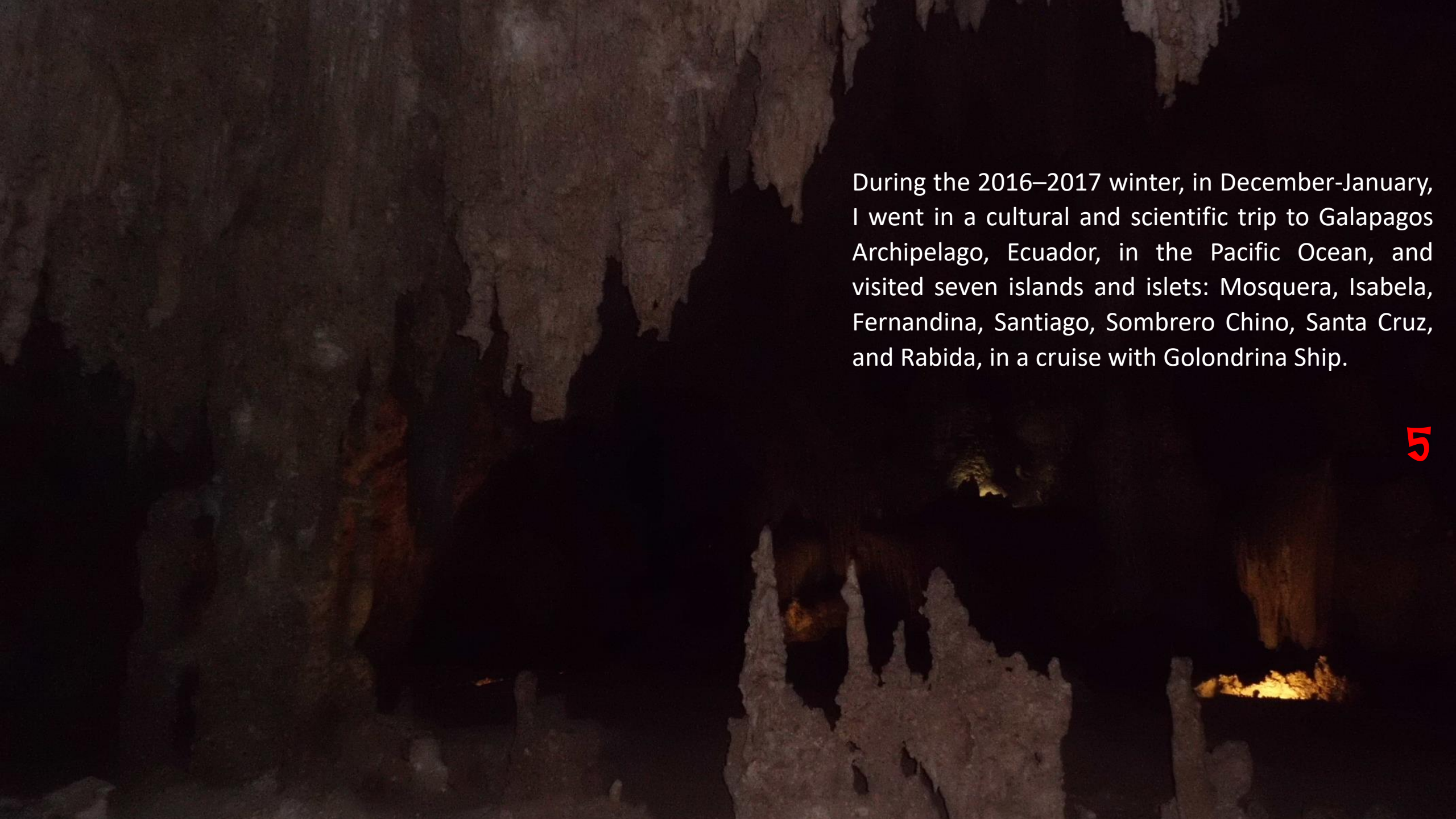
LIST OF CAVES

Carlsbad Caverns (New Mexico)
Grand Canyon Caverns (Arizona)
Kartchner Caverns (Arizona)
Colossal Cave (Arizona)
Mitchell Caverns (California)
Boyden Cave (California)
Crystal Cave (California)
Subway Cave (California)
Bear Gulch Cave (California)
Lehman Caves (California)
Timpanogos Cave (Utah)

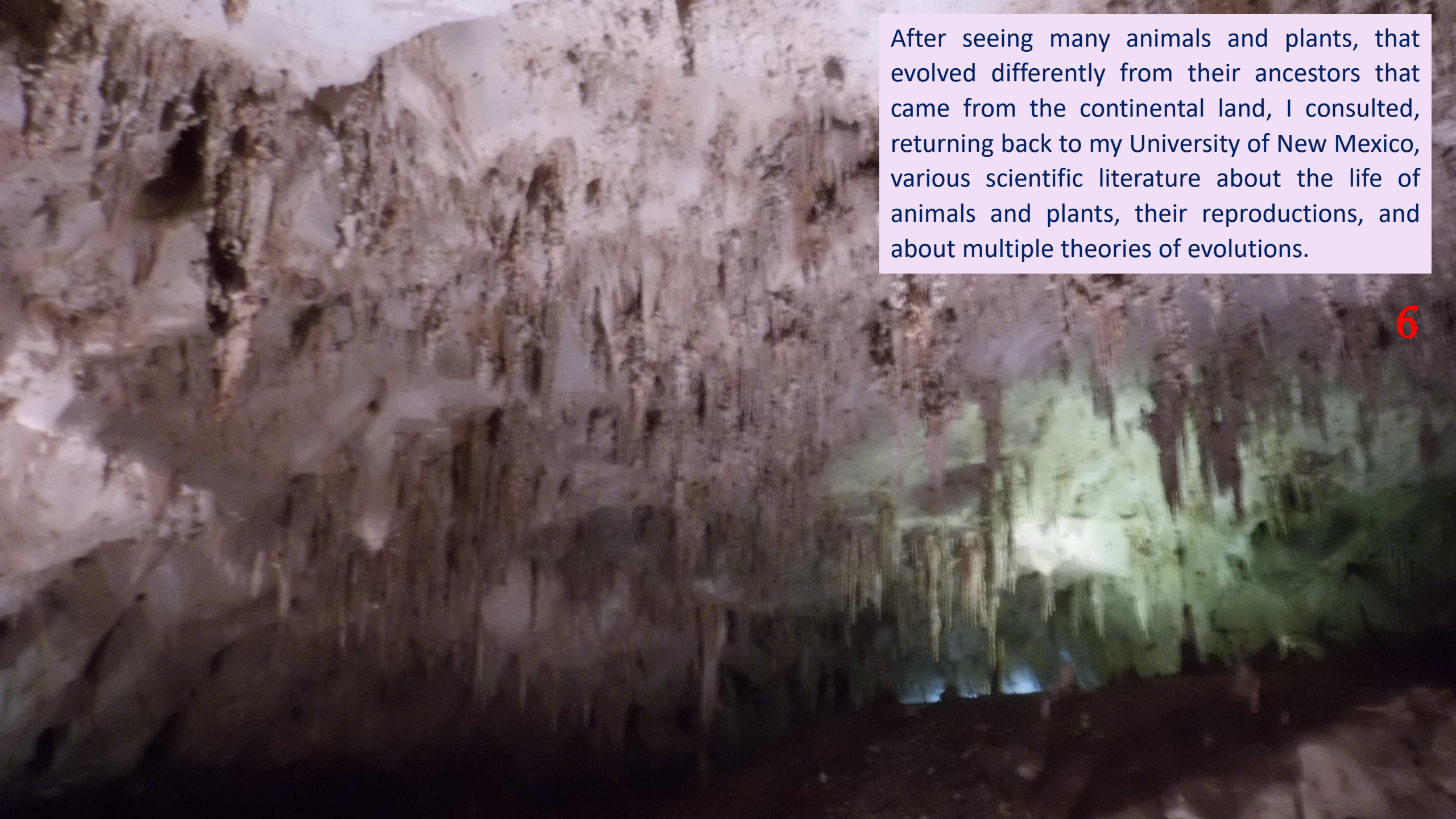
ISBN 978-1-59973-679-2

Song: **Ephemera** by Scott Buckley
https://soundcloud.com/scottbuckley

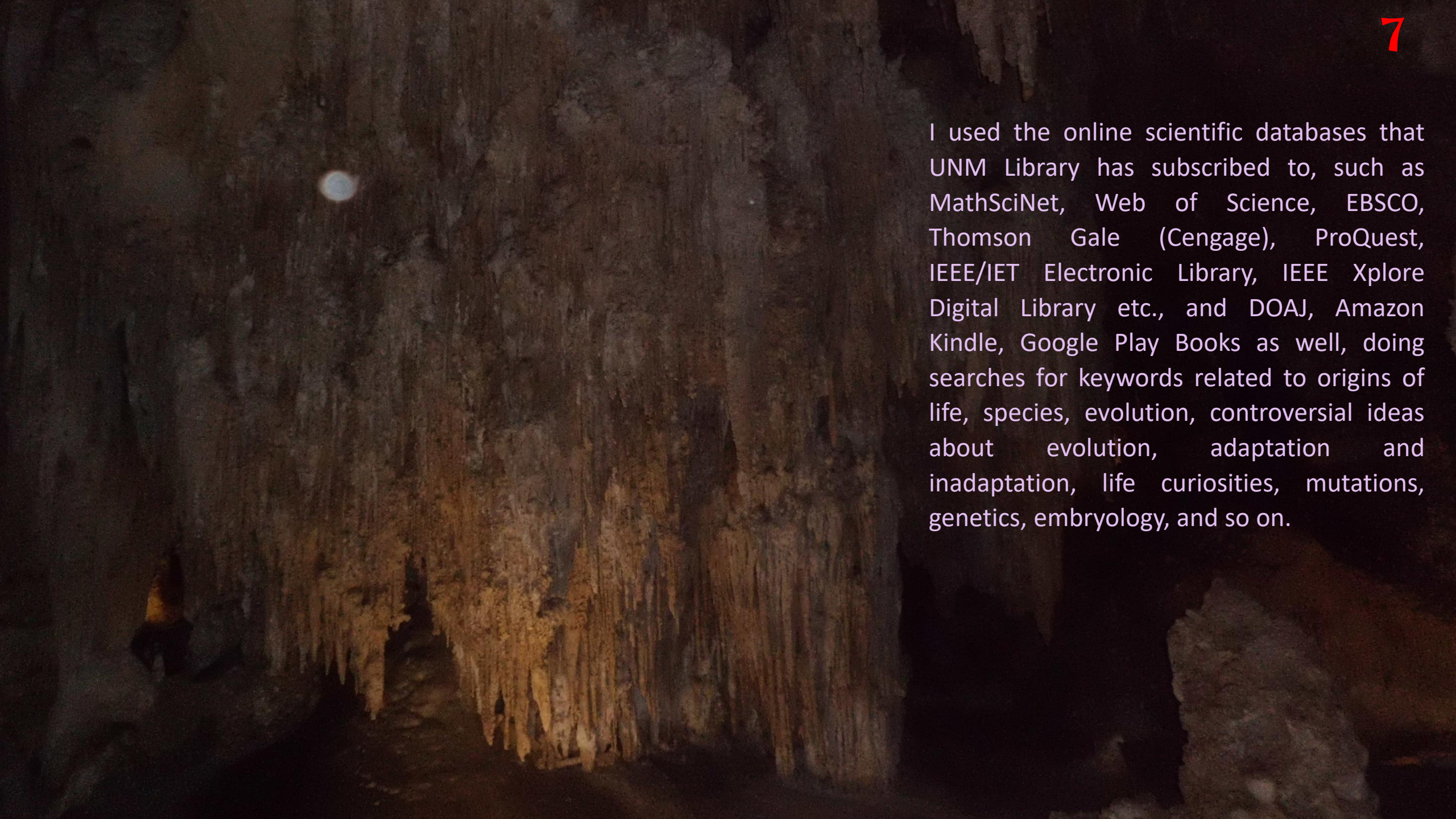
Free Download / Stream: https://bit.ly/al-ephemera
Music promoted by Audio Library https://youtu.be/rtyEmZCUI5g



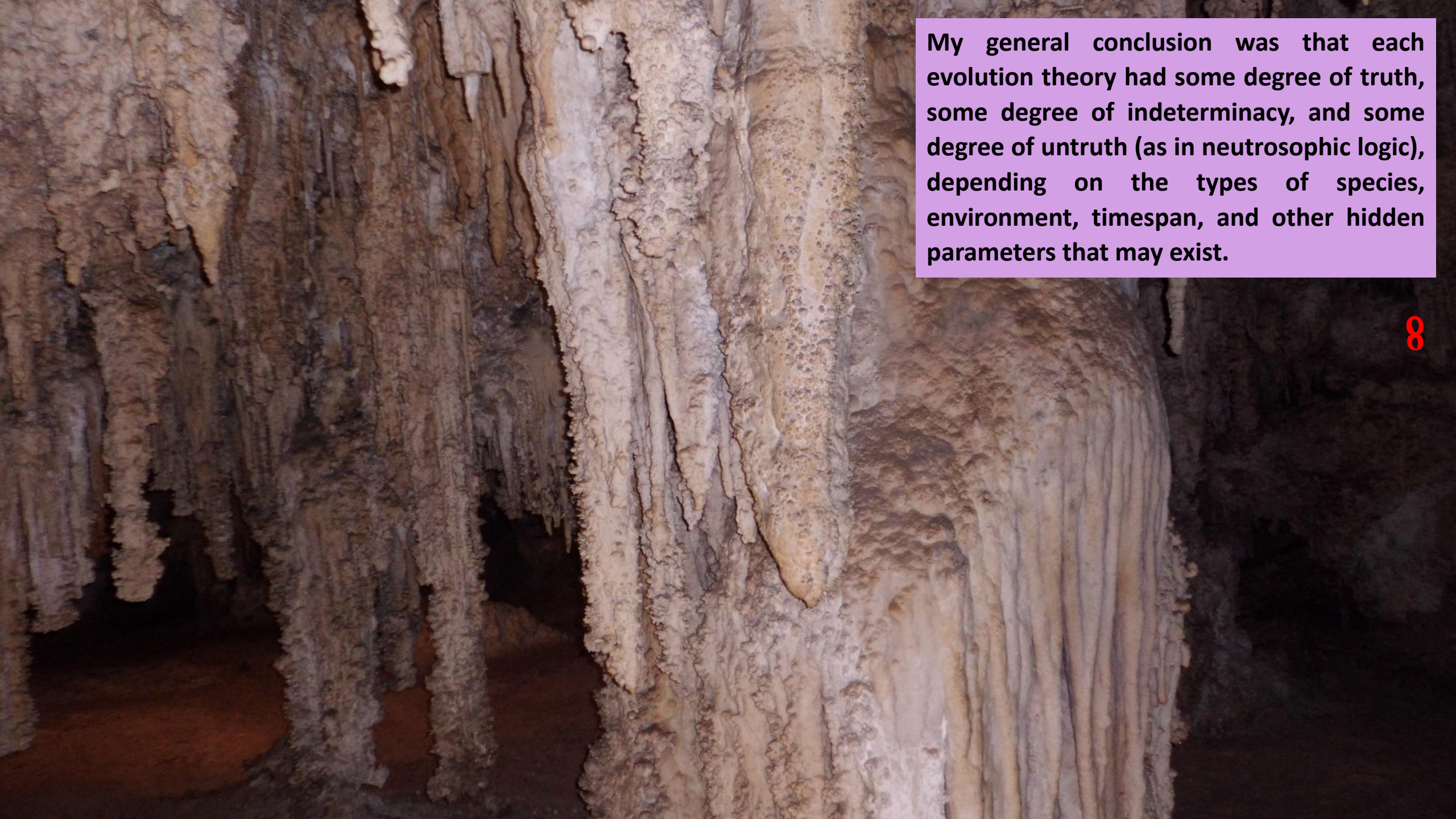
During the 2016–2017 winter, in December-January, I went in a cultural and scientific trip to Galapagos Archipelago, Ecuador, in the Pacific Ocean, and visited seven islands and islets: Mosquera, Isabela, Fernandina, Santiago, Sombrero Chino, Santa Cruz, and Rabida, in a cruise with Golondrina Ship.



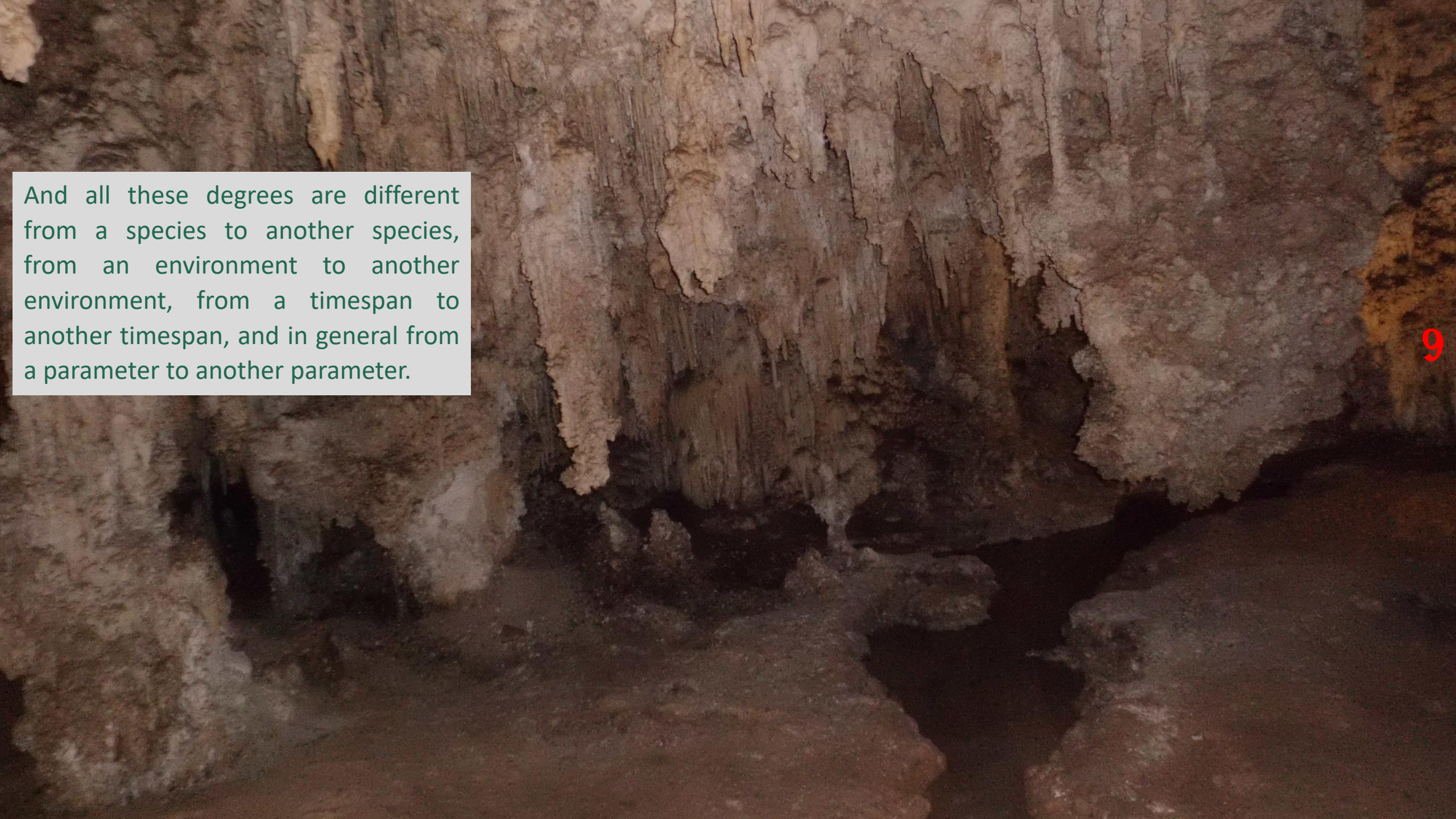
After seeing many animals and plants, that evolved differently from their ancestors that came from the continental land, I consulted, returning back to my University of New Mexico, various scientific literature about the life of animals and plants, their reproductions, and about multiple theories of evolutions.



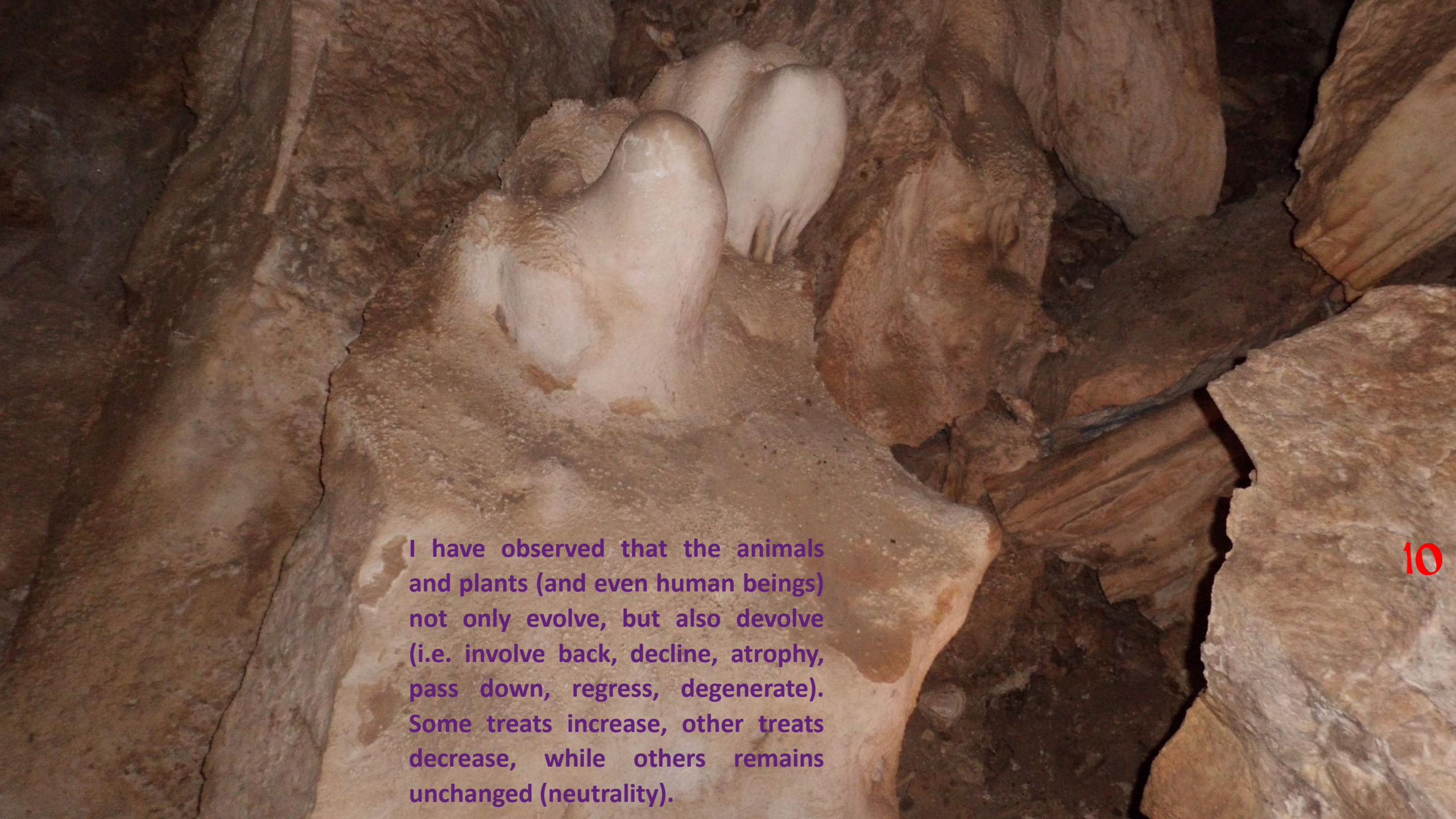
I used the online scientific databases that UNM Library has subscribed to, such as MathSciNet, Web of Science, EBSCO, Thomson Gale (Cengage), ProQuest, IEEE/IET Electronic Library, IEEE Xplore Digital Library etc., and DOAJ, Amazon Kindle, Google Play Books as well, doing searches for keywords related to origins of life, species, evolution, controversial ideas about evolution, adaptation and inadaptation, life curiosities, mutations, genetics, embryology, and so on.



My general conclusion was that each evolution theory had some degree of truth, some degree of indeterminacy, and some degree of untruth (as in neutrosophic logic), depending on the types of species, environment, timespan, and other hidden parameters that may exist.

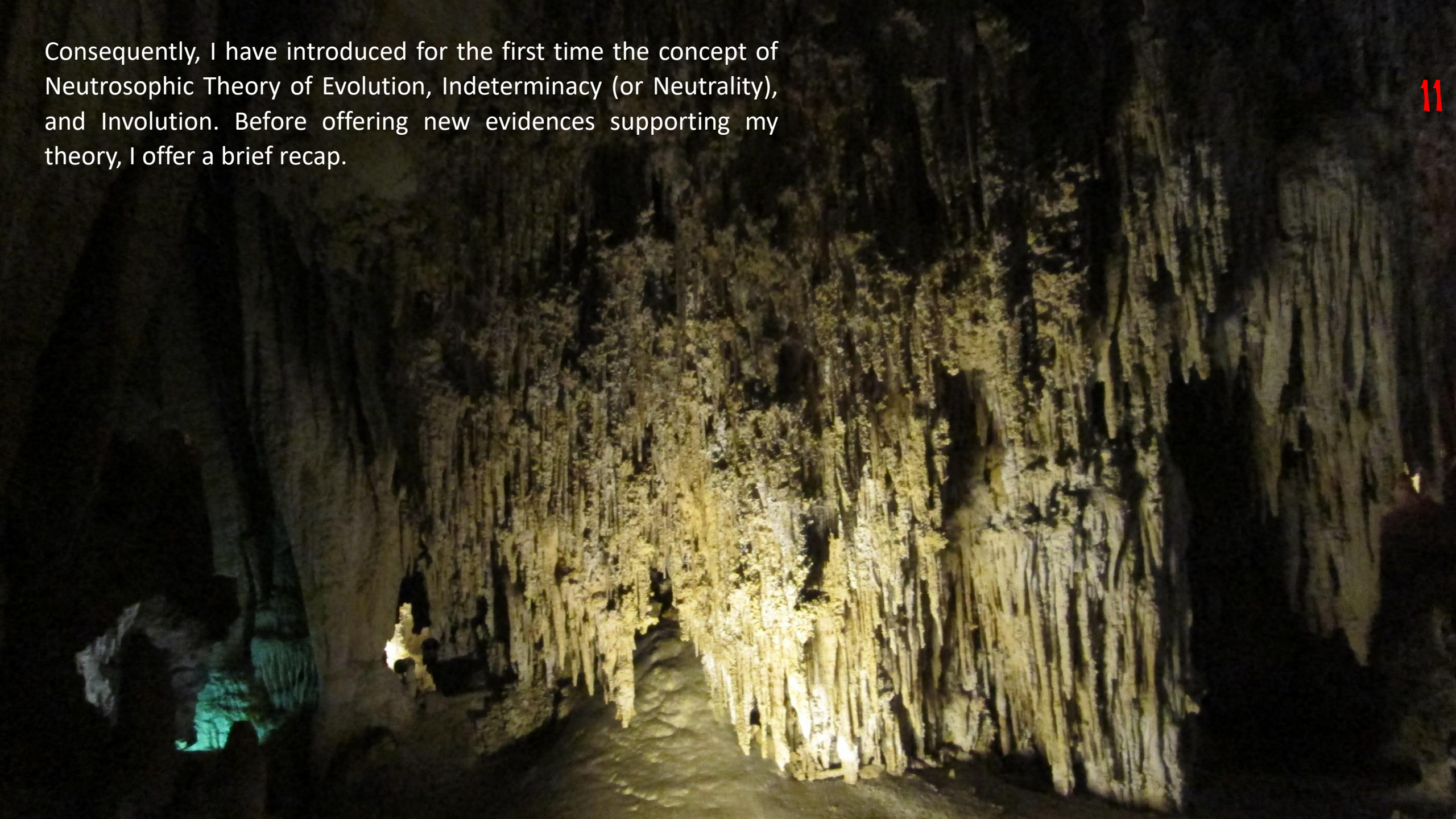


And all these degrees are different from a species to another species, from an environment to another environment, from a timespan to another timespan, and in general from a parameter to another parameter.

