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Some minor points added 23 May and 10 June 2023 as well as Photographs and 2 Videos (p. 61) in the following weeks at the end of the document (see Supplement).

Origin and Evolution of the Rhinos (Family Rhinocerotidae): What Do We Really Know?

Applying Our Previous Tests for Gradualism, Punctuated Equilibrium and Intelligent Design Now also on the Rhinos

Some Recollections and Several New Aspects

Abstract

Some rhinoceroses like the square-lipped *Ceratotherium simum* of the African savanna weigh more than 3 tons and thus **belong to the largest land mammals** after the African elephant. After an extensive revision of the family Rhinocerotidae, presently some 21 genera have been found to be valid, most of which, however, do not exist anymore. Just four of the genera are still extant.

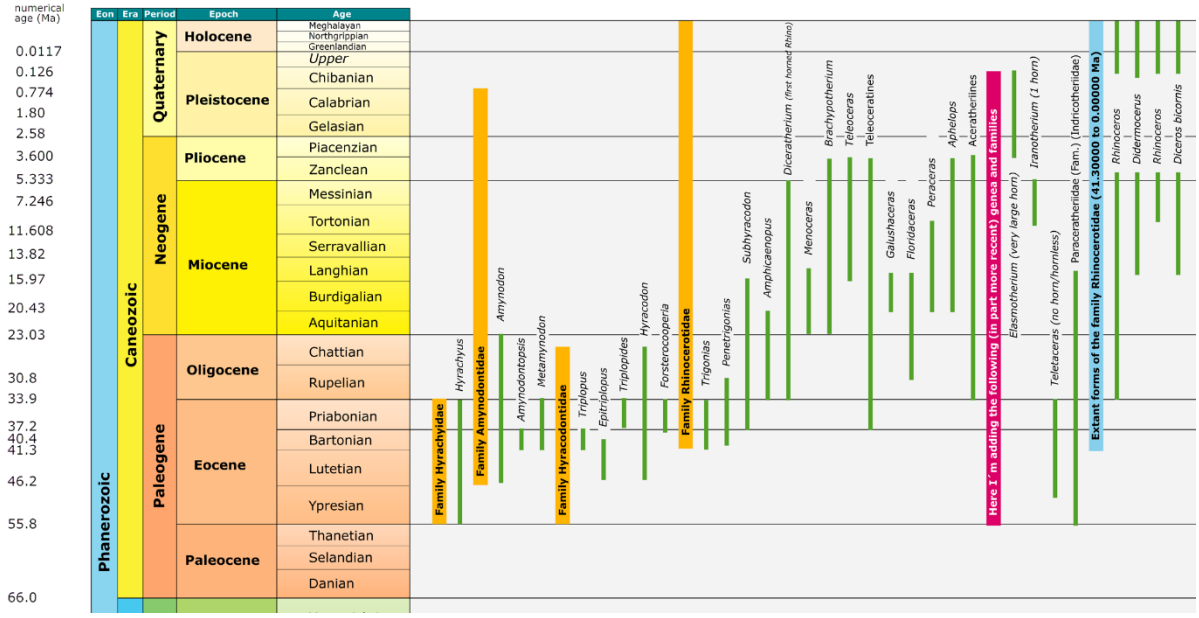

Figure on the chronological occurrence of the four families of the Rhinocerotoids: Hyracodontidae, Amynodontidae, Paraceratheriidae and Rhinocerotidae by Roland Slowik (Dietzenbach, Germany) for the present article (3 May 2023). The order follows the evolutionary representation in a figure given by Donald R. Prothero in several of his books (*cf.* figure below).

Although they do not belong to the most handsome/good-looking or graceful creatures of the animal kingdom, the Rhinocerotoidea (superfamily) are a fascinating group for research not only due to an extraordinarily **rich fossil record**[1] but also many striking anatomical and physiological characteristics.

Intriguingly many of the past and present forms have **lived contemporaneously** for millions of years according the geological time table. Also, all ***families and genera*** of the rhinocerotoids appear ***abruptly*** in the fossil record. None of them is linked to any other by a series of "infinitesimally small changes", "infinitesimally slight variations", "insensibly fine steps" etc. (Darwin and the neo-Darwinians/Modern Synthesis). Hence, the fossil record is in full agreement with the statement of the eminent evolutionary biologist Donald R. Prothero, paleontologist and leading rhino researcher, that "the most striking thing about the overall pattern of rhinocerotid evolution is that of **stasis**". Even for the ***species level*** he notes that "although some limited examples of gradual change can be documented in the rhinocerotids, *the overwhelming pattern is one of stable species which show no measurable change over long periods of time*, consistent with the predictions of Eldredge and Gould (1972)"[2].

So, what do we really know about their origin and evolution? The entire fossil series of the family of the rhinos starts with a rhinoceros (*Teletaceras*) and ends with rhinoceroses. The viewpoint of natural selection of random/accidental/haphazard DNA mutations can be – except for microevolution – excluded for many scientific reasons as shown below. Intelligent design is definitely the scientifically superior explanation.

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[1] According to the Paleobiology Database (PBDB) (2023) for the superfamily: "**Collections** (**2419 total**)" and for the family **Rhinocerotidae** alone "**Collections** (**1892 total**)". Let's take for a comparison the family **Elephantidae**, showing an "excellent", "very complete" fossil record, displaying an "enormous quantity of fossil bones": "**Collections (1316 total**)". (Numbers of PBDB all retrieved 10 June 2023). For the fossil record of the elephants, see also: http://www.weloennig.de/ElephantEvolution.Critique.pdf

[2] Emphasis added.

Contents / Keywords

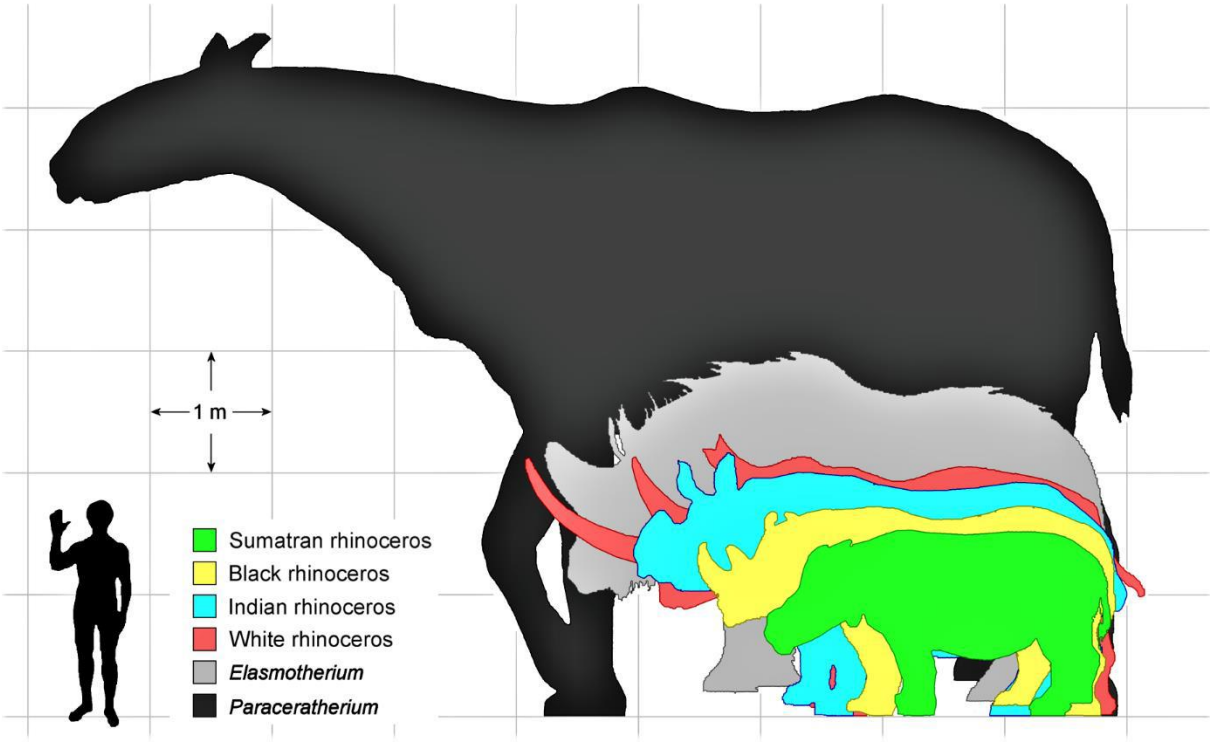
Note please that virtually all **highlighting/emphasis in the typeface** by W.-E. L. (except italics for ***genera*** and ***species*** names).

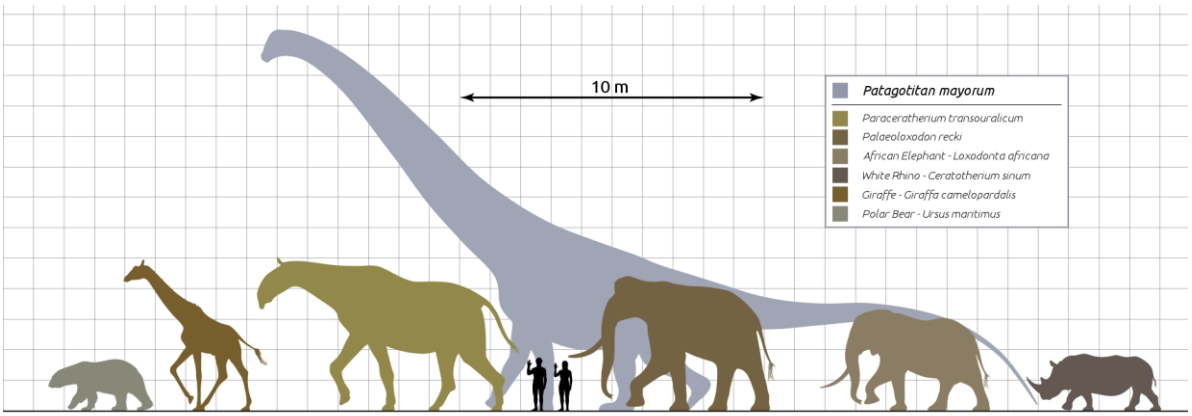
Since many people do not have the time to study a more extensive work in detail, these highlights can serve as **keywords** for the respective texts.

Some Size Comparisons – Fossil and Recent Rhinos

Some size comparisons between known recent and fossil Rhinos (The large *Paraceratherium* without "horns") and some other animals.