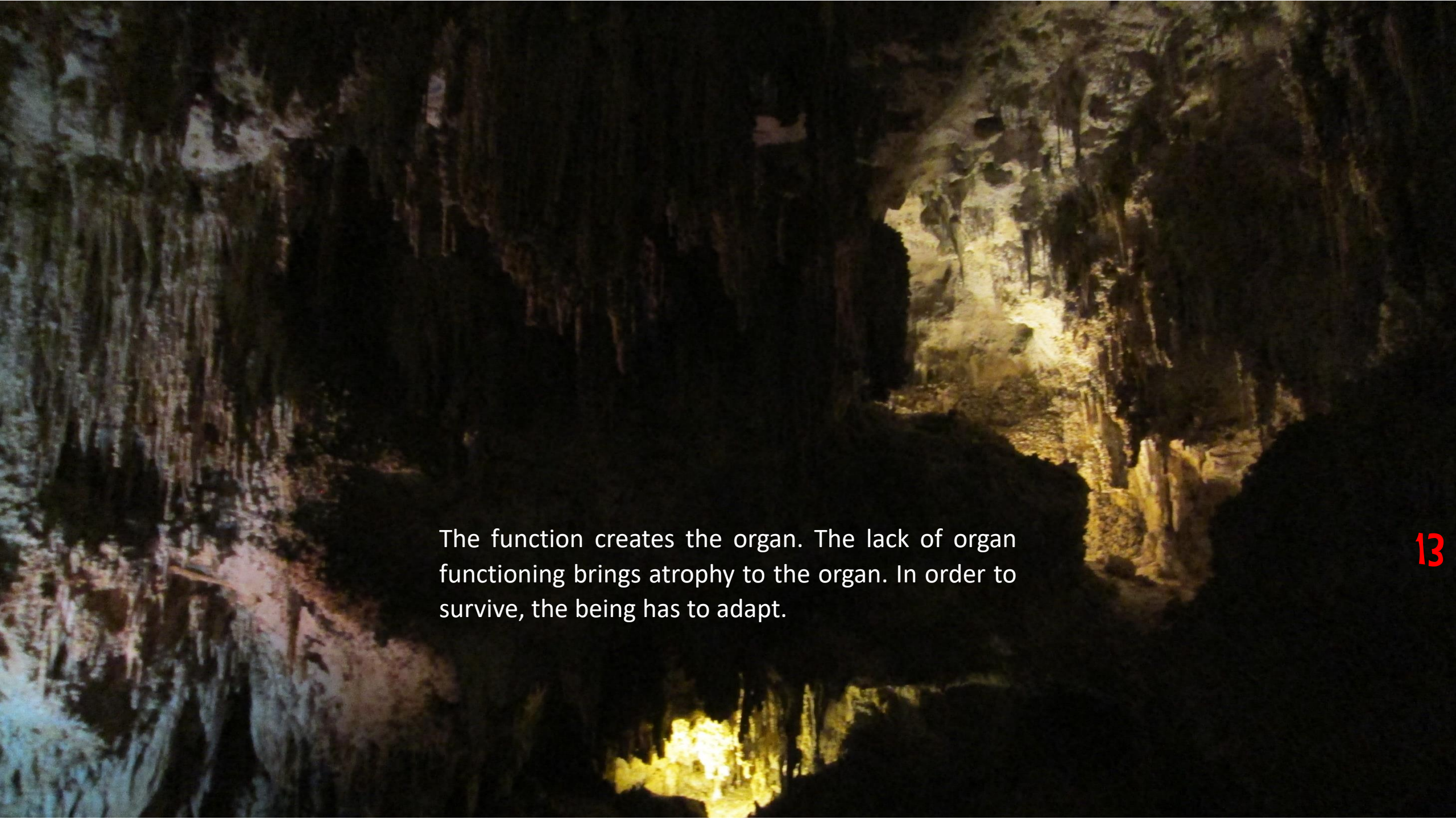


I have observed that the animals and plants (and even human beings) not only evolve, but also devolve (i.e. involve back, decline, atrophy, pass down, regress, degenerate). Some treats increase, other treats decrease, while others remains unchanged (neutrality).

Consequently, I have introduced for the first time the concept of Neutrosophic Theory of Evolution, Indeterminacy (or Neutrality), and Involution. Before offering new evidences supporting my theory, I offer a brief recap.

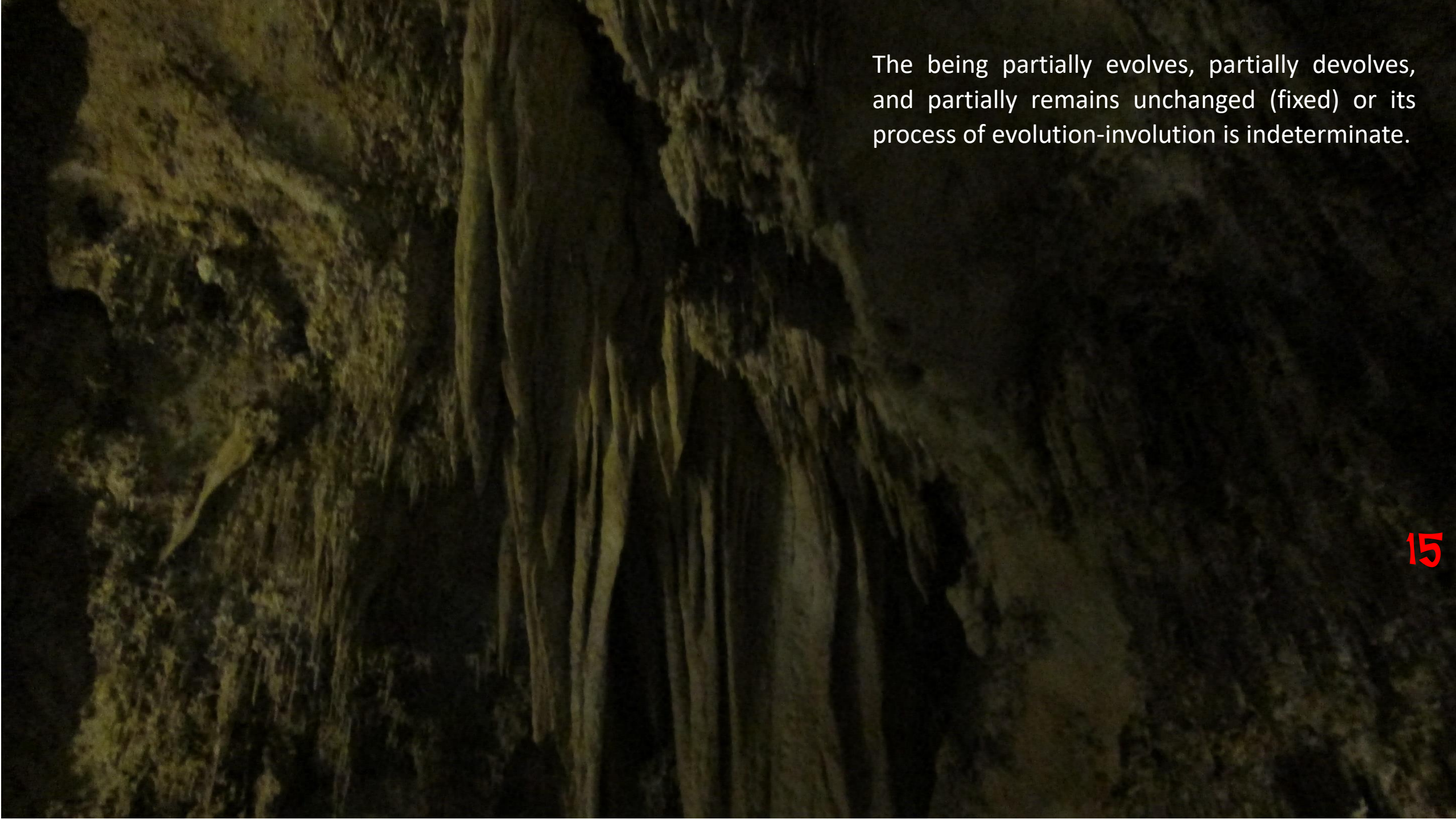


For each being, during a long timespan, there is a process of partial evolution, partial indeterminacy or neutrality, and partial involution with respect to the being body parts and functionalities.



The function creates the organ. The lack of organ functioning brings atrophy to the organ. In order to survive, the being has to adapt.


One has adaptation by evolution, or adaptation by involution. There are species partially adapted and partially struggling to adapt.



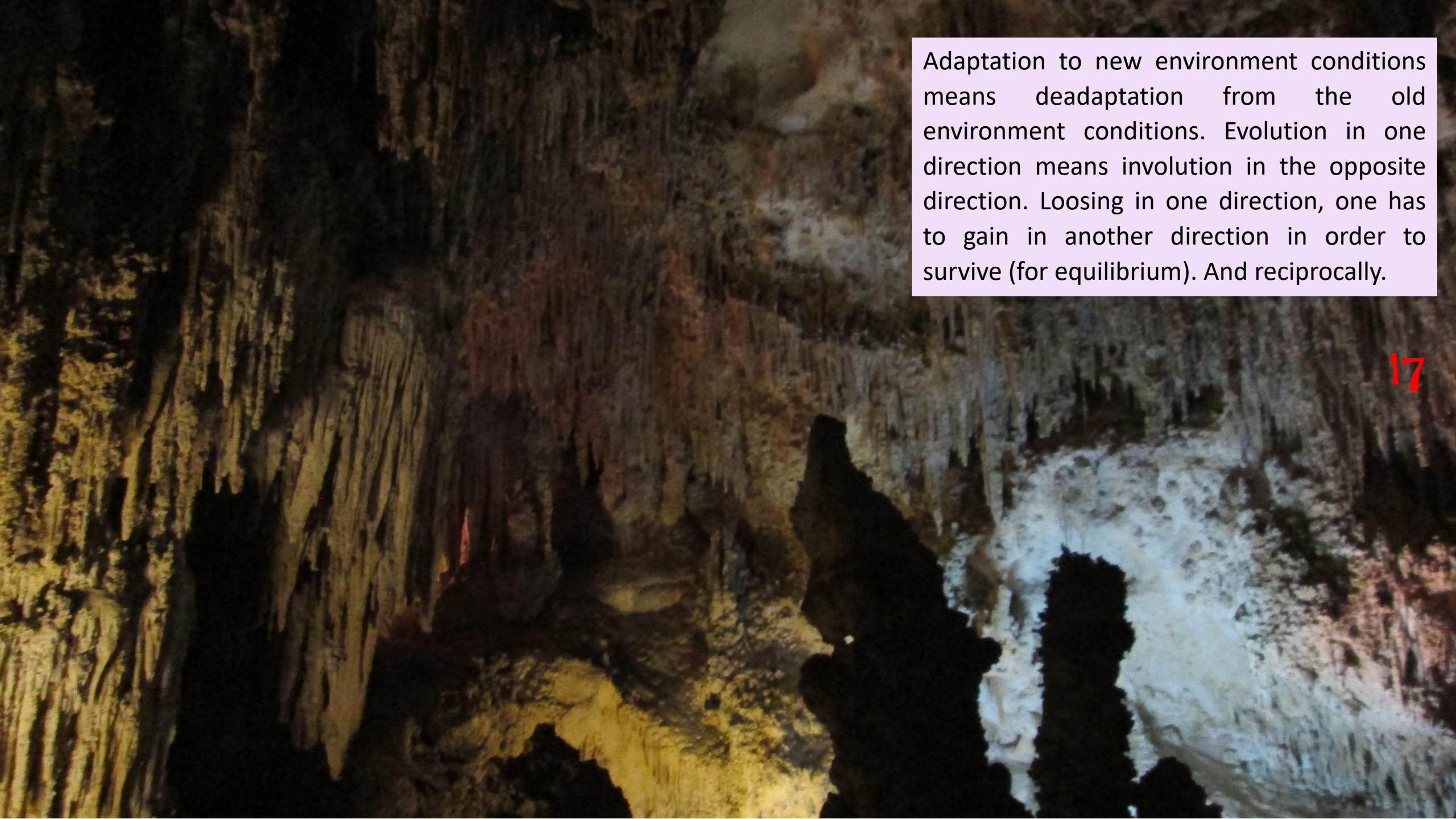
The being partially evolves, partially devolves, and partially remains unchanged (fixed) or its process of evolution-involution is indeterminate.

During the process of adaptation of a being (plant, animal, or human) B, to a new environment η,

— B partially evolves;

— B partially devolves (involves, regresses, degenerates);

— and B partially remains indeterminate which means neutral (unchanged), or ambigous— i.e. not sure if it is evolution or involution.



Adaptation to new environment conditions means deadaptation from the old environment conditions. Evolution in one direction means involution in the opposite direction. Loosing in one direction, one has to gain in another direction in order to survive (for equilibrium). And reciprocally.

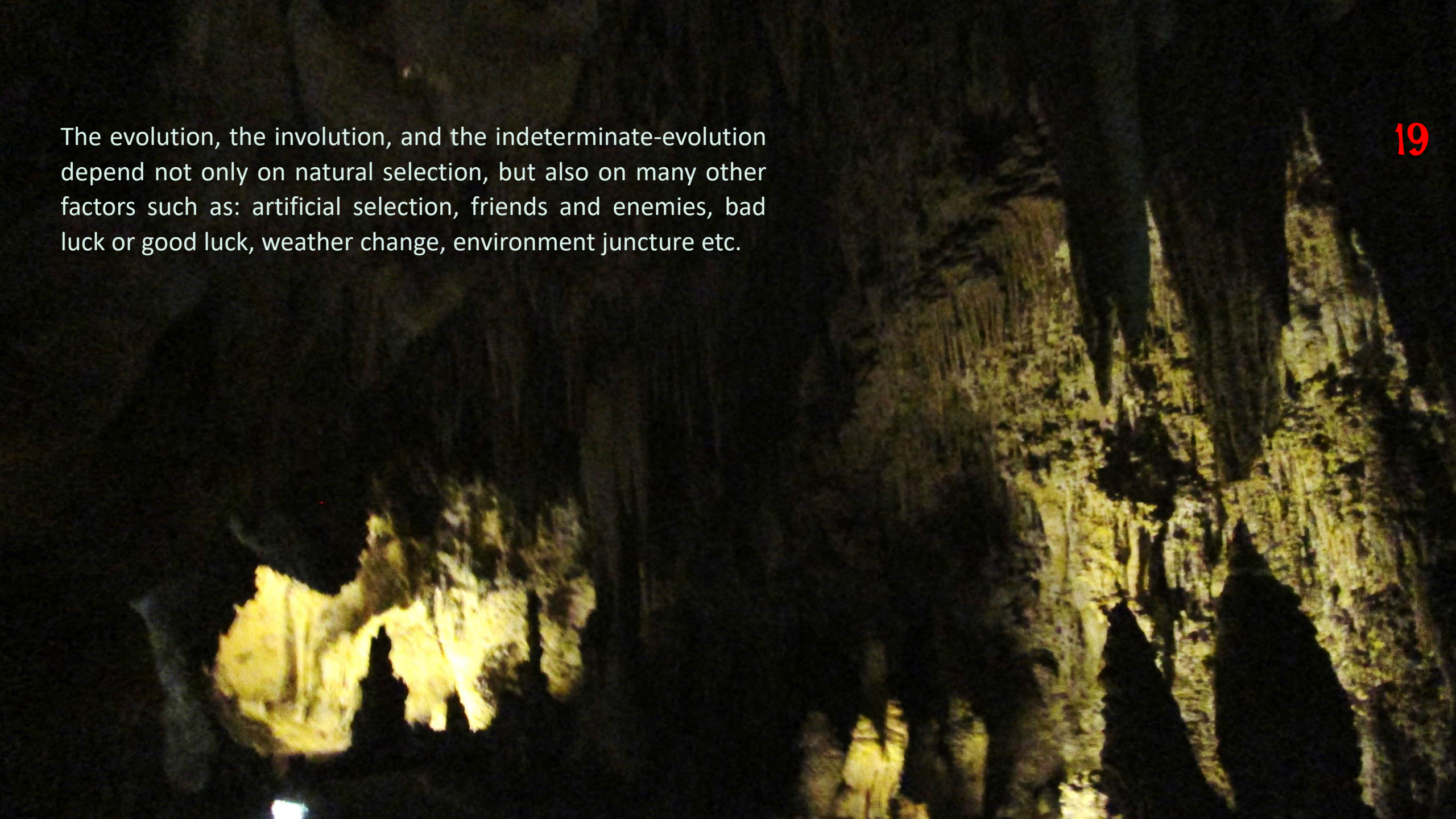
A species, with respect to an environment, can be:

— in equilibrium, disequilibrium, or indetermination;

— stable, unstable, or indeterminate (ambiguous state);

— optimal, suboptimal, or indeterminate.

The evolution, the involution, and the indeterminate-evolution depend not only on natural selection, but also on many other factors such as: artificial selection, friends and enemies, bad luck or good luck, weather change, environment juncture etc.

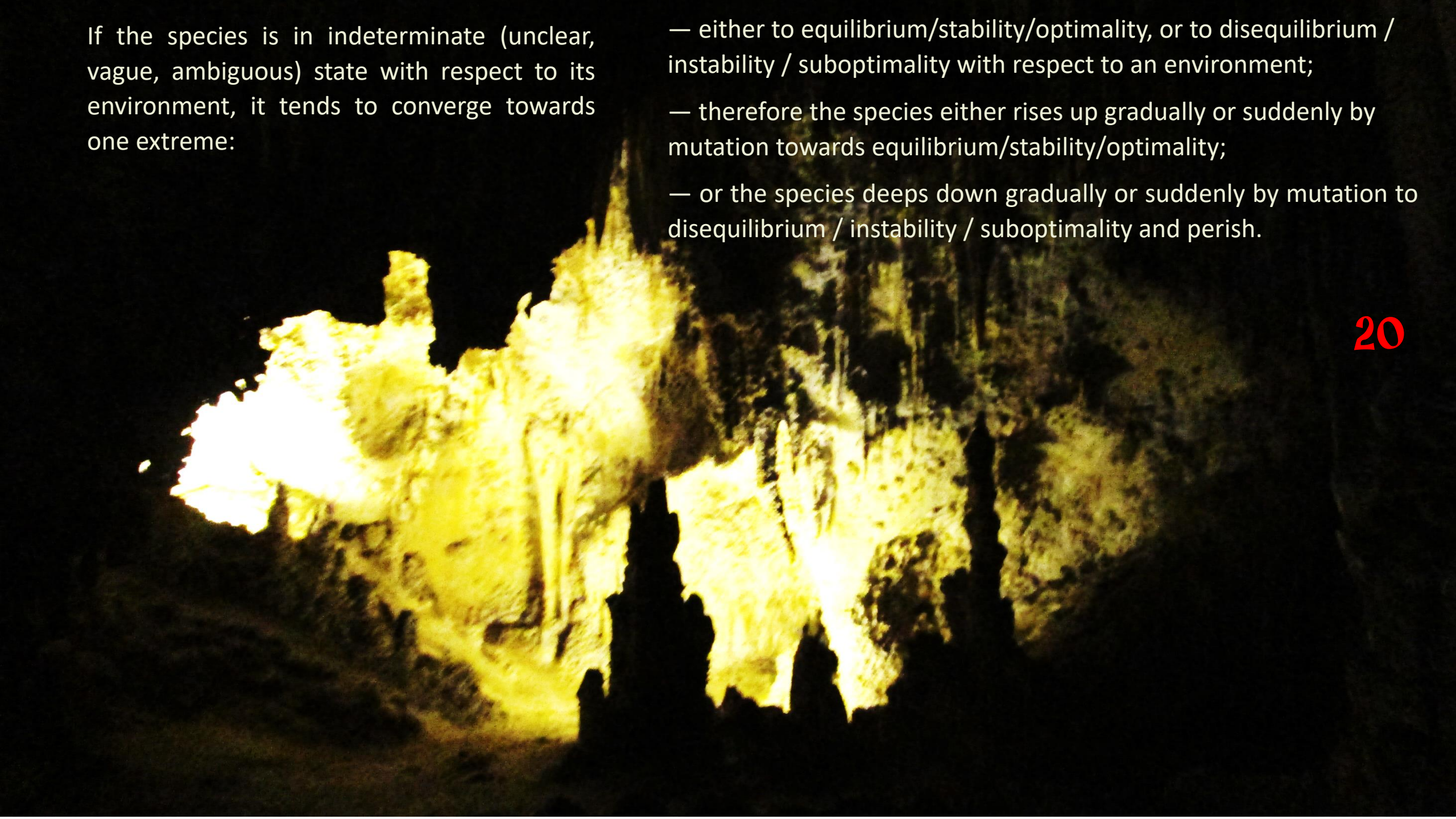


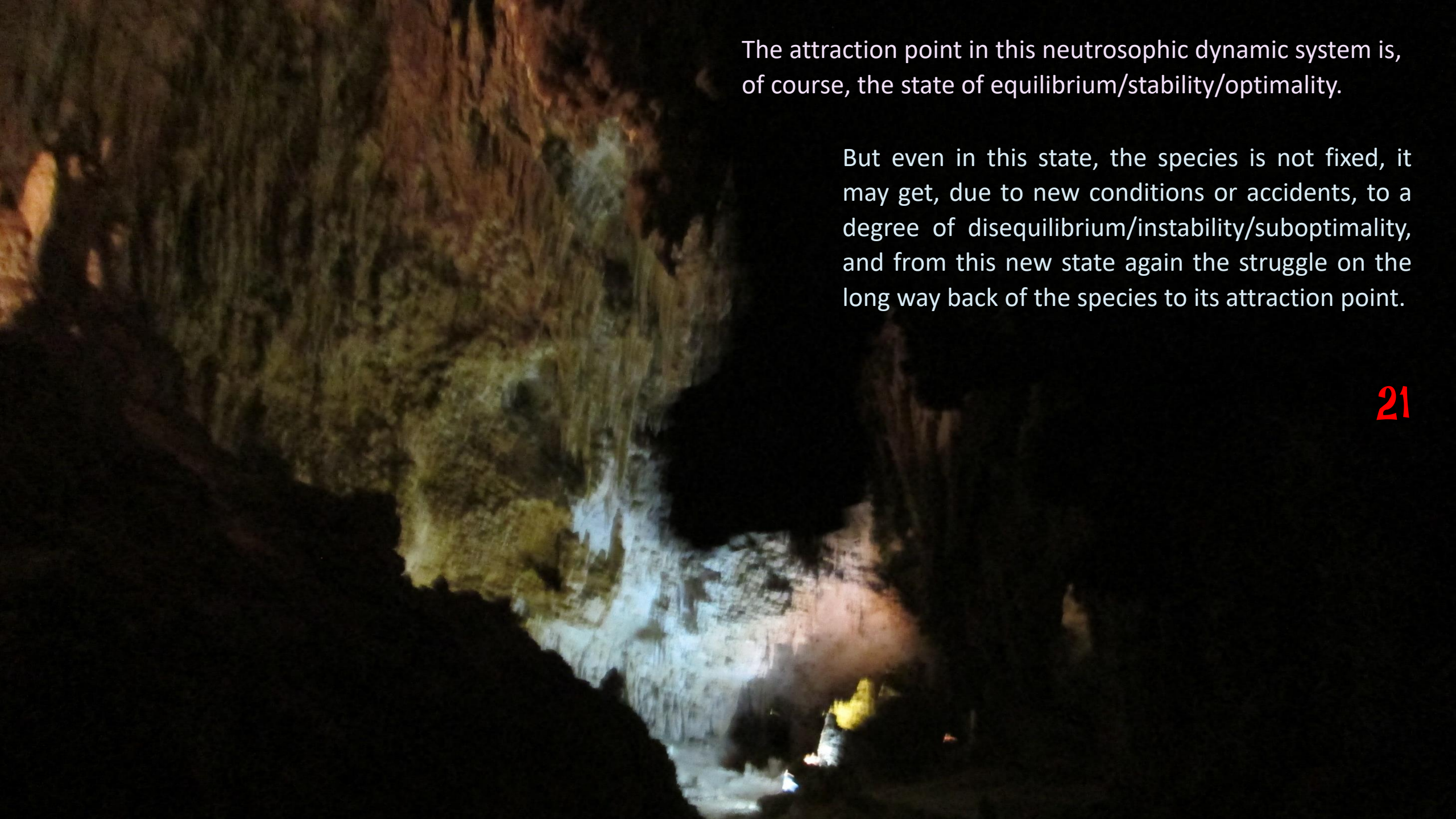
If the species is in indeterminate (unclear, vague, ambiguous) state with respect to its environment, it tends to converge towards one extreme:

— either to equilibrium/stability/optimality, or to disequilibrium / instability / suboptimality with respect to an environment;

— therefore the species either rises up gradually or suddenly by mutation towards equilibrium/stability/optimality;

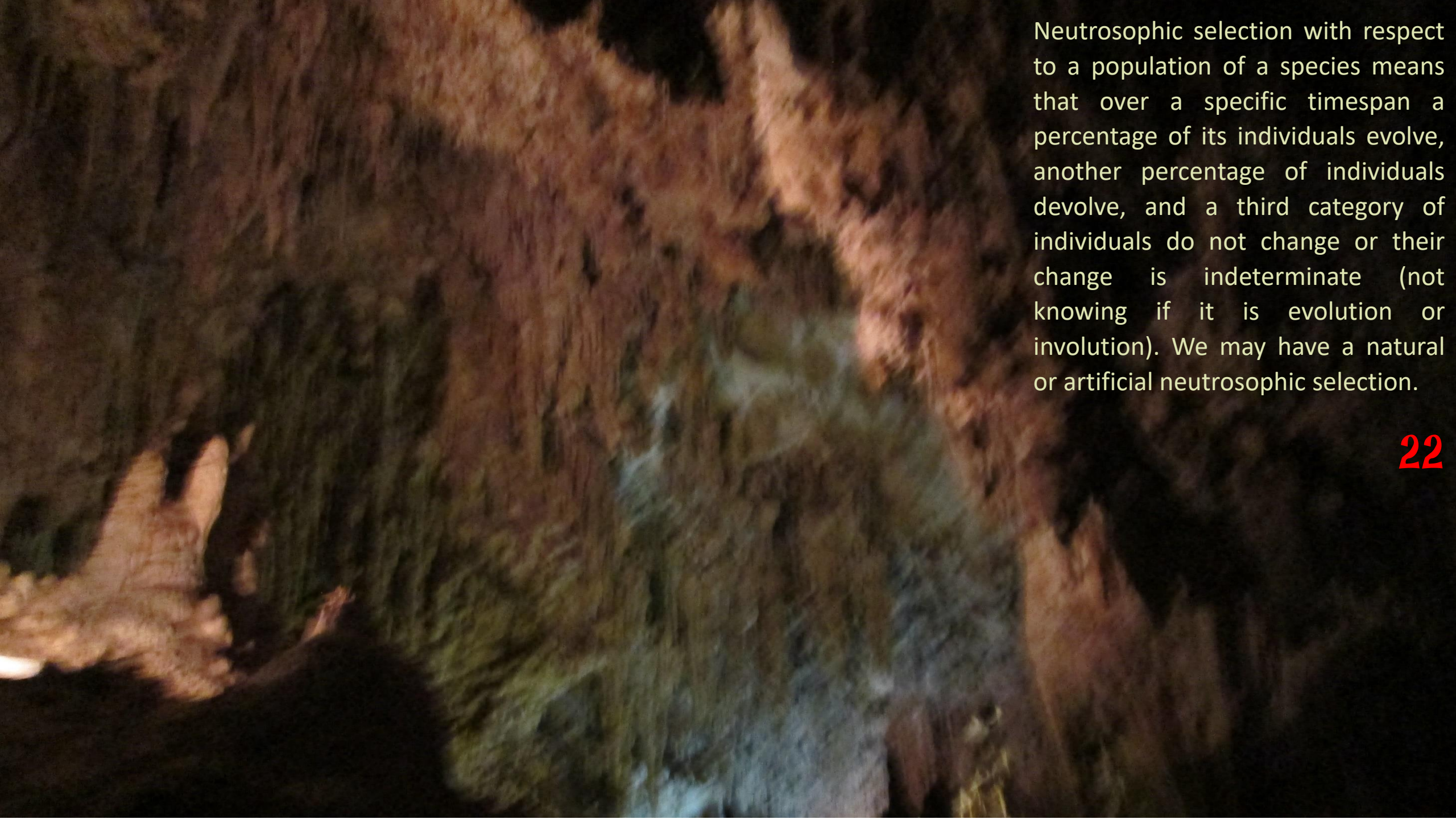
— or the species deeps down gradually or suddenly by mutation to disequilibrium / instability / suboptimality and perish.



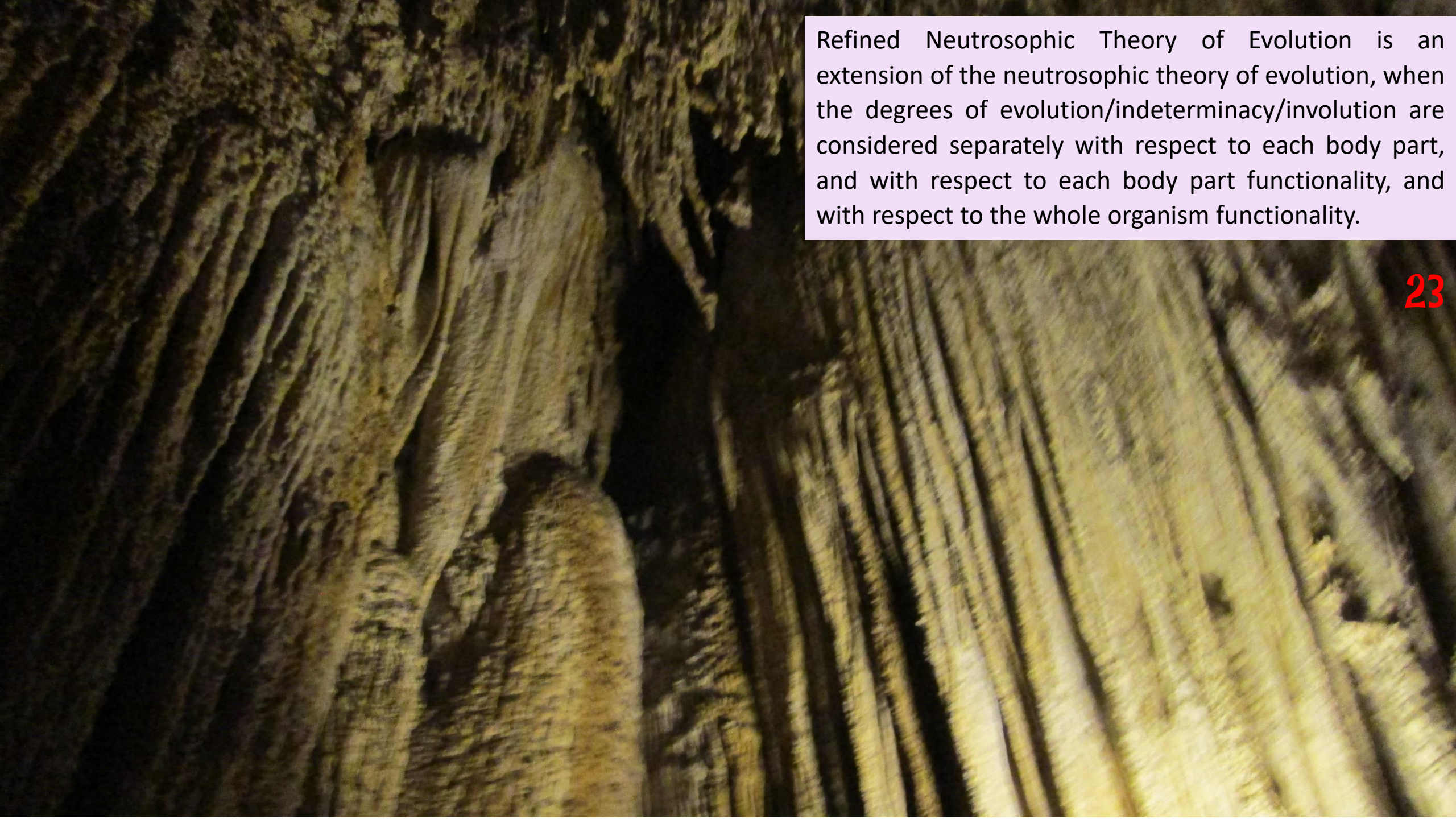


The attraction point in this neutrosophic dynamic system is, of course, the state of equilibrium/stability/optimality.

But even in this state, the species is not fixed, it may get, due to new conditions or accidents, to a degree of disequilibrium/instability/suboptimality, and from this new state again the struggle on the long way back of the species to its attraction point.

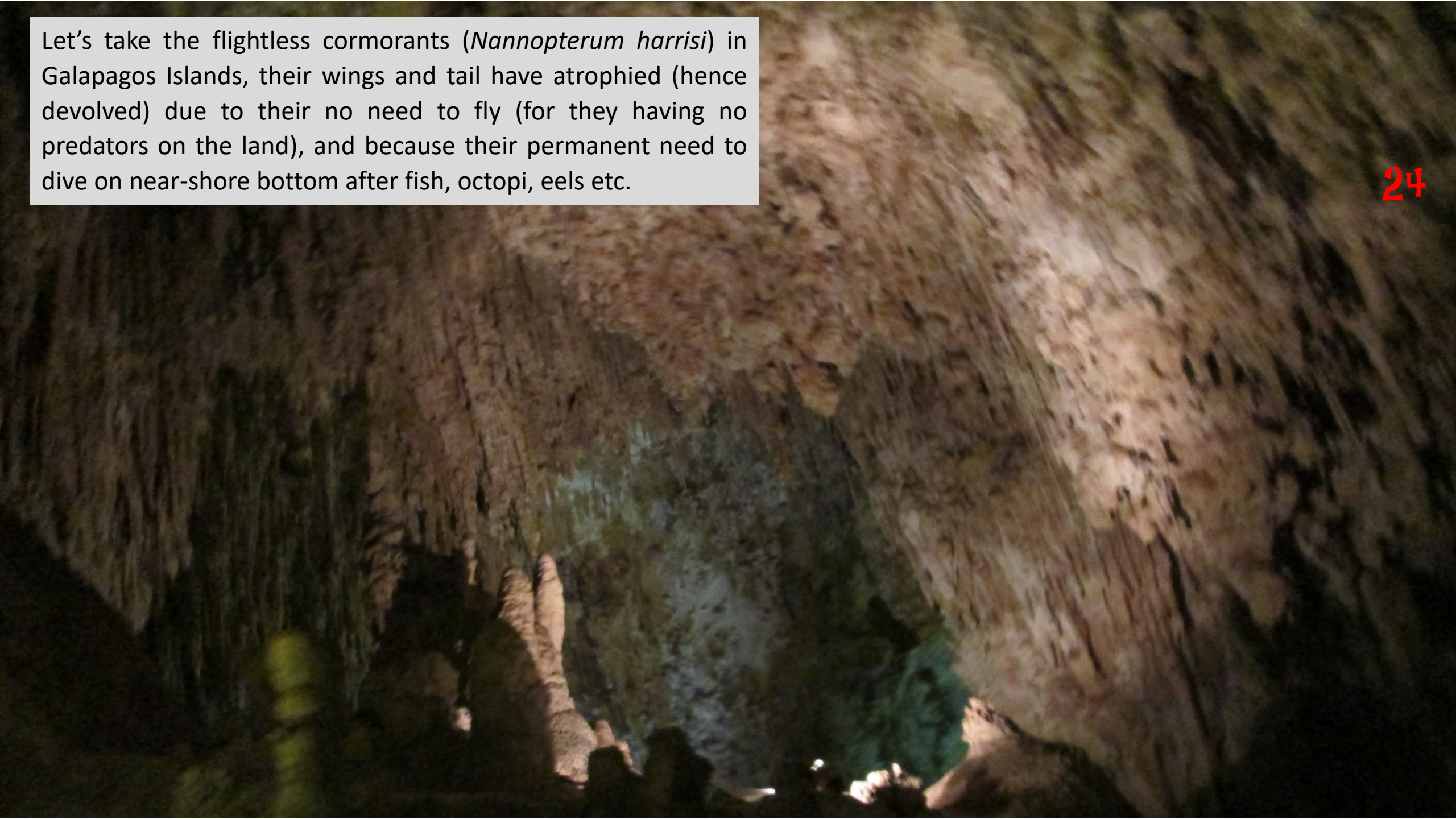


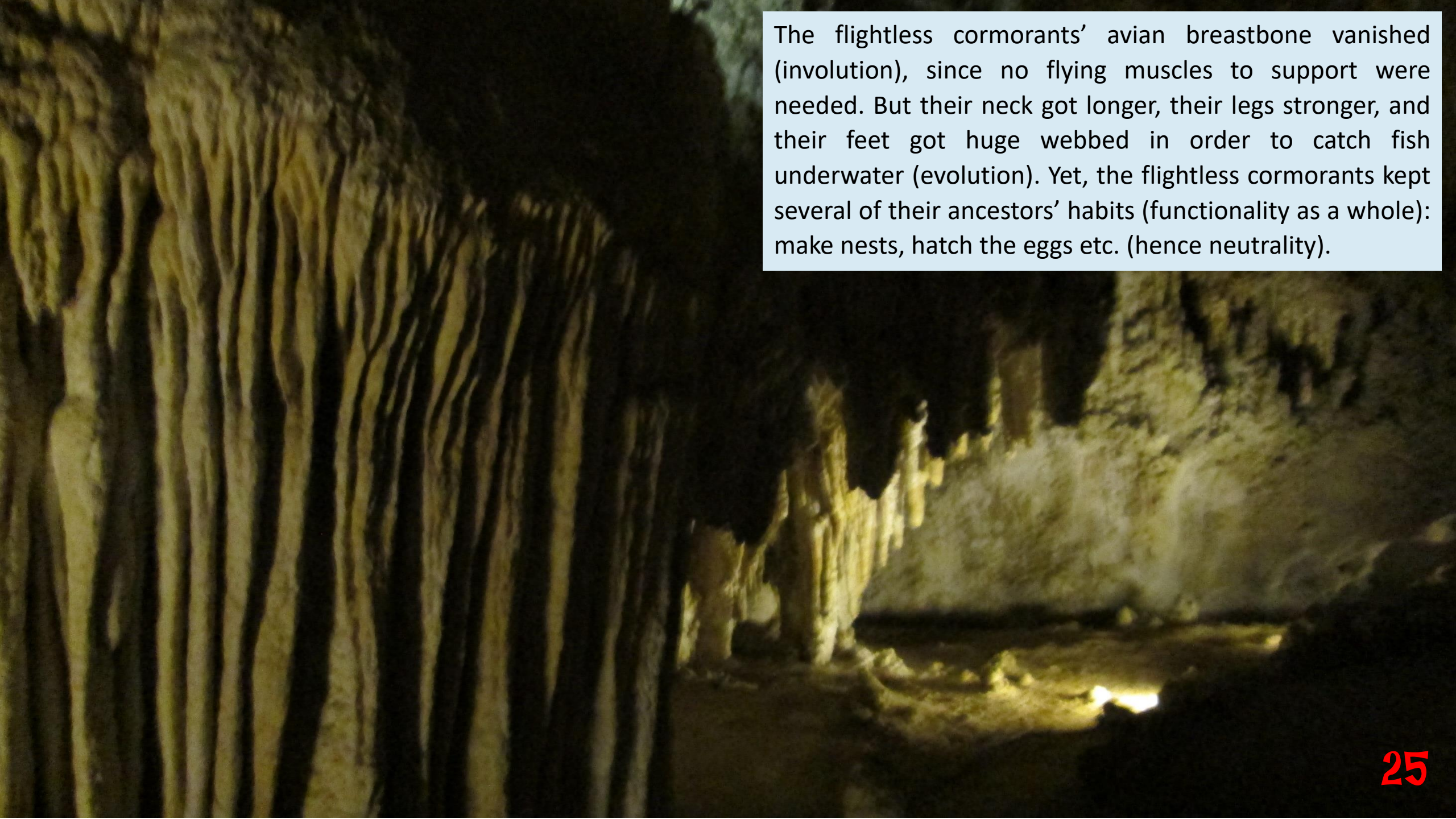
Neutrosophic selection with respect to a population of a species means that over a specific timespan a percentage of its individuals evolve, another percentage of individuals devolve, and a third category of individuals do not change or their change is indeterminate (not knowing if it is evolution or involution). We may have a natural or artificial neutrosophic selection.



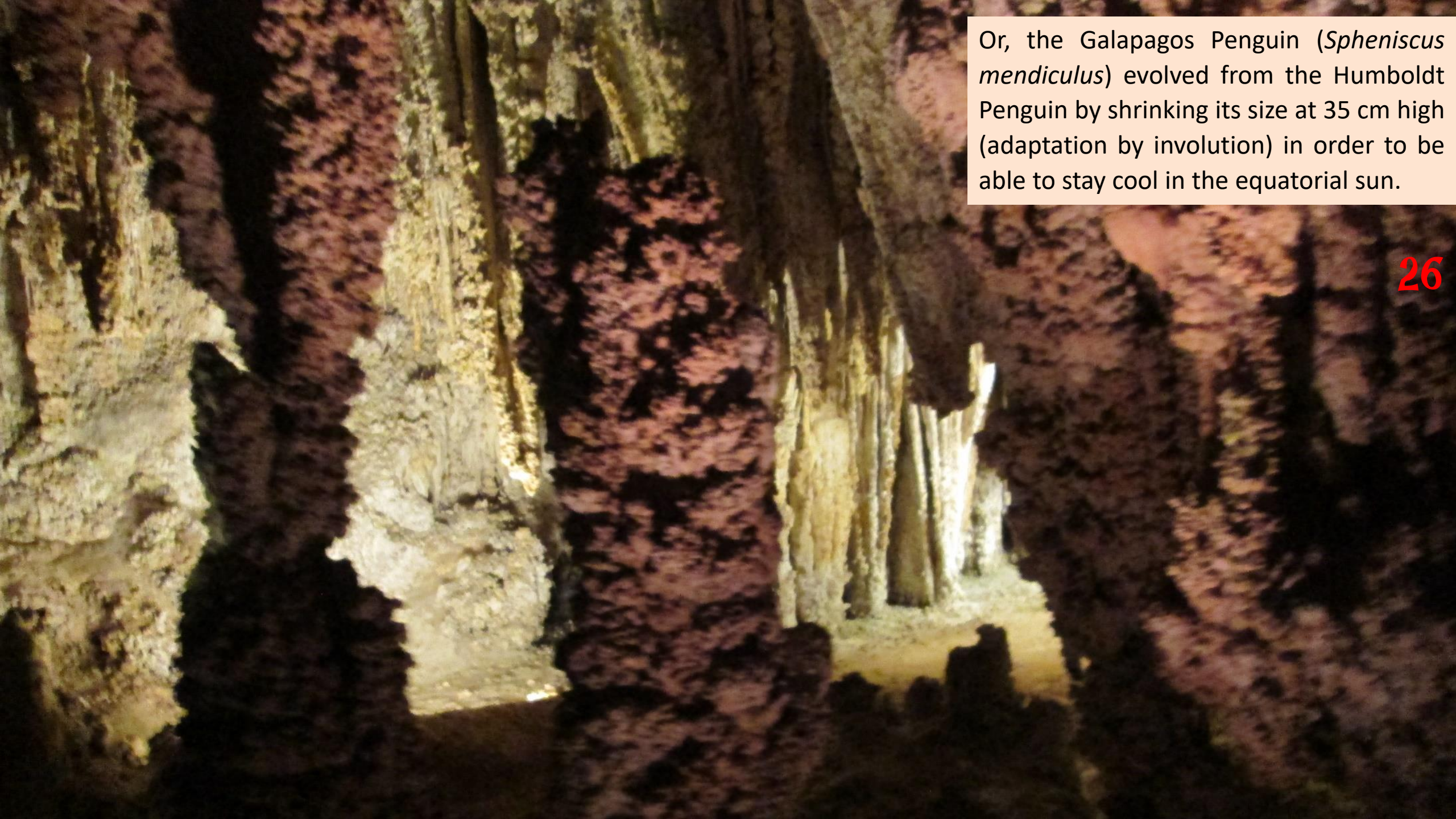
Refined Neutrosophic Theory of Evolution is an extension of the neutrosophic theory of evolution, when the degrees of evolution/indeterminacy/involution are considered separately with respect to each body part, and with respect to each body part functionality, and with respect to the whole organism functionality.

Let’s take the flightless cormorants (*Nannopterum harrisi*) in Galapagos Islands, their wings and tail have atrophied (hence devolved) due to their no need to fly (for they having no predators on the land), and because their permanent need to dive on near-shore bottom after fish, octopi, eels etc.

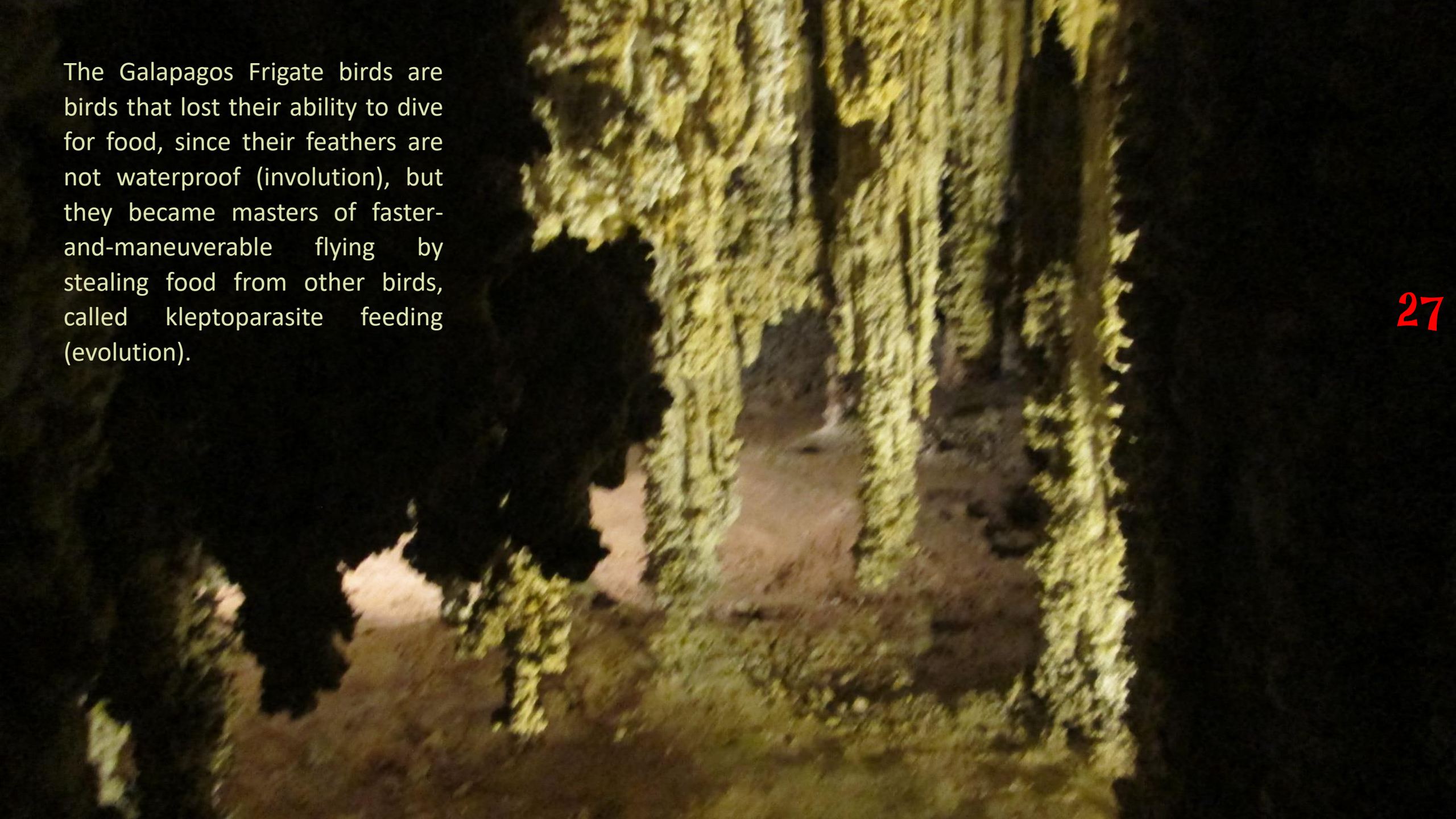




The flightless cormorants' avian breastbone vanished (involution), since no flying muscles to support were needed. But their neck got longer, their legs stronger, and their feet got huge webbed in order to catch fish underwater (evolution). Yet, the flightless cormorants kept several of their ancestors' habits (functionality as a whole): make nests, hatch the eggs etc. (hence neutrality).

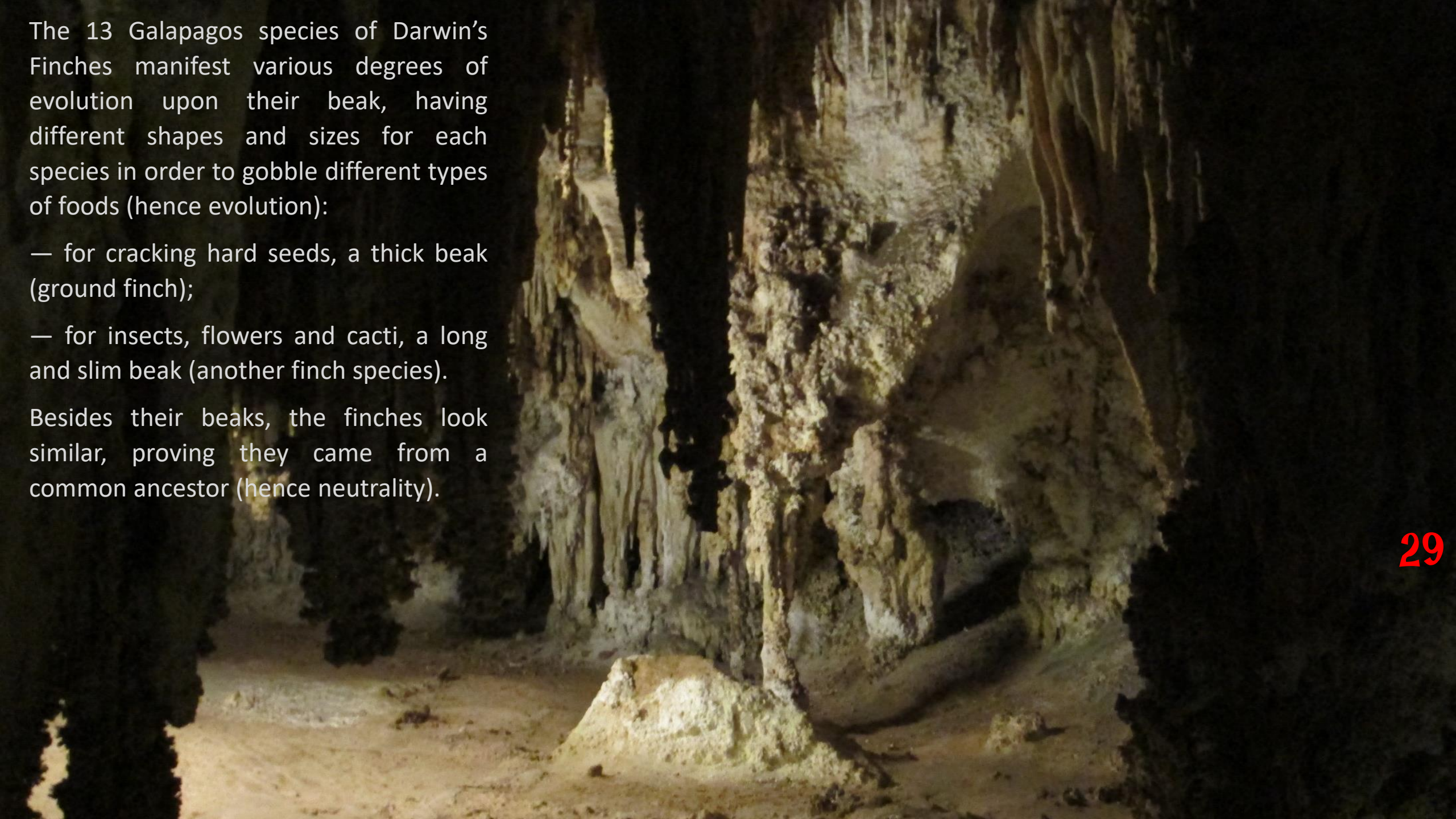


Or, the Galapagos Penguin (*Spheniscus mendiculus*) evolved from the Humboldt Penguin by shrinking its size at 35 cm high (adaptation by involution) in order to be able to stay cool in the equatorial sun.



The Galapagos Frigate birds are birds that lost their ability to dive for food, since their feathers are not waterproof (involution), but they became masters of faster-and-maneuverable flying by stealing food from other birds, called kleptoparasite feeding (evolution).

For the moles, mammals that live underground, their eyes and ears have degenerated and become minuscule since their functions are not much needed (hence adaptation by involution), yet their forelimbs became more powerful and their paws larger for better digging (adaptation by evolution).



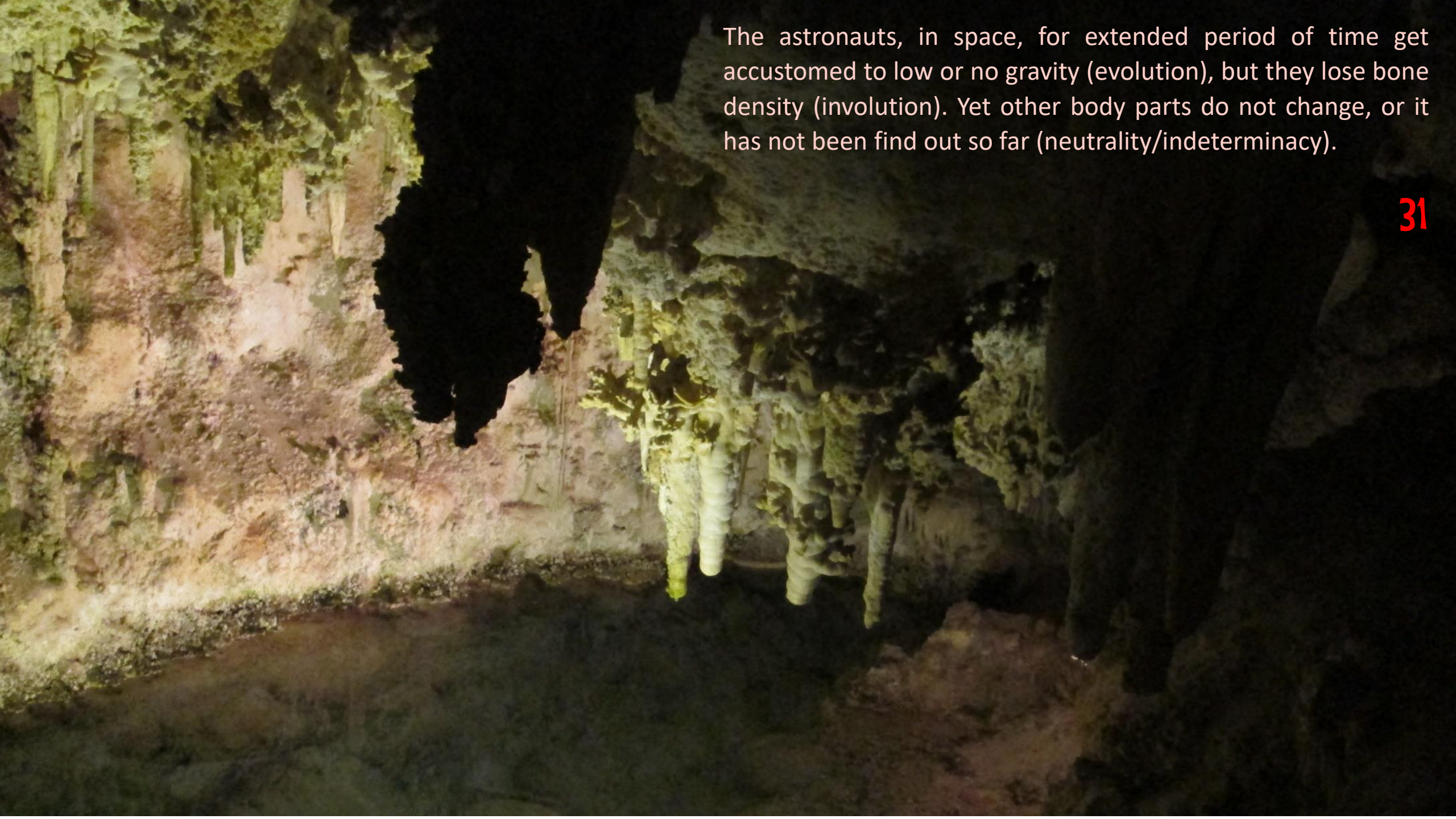
The 13 Galapagos species of Darwin's Finches manifest various degrees of evolution upon their beak, having different shapes and sizes for each species in order to gobble different types of foods (hence evolution):

— for cracking hard seeds, a thick beak (ground finch);

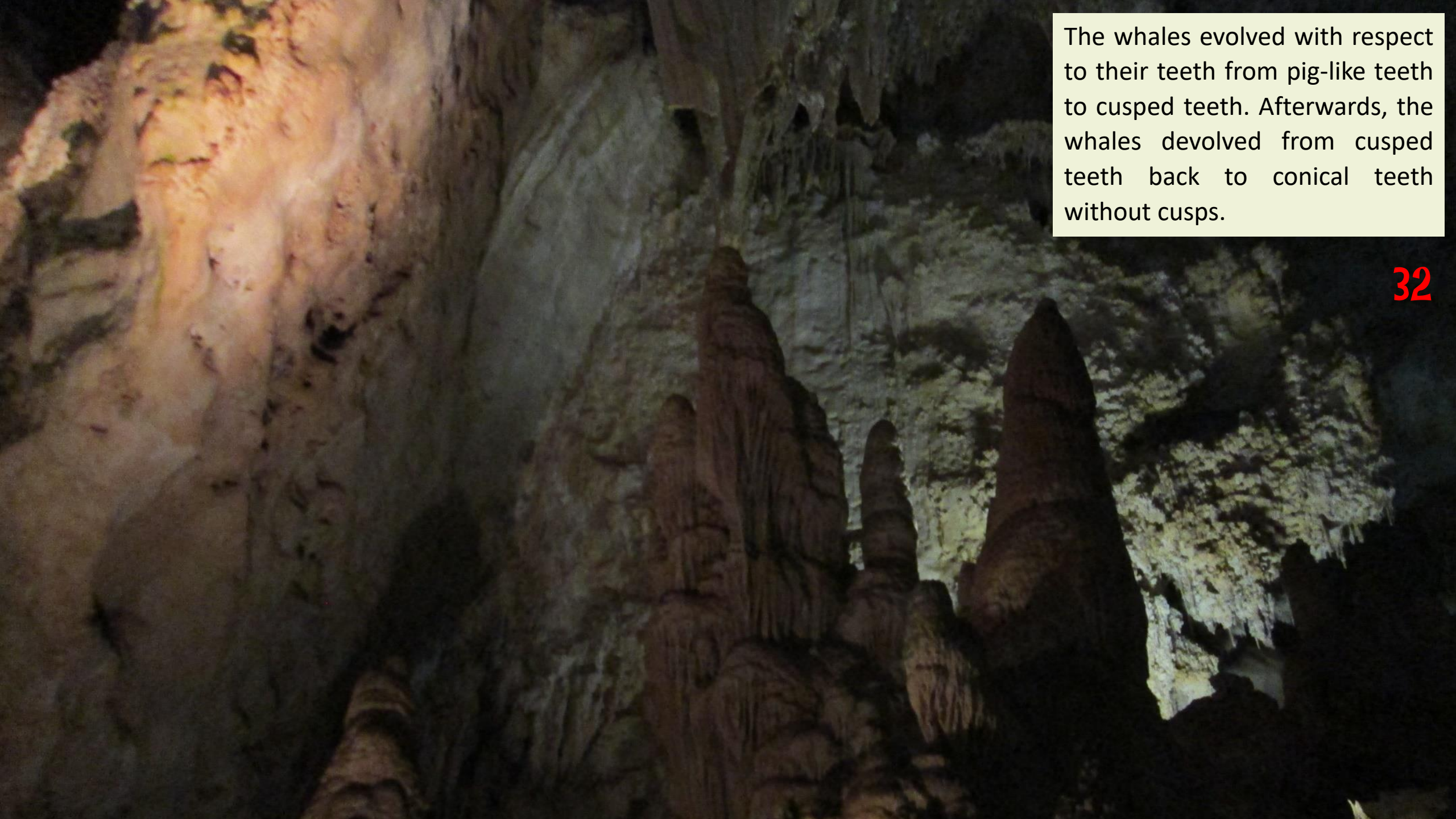
— for insects, flowers and cacti, a long and slim beak (another finch species).

Besides their beaks, the finches look similar, proving they came from a common ancestor (hence neutrality).