By the way, the **Sumatran Rhinoceros** also has two horns made of keratin on its "nose"; "Like the African species, it has two horns; the larger is the front (**25–79 centimeters** (9.8–31.1 in), with the smaller usually less than 10 centimeters (3.9 in) long."[3]





Size of *Paraceratherium* (the animal in black above) and white Rhino (right below) as compared to the dinosaur *Potagotitan mayorum* and several other recent and fossil species[4]

[3] https://en.wikipedia.org/wiki/Rhinoceros#Horn_use (retrieved 10 Dec. 2022).
[4] Above: https://pl.wikipedia.org/wiki/Paraceratherium and https://pl.wikipedia.org/wiki/Paraceratherium#/media/Plik:Rhino_sizes_English.png
Below: https://en.wikipedia.org/wiki/Paraceratherium#/media/File:Patagotitan_vs_Mammals_Scale_Diagram_SVG_Steveoc86.svg (both retrieved 9 Dec. 2022

Brief Profile of the Rhinoceros

Encyclopaedia Britannica:

"rhinoceros, Any of five extant African and Asian species (family Rhinocerotidae) of three-toed horned ungulates. ***One of the largest of all land animals*** (the white rhinoceros is second only to the elephant), the rhinoceros is particularly distinguished by one or two **horns**—**growths of keratin, a fibrous hair protein**—on its upper snout. All have thick, virtually hairless skin that, in the three Asian species, forms platelike folds at the shoulders and thighs. Rhinos grow to 8–14 ft (2.5–4.3 m) long and 3–6.5 ft (1.5–2 m) tall; adults **weigh 3–5 tons**. Most are solitary inhabitants of open grassland, scrub forest, or marsh, but the Sumatran rhino lives in deep forest. The African black rhino browses on succulent plants, the white and great Indian rhinos graze on short grasses, and the Sumatran and Javan rhinos browse on bushes and bamboo. In the second half of the 20th century, the rhinoceroses were brought to the brink of extinction by hunters, mostly seeking the horn. All five species are threatened or endangered.[5]

…[The present] Rhinoceroses are characterized by the possession of one or two horns on the upper surface of the snout; these horns are ***not true horns but are composed of keratin***, a fibrous protein found in hair. Modern rhinoceroses are large animals, ranging from 2.5 metres (8 feet) long and 1.5 metres (5 feet) high at the shoulder in the Sumatran rhinoceros to about 4 metres (13 feet) long and nearly 2 metres (7 feet) high in the white rhinoceros. **Adults of larger species weigh 3–5 tons.** Rhinoceroses are noted for their thick skin, which forms platelike folds, especially at the shoulders and thighs. All rhinos are ***gray or brown in colour, including the white rhinoceros, which tends to be paler than the others***. Aside from the Sumatran rhinoceros, they are nearly or completely **hairless,** except for the tail tip and ear fringes, but some fossil species were covered with dense fur. The feet of the modern species have three short toes, tipped with broad, blunt nails."[6]

Encyclopedia.com (Oxford University Press):

Rhinoceroses. Popularly called rhinos, [present] rhinoceroses are heavily-built, thick-skinned herbivores with one or two horns on their snout and three toes on their feet. The family Rhinocerotidae includes five species found in Asia and Africa, all of which face extinction.

The two-ton, ***one-horned Great Indian rhinoceroses*** (*Rhinoceros unicornis*) *are shy and inoffensive animals* that seldom act aggressively. These rhinos were once abundant in Pakistan, northern India, Nepal, Bangladesh, and Bhutan. Today, there are about 2,400 Great Indian rhinos left in two game reserves in Assam, India, and in Nepal. The smaller ***one-horned Javan rhinoceros*** (*Rhinoceros sondaicus*) is the ***only species in which the females are hornless***. Once ranging throughout southeast Asia, Javan rhinos are now on the verge of extinction, with only 60 living on reserves in Java and Vietnam.

The Sumatran rhinoceros (*Didermocerus sumatrensis*), the smallest of the rhino family, has two horns and a hairy hide. There are two subspecies—*D. s. sumatrensis* (found in Sumatra and Borneo) and *D. s. lasiotis* —found in Thailand, Malaysia, and Burma. Sumatran rhinos are found in hilly jungle terrain and ***once coexisted in southeast Asia with Javan rhinos.*** Now there are only 300 Sumatran rhinos left.

The two-horned, white, or square-lipped, rhinoceros **(*Ceratotherium simum*) of the African savanna is the largest land mammal after the African elephant**, standing 7 ft (2 m) at the shoulder and weighing **more than 3 tons**. White rhinos have a wide upper lip for grazing. There are two subspecies: the northern white (*C. s. cottoni*) and the southern white (*C. s. simum*). Once common in the Sudan, Uganda, and Zaire, northern white rhinos are now extremely rare, with only 40 left (28 in Zaire, the rest in zoos). Southern African white rhinos are faring somewhat better (7,500) and are the world's most common rhino.

The smaller two-horned black rhinoceros (*Diceros bicornis*) has a pointed upper lip for feeding on leaves and twigs. Black rhinos can be aggressive but their poor eyesight makes for blundering charges. *Black rhinos (which are actually dark brown*) were once common throughout sub-Saharan Africa but are now found only in Kenya, Zimbabwe, Namibia, and South Africa. Today, there are only 2,600 black rhinos left in the wild, compared to 100,000 30 years ago.[7]

Wikipedia[8]:

A rhinoceros (/raɪˈnɒsərəs/; from Ancient Greek ῥῑνόκερως (rhīnókerōs) 'nose-horned'; from ῥῑνός (rhīnós) 'nose', and κέρας (kéras) 'horn'), commonly abbreviated to rhino, is a member of any of the five extant species (or numerous extinct species) of odd-toed ungulates in the family Rhinocerotidae. (It can also refer to a member of any of the extinct species of the superfamily Rhinocerotoidea.) Two of the extant species are native to Africa, and three to South and Southeast Asia.

Rhinoceroses are some of the largest remaining megafauna: **all weigh at least one tonne in adulthood**. They have a herbivorous diet, small brains (400–600 g) for mammals of their size, one or two horns, and a thick (1.5–5 cm), ***protective skin formed from layers of collagen positioned in a lattice structure***. They generally eat leafy material, although their ability to ferment food in their hindgut allows them to subsist on more fibrous plant matter when necessary. Unlike other perissodactyls, the two African species of rhinoceros lack teeth at the front of their mouths; they rely instead on their lips to pluck food.[9]

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[5] https://www.britannica.com/animal/rhinoceros-mammal (brief summary) (retrieved 17 January 2023).
All **emphasis** (except *italics* in species names) here and in the following quotations by W.-E. L.
[6] Quoted from the full text on the rhino of the Britannica.
[7] https://www.encyclopedia.com/environment/encyclopedias-almanacs-transcripts-and-maps/rhinoceroses (2019)
[8] Although the Wikipedia articles are not always of the same quality, there is a series of well researched articles by (an) anonymous author(s?) about the different genera of the family Rhinocerotidae. Many of them are only in German so far. The quotations were first translated with DeepL and further/additionally corrected. (Comment 4 February 2023.) On the Wikipedia, see also: http://www.weloennig.de/AngiospermsLivingFossils.pdf p. 21
[9] https://en.wikipedia.org/wiki/Rhinoceros (retrieved 17 January 2023)

Background for this Article: Gradualism, Punctuated Equilibrium (Punk Eek) and ID

For a full understanding/comprehension of the following paper by those readers who may not yet be thoroughly familiar with today's evolutionary frameworks, I would like to repeat the basic presuppositions of neo-Darwinism and Punctuated Equilibrium from some of my earlier articles, i. e. the background against which the following paleontological facts and arguments have been presented.

1) Gradualism: Still the dominant evolutionary theory. Gradualism in biology and geology refers to a theory that changes of organic life and of the Earth occur through gradual increments, and that transitions between different species, genera, families are continual and slow rather than periodic and rapid.[10]

   Thus, according to today's dominant theory of evolution – neo-Darwinism, also called "the synthetic theory of evolution" and "modern synthesis" – all life forms have evolved gradually from earlier life forms by natural selection of an almost endless array of **mutations with "slight or even invisible effects on the phenotype"** (in the words of Mayr, one of the architects of the modern synthesis) or *phenotypically* exactly as in Darwin's formulations of his theory between 1859 and 1882 by "…innumerable slight variations", "extremely slight variations" and "infinitesimally small inherited variations".[i]

   And since this key point of the theory, its bottom line, core and essence, even "the same yesterday, and today and forever" – gradualism in combination with omnipotent natural selection[11] – can hardly be overemphasized, I would like to continue to point out that Darwin correspondingly imagined the origin of species (and, in fact, of all life forms) by selection of "infinitesimally small changes", "infinitesimally slight variations" and "slow degrees" and hence imagined "steps not greater than those separating fine varieties", "insensibly fine steps" and "insensibly fine gradations", "for natural selection can act only by taking advantage of slight successive variations; ***she can never take a leap***, but must advance by the shortest and slowest steps" or "the transition [between species] could, according to my theory, be effected only by numberless small gradations" (All emphasis added).

   In the 1st edition of Darwin's *Origin* (1859) we find his assertion that "Natura non facit saltum" ("nature doesn't jump") **eight times and in the 6th edition (1872) twelve times**, so even four times more. Darwin comments *inter alia* (1872, p. 166): "On the theory of natural selection we can clearly understand the full meaning of that old canon in natural history, "**Natura non facit saltum**." This canon, if we look to the present inhabitants alone of the world, is not strictly correct; *but if we include all those of past times, whether known or unknown, **it must on this theory be strictly true.***"[12]

   Virtually the same answer is presented by neo-Darwinism today.[13]

2) "Punctuated equilibrium: evolution that is characterized by long periods of stability in the characteristics of an organism and short periods of rapid change during which new forms appear especially from small subpopulations of the ancestral form in restricted parts of its geographic range."[14]

   See more on this theory in http://www.weloennig.de/ElephantEvolution.pdf (2019, pp. 3 – 6 and 7 – 8, 13, 14, 16, 18, 20, 27, 31, 36, 37, 40, 42, 43, 47, 48, 51, 57, 58, 60, 61.)

See please, for example, these three encyclopedias for much more information. However, their doubtful evolutionary statements are discussed in the following paper.

[10] In part based on (but corrected) Melanie Hopkins and Scott Lidgard: Gradualism (Last reviewed 17 March 2021): Oxford Bibliographies https://www.oxfordbibliographies.com/display/document/obo-9780199941728/obo-9780199941728-0072.xml ("...and often that transitions between different states are more or less continual and slow…). Not just "often" and "more or less" but virtually always.