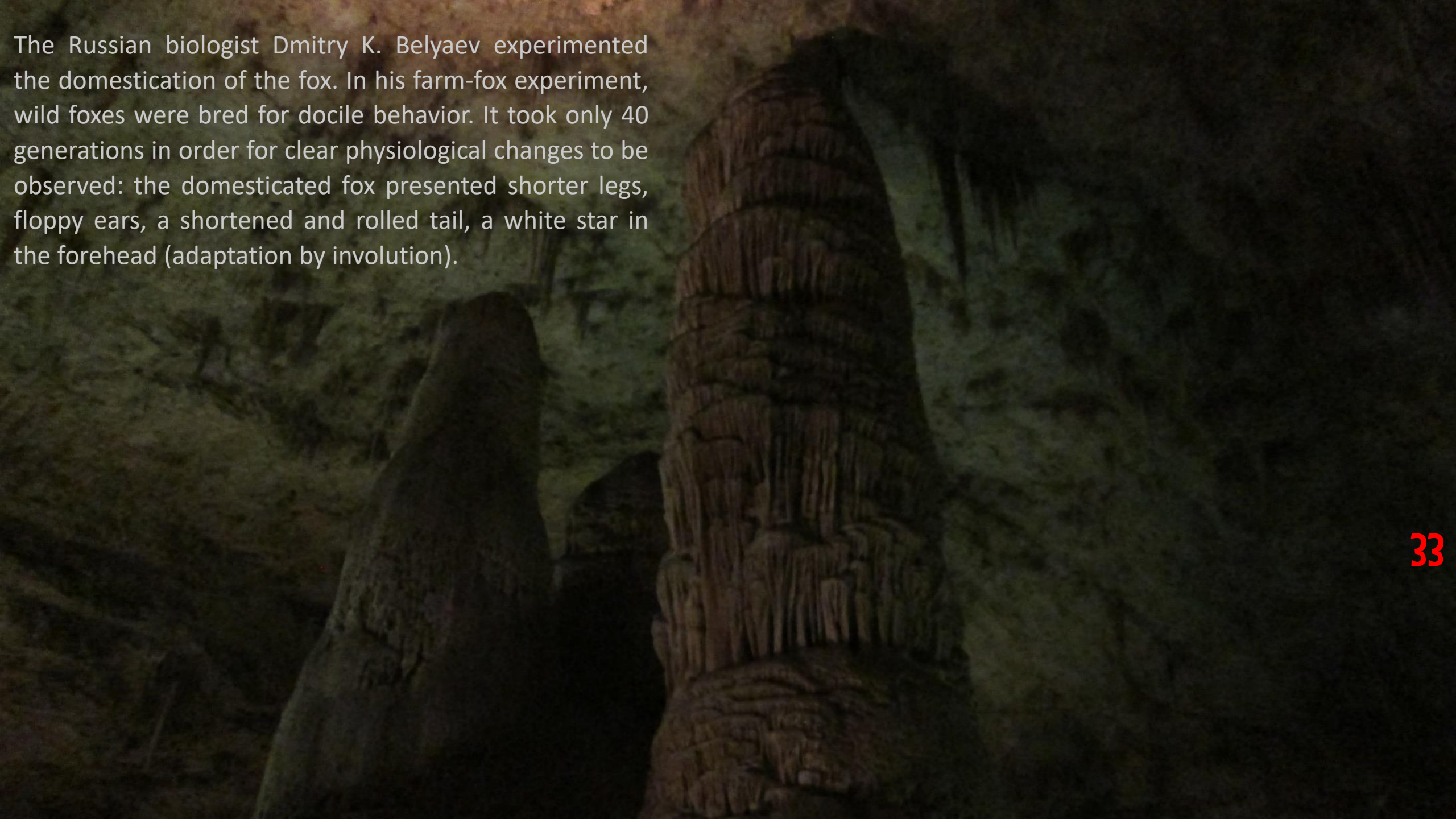
During the 1997–1998 El Nino, the marine algae died, and because the lack of food, on one of the Galapagos islands some marine iguanas shrank a quarter of their length and lost half of their weight (adaptation by involution). After plentiful of food became available again, the marine iguanas grew back to their original length and weight (re-adaptation by evolution).



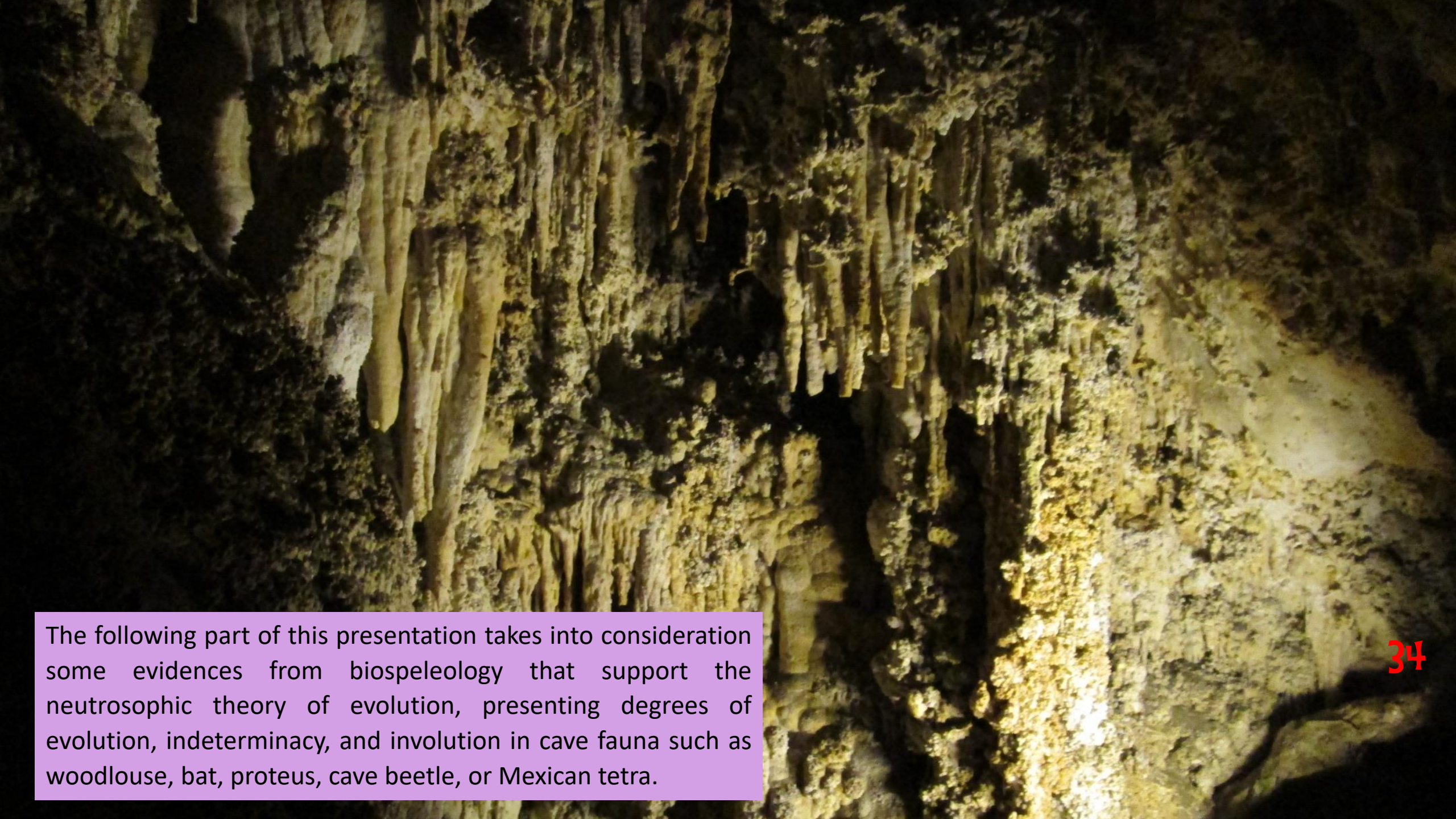
The astronauts, in space, for extended period of time get accustomed to low or no gravity (evolution), but they lose bone density (involution). Yet other body parts do not change, or it has not been find out so far (neutrality/indeterminacy).



The whales evolved with respect to their teeth from pig-like teeth to cusped teeth. Afterwards, the whales devolved from cusped teeth back to conical teeth without cusps.



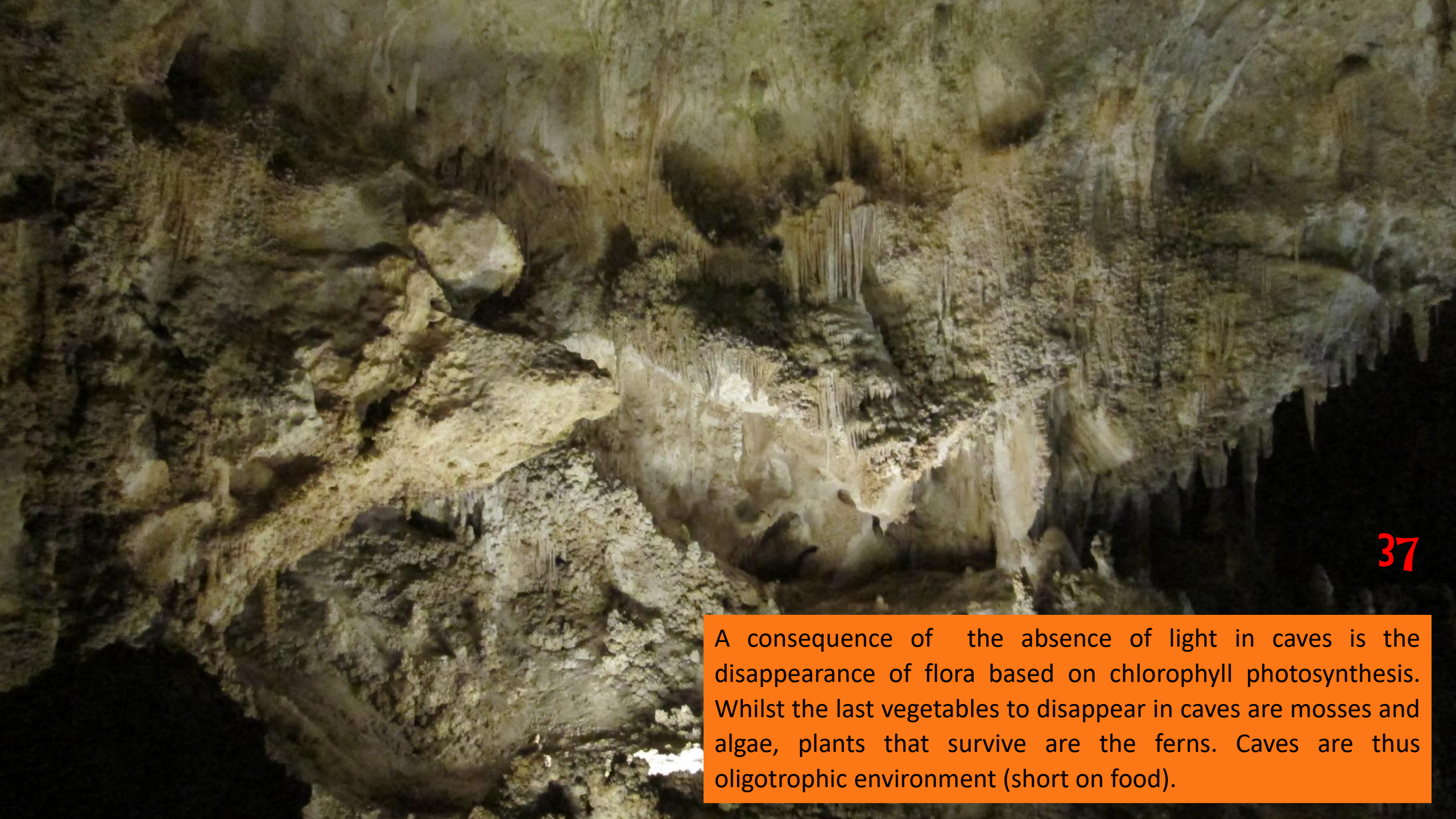
The Russian biologist Dmitry K. Belyaev experimented the domestication of the fox. In his farm-fox experiment, wild foxes were bred for docile behavior. It took only 40 generations in order for clear physiological changes to be observed: the domesticated fox presented shorter legs, floppy ears, a shortened and rolled tail, a white star in the forehead (adaptation by involution).



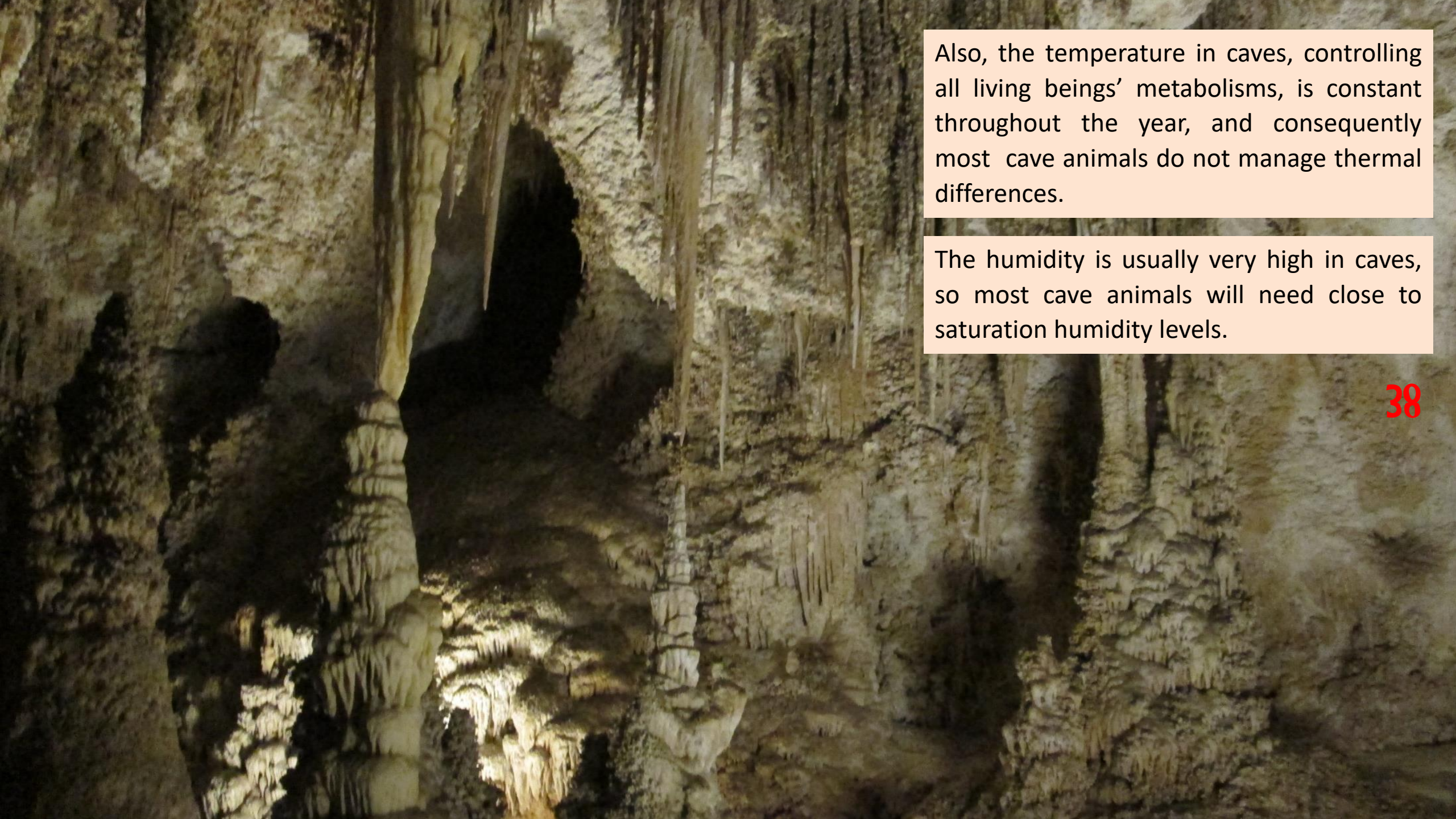
The following part of this presentation takes into consideration some evidences from biospeleology that support the neutrosophic theory of evolution, presenting degrees of evolution, indeterminacy, and involution in cave fauna such as woodlouse, bat, proteus, cave beetle, or Mexican tetra.

Biospeleology - born in 1907 thanks to the work of the Romanian naturalist Emil Gheorghe Racoviță - is a branch of zoology that is preoccupied by the life cycle and adapation of the animals that inhabit caves.

Racoviță explored over 1,400 caves in France, Spain, Algeria, Italy, Slovenia, and Romania, with particular interest in isopoda, an order of crustaceans including woodlice and relatives, and capable of living both in waters (in the sea, but in fresh water or cave waters as well), or on land.

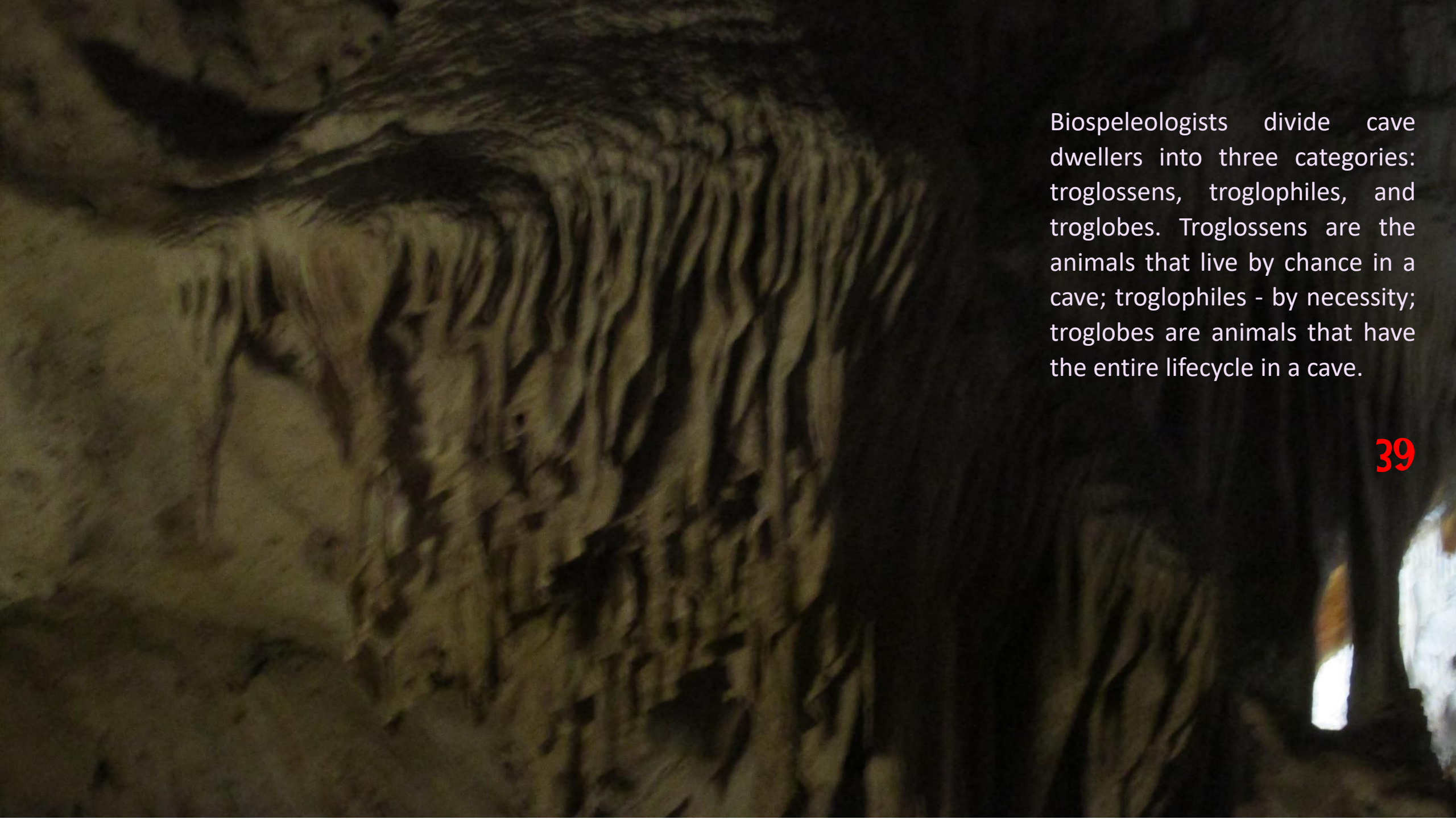


A consequence of the absence of light in caves is the disappearance of flora based on chlorophyll photosynthesis. Whilst the last vegetables to disappear in caves are mosses and algae, plants that survive are the ferns. Caves are thus oligotrophic environment (short on food).



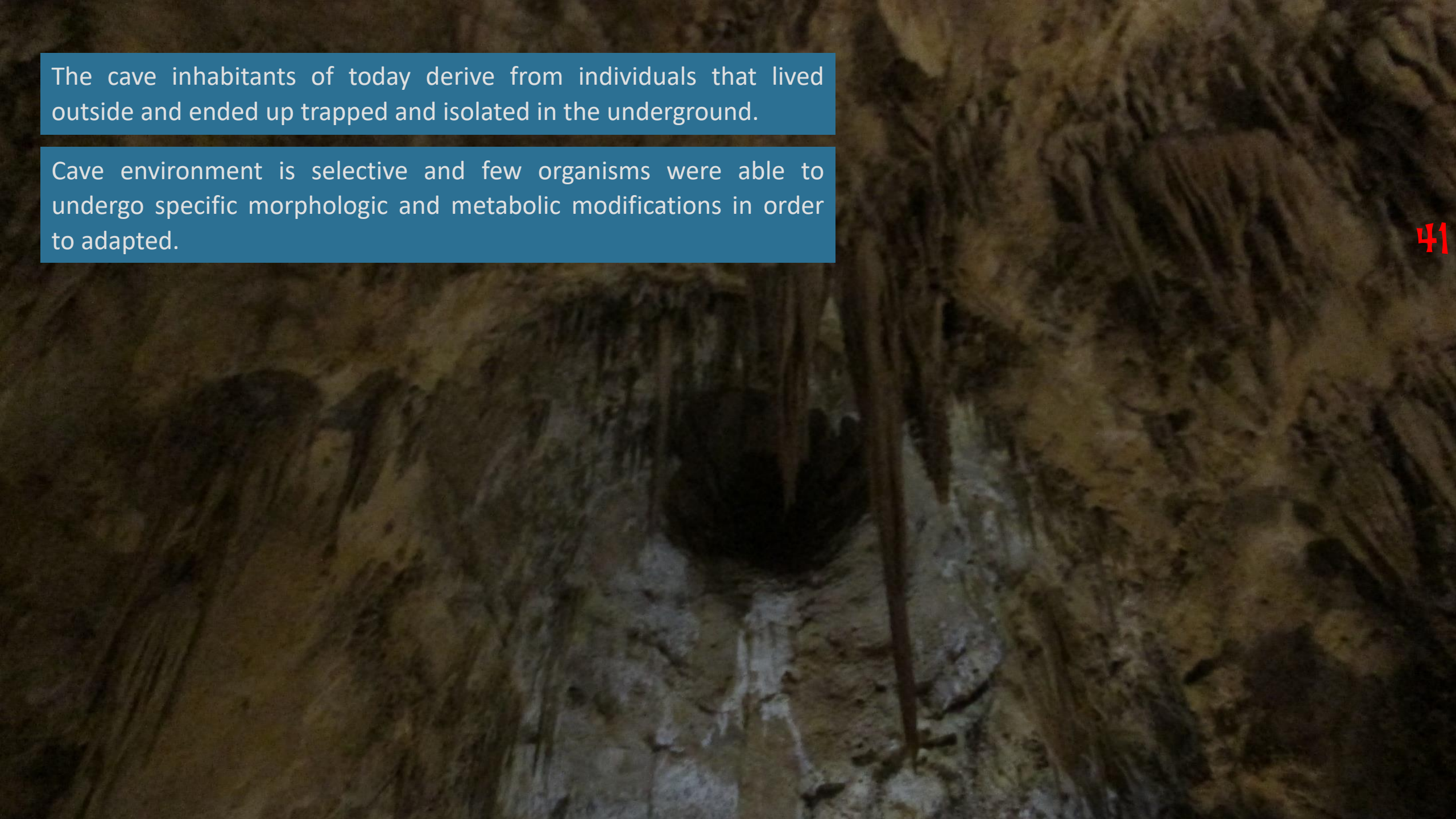
Also, the temperature in caves, controlling all living beings' metabolisms, is constant throughout the year, and consequently most cave animals do not manage thermal differences.

The humidity is usually very high in caves, so most cave animals will need close to saturation humidity levels.



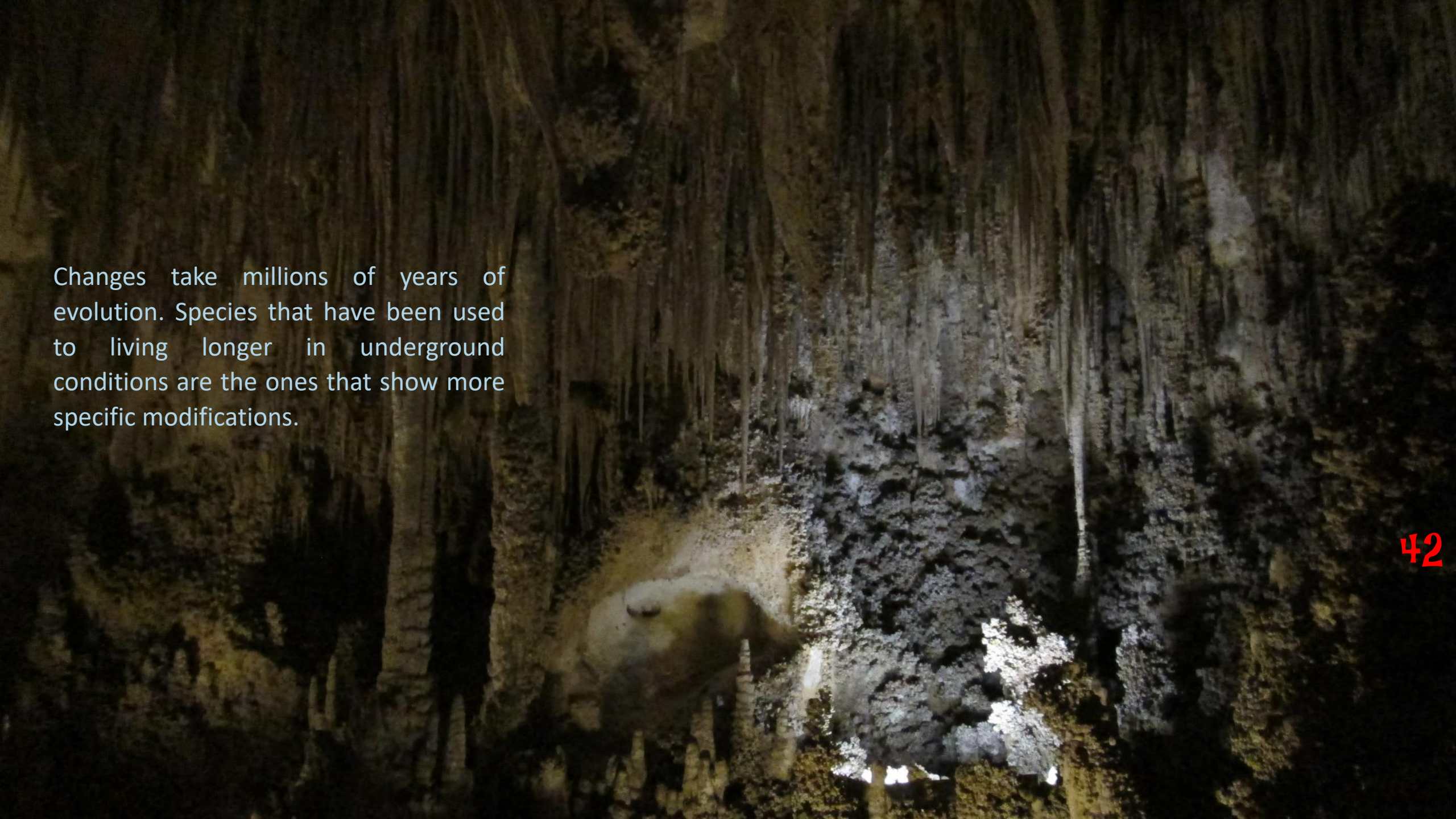
Biospeleologists divide cave dwellers into three categories: troglossens, troglophiles, and troglobes. Troglossens are the animals that live by chance in a cave; troglophiles - by necessity; troglobes are animals that have the entire lifecycle in a cave.

The cave environment has particular physical and morphological features, different from any other environment. Only those animals that developed specific evolutionary modifications survive here.

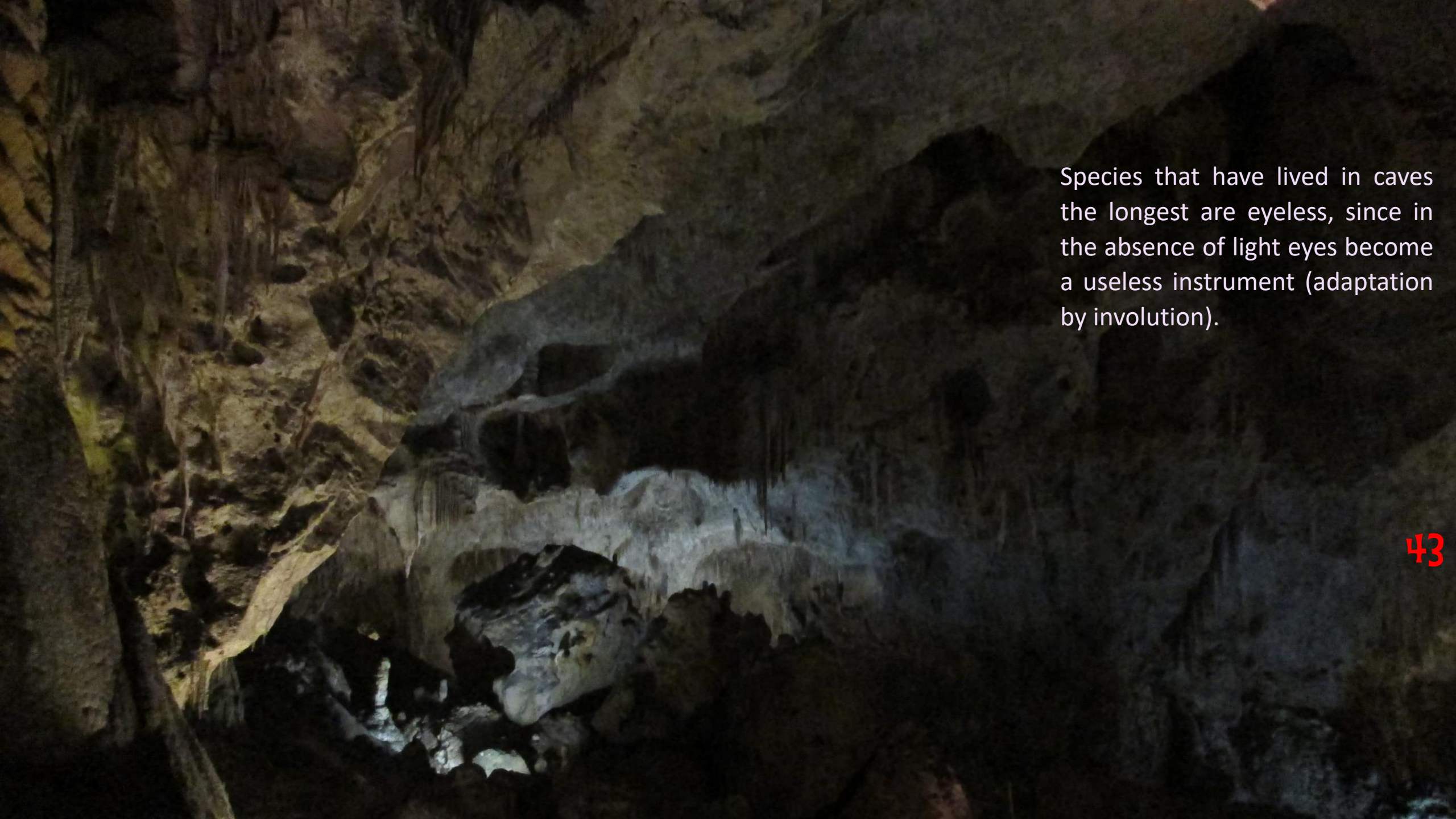


The cave inhabitants of today derive from individuals that lived outside and ended up trapped and isolated in the underground.