[11] Wolf-Ekkehard Lönnig "Evolution by Natural Selection – Unlimited and Omnipotent?" See http://www.weloennig.de/OmnipotentImpotentNaturalSelection.pdf (2018): and Wolf-Ekkehard Lönnig (2016): "On the Limits of Natural Selection." *Cf.* http://www.weloennig.de/jfterrorchipmunks.pdf

[12] For all the references of the Darwin quotes, see, please http://darwin-online.org.uk/

[13] See documentation by Wolf-Ekkehard Lönnig, "The evolution of man: What do we really know? Testing the theories of gradualism, saltationism and intelligent design." http://www.weloennig.de/HumanEvolution.pdf or http://ad-multimedia.de/evo/long-necked-giraffe_mU.pdf (especially pp. 129/130)

[14] https://www.merriam-webster.com/dictionary/punctuated%20equilibrium (retrieved 8 January 2023)

For a more detailed clarification I'm going to reproduce p. 5 of that document:

Stephen C. Meyer (2013/2014, pp. 136-152) has carefully and convincingly provided an in-depth analysis showing that punctuated equilibrium ("*punk eek*") with its main components of *allopatric speciation* and *species selection* have – after much ado in the 1970s and 1980s (I have intensely and often enthusiastically studied the relevant publications of that time and also in the following decades) – eventually ended up in "good, old-fashioned natural selection acting on random mutations and variations – that is, […] the neo-Darwinian mechanism acting over long periods of time on large, relatively stable, populations". After Meyer had pointed out that *punk eek* already had come to naught by the Cambrian explosion (p. 142: "First, the top-down pattern of appearance of Cambrian animal forms […] contradicts punctuated equilibrium's depiction of the history of life almost as much as it does the Darwinian picture"), Meyer goes on to say (pp. 146-148)[15]:

> "Neither allopatric speciation nor species selection can generate the new genetic and anatomical traits necessary to produce animal forms, let alone in the relatively brief time of the Cambrian explosion. As conceived by Gould and the other advocates of punctuated equilibrium, allopatric speciation just allows for the possibility of the *rapid fixation* of preexisting traits, not the *generation* of new traits. When a parent population splits into two or more daughter populations, each of the daughter populations retains a part, but usually not the whole, of the gene pool of the original population. No new genetic traits are generated by the geographical isolation of one part of a population from another.
>
> It could be argued, of course, that mutations might occur during the process of speciation, thus generating new genetic traits. But as Gould and Eldredge conceived of it, allopatric speciation occurs much too rapidly to have a reasonable chance of mutations generating anything fundamentally new. Darwin recognized in *On the Origin of Species* that evolution is a numbers game: larger population sizes and more generations offer more opportunities for favorable new variations to arise. As he explained: "Forms existing in larger numbers will always have a better chance … of presenting further favourable variations for natural selection to seize on, than will the rarer forms which exist in lesser numbers." ***Yet for the mechanism of allopatric speciation to generate new traits, it would need to generate significant changes in form in small "peripherally isolated" populations over relatively few generations***. Because of these constraints, many biologists have concluded that ***allopatric speciation requires too much change too quickly to provide the theory of punctuated equilibrium with a biologically plausible mechanism for producing new traits or forms of animal life***.
>
> And that is why Gould and Eldredge, especially in their later formulations of the theory, envisioned new traits arising during long period of stasis in larger populations rather than during short bursts of speciation. ***But a process in which traits arise "during long periods of stasis" does not constitute a "mechanism of unusual speed and flexibility***," though that is precisely what, according to Gould and Foote, punctuated equilibrium requires in order to explain the abrupt appearance of new animal forms."

But what about species selection?

> "If allopatric speciation does not produce a fast-acting trait-generating mechanism, does **species selection**? Again, the answer is no. ***Species selection does not account for the origin of the different anatomical traits that distinguish one species from another***. Species selection, as conceived by the proponents of punctuated equilibrium, acts on species and traits that *already* exist. Indeed, when Stanley, Gould, and Eldredge envisioned natural selection acting to favor the most fit species over another in a competition for survival, they presupposed the existence of a pool of different species and, therefore, also the existence of some mechanism for producing the traits that characterize those different species. That mechanism, however, would necessarily need to generate those differentiating traits before species could enter into competition with each other. Species selection *eliminates* less fit species in a competition for survival; it does not *generate* the traits that distinguish species and establish the basis for interspecies competition.
>
> So where do these traits come from? When pressed, Gould eventually acknowledged that the origin of anatomical traits themselves result from good, old-fashioned natural selection acting on random mutations and variations—that is, from the neo-Darwinian mechanism acting overlong periods of time on large relatively stable populations. ***But that meant that punctuated equilibrium, to the extent it relies on mutation and natural selection, is subject to the same evidential and theoretical problems as neo-Darwinism***. And one of those problems is that the neo-Darwinian mechanism does not act quickly enough to account for the explosive appearance of new fossil forms in the Cambrian period [or other periods]. Like allopatric speciation, species selection does not qualify as the kind of rapid and flexible mechanism that Gould elsewhere insisted his theory must have in order to explain the abrupt appearance of animal forms in the fossil record."

I myself have pointed out similar problems of *punk eek* in 1986/1993/2011[16]. We are going to come back to special formulations of this theory in the discussion

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[15] To repeat: All emphasis (***blue, bold, italics*** – here in the following quotations, if not otherwise stated) by W-E L

[16] www.weloennig.de/AesV3.Konti.html, www.weloennig.de/AesIV5.SysDis.html, see also the revealing very important details in http://ad-multimedia.de/evo/long-necked-giraffe_mU.pdf pp. 128-130.

of the problems the elephant fossil record provides for classical neo-Darwinism and *punk eek* as well.

3) Intelligent Design: See please, the same document just mentioned pp. 56/57 as well as http://www.weloennig.de/HumanEvolution.pdf (2019, pp. 46 – 47) and http://www.weloennig.de/PlantGalls.xyz.pdf (2020, pp. 50 – 55).

To arouse the reader's interest, I'm going to quote the following sentences from it (p. 52):

William Dembski has repeatedly emphasized that in this method there is "***no magic, no vitalism, no appeal to occult forces***" involved (likewise Behe and others). And, indeed: "Inferring design is widespread, rational, and objectifiable."

> Dembski: "Hardly a dubious innovation, Intelligent Design formalizes and makes precise something we do all the time. All of us are all the time engaged in a form of rational activity which, without being tendentious, can be described as inferring design. ***Inferring design is a perfectly common and well-accepted human activity***. People find it important to identify events that are caused through the purposeful, premeditated action of an intelligent agent, and to distinguish such events from events due to either law or chance. Intelligent Design unpacks the logic of this everyday activity, and applies it to questions in science. There's no magic, no vitalism, no appeal to occult forces here. Inferring design is widespread, rational, and objectifiable. The purpose of this paper is to formulate Intelligent Design as a scientific theory.
>
> The key step in formulating Intelligent Design as a scientific theory is to ***delineate a method for detecting design***. Such a method exists, and in fact, we use it implicitly all the time. The method takes the form of a ***three-stage Explanatory Filter***. Given something we think might be designed, we refer it to the filter. If it successfully passes all three stages of the filter, then we are warranted asserting it is designed. Roughly speaking the filter asks three questions and in the following order: (1) Does a law explain it? (2) Does chance explain it? (3) Does design explain it?"

See, please, for further discussion the document referred to above.

You may also check the following argumentation from p. 47 of the article about *Human Evolution* mentioned in http://www.weloennig.de/HumanEvolution.pdf:

> Now, if one is prepared to break away from the prohibition of materialistic philosophy, one could, for example, accept the following reasoning – in part[17] according to Austrian cell physiologist Siegfried Strugger (professor of botany at the University of Münster): "**The cell is the most perfect cybernetic system on earth** [usually consisting of thousands of spatiotemporally precisely matched gene functions, gene interactions, cascades and pathways in a steady-state network of ingeniously complex physiological processes characterized by specified as well as (often) irreducible complexity including an abundance of information at least to the gigabyte to terabyte range]. **In comparison to the cell, all automation of human technology is only a primitive beginning of man in principle to arrive at a biotechnology**."[ii]
>
> Well, if the first steps on the way/the path to the ingenious level of cybernetic complexities of the cell, i.e. the "primitive beginning" in Strugger's formulation, demands conscious action, imagination, perception, intelligence, wisdom, mental concepts, spirit and mind – all being already absolutely necessary for the basic start, – so how much more so does this have to apply to the origin of the infinitely more complex cybernetic systems of the life forms themselves – including all the specified and irreducibly complex structures inescapably necessary for the origin of man.

Now, let's turn directly to the origin of the *Rhinocerotidae*:

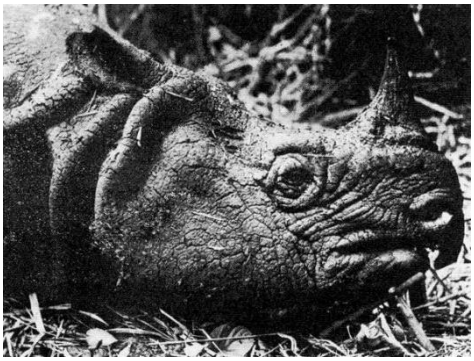
[17] Points in square brackets added.

"*Living fossils are something of an embarrassment to the expectation that evolutionary change is inevitable as time goes by*."
Niles Eldredge[18]

Rhinoceros **(one-horned rhinoceros) in the Fossil Record: Age Range and Collections According to PBDB[19] (2023) :**

https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43222&is_real_user=1

Oligocene (Rupelian 33.9 – 28.1 Ma) to present. LIVING FOSSIL[20] (Genus): CONSTANCY/stasis up to almost 34 Ma. Total: 95 collections including 104 occurrences.