Cave environment is selective and few organisms were able to undergo specific morphologic and metabolic modifications in order to adapted.

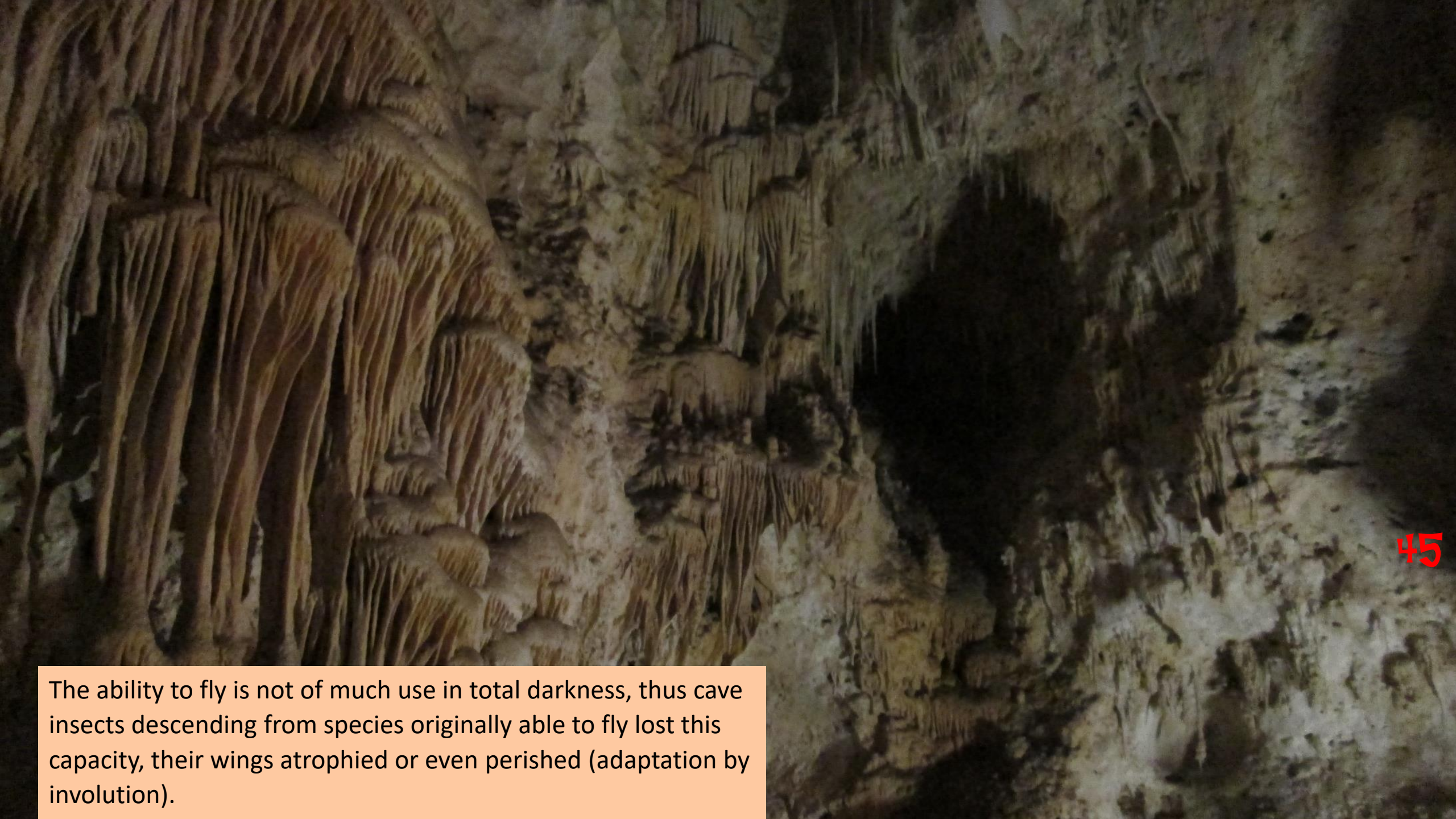


Changes take millions of years of evolution. Species that have been used to living longer in underground conditions are the ones that show more specific modifications.

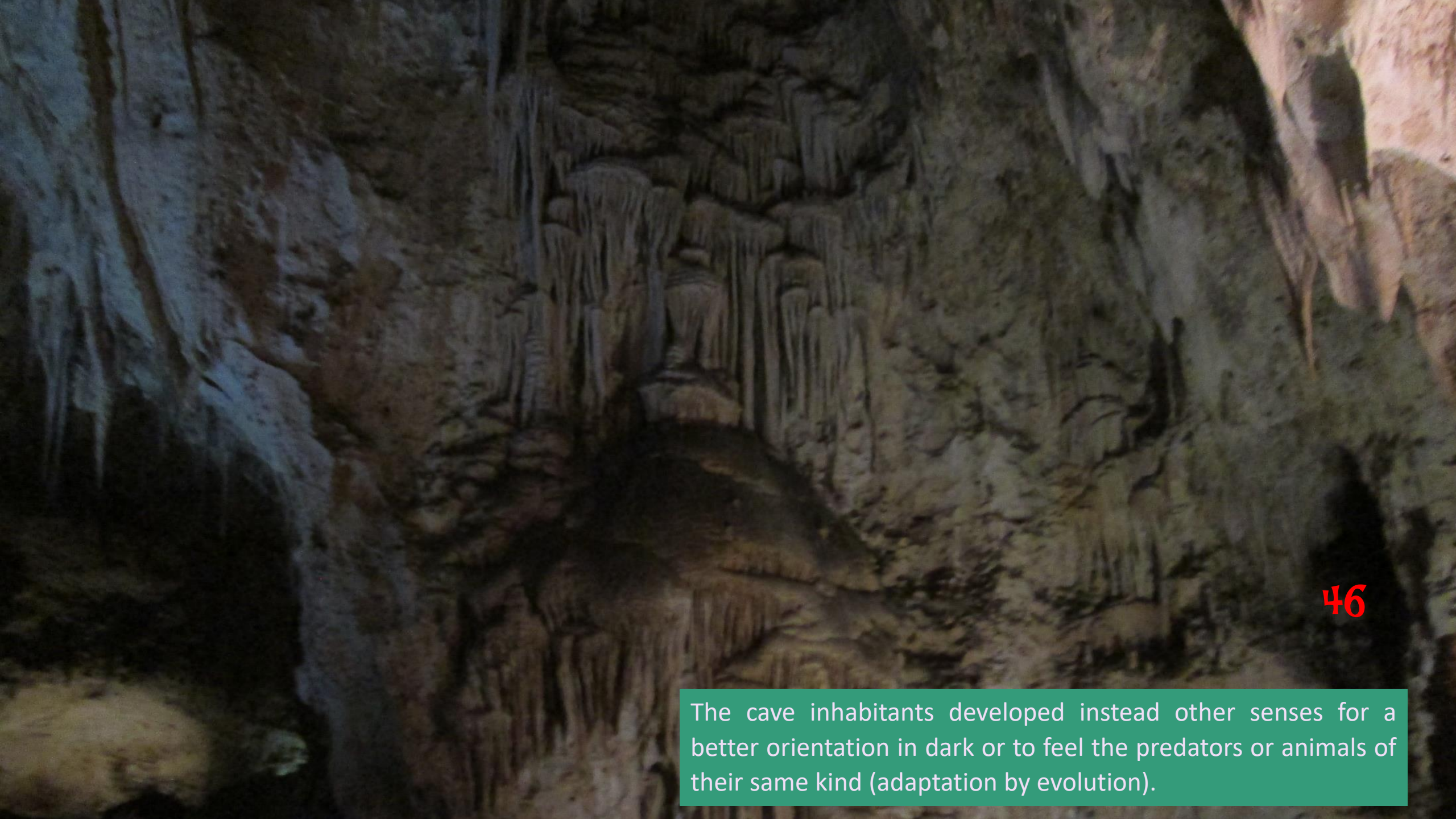


Species that have lived in caves the longest are eyeless, since in the absence of light eyes become a useless instrument (adaptation by involution).

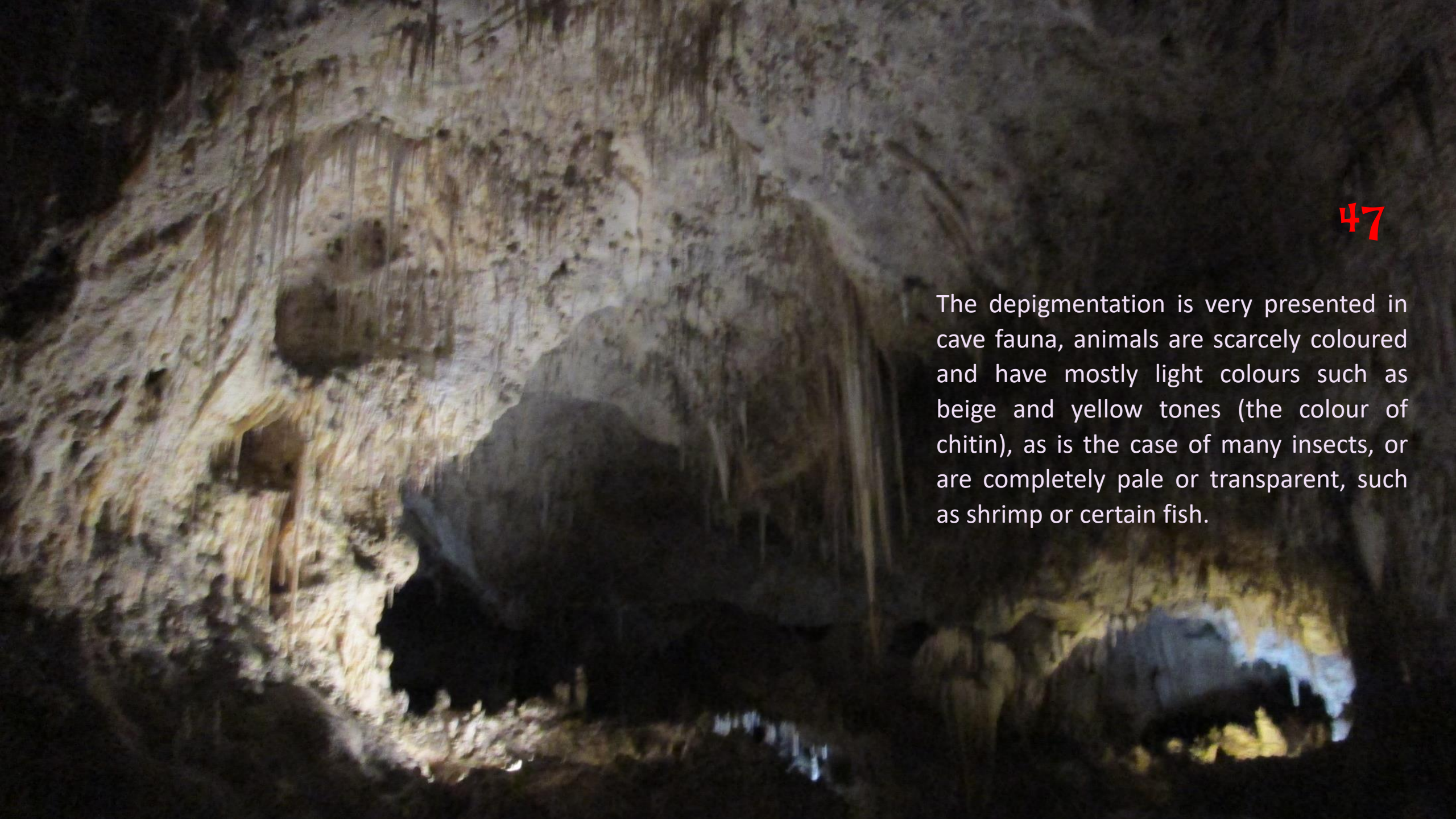
Some species still have eyes, but very small or underdeveloped, and some others have eyes at the time of birth but they disappear in adulthood.



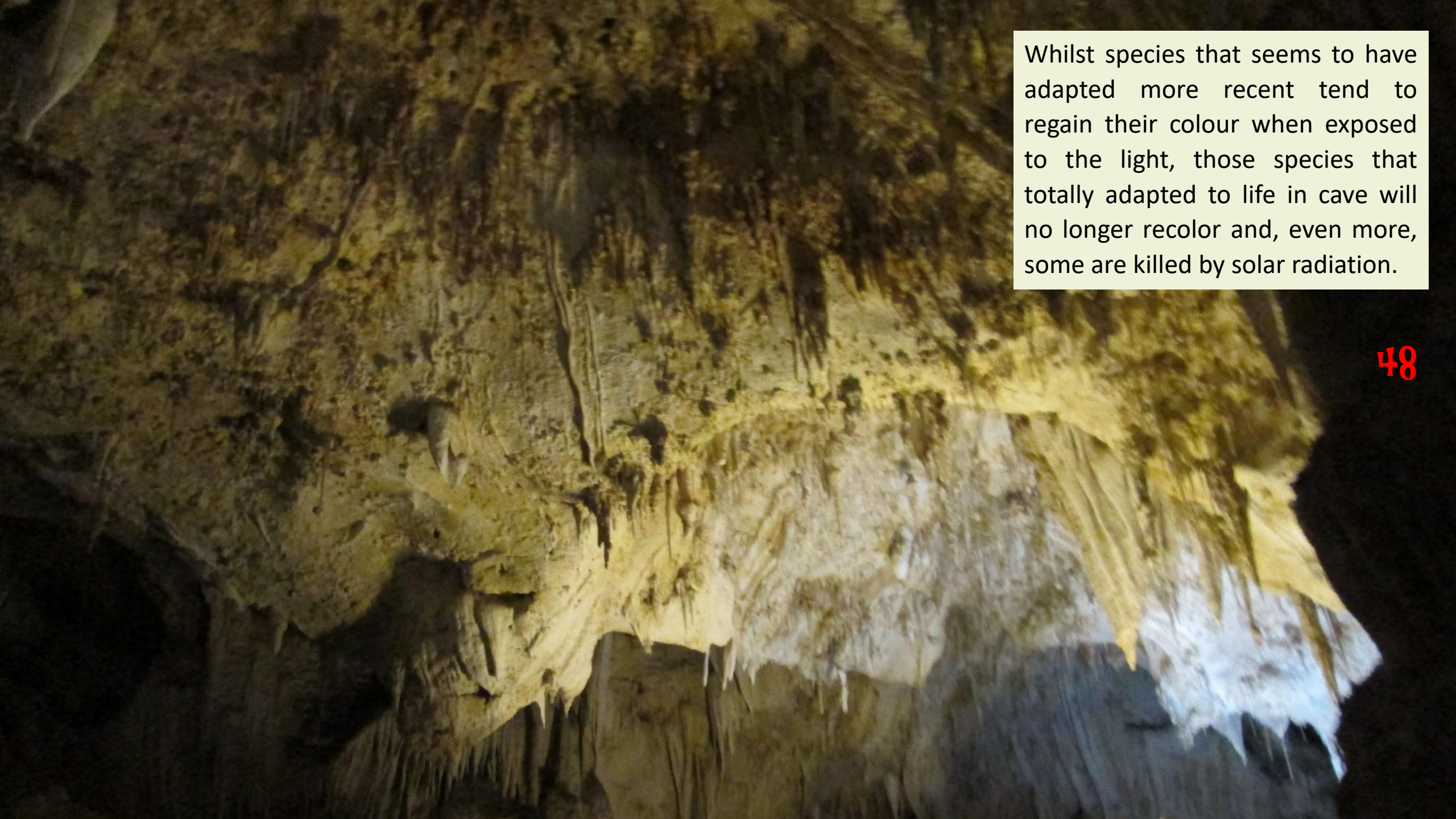
The ability to fly is not of much use in total darkness, thus cave insects descending from species originally able to fly lost this capacity, their wings atrophied or even perished (adaptation by involution).



The cave inhabitants developed instead other senses for a better orientation in dark or to feel the predators or animals of their same kind (adaptation by evolution).



The depigmentation is very presented in cave fauna, animals are scarcely coloured and have mostly light colours such as beige and yellow tones (the colour of chitin), as is the case of many insects, or are completely pale or transparent, such as shrimp or certain fish.



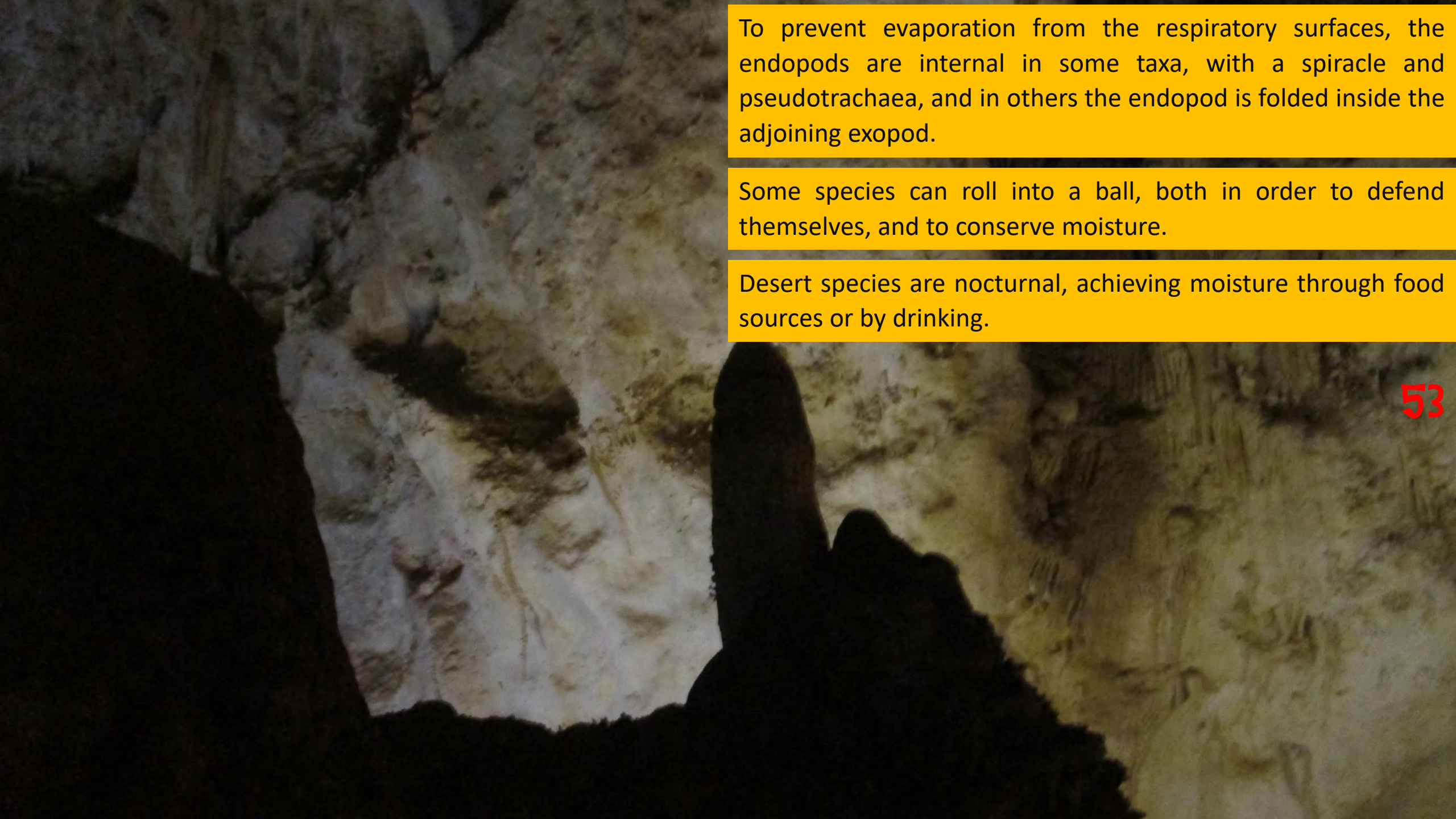
Whilst species that seems to have adapted more recent tend to regain their colour when exposed to the light, those species that totally adapted to life in cave will no longer recolor and, even more, some are killed by solar radiation.

Some beetles developed a particular elytra welding, to create a cavity in the abdomen, as a reservoir for back-up liquids (adaptation by evolution) .

In general, a cave species if compared to its possible surface cognate will have highly developed olfactory sense, longer legs and longer antennas, and their hairs or bristles function as tactile organs as well (adaptation by evolution).

The crustaceans are aquatic animals, and among them only the isopods, together with a small number of amphipods (like sandhoppers) and decapods (crabs, shrimp, etc.), have as well members that now live on land.

Since woodlice show various neutrosophic adaptations for life on land, the gradation of morphological, physiological and behavioral adaptations of the isopods for terrestrial life is of special interest for neutrosophic evolution.



To prevent evaporation from the respiratory surfaces, the endopods are internal in some taxa, with a spiracle and pseudotrachaea, and in others the endopod is folded inside the adjoining exopod.

Some species can roll into a ball, both in order to defend themselves, and to conserve moisture.

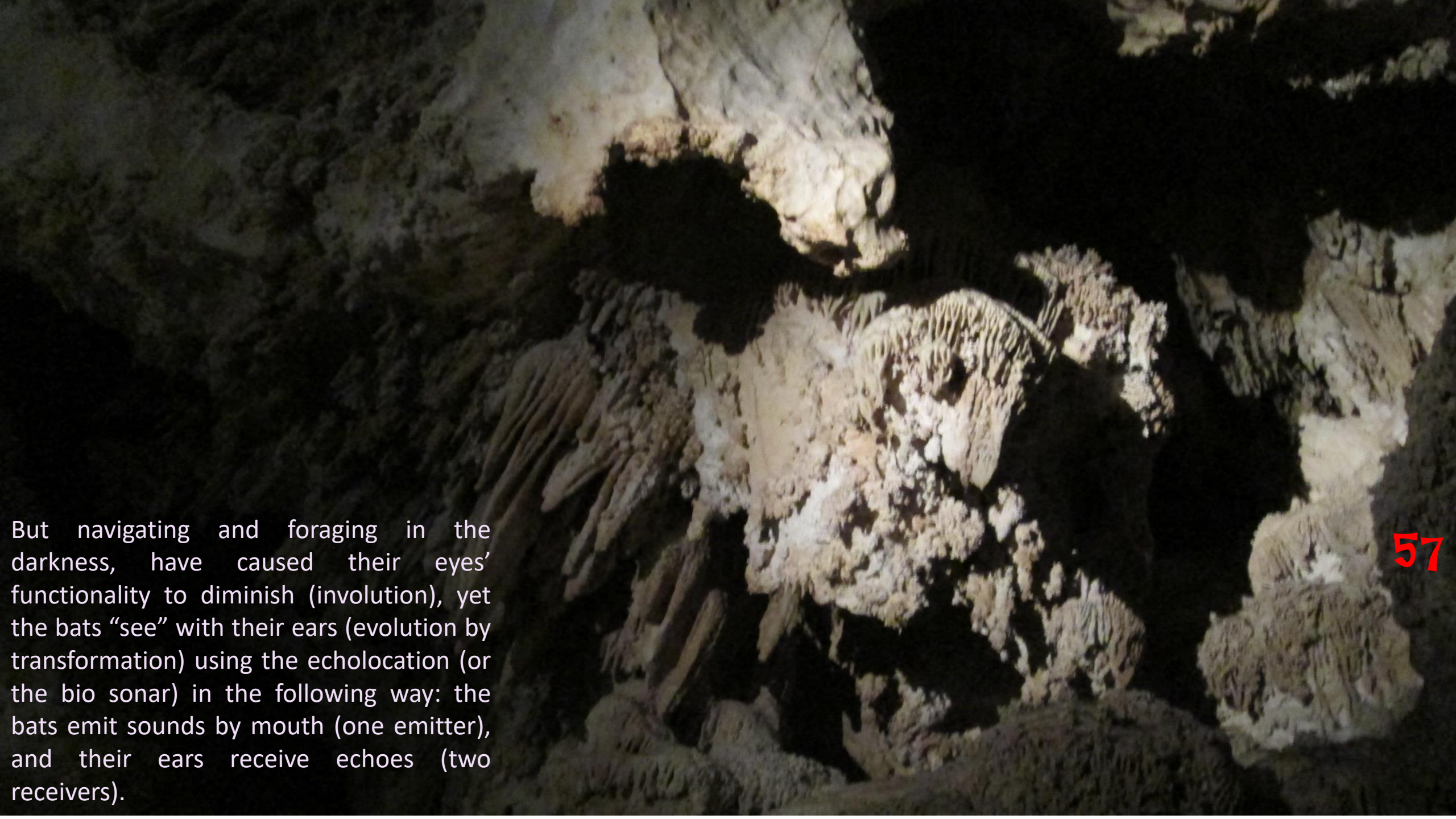
Desert species are nocturnal, achieving moisture through food sources or by drinking.

Most isopoda species have separate sexes with little sexual dimorphism, but a very interesting case for the neutrosohic evolution is of the few species that are hermaphroditic.

Some *Cymothoidans* are protandrous hermaphrodites (start life as males and later transform in females), and some *Anthuroideans* are protogynous hermaphrodites (start life as females and later transform in males).

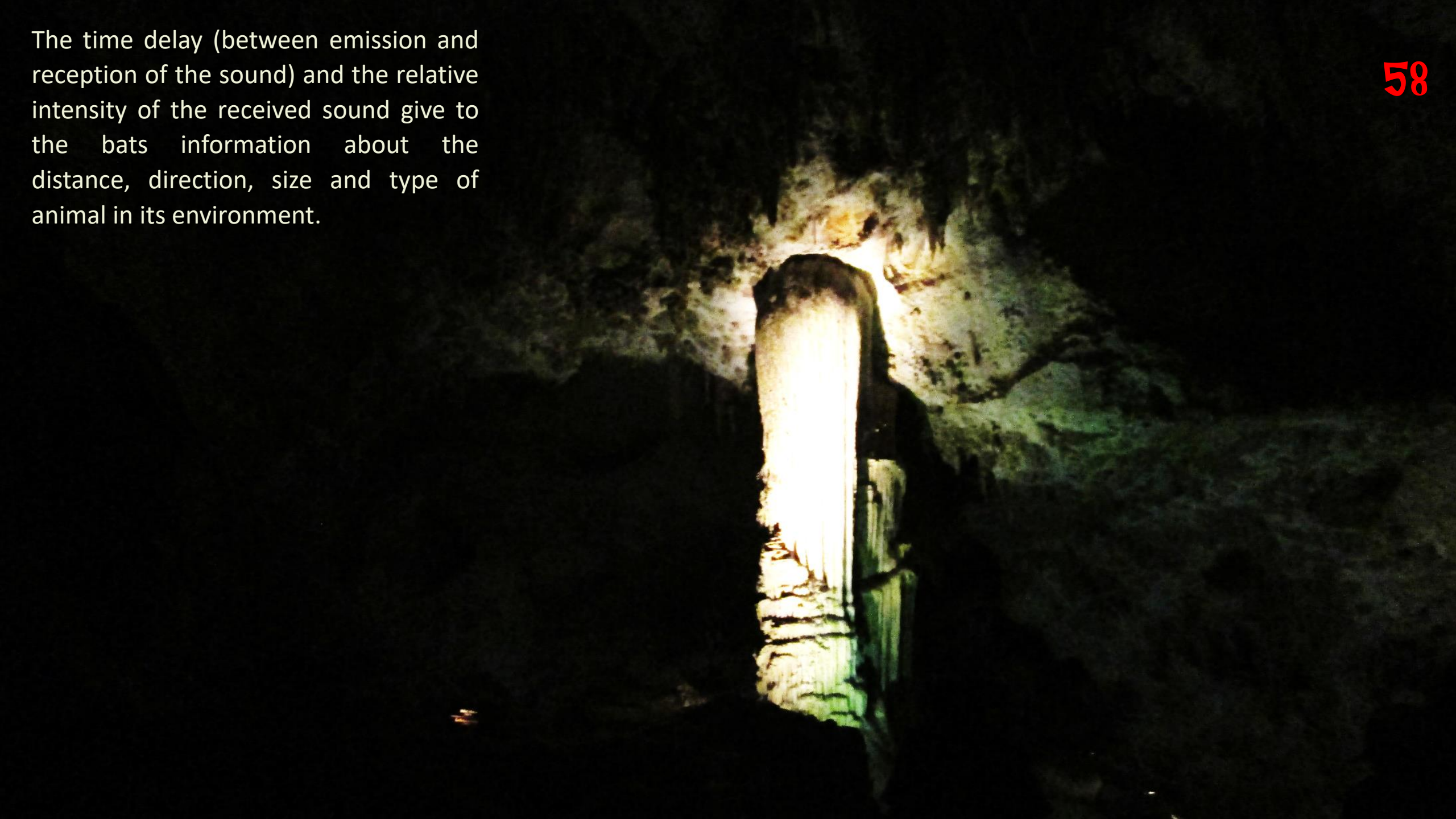
The families *Ligiidae* and *Tylidae*, even if inhabitting the rocky shores, can still swim if immersed in water.