Left: Head of a **male Javan rhino** *Rhinoceros sondaicus* (Photographed 31 January 1934 in Sindangkerta, West Java.): Author P. F. Franck https://de.wikipedia.org/wiki/Java-Nashorn Right: *Rhinoceros unicornis* "Greater one-horned rhinoceros at Chitwan, Nepal": Author: Aditya Pal, 16 June 2019, https://de.wikipedia.org/wiki/Rhinoceros_(Gattung). (Retrieved 4 January 2023)

First 16 entries in PBDB on age range and collections (see please the internet site for all the 95 collections with many more data and links to the original publications):

Basic info	Taxonomic history	Classification	Included Taxa
Morphology	Ecology and taphonomy	External Literature Search	**Age range and collections**

Rhinoceros (one-horned rhinoceros)

Mammalia - Perissodactyla - Rhinocerotidae

Age range

Maximum range based only on fossils: base of the Rupelian to the top of the Holocene *or* 33.90000 to 0.00000 Ma
Minimum age of oldest fossil (stem group age): 28.1 Ma

Collections (95 total)

Time interval	Ma	Country or state	Original ID and collection number
Rupelian	33.9 - 28.1	Belgium (Antwerpen)	Rhinoceros sp. (52047)
Aquitanian	23.03 - 20.44	Italy	Rhinoceros aurelianensis (47623)
Early/Lower Miocene	23.03 - 15.97	North Korea (Hamgyeongbuk-do)	Rhinoceros sp. (48623)
Miocene	23.03 - 5.333	Serbia and Montenegro (Serbia)	Rhinoceros sp. (39715)
Miocene	23.03 - 5.333	China (Gansu)	Rhinoceros sp. (42555)
Miocene	23.03 - 5.333	Austria	Rhinoceros sp. (63085)
Neogene	23.03 - 2.588	Myanmar	Rhinoceros sp. (215569)
Neogene	23.03 - 2.588	Italy	Rhinoceros sp. (96713)
Neogene	23.03 - 2.588	Taiwan (Tao-yuan)	Rhinoceros sp. (76856)
Neogene	23.03 - 2.588	Taiwan	Rhinoceros sp. (76868)
Burdigalian	20.44 - 15.97	Slovakia	Rhinoceros sp. (48642)
Burdigalian	20.44 - 15.97	Portugal (Lisbon)	Ceratorhinus tagicus (36617)
MN 4	16.9 - 15.97	France (Midi-Pyrénées)	Ceratorhinus tagicus (71873)
Middle Miocene	15.97 - 11.608	Pakistan (Punjab)	Rhinoceros browni (13472)
Serravallian	13.82 - 11.62	Ukraine (Odessa)	Rhinoceros pachygnathus (75786 75790)
MN 7 + 8	12.75 - 11.1	Switzerland (Baselland)	Rhinoceros sp. (49421)

[18] See reference and more on the problems of Living Fossils in http://www.weloennig.de/AngiospermsLivingFossils.pdf (2021) and
[19] To repeat: Paleobiology Database https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43222&is_real_user=1
[20] For an extensive discussion of the term see http://www.weloennig.de/AngiospermsLivingFossils.pdf pp. 4 – 14 and p. 20 as well as http://www.weloennig.de/mendel20.htm

The reader may perhaps ask why we start our investigation with the genus *Rhinoceros* (one-horned rhinoceros) and not with the two-horned forms, which are often shown in zoos, films and many commentaries? Two paleontologists, Prothero and Schoch, state:

> "The only living beasts to bear the scientific name *Rhinoceros* are the two larger Asian species, the Indian rhino (*Rhinoceros unicornis*) (Fig. 1 5 .7) and the Javan rhino (*Rhinoceros sondaicus*) (Fig. 1 5 . 8). They are also known as the greater and lesser one-horned rhino because they are the only living rhinos with a single nasal horn. However ***the majority of extinct horned rhinos had only a single nasal horn as well, and the tandem-homed condition seen in the dicerotines and dicerorhinines is an exception to the rule***. The single horn of the Indian rhino tends to be a foot long or less, and they tend to use their sharp lower tusks as their principal weapon. The Javan rhino has even a smaller nasal horn, found only in males. Adult male Indian rhinos weigh about 4000 pounds (2000 kg) and females about 1 600 kg, about the same as the white rhino, and the Javan rhino weighs slightly less. Both are distinguished by their distinctive skin folds that give them an "armored" appearance" (Prothero and Schoch 2002, pp. 284/285).[21]

Now, where do these one-horned forms come from? What are their supposed ancestors according to evolutionary authors? What do we really know?

After a general overview of the present understanding of the faunal differences between the Oligocene and Eocene (including possible causes for the assumed climatic shift – see long footnote below)[22], the authors continue to state (p. 263):

> "In the midst of this the true rhinoceroses (Family Rhinocerotidae) make their appearance (Fig. 14. I). They were first known from the **middle Eocene** of Asia and North America, **and looked very much like hyracodonts**. The oldest known species is ***Teletaceras radinskyi***, recently described from the middle Eocene[23] of Oregon."

In that rather sketchy Fig. 14.I, however, *Teletaceras radinskyi* is missing, also the genus *Rhinoceros*. According to evolutionists, all three families (Amynodonts[24], Hyracodonts[25] and Rhinocerotids[26]) are derived from the genus *Hyrachyus*[27].

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[21] Donald R. Prothero and Robert M. Schoch (2002): Horns, Tusks, & Flippers: The Evolution of Hoofed Mammals. The Johns Hopkins University Press. Baltimore and London. *Cf.* also the paperback edition of 10 March 2003.

[22] "Life in the Oligocene looked very different from what we have seen in the Eocene. The climate was more temperate and arid than the subtropical world of the Eocene, with vegetation of mixed forest and savanna grasslands. These changes were effected by a number of causes we discussed in Chapter 12. Separation of Australia from Antarctica caused cold bottom waters to form and triggered climatic cooling. Rapid growth of Antarctic glaciers ultimately led to cooling and vegetational change, which caused the **late Eocene extinctions** that wiped out the brontotheres. Other animals felt the effects as well. The alligators, pond turtles, and other subtropical reptiles were replaced by land tortoises in great abundance. Tree-dwellers, such as lemur-like primates, vanished from North America as the forest canopy disappeared. Browsing animals with low-crowned teeth were becoming scarcer and were replaced by many modern groups of animals. These include shrews, squirrels, pocket mice and gophers, beavers, rabbits, dogs, camels, peccaries, elephants, **true tapirs and rhinos, which first appear in the late Eocene.** The grazing artiodactyls, especially the efficient ruminants, became more important, and most perissodactyl groups (especially tapirs and titanotheres) became scarce. The most common fossils in the Big Badlands of South Dakota are either artiodactyls (primarily oreodonts, deer, and camels) or tortoises. The only common Oligocene perissodactyls are the horses and hyracodonts, and they are far outnumbered by artiodactyls. The role of dominant herbivore had shifted from the perissodactyls to the artiodactyls. Today the artiodactyls are by far the most abundant of ungulates." (Prothero and Schoch pp, 263/264).

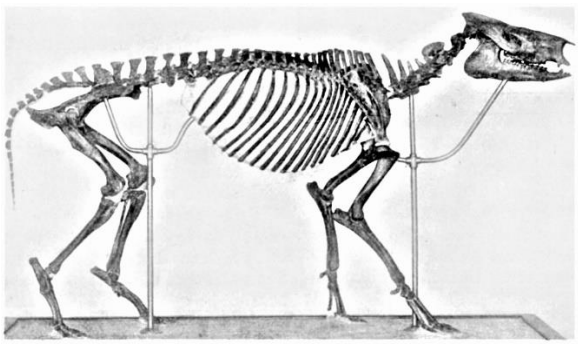
[23] Yet, according to fossilworks (2023) from the Late Eocene. http://www.fossilworks.org/cgi-bin/bridge.pl?a=taxonInfo&taxon_no=52132

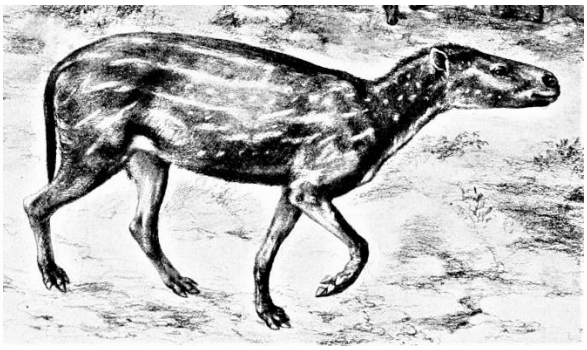
[24] The following quotations on the three families are from the **American Museum of Natural History (2023)**:
"**Amynodontidae**: Amynodont rhinos are a group of large-bodied, hornless rhinos that were common in Asia and North America from the Middle part of the Eocene through the early Oligocene. Amynodonts are sometimes called swamp rhinos, in reference to an older idea that these animals spent much of their time wallowing in ponds, shallow lakes, and rivers, although there is very little evidence that this is the case. The last North American amynodont, Metamynodon, may have been semi-aquatic. It shows some hippo-like features, including shortened limbs, a long broad torso, and eyes that were positioned towards the top of its skull. Fossils of Metamynodon are also commonly found in sandstone river deposits, further suggesting a semi-aquatic lifestyle. However, there is little evidence that other amynodonts were semi-aquatic. … **Amynodonts have no living relatives**, and because they are so distantly related to living rhinos it is hard to say much about their behavior or diet, although the elaborate facial musculature suggested by their skull morphology suggests they were successful browsers, which used their enlarged upper lips or proboscis to pluck woody twigs and leaves as the main part of their diet. https://research.amnh.org/paleontology/perissodactyl/evolution/groups/amynodonts

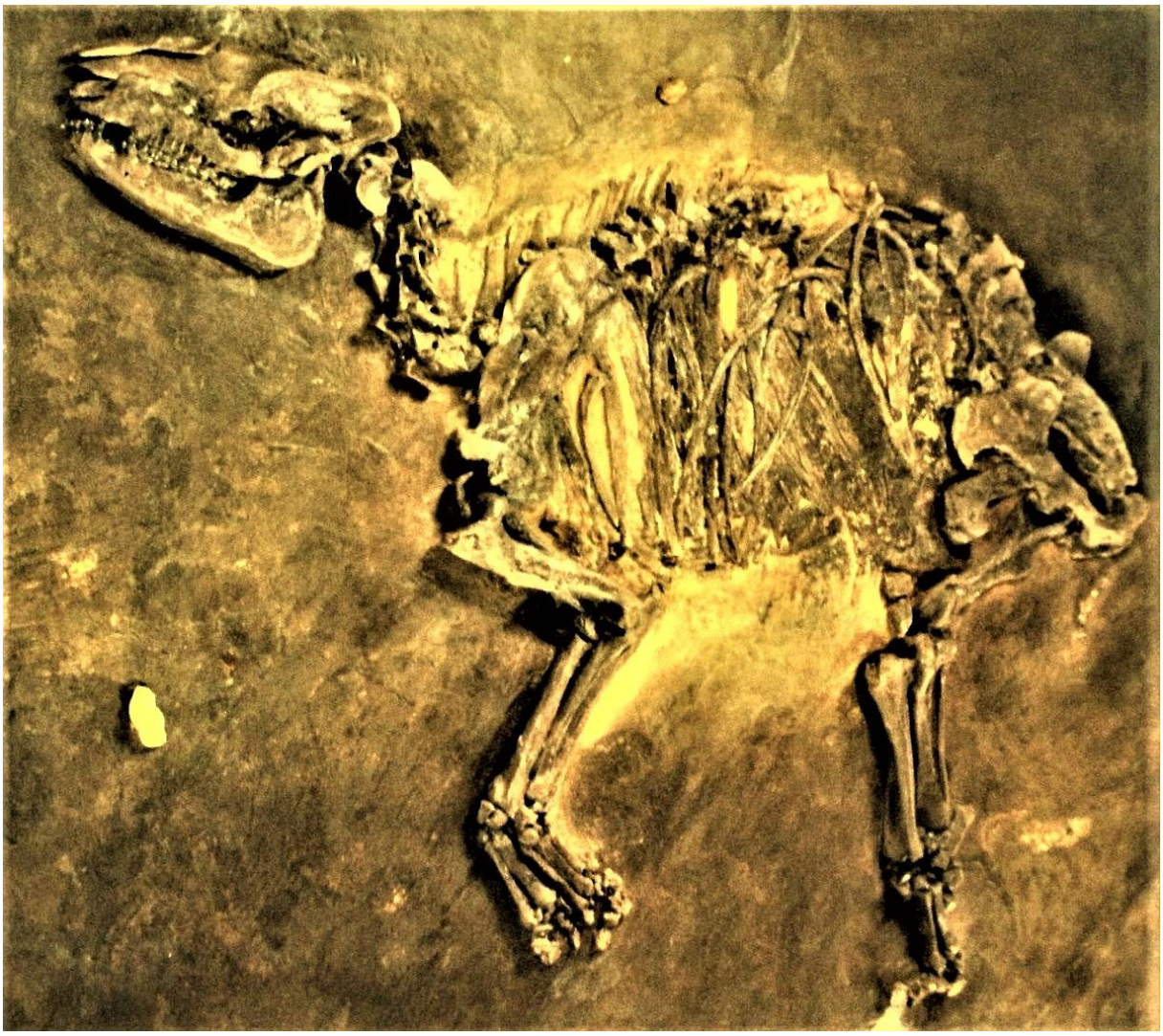
[25] **Hyracodontidae**: "Hyracodonts were perhaps the most unusual of the rhinos in that they had **long slender limbs and feet**. In this sense they were more horse-like in body proportions than other rhinos although, unlike horses, hyracodonts retained three toes on all four feet. Hyracodontids showed extreme variation in size, ranging from small, pony-sized species to some of the largest land mammals that ever lived." https://research.amnh.org/paleontology/perissodactyl/evolution/groups/hyracodontidae

[26] **Rhinocerotidae**: True rhinos are members of the family Rhinocerotidae. Compared to other perissodactyl families, true rhinos got off to a late start and do not appear in the fossil record until about 40 million years ago; most of the other perissodactyl families appear 55.5-46 million years ago. We think of rhinos as being characterized by a nasal horn, **but in fact most members of the group are hornless**. True rhinos are united by having large, tusk-like lower incisor teeth that sharpen on smaller chisel-shaped upper incisors. Curiously, the living African rhinos have lost their incisors, although they have many other anatomical features that indicate they are closely related to other true rhinos.

[27] *Hyrachyus* (from Hyrax and Ancient Greek: ὗς "pig") is an extinct genus of perissodactyl mammal that lived in Eocene Europe, North America, and Asia. Its remains have also been found in Jamaica. It is [thought to be] closely related to *Lophiodon*. https://en.wikipedia.org/wiki/Hyrachyus.







Above left: *Hyrachyus* skeleton (before 1894. For further information, see https://commons.wikimedia.org/wiki/File:Hyrachyus.jpg)
Above right: Clip of a restoration of *H. eximius* (Family Hyrachyidae). Date 1913. https://commons.wikimedia.org/wiki/File:Hyrachyus_eximius.jpg
Below: Photograph of **strongly compressed body** of a fossil of *Hyrachyus*. (Author: 'Ghedoghedo'; photo at Senckenberg Museum of Frankfurt. https://commons.wikimedia.org/wiki/File:Hyrachyus_sp.jpg
(All three retrieved 11 January 2023)

***Hyrachyus*: Evolutionary Ancestor of the Rhinocerotids and Several Further Families?**

Before we turn to *Teletaceras* let us ask: how do we know that *Hyrachyus* was the evolutioary ancestor of the three families including the Rhinocerotids mentioned above? The only correct/honest/truthful answer is: ***We don't know it***!

To further analyze that point let us look more closely at that genus:

"In general, *Hyrachyus* is a **lightly built animal**. The relatively long lower leg sections of both the front and the hind limbs indicate a **fast walking (cursorial) gait**. This is also supported by the high positions of the three [Rollhügel/Trochanter major?] on the femur and the generally narrow pelvis as well as the rather narrow joint rolls on the humerus. The neck of *Hyrachyus* was relatively long and corresponded approximately to the length of the head. The shape of the cervical vertebrae indicates that the neck was carried obliquely forward and there was an angle of about 60° to the head. The indented vertebral heads, however, possibly allowed only a limited lateral range of movement of the neck [?]. However, due to the large spinous processes of the anterior thoracic vertebrae, there was a strongly developed neck musculature for raising and lowering the head. The light build of *Hyrachyus* therefore probably caused fewer bone pathologies ***compared to the heavy-boned later odd-toed ungulates***."[28]

How sure are these reconstructions? How many fossils have been found? How complete are the findings?

"Fossil remains of *Hyrachyus* come mainly from North America and Eurasia and date from the end of the Lower Eocene to the beginning of the Upper Eocene, 50 to 42 million years ago [see, however, larger age range below]. Outstanding are the finds from the Bridger Basin in the southwest of the US state of Wyoming. They date to the end of the Lower Eocene (local stratigraphy Bridgerian). They include **numerous, partly complete skulls and several articulated skeletons**. A few finds have also been recovered from the Washakie Basin and the Wind River Basin, both also in Wyoming, as well as the Huerfano Basin in Colorado, and are of roughly similar age.

In Europe, finds of *Hyrachyus* are known mainly from the Middle Eocene. One of the most remarkable finds is **a complete skeleton from the Messel Pit near Darmstadt**, which dates to about 47 million years ago. Also of great importance are the remains from the Geisel Valley in Saxony-Anhalt. Here, at least **75 skull and dentition remains** of all ages were found, stratigraphically distributed over the Lower and Middle Coal of the lignite seams there. Furthermore, finds from France, such as from the freshwater marl sands of Argenton and from Bouxviller, as well as from Great Britain were reported. A mandible fragment has also survived from the Csordakút Basin in Hungary, which is one of the few Eocene terrestrial mammal fossils ever found in that country. In contrast, only a few finds have been reported from Asia, such as a maxilla with preserved last premolar and all three molars from the Irdin Manha Formation of the Middle Eocene in Inner Mongolia. Via a mandible discovered in sandstones of the Middle Eocene Oyake Formation, *Hyrachyus* is also attested on the southern **Japanese main island of Kyūshū**.[29]

On the age range and collections the PBDB (2023)[30] has this to say:

Collections: **165 total**.
"Age range: base of the Wasatchian to the top of the Late/Upper Eocene or **55.80000 to 33.90000 Ma**."
However, according to https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43141&is_real_user=1 (2023) oldest findings Ypresian [Early Eocene] **56.0 – 41.3 Ma**.

Genus *Hyrachyus* (Family Hyrachyidae): Eocene 56.0 to 33.9 Ma. CONSTANCY/stasis up to 22.1 Ma.

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[28] https://de.wikipedia.org/wiki/Hyrachyus
Original German text: "Allgemein handelt es sich bei *Hyrachyus* um ein **leicht gebautes Tier**. Die relativ langen unteren Beinabschnitte sowohl der vorderen als auch der hinteren Gliedmaßen sprechen für einen schnellläufigen (cursorialen) Gang. Dies unterstützen auch die jeweils hohen Positionen der drei Rollhügel am Oberschenkelknochen und das generell schmale Becken ebenso wie die eher schmalen Gelenkrollen am Oberarmknochen. Der Hals von *Hyrachyus* war relativ lang ausgebildet und entsprach in etwa der Kopflänge. Die Form der Halswirbel weist darauf hin, dass der Hals schräg nach vorn getragen wurde und zum Kopf ein Winkel von etwa 60° bestand. Die eingedellten Wirbelköpfe ließen aber möglicherweise nur einen begrenzten seitlichen Bewegungsspielraum des Nackens zu. Allerdings bestand aufgrund der großen Dornfortsätze der vorderen Brustwirbel eine kräftig ausgebildete Nackenmuskulatur für das Heben und Senken des Kopfes. Der leichte Körperbau von *Hyrachyus* verursachte daher wohl weniger Knochenpathologien im Vergleich zu den **schwergewichtigen späteren Unpaarhufern**."

[29] Again from the excellent German article of https://de.wikipedia.org/wiki/Hyrachyus
"Fossile Reste von *Hyrachyus* stammen vor allem aus Nordamerika sowie Eurasien und datieren vom ausgehenden Unteren bis ins beginnende Obere Eozän vor 50 bis 42 Millionen Jahren. Herausragend sind die Funde aus dem Bridger-Becken im Südwesten des US-Bundesstaates Wyoming. Sie datieren in das ausgehende Untereozän (lokalstratigraphisch Bridgerium). Diese umfassen **zahlreiche, teils vollständige Schädel und mehrere artikulierte Skelette**. Einige wenige Funde konnten auch aus dem Washakie-Becken und dem Wind-River-Becken, beide ebenfalls in Wyoming, sowie dem Huerfano-Becken in Colorado geborgen werden und sind etwa ähnlich alt.

In Europa sind Funde von *Hyrachyus* hauptsächlich aus dem Mittleren Eozän bekannt. Einer der bemerkenswertesten Funde ist ein **vollständiges Skelett aus der Grube Messel bei Darmstadt**, das in die Zeit vor etwa 47 Millionen Jahren datiert. Ebenfalls von großer Bedeutung sind die Reste aus dem Geiseltal in Sachsen-Anhalt. Hier kamen wenigstens **75 Schädel- und Gebissreste aller Altersstufen zum Vorschein**, die sich stratigraphisch über die **Unter- und Mittelkohle** der dortigen **Braunkohleflöze** verteilen. Weiterhin konnten Funde aus **Frankreich**, so aus den Süßwassermergelsanden von Argenton und aus Bouxviller, sowie **Großbritannien** vermeldet werden. Ein Unterkieferfragment ist zudem aus dem Csordakút-Becken in **Ungarn** überliefert, das zu den wenigen eozänen Landsäugetierfossilien des Landes überhaupt gehört. Aus **Asien** sind dagegen nur wenige Funde berichtet worden, so ein Oberkiefer mit erhaltenem letzten Prä- und allen drei Molaren aus der Irdin-Manha-Formation des Mittleren Eozän in der **Inneren Mongolei**. Über einen Unterkiefer, der in Sandsteinen der mitteleozänen Oyake-Formation entdeckt wurde, ist *Hyrachyus* auch auf der südlichen **japanischen Hauptinsel Kyūshū belegt**."