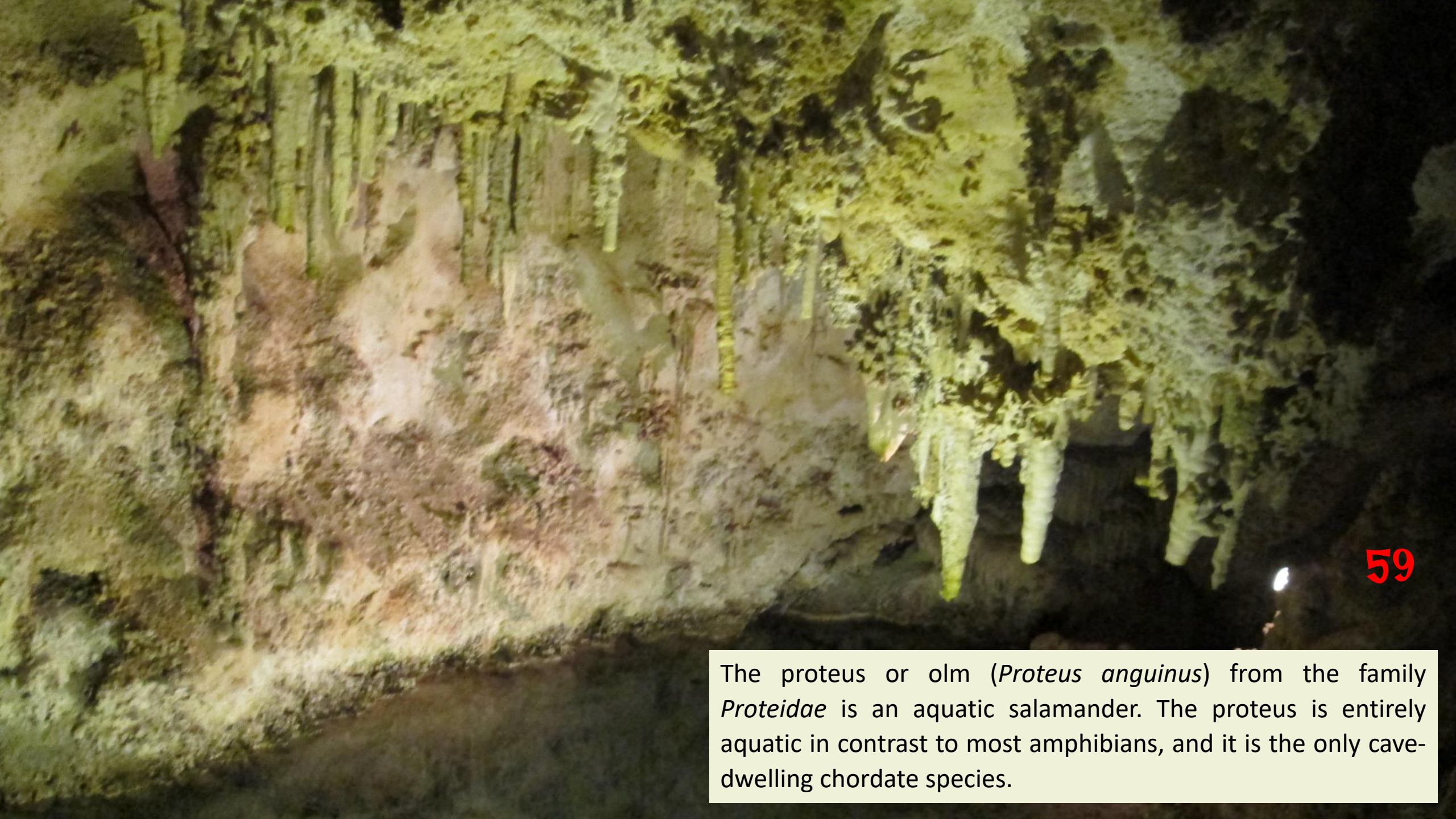
The bats are the only mammals capable of naturally flying, due to the fact that their forelimbs have developed into webbed wings (evolution by transformation).



But navigating and foraging in the darkness, have caused their eyes' functionality to diminish (involution), yet the bats "see" with their ears (evolution by transformation) using the echolocation (or the bio sonar) in the following way: the bats emit sounds by mouth (one emitter), and their ears receive echoes (two receivers).

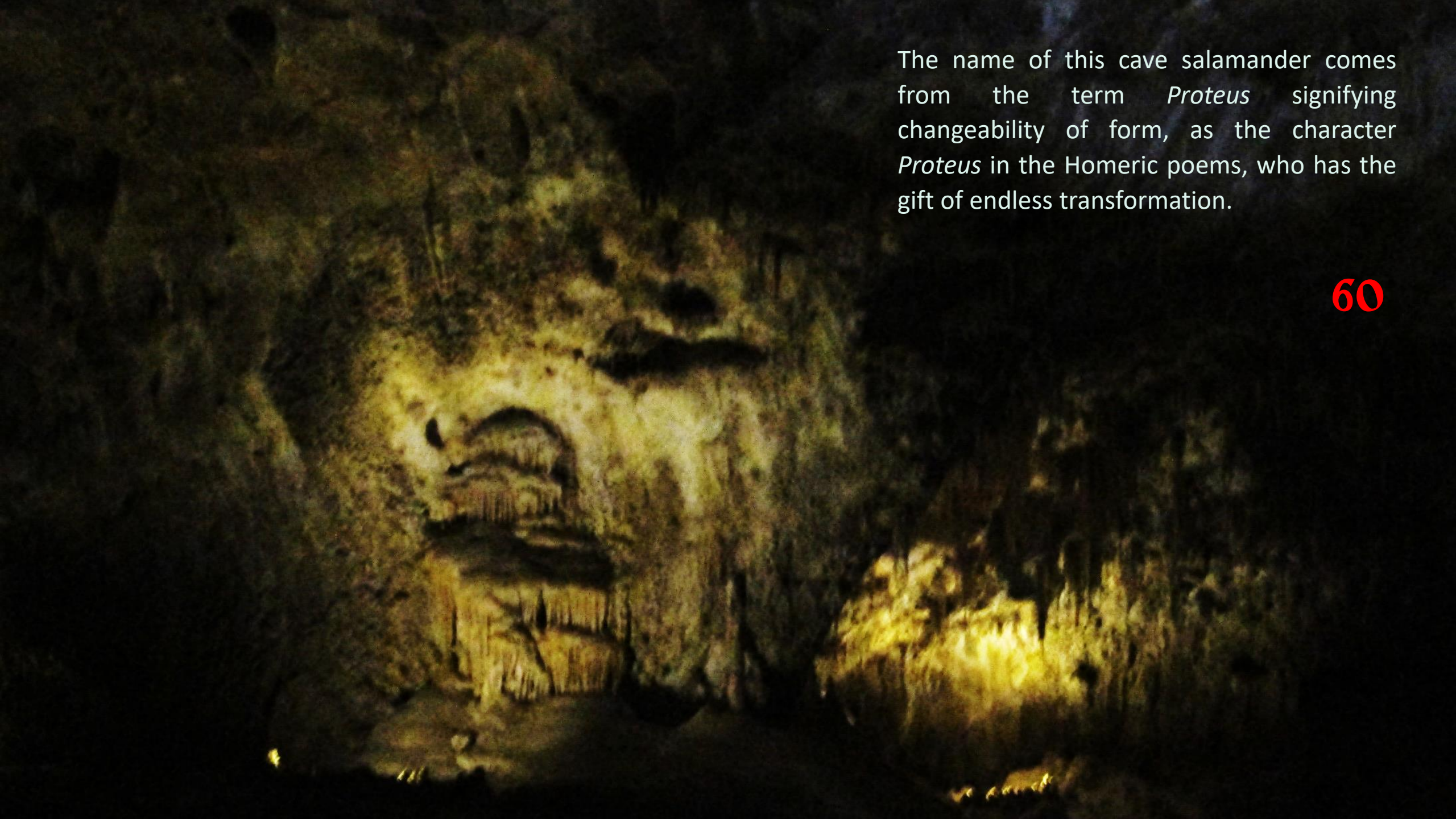
The time delay (between emission and reception of the sound) and the relative intensity of the received sound give to the bats information about the distance, direction, size and type of animal in its environment.





59

The proteus or olm (*Proteus anguinus*) from the family *Proteidae* is an aquatic salamander. The proteus is entirely aquatic in contrast to most amphibians, and it is the only cave-dwelling chordate species.



The name of this cave salamander comes from the term *Proteus* signifying changeability of form, as the character *Proteus* in the Homeric poems, who has the gift of endless transformation.

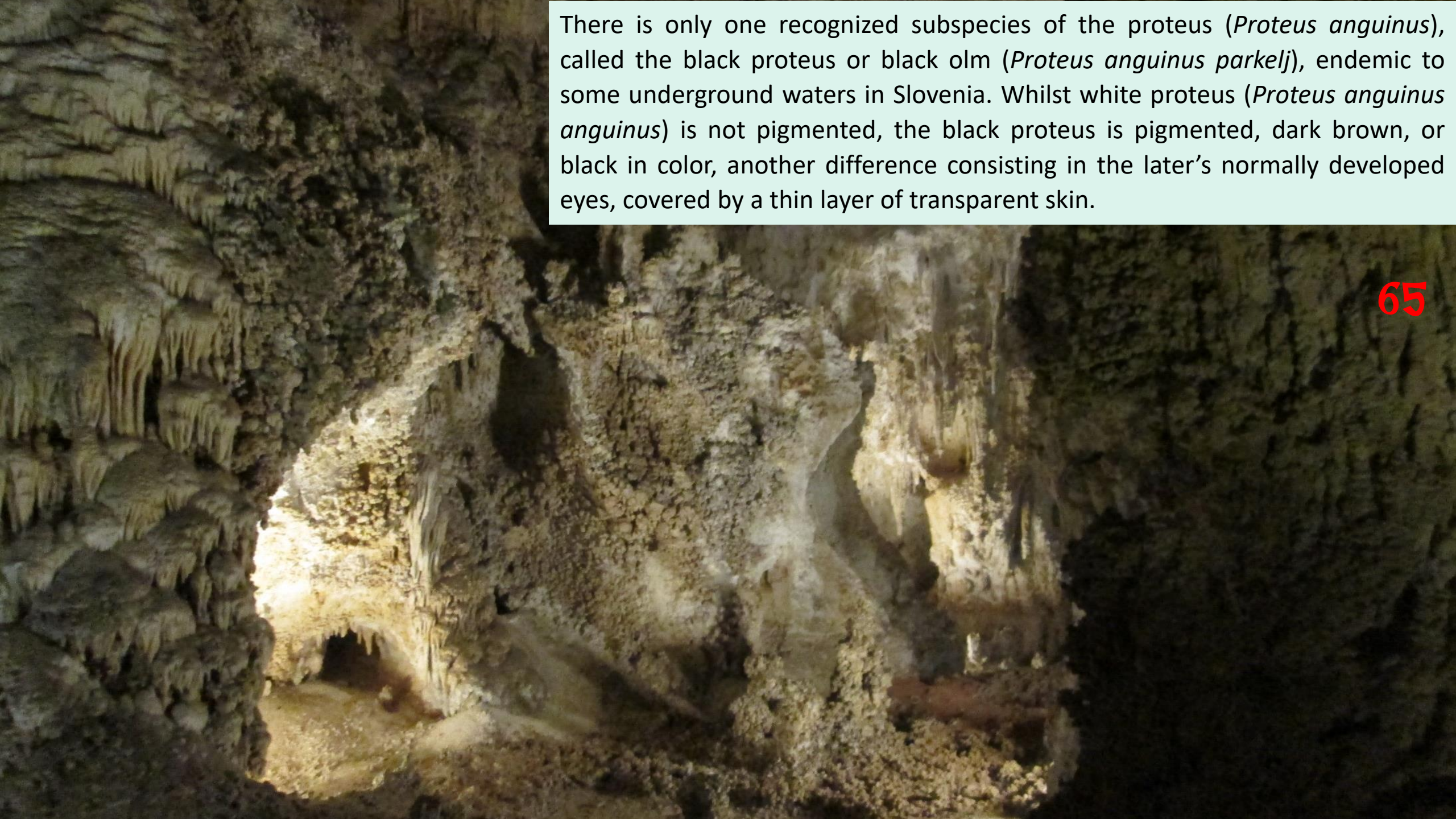
The adaptation of proteus to the life in its underground habitat of complete darkness is expressed by the undeveloped blind eyes (adaptation by involution), covered by a layer of skin, while smell and hearing are acutely developed (adaptation by evolution).

Paradoxically, the proteus swims away from light, although blind, therefore the eyes, placed deep below the dermis of the skin and rarely visible except in younger adults, retain sensitivity. Larvae have normal eyes, but they atrophy after four months of development (adaptation by involution).

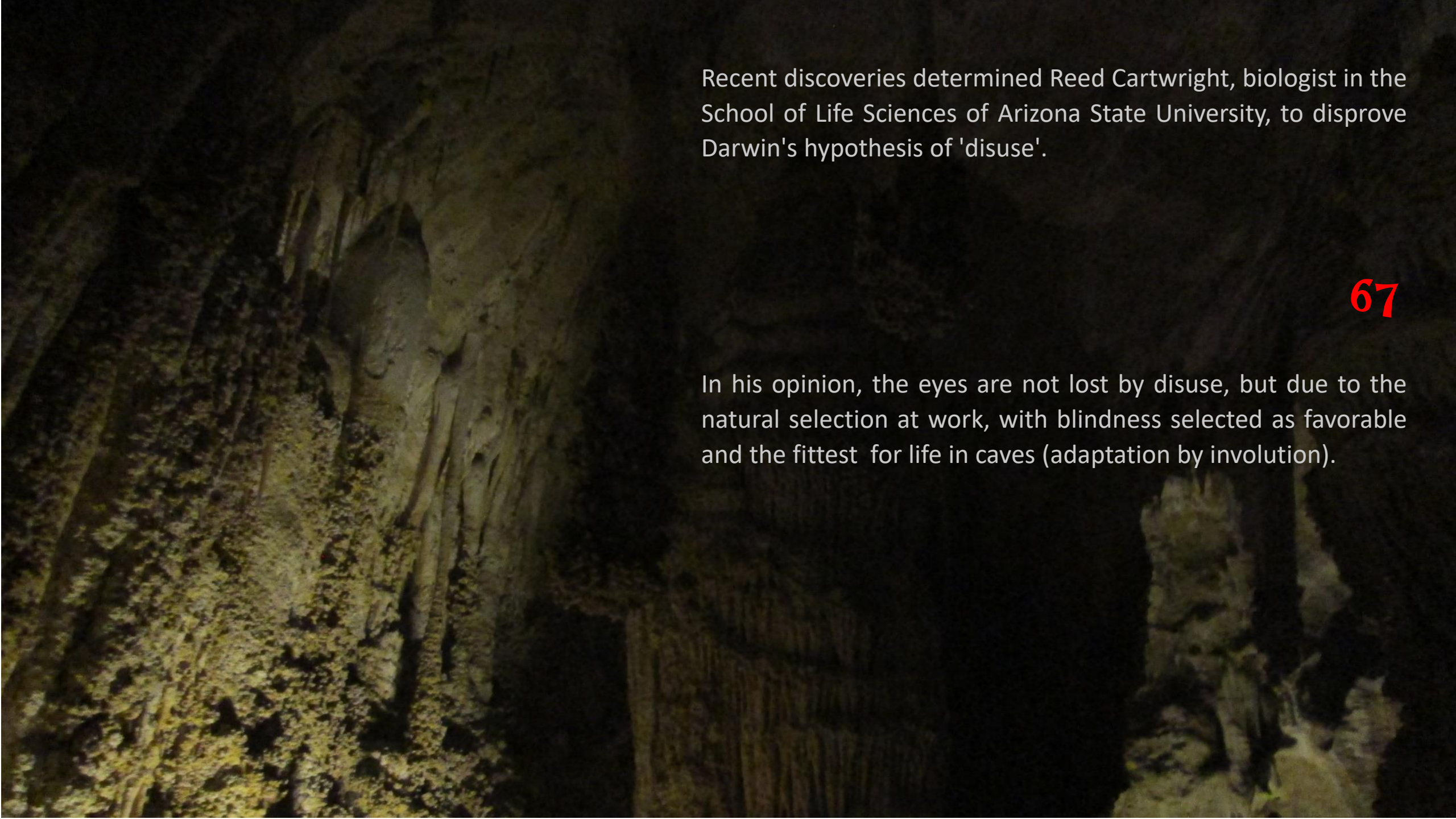
Employing light and electron microscopy, a new type of electroreception sensory organ has been detected on the head of proteus, described as ampullary organs (adaptation by evolution).

The proteus is also called human fish in some languages for the resemblance of the color of its skin to that of white people, while the ability to produce melanin is retained, and gradually turns dark when exposed to light (hence indeterminacy).

There is only one recognized subspecies of the proteus (*Proteus anguinus*), called the black proteus or black olm (*Proteus anguinus parkelj*), endemic to some underground waters in Slovenia. Whilst white proteus (*Proteus anguinus anguinus*) is not pigmented, the black proteus is pigmented, dark brown, or black in color, another difference consisting in the later's normally developed eyes, covered by a thin layer of transparent skin.

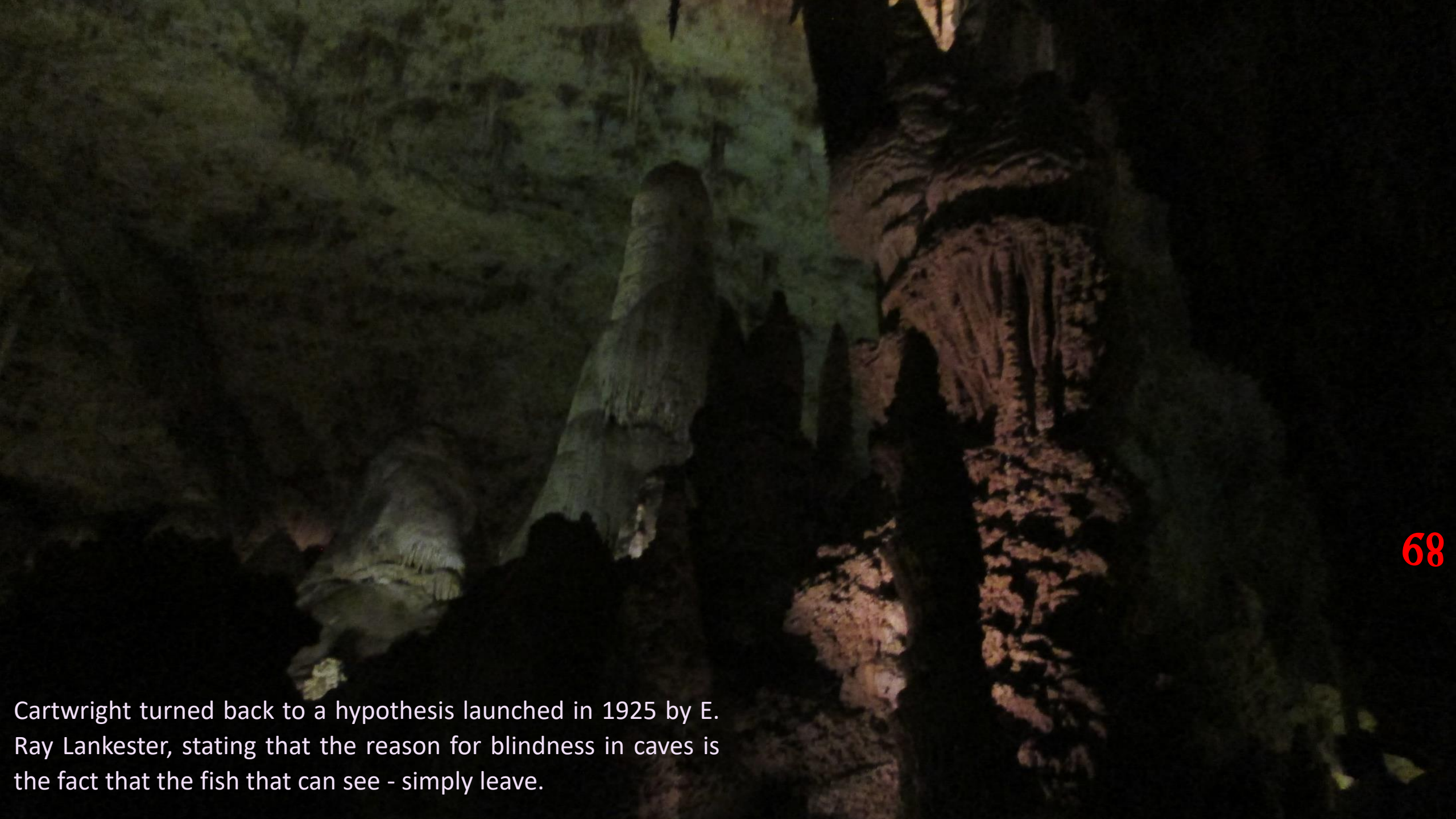


Charles Darwin used the proteus case to prove the reduction of structures through disuse: “Far from feeling surprise that some of the cave-animals should be very anomalous... as is the case with blind Proteus with reference to the reptiles of Europe, I am only surprised that more wrecks of ancient life have not been preserved, owing to the less severe competition to which the scanty inhabitants of these dark abodes will have been exposed.”



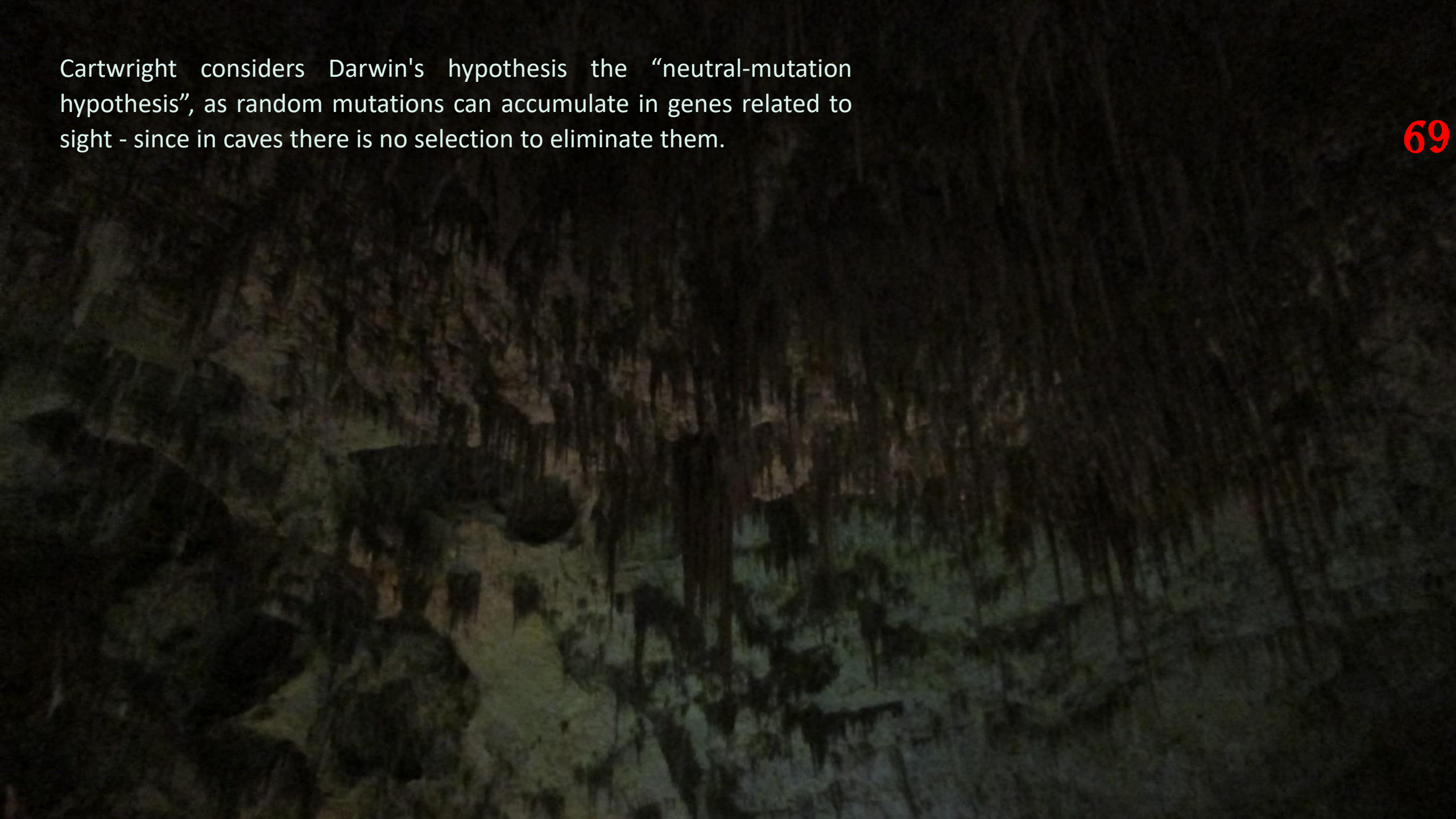
Recent discoveries determined Reed Cartwright, biologist in the School of Life Sciences of Arizona State University, to disprove Darwin's hypothesis of 'disuse'.

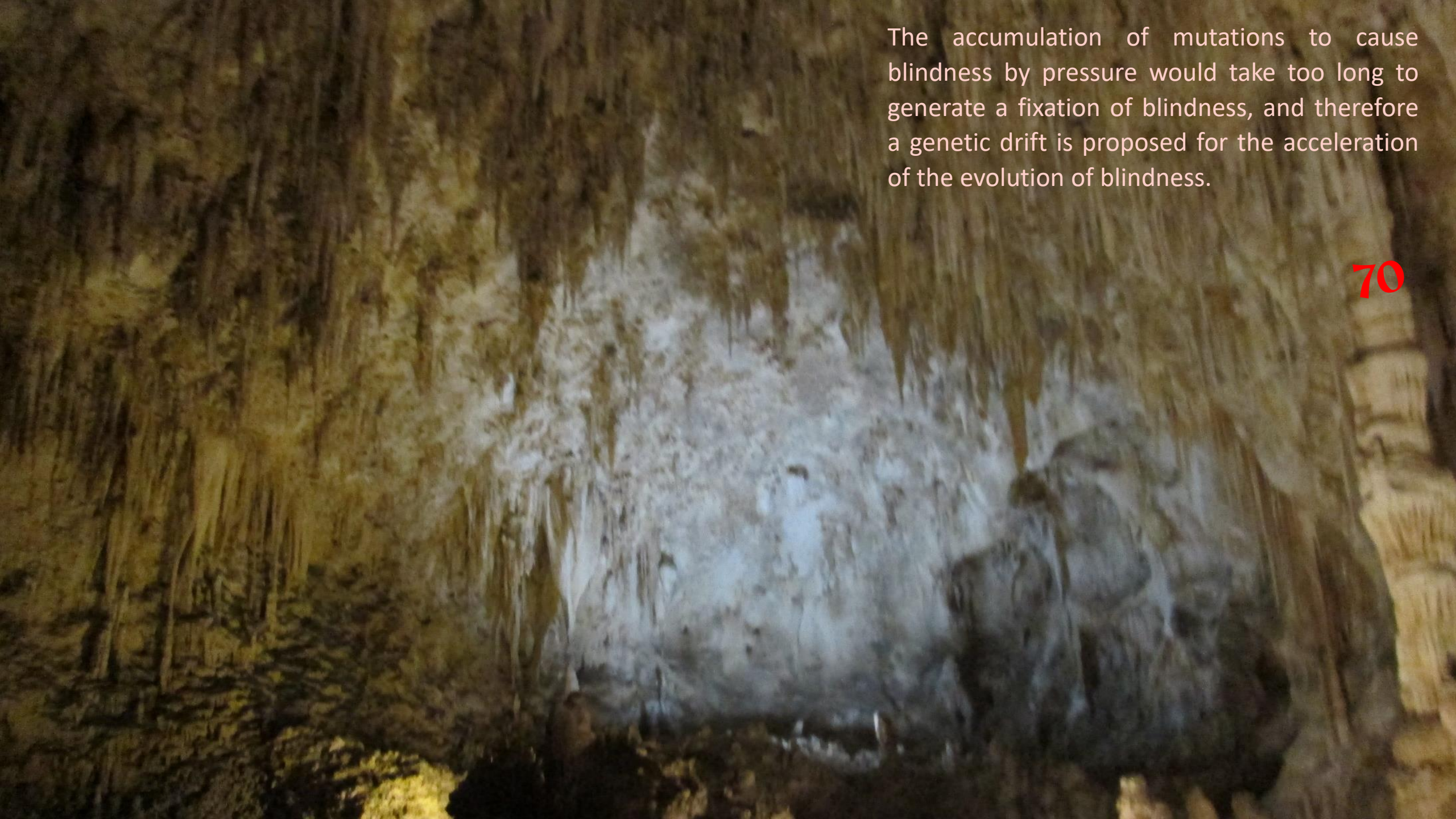
In his opinion, the eyes are not lost by disuse, but due to the natural selection at work, with blindness selected as favorable and the fittest for life in caves (adaptation by involution).



Cartwright turned back to a hypothesis launched in 1925 by E. Ray Lankester, stating that the reason for blindness in caves is the fact that the fish that can see - simply leave.