[30] https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43141&is_real_user=1

Teletaceras

Now let us turn our attention to *Teletaceras radinsky* described from the ‘middle Eocene of Oregon’.

> “The name *Teletaceras* comes from the Greek words τελετα (teleta "initiation" or "introduction"; teleta, however, written without "a" in the scientific name), α (a "not") and κέρας (kéras "horn"). The meaning refers to the phylogenetically very early position of the genus and the absence of horns.”[31]

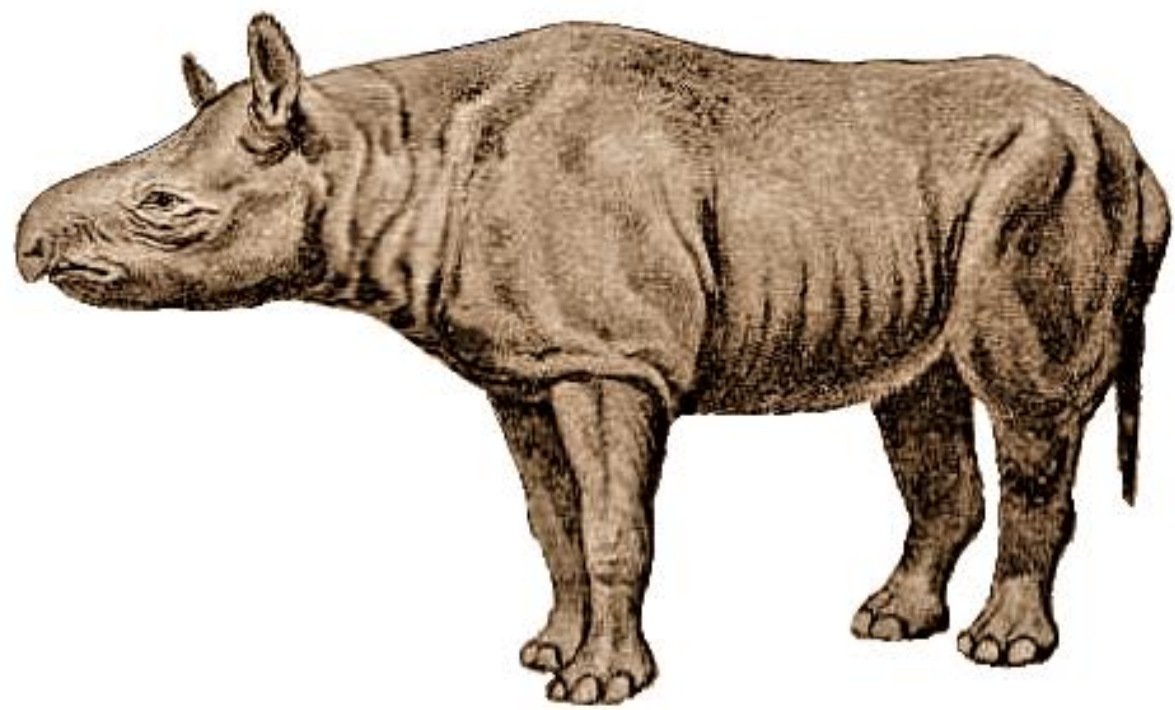

Illustration of *Teletaceras* sp. Author: Heinrich Harder (1858 – 1935), modified by A.C. Tatarinov (2013). Source: The Wonderful Paleo Art of Heinrich Harder https://commons.wikimedia.org/wiki/File:Teletaceras.png.

> “Finds of *Teletaceras* are known from Eurasia as well as from North America. Very extensive finds with five complete skulls, three mandibles and postcranial skeletal elements are available from the uppermost member of the Clarno Formation of the Hancock Quarry in the US state of Oregon.”
>
> “Possible early forms of rhinoceroses, *Uintaceras* and *Teletaceras*, have also been identified in the Middle or Upper Eocene, but like all primitive representatives they did not have a horn formation. Both forms were also relatively small [weight specifications are around 152 kg[32]]. *Uintaceras* is so far only recorded from North America, while *Teletaceras* was widespread and has been found in the Clarno Formation in North America and in the Pondaung Formation in Southeast Asia, among other places. In the Upper Eocene, the first true[?] and already larger rhinoceroses appeared, such as the cattle-sized *Trigonias*.”[33]

As to “like all primitive representatives they did not have a horn formation”: Well, “Horns occur in all five ***living*** *species* of fossil rhino, but they are *only rarely found in* ***a few lineages of fossil rhinos***. … Because the size of roughened area[34] indicates where a horn was once present, we are pretty sure that ***most extinct rhinos had no horn whatsoever***.”[35] Well, so ‘no horn formation’ does not

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[31] Der Name *Teletaceras* stammt von den griechischen Wörtern τελετα (teleta „Initiation“ oder „Einführung“; teleta allerdings im wissenschaftlichen Namen ohne „a“ geschrieben), α (a „nicht“) und κέρας (kéras „Horn“). Die Bedeutung bezieht sich auf die stammesgeschichtlich sehr frühe Stellung der Gattung und das Fehlen der Hörner. https://de.wikipedia.org/wiki/Teletaceras

[32] https://de.wikipedia.org/wiki/Teletaceras

[33] Again the original German Text: Mögliche Frühformen der Nashörner sind mit *Uintaceras* und *Teletaceras* ebenfalls im Mittleren oder Oberen Eozän nachgewiesen, besaßen aber wie alle urtümlichen Vertreter **keine Hornbildung**. Beide Formen waren ebenfalls relativ klein. *Uintaceras* ist weitgehend nur aus Nordamerika belegt, *Teletaceras* hingegen kam weitverbreitet vor und ist unter anderem aus der Clarno-Formation in Nordamerika sowie aus der Pondaung-Formation in Südostasien überliefert. Im Oberen Eozän traten dann auch die ersten echten und schon größeren Nashörner auf, wie etwa das rindergroße *Trigonias*. https://de.wikipedia.org/wiki/Nash%C3%B6rner

[34] …we must infer the size and shape of the horn from the roughened area on the top of the skull (nose or forehead or both). This indicates the point where the hairs of the horn glued in to the skull. Prothero, Donald R.: Rhinoceros Giants (Life of the Past) (S.53). Indiana University Press. Kindle-Version.

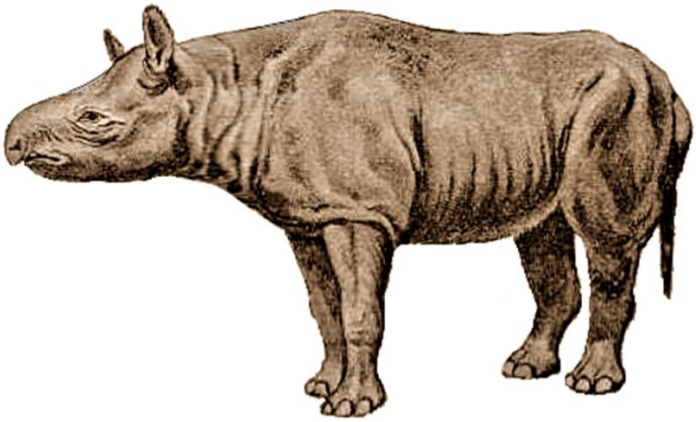
[35] Prothero, Donald R.. Rhinoceros Giants (Life of the Past) (S.53). Indiana University Press. Kindle-Version.

necessarily mean “primitiveness” – otherwise almost all fossil rhinos would have been “primitive” – which no contemporary evolutionist would subscribe to. As for the term “primitive” itself, see the discussion in http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf, pp. 286 – 295 (key point p. 287: “However, the use of the term "primitive" in all its forms (adjective, adverb, noun) is highly controversial, even in today's theories of evolution and phylogenetics”).

Age range and collections of *Teletaceras* according to the PBDB (2023):

Collections: **5** so far.
“Age range: base of the Bartonian to the top of the Chadronian *or* **41.30000**[36] **to 33.90000 Ma**”

Genus *Teletaceras* (Family Rhinocerotidae):
Eocene 48.6 (41.3) to 33.9 Ma.
CONSTANCY/stasis up to 14.7 Ma.



Left: Weight of average forms of *Hyrachyus* around 36 kg – larger ones perhaps twice as much. “It was about the size of a modern German Shepherd and had complete mammalian dentition with barely molarised premolars.”Weight of *Teletaceras* some 152 kg (*cf.* the Wikipedia articles referred to above)

Donald R. Prothero: “From such an unremarkable creature as *Hyrachyus*, barely distinguishable from the earliest contemporary horses and tapirs, rhinos soon diverged into three easily distinguished families, two of which are now extinct.”[37]

Now, comparing the two genera *Hyrachyus* (of the Family Hyrachyidae of lightly built animals) and *Teletaceras* (of the heavy-boned Family Rhinocerotidae) with each other – do we really/actually/truly ***know*** that *Hyrachyus* was the ancestor of *Teletaceras*?”

Evolutionary scientists usually focus their studies on the similarities but often disregard and thus fail to explain the origin of the anatomical and other differences, which have – according to their theories (both gradualism and punk eek) – to be explained by natural selection of mutations with “slight or invisible effects on the

[36] https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43227&is_real_user=1 (First: In the table “Middle Eocene **48.6 – 37.2** USA (Oregon).)
[37] Prothero, Donald R.. Rhinoceros Giants (Life of the Past) (S.58). Indiana University Press. Kindle-Version.

phenotype" (Mayr) See also Darwin above: selection of "infinitesimally small changes" etc.). Thus, we should expect that there would have been hundreds to thousands[38] of generations showing a series of connecting links between these two forms, which, however, have not been found – probably because such a series never existed at all (*cf.* pp. 11 – 24, 48, 62, 75, 81, 82, 84, 99, 129 in http://ad-multimedia.de/evo/long-necked-giraffe_mU.pdf).

Interestingly these two genera **lived contemporaneously for at least 14.7 Ma**. And they may even have met each other (*Teletaceras* 'lived in a wooded/forested biotope' and *Hyrachyus* 'lived in tropical to subtropical forests near water'). There is no proof that one (*Hyrachyus*) slowly evolved into the other (*Teletaceras*) – neither by strict gradualism nor by the revised punk eek theory.

Nevertheless – are there not special anatomical similarities between the two genera and later members of the family Rhinocerotidae, which prove their gradual evolution from *Hyrachyus*?

> "*Teletaceras* is the oldest and most basal member of the extent family of the Rhinocerotidae…"[40]
> "The 1.5-m-long beast was related to palaeotheres, and ***suspected*** to be the ancestor of modern tapirs and rhinoceroses. Physically, ***it would have looked very similar to modern tapirs***, although it probably lacked the tapir's characteristic proboscis. **Its teeth**, however, ***resembled those of a rhinoceros***, supporting the idea of its relationship with that group."[41]
>
> "The middle Eocene ceratomorph *Hyrachyus* has been considered a pivotal genus in ceratomorph evolution, **either** as a transitional form from tapiroids to rhinocerotoids, giving rise to all later rhinocerotoids, **or else** as the sister taxon to other rhinocerotoids. Thus, ***Hyrachyus*** has been commonly chosen as an outgroup in phylogenetic analyses of rhinocerotoids. … Our bone-by-bone description provides detailed information on the osteological morphology of *Hyrachyus*, which ***should be useful for phylogenetic analyses*** of both rhinocerotoids and perissodactyls in general, because it provides one of the more complete and best-preserved examples of the skeleton of an earlier Eocene perissodactyl.[42]

Well, "suspected" … looked very similar to", "either … or else … should be useful for…" Evolutionists simply presuppose, surmise, assume their doubtful theory as being true and then interpret everything within that evolutionary box[43]

So, what do we really know? *Since the postulated **series** are missing in all hypothetically possible evolutionary directions*, the methods, the argumentation, the evidence, the "proofs" are necessarily reduced and diminished to certain morphological-anatomical similarities of this genus displaying a mosaic of different features/characters (for example the teeth in contrast to the slender legs).

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[38] "…species form over hundreds or thousands of generations and through a series of intermediate stages" Gould (see http://www.weloennig.de/ElephantEvolution.pdf p. 14.

[39] Since roughly half of the extant genera of mammals have also been detected as fossils (details see http://www.weloennig.de/NeoB.Ana4.html), one might – as a realistic starting point to solve the question of how many genera have existed at all – double the number of the fossil forms found. Thus, there does not seem to exist a larger arithmetical problem to come to the conclusion that by also doubling the intermediate fossil genera so far found (which represent in reality most often mosaics) one cannot bridge the huge gaps between the extant and fossil plant and animal taxa.

And another repetition from Kuhn's work whose weighty message can hardly be overstated.: "The prejudice that the phylogenetic history of life could only be an accumulation of the smallest variational steps and that a more complete knowledge of the paleontological documents would prove [the assumed] gradual evolution, is deeply rooted and widely accepted. **But the paleontological facts have long spoken against this prejudice**! Especially German paleontologists such as B e u r l e n, D a c q u é and S c h i n d e w o l f have emphatically pointed out that in many animal groups such a rich, even overwhelming amount of fossil material exists (foraminifers, corals, brachiopods, bryozoans, cephalopods, ostracods, trilobites etc.), that **the gaps between the types and subtypes must be viewed as real**" (Book on the giraffe p, 6. See a discussion with an evolutionary geologist http://www.weloennig.de/ExplosiveOrigins.pdf in support of this statement (76 pp. 2018)."Increasingly, paleontologists accept **that fossil discontinuities are real** and need to be explained, not explained away" (Bechly and Meyer 2017, p. 6)..

[40] P. A. Holroyd et al. (2006, p. 491): https://www.jstor.org/stable/4524591

[41] https://en.wikipedia.org/wiki/Hyrachyus (retrieved 17 January 2023)

[42] https://bioone.org/journals/bulletin-of-the-american-museum-of-natural-history/volume-2017/issue-413/0003-0090-413.1.1/Osteology-of-The-Middle-Eocene-Ceratomorph-Hyrachyus-modestus-Mammalia-Perissodactyla/10.1206/0003-0090-413.1.1.short?tab=ArticleLink

[43] "Now, evolution is the substance of fossils hoped for, the evidence of links not seen" – creationist Duane T. Gish.

What do these similarities really prove? Here it seems to be very appropriate to repeat the captivating statement by renowned German paleontologist Oskar Kuhn adressing these basic questions:

> "The similarity of forms was explained by evolution, and evolution in turn was proven by the various grades of similarities. It was hardly noticed that here one has fallen victim to **circular reasoning**; the very point that one set out to prove, namely that similarity was based on evolution, **was simply assumed**, and then the different degrees in the gradation of the (typical) similarities, were used as evidence for the truth of the idea of evolution. Albert Fleischmann has repeatedly pointed out the lack of logic in the above thought process. **The same idea**, according to him, **was used interchangeably as assertion and as evidence**.
>
> However, **similarity can also be the result of a plan**, and ... morphologists such as **Louis Agassiz**, one of the greatest morphologists that ever lived, attributed the similarity of forms of organisms to a creation plan [intelligent design], not to evolution."

Concerning the forefoot of *Teletaceras* – the following has been observed so far:

> "…the upper saddle-shaped joint surface for the attachment of the hooked bone (unciform) indicates that the entire hand was probably made up of only three rays and not, as in all other early odd-toed ungulates, of four. **Such a three-rayed hand differs significantly from the four-rayed hands of younger rhino representatives such as *Trigonias* and is to be understood as an independent derivative development within *Teletaceras*** (**autapomorphy**). Only later did rhinos develop hands with only three fingers again."[44]

First, I would like to point out that although *Trigonias* appears to be "a younger rhino representatives" (age range of its 24 collections according to PBDB (2023): "Base of the Duchesnean to the top of the Orellan or 40.40000 [42.00000[45]] to 33.30000 Ma.") the two rhino forms existed **contemporaneously for about 6.5 Ma**[46].

Genus *Trigonias* (Family Rhinocerotidae): From Duchesnean 42.0 to Orellan 33.3 Ma.
CONSTANCY/stasis up to 8.7 Ma.

Second, the **autapomorphy**[47] excludes *Teletaceras*, "the oldest and most basal member of the extent family of the Rhinocerotidae", to be an ancestor of *Trigonias*.[48]

Comparing the putative age ranges calculated so far for the tree genera, we may note that all three lived **contemporaneously for at least 8.1 Ma.**

Genus *Hyrachyus*	(Family Hyrachyidae):	Eocene	56.0 to 33.9 Ma. Constancy/stasis up to 22.1 Ma.
Genus *Teletaceras*	(Family Rhinocerotidae):	Eocene	48.6 to 33.9 Ma. Constancy/stasis up to 14.7 Ma.
Genus *Trigonias*	(Family Rhinocerotidae):	Eocene/Oligocene	42.0 to 33.3 Ma. Constancy/stasis ca. 8.7 Ma.

Any ***series*** of connecting/intermediate/continuous transitional links in the neo-Darwinian sense[49] between these three genera has/have never been found.

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[44] "… die obere sattelförmig ausgeprägte Gelenkfläche für das Ansetzen des Hakenbeins (Unciform) gibt an, dass die gesamte Hand wohl nur aus drei Strahlen aufgebaut war und nicht wie bei allen anderen frühen Unpaarhufern aus vier. **Eine solche dreistrahlige Hand unterscheidet sich deutlich von den vierstrahligen Händen bei jüngeren Nashornvertretern wie *Trigonias* und ist als eine eigenständige abgeleitete Entwicklung innerhalb von *Teletaceras*** (**Autapomorphie**) aufzufassen. Erst später entwickelten sich bei den Nashörnern wieder Hände mit nur drei Fingern." https://de.wikipedia.org/wiki/Teletaceras (Retrieved 20 January 2023)

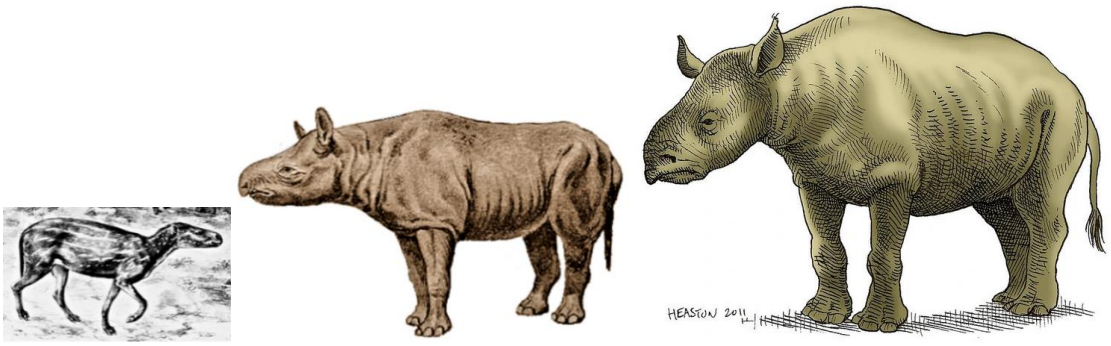
[45] https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43229&is_real_user=1 (But an "age from 42 to 38 million years BP, representing 4 million years…" According to https://en.wikipedia.org/wiki/Duchesnean (Retrieved 28 January 2023.) See also https://ngmdb.usgs.gov/Geolex/UnitRefs/DuchesneanRefs_11847.html

[46] *Teletaceras*: Eocene **48.6 to 33.9 Ma**, *Trigonias* Eocene **40.4 to 33.3 Ma**.

[47] "In cladistics, an autapomorphy is a distinctive anatomical feature, known as a derived trait, that is unique to a given terminal group. That is, it is found only in one member of a clade, but not found in any others or outgroup taxa, not even those most closely related to the group (which may be a species, family or in general any clade).[2] It can therefore be considered an apomorphy in relation to a single taxon.[3] The word "autapomorphy" is derived from the Greek words αὐτός, aut = self; ἀπό, apo = away from; and μορφή, morphe = shape." (*cf.* http://en.wikipedia.org/wiki/Autapomorphy (Zugriff 8. 4. 2013) and p. 283 of http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf

[48] Beispiel: "***Nach evolutionstheoretischen Prämissen schließen die Autapomorphien*** ('*distinctive anatomical features, known as derived traits, that are unique to a given terminal group*') ***Prohesperocyon als Vorfahr von Hesperocyon aus***.
In einem ganz anderen Zusammenhang, und zwar der Frage nach der Entstehung der Angiospermen (bedecktsamigen Blütenpflanzen) und der spezifischen Kelchentwicklung von *Physalis* (Chinese Lantern), konnte ich auf folgende Hauptpunkte – peer reviewed by 5 Reviewers – aufmerksam machen (2010, p. 11):
"To my knowledge, no evolutionist hypothezises that the entire class of angiosperms represented by some 56 orders, 457 families, 13,208 genera and between 250,000 to 400,000 species is derived from a common ancestor displaying such a special sepal feature like the Chinese lantern or any other comparably specialized character (**the very term "heterobathmy" usually applied here, in German "Spezialisationskreuzungen" a translation of Dollo's "chevauchement [overlappings] de specialisation", in English also "specialization-crossings" and "cross-specializations**" – for the detailed history of the term see Nelson 2004, p. 131 – ***implies the irreversibility of complex special traits as a basic criterion to exclude species displaying them from being ancestors to others without these characters***)." See please http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf p. 283 – 285.