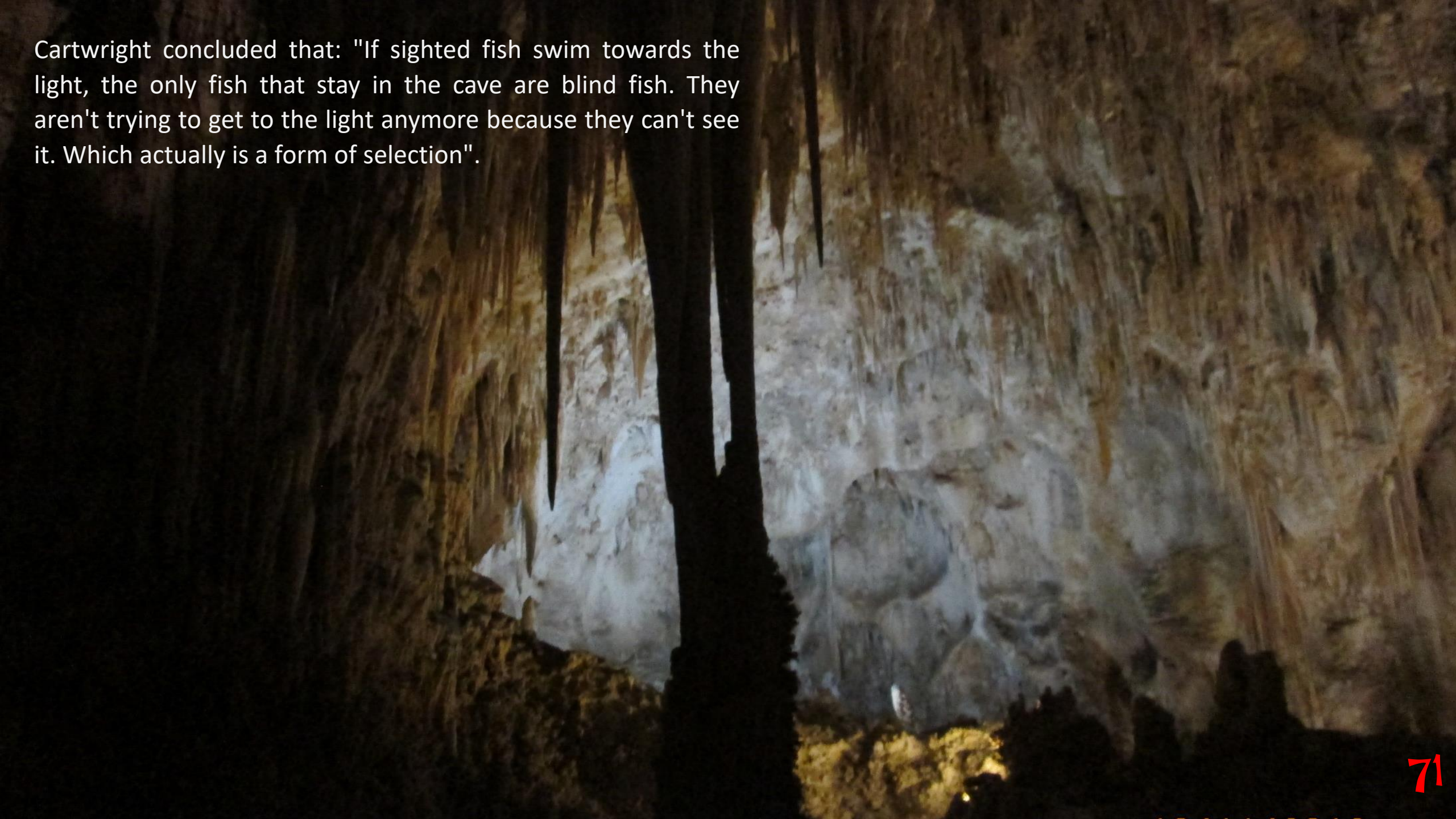
Cartwright considers Darwin's hypothesis the “neutral-mutation hypothesis”, as random mutations can accumulate in genes related to sight - since in caves there is no selection to eliminate them.

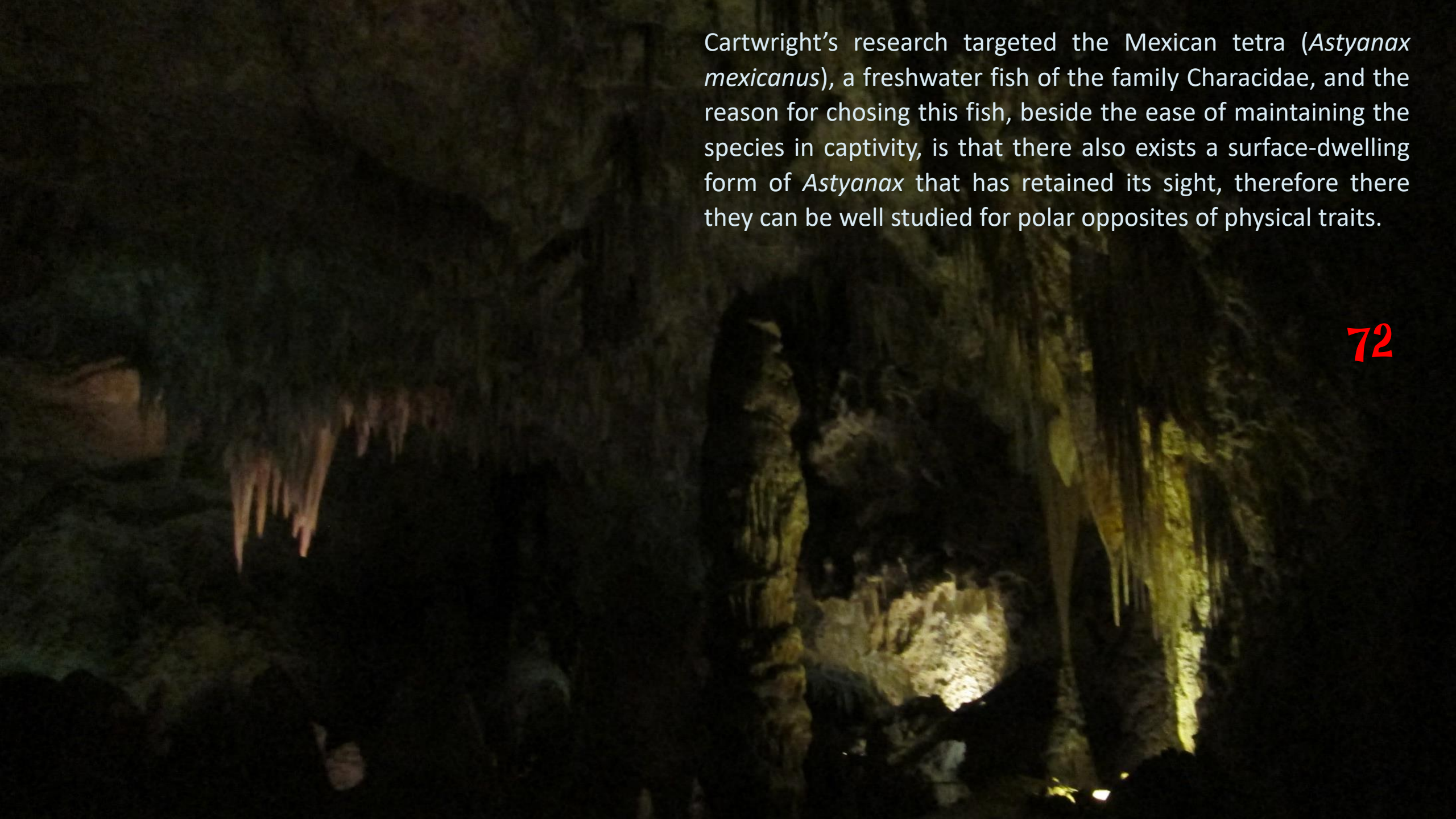




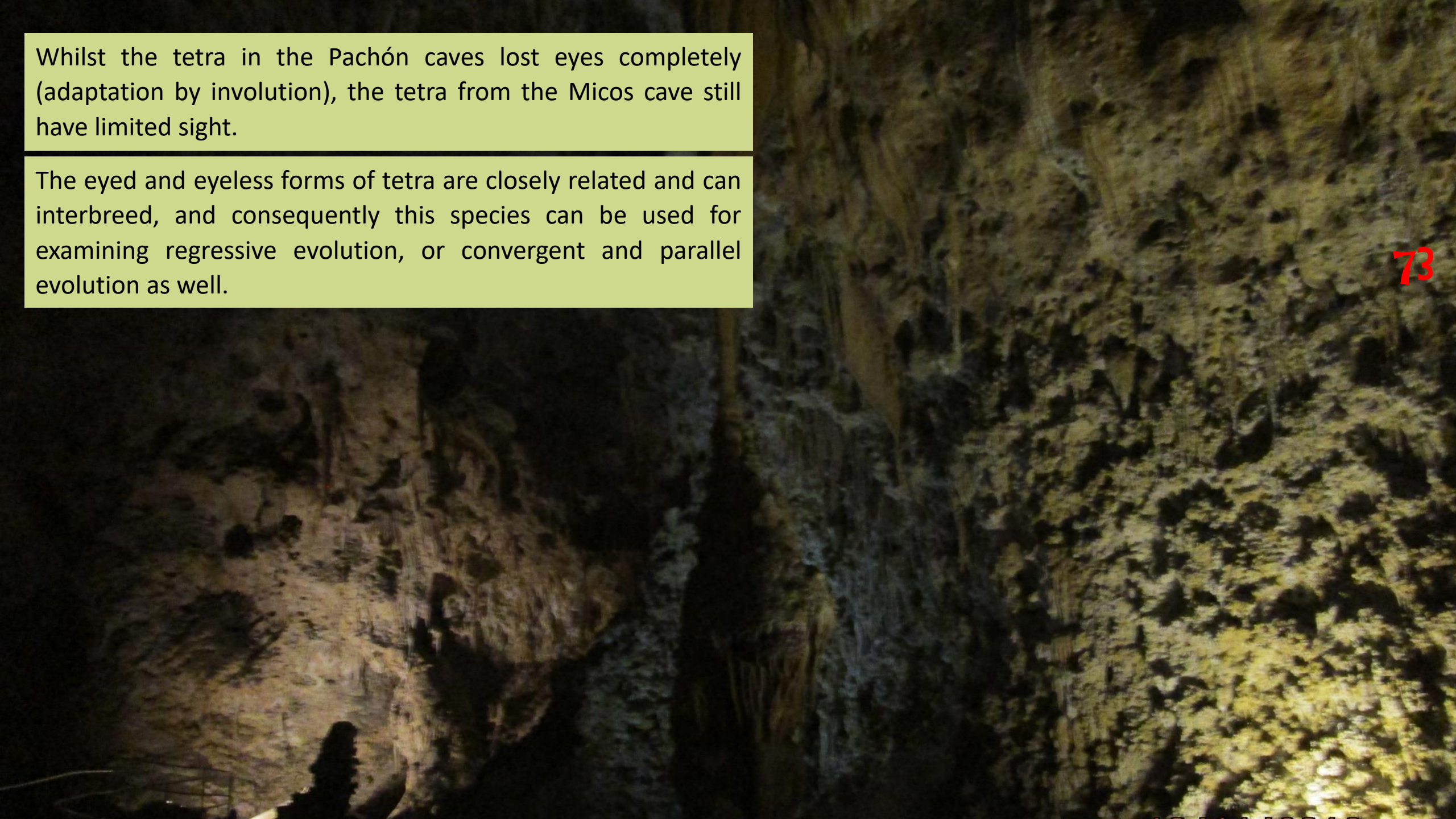
The accumulation of mutations to cause blindness by pressure would take too long to generate a fixation of blindness, and therefore a genetic drift is proposed for the acceleration of the evolution of blindness.

Cartwright concluded that: "If sighted fish swim towards the light, the only fish that stay in the cave are blind fish. They aren't trying to get to the light anymore because they can't see it. Which actually is a form of selection".



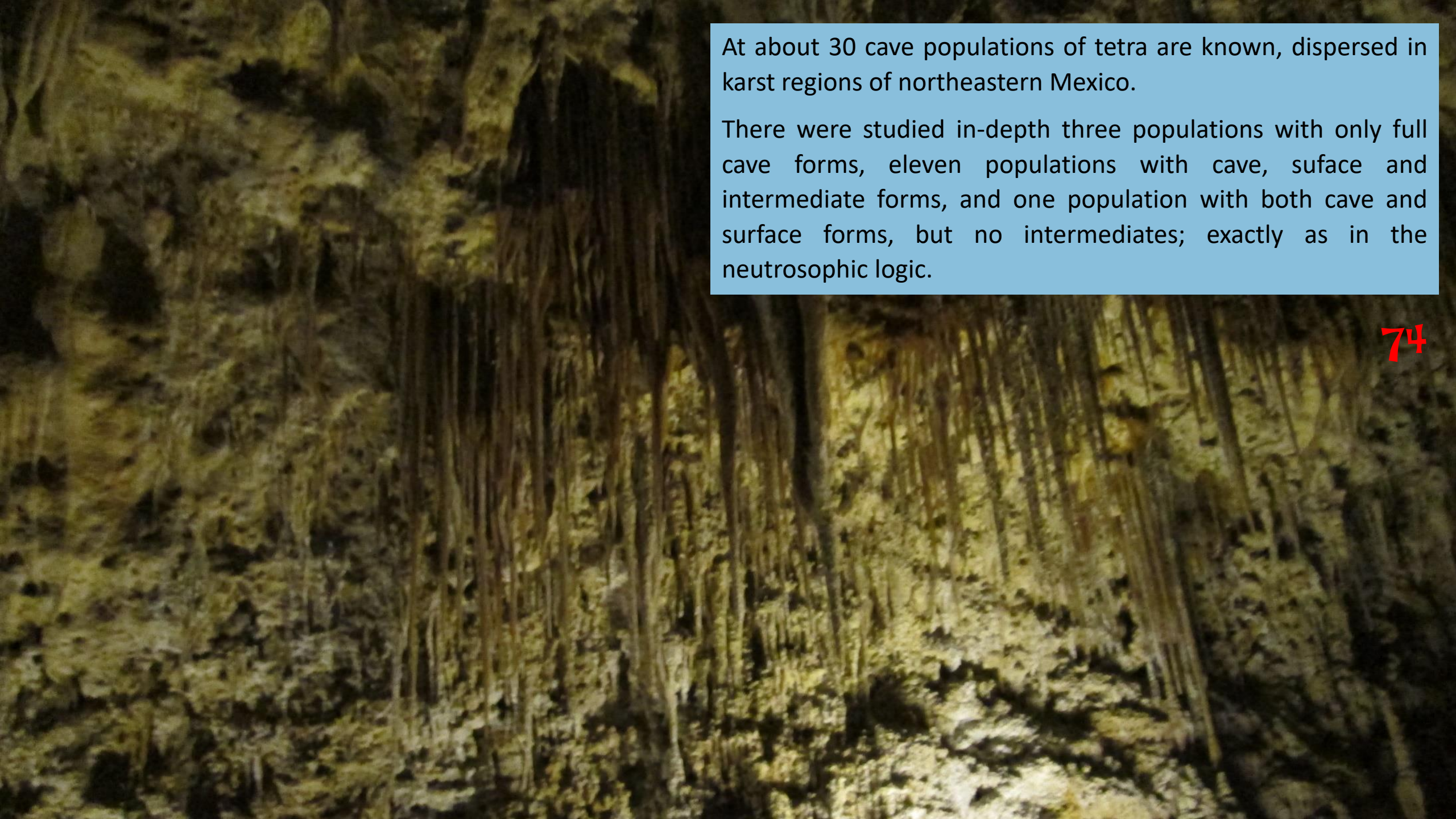


Cartwright's research targeted the Mexican tetra (*Astyanax mexicanus*), a freshwater fish of the family Characidae, and the reason for chosing this fish, beside the ease of maintaining the species in captivity, is that there also exists a surface-dwelling form of *Astyanax* that has retained its sight, therefore there they can be well studied for polar opposites of physical traits.



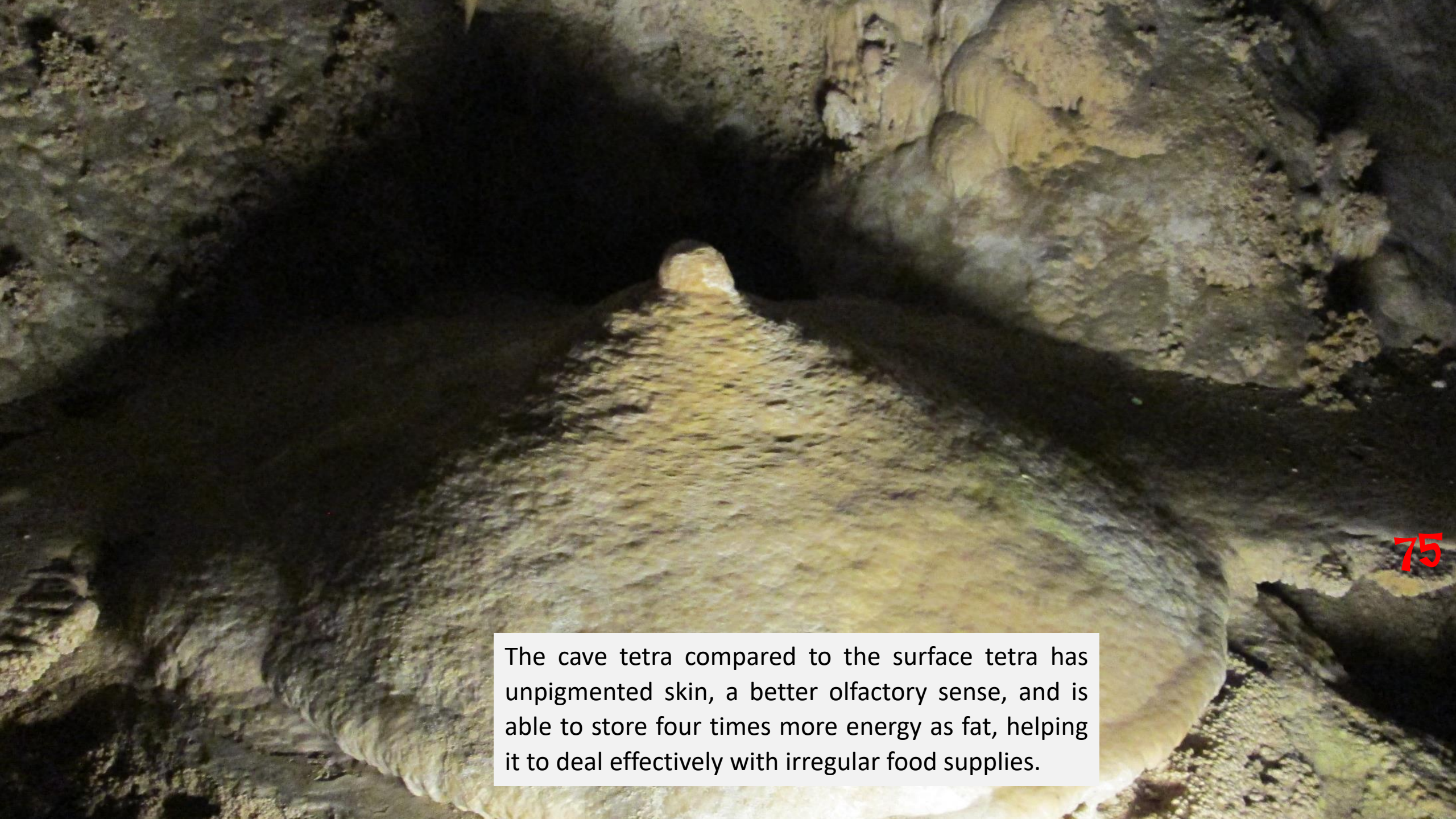
Whilst the tetra in the Pachón caves lost eyes completely (adaptation by involution), the tetra from the Micos cave still have limited sight.

The eyed and eyeless forms of tetra are closely related and can interbreed, and consequently this species can be used for examining regressive evolution, or convergent and parallel evolution as well.

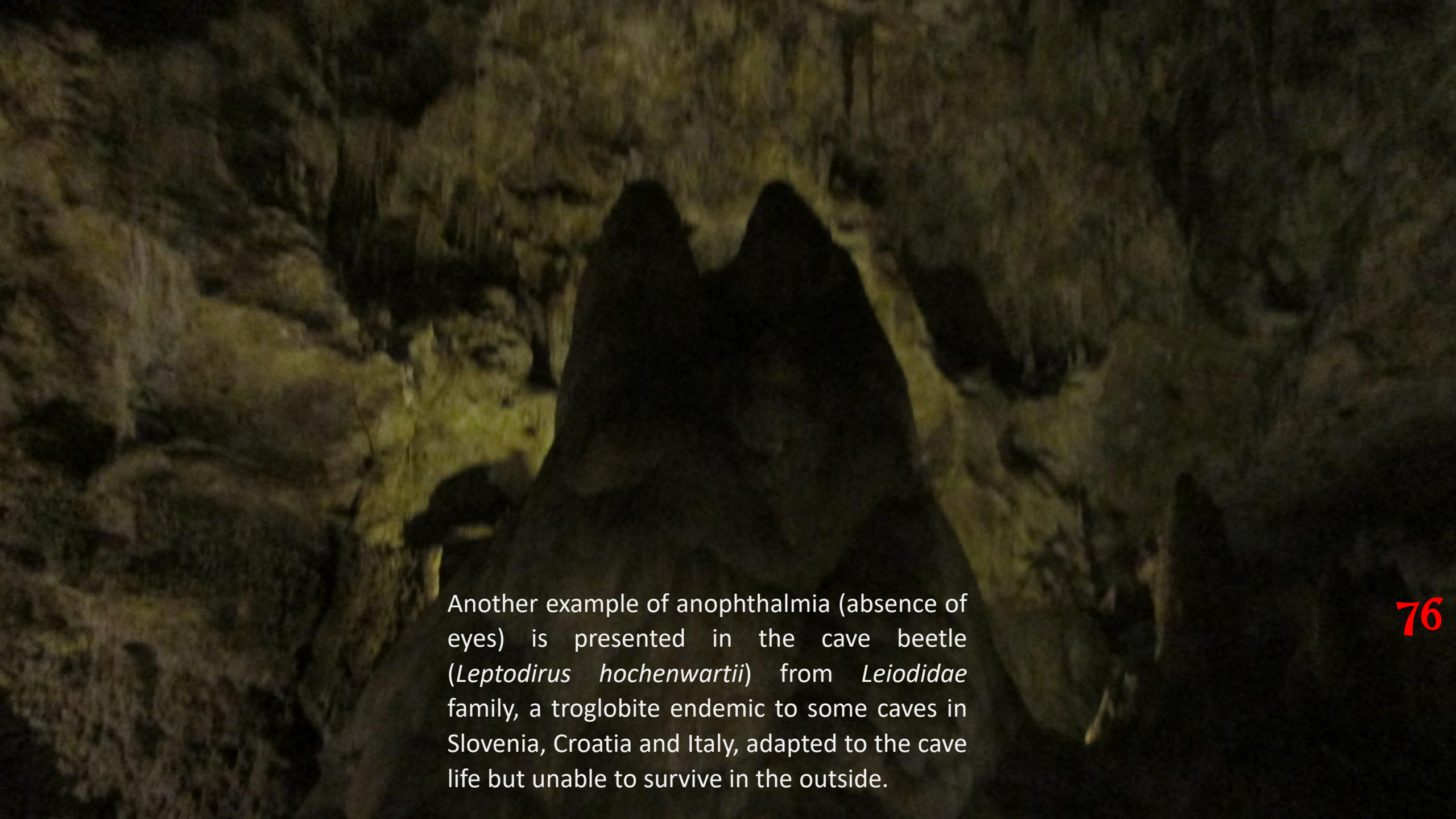


At about 30 cave populations of tetra are known, dispersed in karst regions of northeastern Mexico.

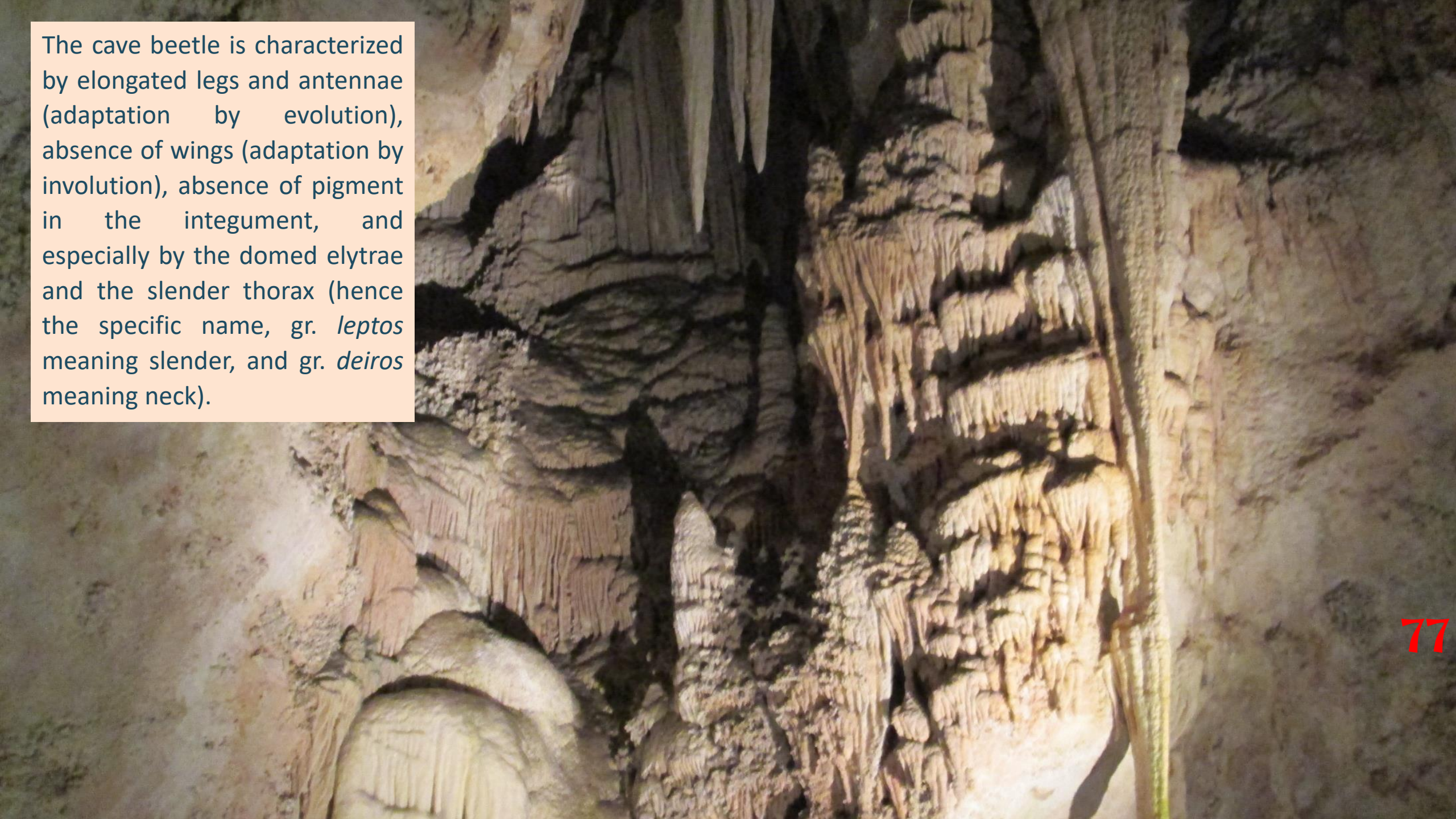
There were studied in-depth three populations with only full cave forms, eleven populations with cave, suface and intermediate forms, and one population with both cave and surface forms, but no intermediates; exactly as in the neutrosophic logic.



The cave tetra compared to the surface tetra has unpigmented skin, a better olfactory sense, and is able to store four times more energy as fat, helping it to deal effectively with irregular food supplies.

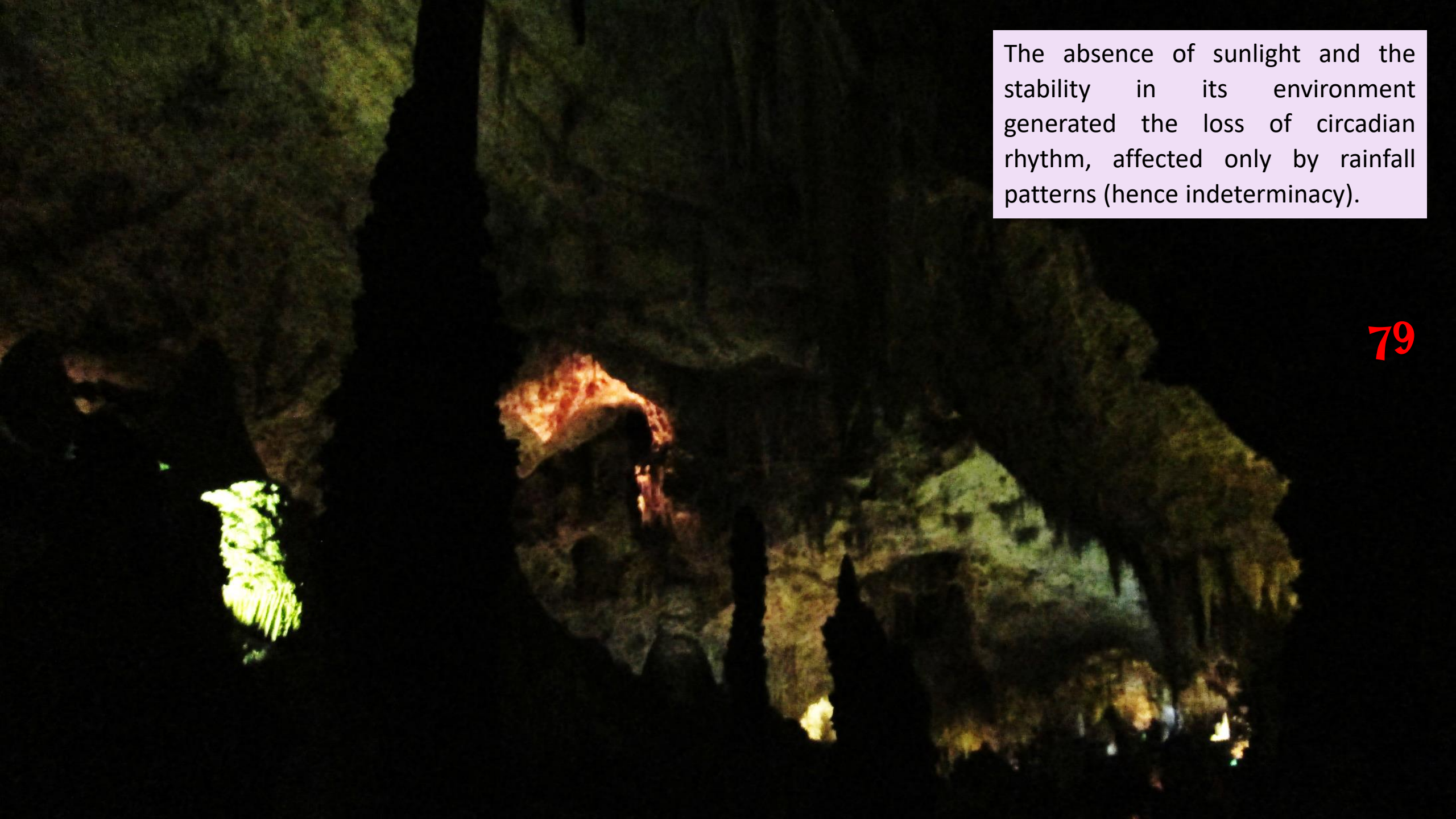


Another example of anophthalmia (absence of eyes) is presented in the cave beetle (*Leptodirus hochenwartii*) from *Leiodidae* family, a troglobite endemic to some caves in Slovenia, Croatia and Italy, adapted to the cave life but unable to survive in the outside.



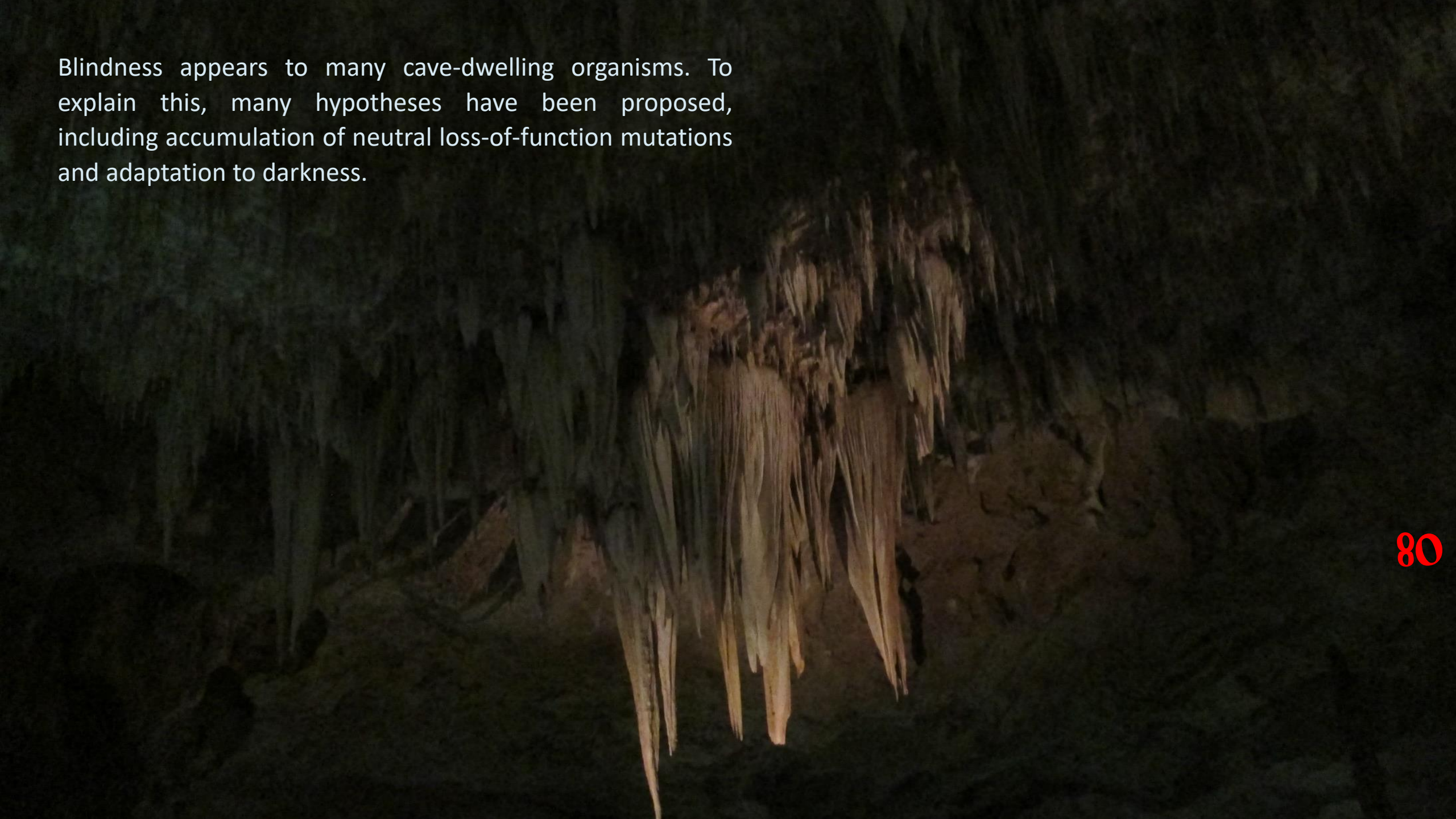
The cave beetle is characterized by elongated legs and antennae (adaptation by evolution), absence of wings (adaptation by involution), absence of pigment in the integument, and especially by the domed elytrae and the slender thorax (hence the specific name, gr. *leptos* meaning slender, and gr. *deiros* meaning neck).

Called *false physogastry*, this type of adaptation of elytrae, covering the abdomen completely, allows the animal to store wet air and use it for breathing in drier areas (adaptation by evolution).



The absence of sunlight and the stability in its environment generated the loss of circadian rhythm, affected only by rainfall patterns (hence indeterminacy).

Blindness appears to many cave-dwelling organisms. To explain this, many hypotheses have been proposed, including accumulation of neutral loss-of-function mutations and adaptation to darkness.



The eyes are neither advantageous nor disadvantageous in the darkness of caves (hence indeterminate).

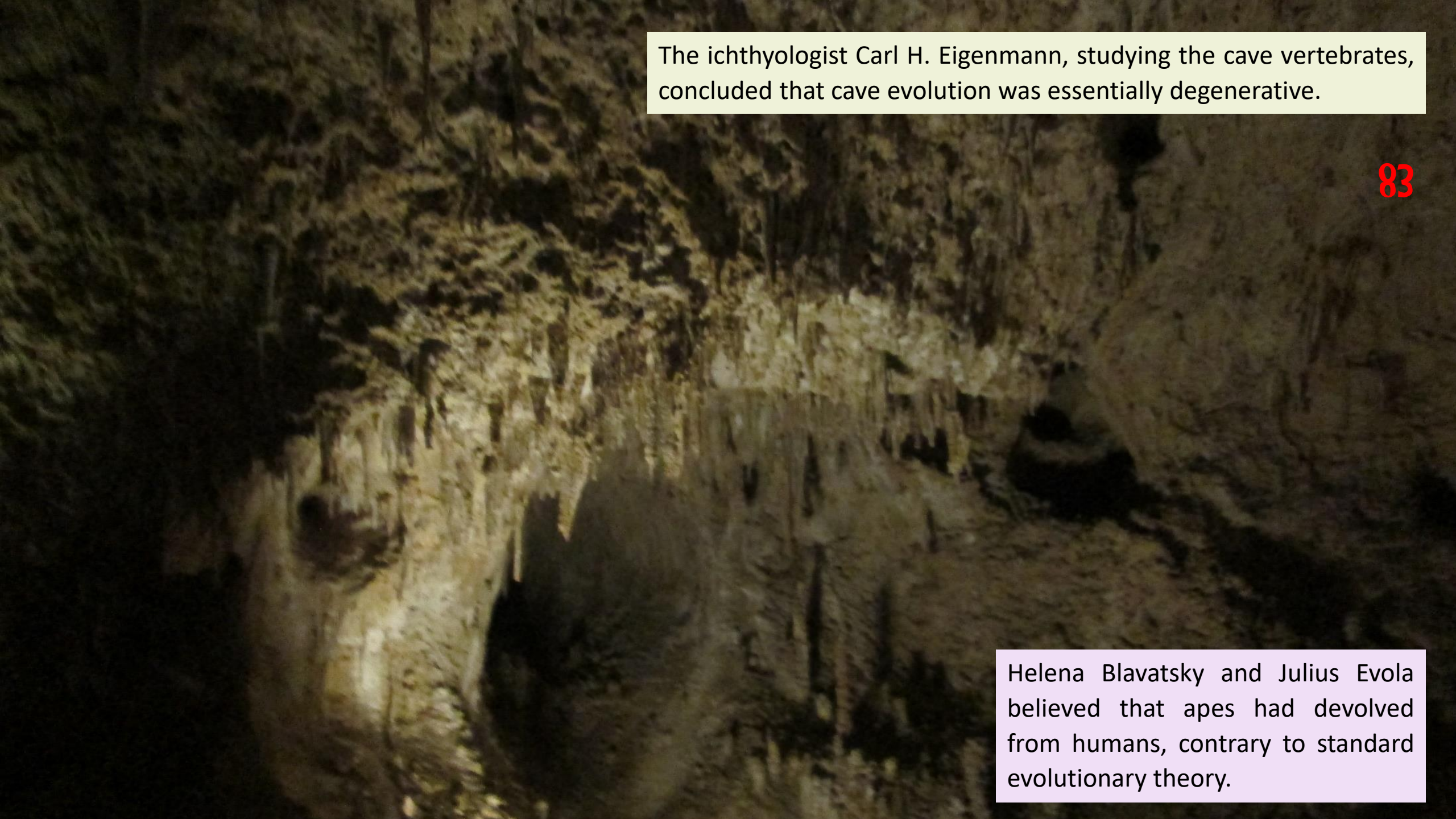
Modern genetics links the lack of eyes with the need for more energy for growth and reproduction.

The "body clock" controlling the periods of light and dark is disabled.

Dawkins claims that this is an evidence of decreasing complexity (devolution).

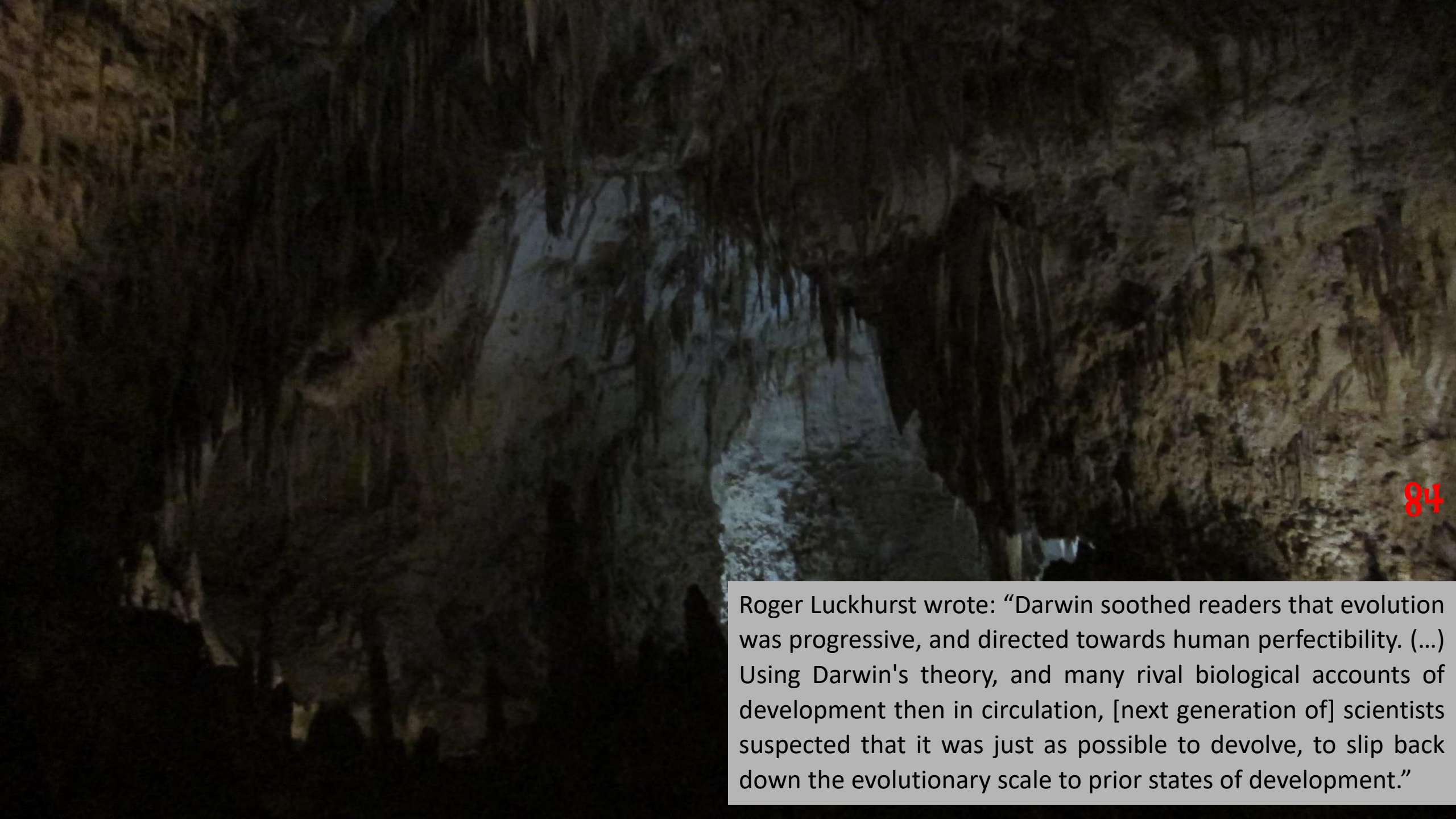
Devolution, or backward evolution, is a theory that states that species can revert to more primitive forms with time.

The concept appears in the novel *Galápagos* by Kurt Vonnegut, set a million years in the future, imagining a society that evolves backwards to have small brains.

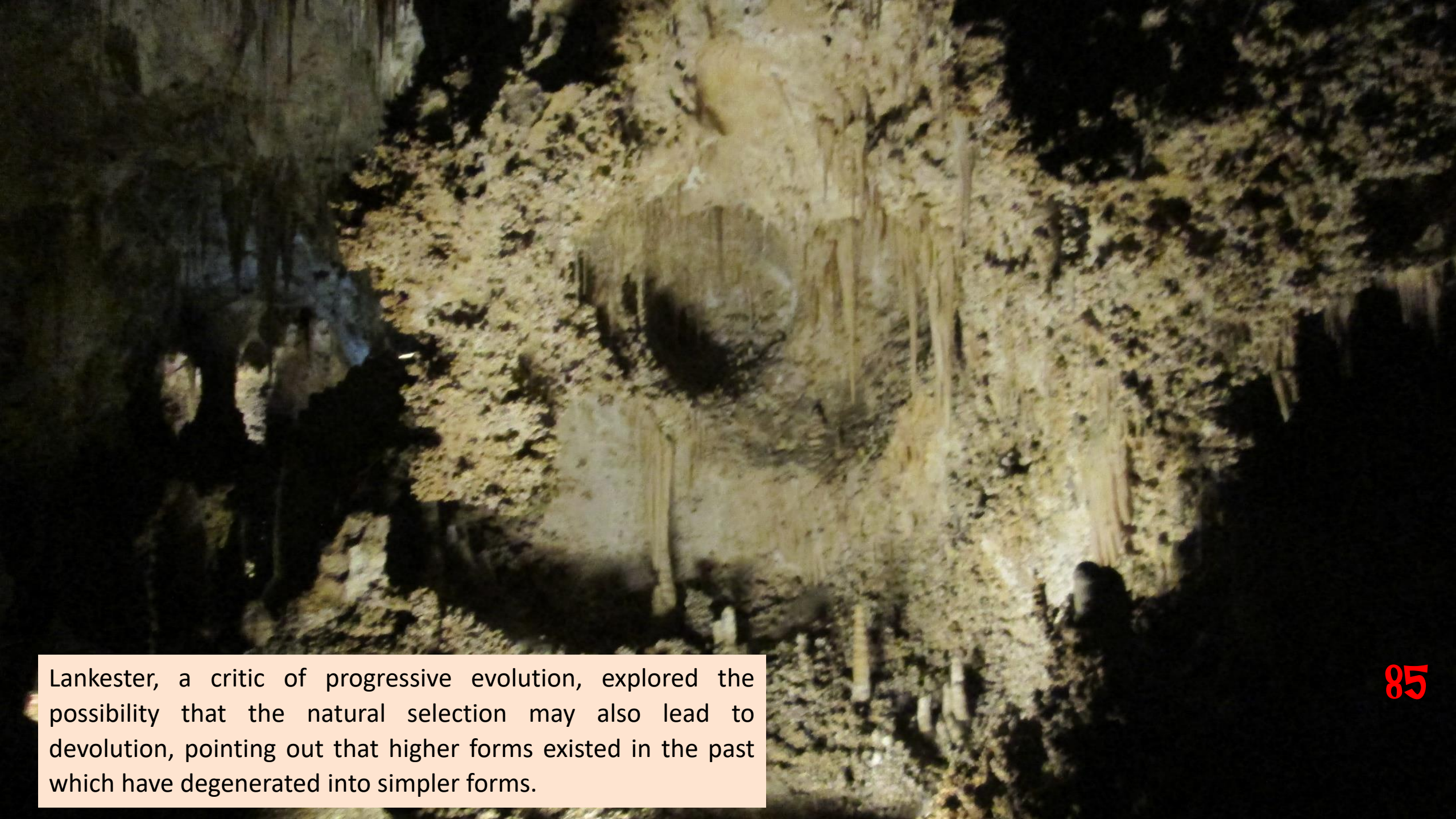


The ichthyologist Carl H. Eigenmann, studying the cave vertebrates, concluded that cave evolution was essentially degenerative.

Helena Blavatsky and Julius Evola believed that apes had devolved from humans, contrary to standard evolutionary theory.

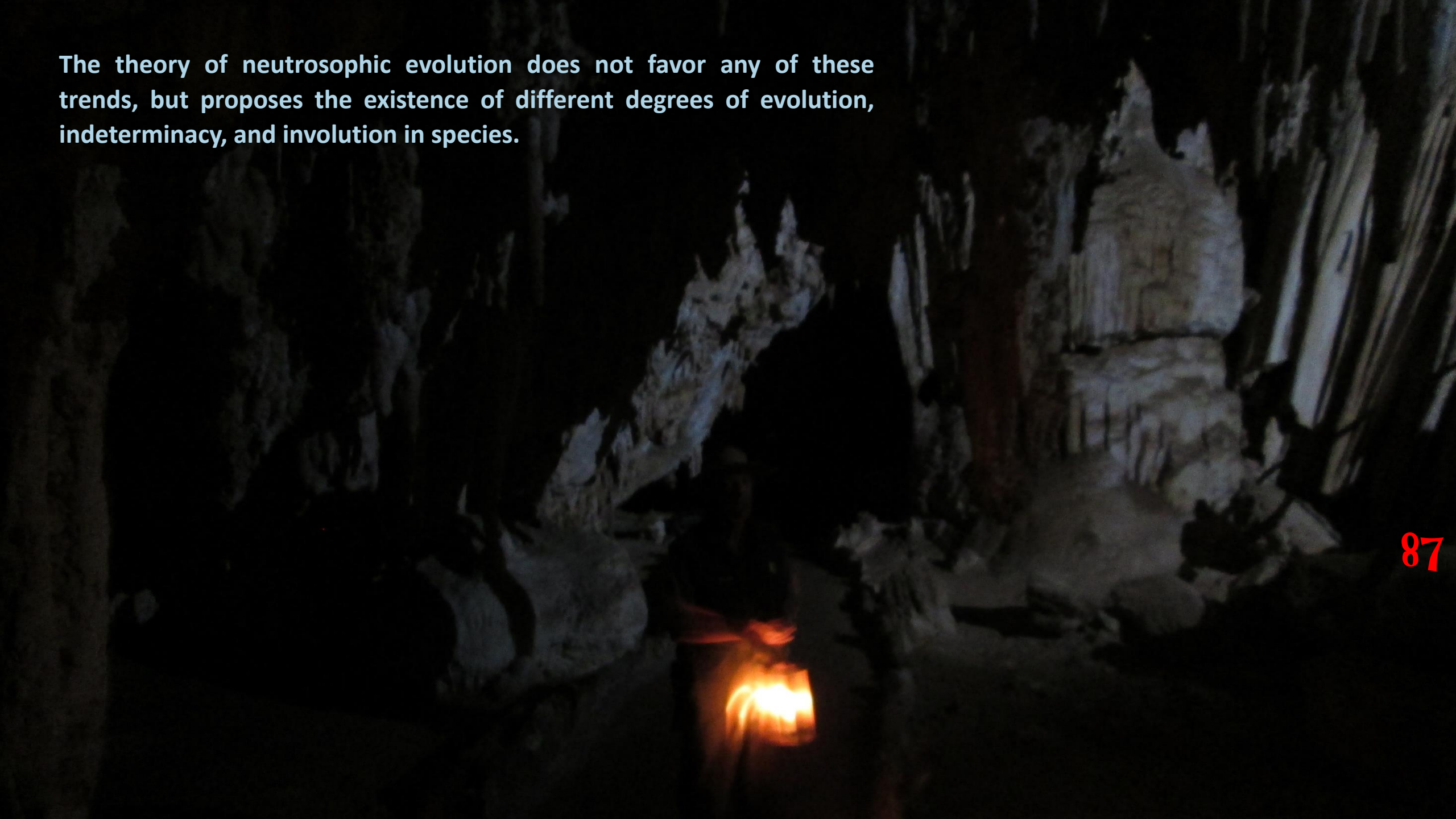


Roger Luckhurst wrote: “Darwin soothed readers that evolution was progressive, and directed towards human perfectibility. (…) Using Darwin's theory, and many rival biological accounts of development then in circulation, [next generation of] scientists suspected that it was just as possible to devolve, to slip back down the evolutionary scale to prior states of development.”



Lankester, a critic of progressive evolution, explored the possibility that the natural selection may also lead to devolution, pointing out that higher forms existed in the past which have degenerated into simpler forms.

Lankester believed that "if it was possible to evolve, it was also possible to devolve, and that complex organisms could devolve into simpler forms or animals".



The theory of neutrosophic evolution does not favor any of these trends, but proposes the existence of different degrees of evolution, indeterminacy, and involution in species.

BIBLIOGRAPHY

Arntzen JW, Sket B (1997) *Morphometric analysis of black and white European cave salamanders, Proteus anguinus*. Journal of Zoology 241 (4): 699–707

Broly P, Deville P, Maillet S (2013) *The origin of terrestrial isopods (Crustacea: Isopoda: Oniscidea)*. Evol Ecol 27, 461–476. https://doi.org/10.1007/s10682-012-9625-8

Brusca RC (1984) *Phylogeny, evolution and biogeography of the marine isopod subfamily Idoteinae (Crustacea: Isopoda: Idoteidae)*. Trans San Diego Soc Nat Hist 20(7):99–134

Brusca RC, Wilson GDF (1991) *A phylogenetic analysis of the Isopoda with some classificatory recommendations*. Mem Qld Mus 31:143–204

Cairns-Smith AG (1966) *The Origin of Life and the Nature of Primitive Gene*. Journal of Theoretical Biology, v. X, 53–88.

Darwin C (1859). *On the origin of species by means of natural selection, or the preservation of favoured races in the struggle for life*. London: John Murray

Dumas P (1998) *The olfaction in Proteus anguinus*. Behavioural Processes. 43: 107–113. https://doi.org/10.1016/S0376-6357(98)00002-3

Ereshefsky M (1992) *The Units of Evolution: Essays on the Nature of Species*. Cambridge, Massachusetts

Friend JA, Richardson AMM (1986) *Biology of terrestrial amphipods*. Annu Rev Entomol 31:25–48

Garwood RJ, Edgecombe GD (2011) *Early terrestrial animals, evolution, and uncertainty*. Evol Educ Outreach 4(3):489–501

Hitching F (1987) *The Neck of the Giraffe: Where Darwin Went Wrong*. New Haven, Connecticut

Linfan M (2016) *Biological n-System with Global Stability*. International Conference on Applications of Mathematics in Topological Dynamics, Section: “Physics, Biological and Chemical Systems”, Kolkata, India, December 9–11, 2016

Millingen JG (1839) *Curiosities of Medical Experience* (2nd ed.). London: Richard Bentley

Poinar GO (1994) *The range of life in amber: significance and implications in DNA studies*. Cell Mol Life Sci 50(6):536–542

Racovitza, GE (1927) *Speologia: O știință nouă a străvechilor taine subpământești*. Astra, Secția Științelor naturale, Biblioteca populară, Cluj

Racovitza GE, Jeannel R (1907–1929) *Énumération des grottes visitées*, series 1–7. Archives de Zoologie expérimentale et générale, Paris

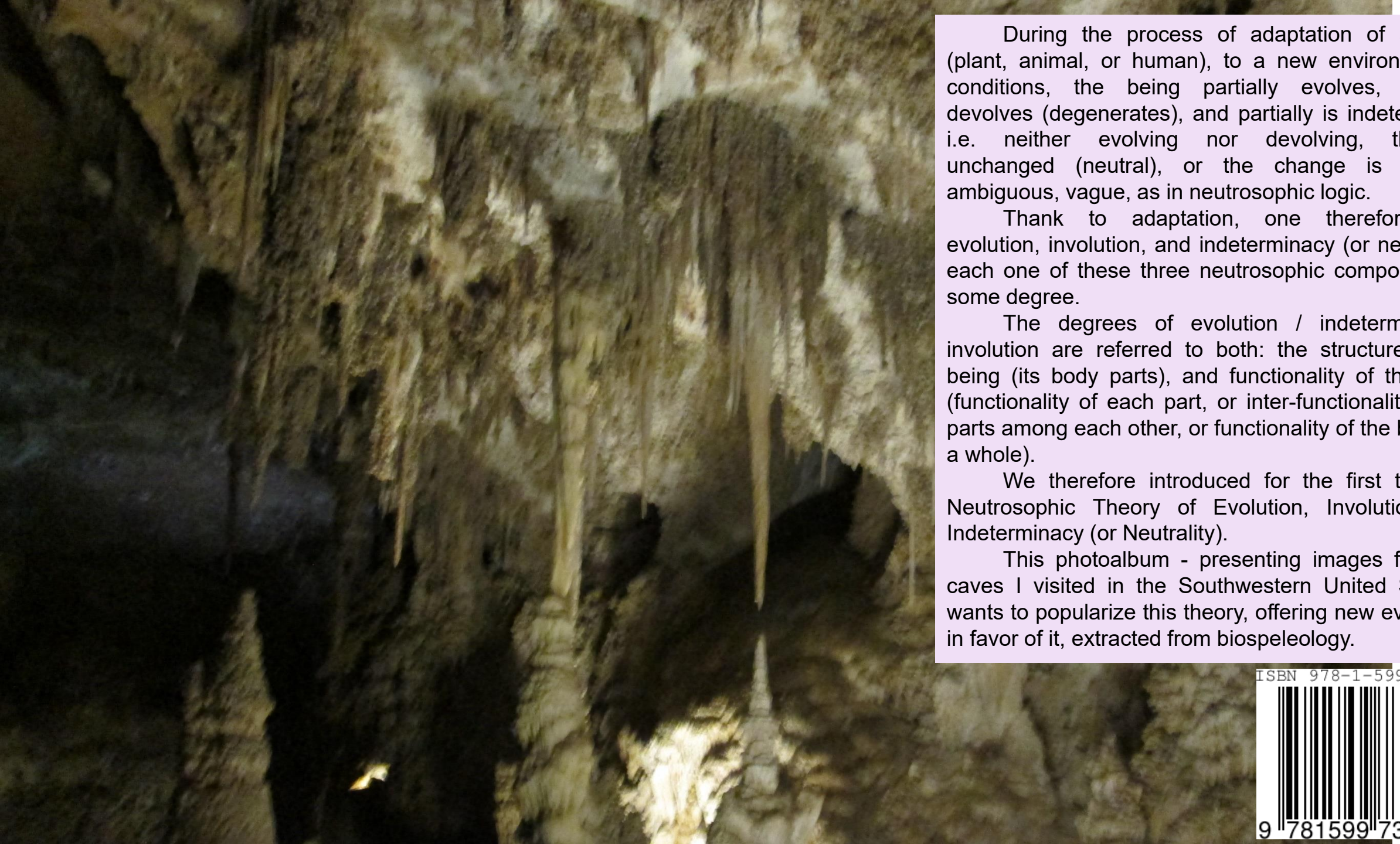
Ruppert E, Fox RS, Barnes RD (2004). *Invertebrate Zoology* (7th ed.). Cengage Learning

Schmalfuss H (1984) *Two new species of the terrestrial isopod genus Pseudarmadillo from Dominican amber (Amber-Collection Stuttgart: Crustacea, Isopoda, Pseudarmadillidae)*. Stutt Beitr Naturk Ser B 102:1–14

Smarandache F (2017) *Galapagos sau Ținutul Broaștelor Țestoase Gigantice: Teoria Neutrosofică a Evoluției*. Editura Agora, Sibiu

Smarandache F (2017) *Introducing a Theory of Neutrosophic Evolution: Degrees of Evolution, Indeterminacy, and Involution*. Progress in Physics, Volume 13. Issue 2 (April), 130-135

Tabacaru I (2002) *L’adaptation à la vie aquatique d’un remarquable trichoniscide cavernicole, Cantabroniscus primitivus Vandel, et le problème de la monophylie des isopodes terrestres*. Trav Inst Spéol “Émile Racovitza” 37–38:115–131



During the process of adaptation of a being (plant, animal, or human), to a new environment or conditions, the being partially evolves, partially devolves (degenerates), and partially is indeterminate i.e. neither evolving nor devolving, therefore unchanged (neutral), or the change is unclear, ambiguous, vague, as in neutrosophic logic.

Thank to adaptation, one therefore has: evolution, involution, and indeterminacy (or neutrality), each one of these three neutrosophic components in some degree.

The degrees of evolution / indeterminacy / involution are referred to both: the structure of the being (its body parts), and functionality of the being (functionality of each part, or inter-functionality of the parts among each other, or functionality of the being as a whole).

We therefore introduced for the first time the Neutrosophic Theory of Evolution, Involution, and Indeterminacy (or Neutrality).

This photoalbum - presenting images from the caves I visited in the Southwestern United States - wants to popularize this theory, offering new evidences in favor of it, extracted from biospeleology.

ISBN 978-1-59973-679-2

9 781599 736792 >