[49] Largely identical with the revised punk eek theory. See, please, above.



Left: *Hyrachyus* (Family Hyrachyidae. Weight ca. 36 kg.). Middle: *Teletaceras* (Family Rhinocerotidae). Weight ca. 152 kg See references above for these two forms. Right: Reconstruction of *Trigonias* (Family Rhinocerotidae) by Paul Heaston (2011) https://www.flickr.com/photos/paul_heaston/6007785720 https://dinopedia.fandom.com/wiki/Trigonias?file=Trigonias.jpg "*Trigonias* is a rhinoceros from Eocene North America. It looks much like a modern-day rhino without a nose horn." (Weight up to 830 kg) https://dinopedia.fandom.com/wiki/Trigonias

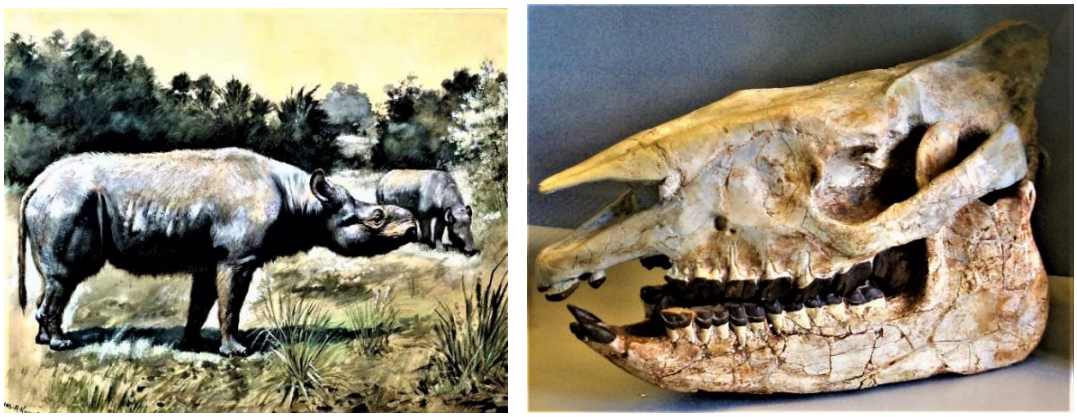
Some more details on *Trigonias*:

> "*Trigonias* was a rather small representative of the rhinos, reaching a head-torso length of about 200 cm and a shoulder height of 110 cm. The weight is given as 600 kg, sometimes up to 830 kg. It is generally described as being the size of cattle. Characteristic were the short, strong limbs."[50]

Also:

> "*Trigonias* typified the early Rhinocerotidae. Known from the late Eocene, it was **cow-sized** and had a very saddle-shaped head. Although it had developed the advanced blade-tusk incisors, it still had the rest of the incisors and the canines in the upper jaw. Later rhinos would lose these useless, peg-like teeth, so that only the tusks and the cheek teeth remained. Although *Trigonias* died out by the early Oligocene, one of its close relatives, ***Subhyracodon*** survived until the late Oligocene and gave rise to later North American rhinos (Fig. 14.12)."[51]

So let's have a look at the 54 collections of *Subhyracodon*: "Age range: base of the Chadronian to the top of the Hemingfordian or 37.20000 to 15.97000 Ma."



Left: Reconstruction of *Subhyracodon* (*Caenopus*). "1890s. known from a 1919 publication." Author Charles R. Knight (1874 – 1953; https://en.wikipedia.org/wiki/Charles_R._Knight) https://commons.wikimedia.org/wiki/File:Knight_Caenopus.jpg
Right: Skull of *Subhyracodon* (*Caenopus*). Author: 'Ghedoghedo' ("took the photo at the Paleontology Museum of Zurich") 13 May 2011. https://commons.wikimedia.org/wiki/File:Caenopus.JPG

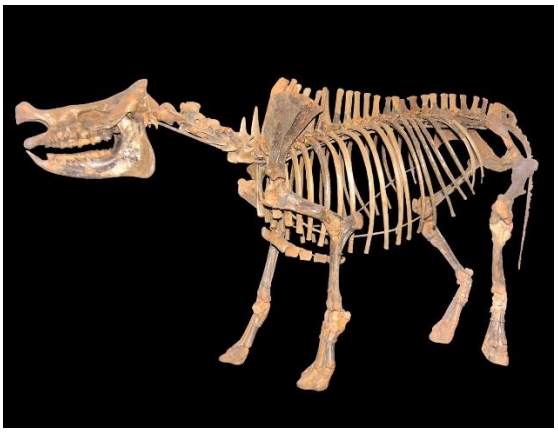
Genus *Subhyracodon* (Family Rhinocerotidae): Eocene 37.2 to 15.97 Ma. CONSTANCY/stasis up to 21.23 Ma.

[50] "*Trigonias* stellte einen eher kleinen Vertreter der Nashörner dar, der eine Kopf-Rumpf-Länge von etwa 200 cm und eine Schulterhöhe von 110 cm erreichte. Das Gewicht wird mit 600 kg, teilweise auch bis 830 kg angegeben. Allgemein wird es als **rindergroß** beschrieben.[2] Charakteristisch waren die kurzen, kräftigen Gliedmaßen." https://de.wikipedia.org/wiki/Trigonias (Retrieved 24 January 2023.) *Trigonias* (Greek: "triangular" (trigonos), "ias" [denotes possession][3]) is an extinct genus of rhinoceros from the late Eocene (Chadronian) some 35 million years ago of North America.[4] Trigonias was about 2.1 metres (6 ft 11 in) long and, **despite lacking horns, looked a lot like modern rhinos**. Its front legs had five toes (as contrasted with three in modern rhinos), the fifth of which was vestigial."

[51] Donald R. Prothero and Robert M. Schoch (2002): Horns, Tusks, & Flippers: The Evolution of Hoofed Mammals. The Johns Hopkins University Press. Baltimore and London. Cf. also the paperback edition of 10 March 2003, p. 263

Next Genus. Prothero and Schoch: "…**The first horned rhino** was the **direct descendant** of *Subhyracodon* named *Diceratherium* ("two horned beast")".[52]

> "*Diceratherium* is an extinct genus of rhinoceros that lived in North America from the Early Oligocene around 33 million years ago to the Middle Miocene 14 million years ago. ***It was the first rhinoceros representative with clearly formed horns***. *Diceratherium* had **two horns**, but these ***were only found in males*** and, unlike today's two-horned rhinoceroses, they **sat in pairs on the nose**. The rhinoceros representative lived in partly open landscapes.
>
> *Diceratherium* comprised **medium-sized to very large rhinoceros** representatives and represented the largest land mammal of its time in North America until the arrival of the early proboscideans. The medium-sized species could reach a head-torso length of 236 cm and had a shoulder height of about 121 cm, the largest representatives were considerably larger, exceeding the medium-sized species in all length measurements by 30%.
>
> The skull grew to 42 to 56 cm in length and was very elongated and flat. The frontal bone was clearly split in the posterior region, the occipital bone had a rather rectangular shape. The nasal bone showed distinct curvatures both laterally and longitudinally and was very elongated. **At the front tip there were two adjacent pearly roughened surfaces, indicating the position of the horns**. These were in pairs, in contrast to the tandem horns of today's two-horned rhinoceroses. The nasal bone had no connection with the intermaxillary bone, but lay far above it, and the nasal interior was relatively large."[53]



Left: Recontruction of *Diceratherium*; Keerthik Sasidharan on Twitter (22 September 2018) with comment: "One slightly villainous looking rhino was the *Diceratherium*…Our guy is one of the earliest of rhinos to show **sexual dimorphism** (male & female differed) in horn and tooth. It had two bony knobs (not as cool as in the drawing here)." https://twitter.com/ks1729/status/1043491136030089217[54]
Skeleton *Diceratherium* of https://upload.wikimedia.org/wikipedia/commons/c/c4/Diceratherium_NHM.jpg (Retrieved 25 January 2023.)

Collections (84 total). "Age range: base of the Orellan[55] to the top of the Late/Upper Miocene or 33.90000 to 5.33300 Ma."[56]

Genus *Diceratherium* (Family Rhinocerotidae): From Orellan (Early Oligocene) 33.9 to Late Miocene 5.333 Ma. CONSTANCY/stasis up to 28.57 Ma.

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[52] Donald R. Prothero and Robert M. Schoch (2002): Horns, Tusks, & Flippers: The Evolution of Hoofed Mammals. The Johns Hopkins University Press. Baltimore and London. Cf. also the paperback edition of 10 March 2003, p. 263

[53] Original German Text: *Diceratherium* ist eine ausgestorbene Gattung der Nashörner, die vom Frühen Oligozän vor rund 33 Millionen Jahren bis zum Mittleren Miozän vor 14 Millionen Jahren in Nordamerika lebte. Es war der erste Nashornvertreter mit deutlich ausgebildeten Hörnern. Dabei besaß *Diceratherium* zwei Hörner, die jedoch nur bei männlichen Tieren vorkamen und im Gegensatz zu den heutigen zweihörnigen Nashörnern paarig auf der Nase saßen. Der Nashornvertreter lebte in teils offenen Landschaften.
Diceratherium umfasste mittelgroße bis sehr große Nashornvertreter und stellte bis zur Ankunft der frühen Rüsseltiere das größte Landsäugetier seiner Zeit in Nordamerika dar.[1] Die mittelgroßen Arten konnten eine Kopf-Rumpf-Länge von 236 cm erreichen und wiesen eine Schulterhöhe von etwa 121 cm auf,[2] die größten Vertreter waren erheblich größer und übertreffen die mittelgroßen Arten in allen Längenmaßen um 30 %.
Der Schädel wurde 42 bis 56 cm lang und war sehr langgestreckt und flach. Das Stirnbein war im hinteren Bereich deutlich aufgesteilt, das Hinterhauptsbein hatte eine eher rechtwinklige Form. Das Nasenbein zeigte sowohl seitlich als auch in Längsrichtung deutliche Krümmungen und war sehr langgestreckt. An der vorderen Spitze befanden sich jeweils zwei nebeneinanderliegende perlartig aufgeraute Flächen, die die Lage der Hörner anzeigt. Diese standen paarig nebeneinander, im Gegensatz zu den Tandemhörnern der heutigen zweihörnigen Nashörner. Das Nasenbein besaß keine Verbindung mit dem Zwischenkieferknochen, sondern lag weit oberhalb, der Naseninnenraum war relativ groß.

[54] Possibly from https://www.adventuresoflupe.com/?p=5335 (part of the picture) about Agate Fossil Beds National Monument, Nebraska.

[55] "The Orellan North American Stage on the geologic timescale is the North American faunal stage according to the North American Land Mammal Ages chronology (NALMA), 34-32 million years ago.[1] It is usually considered to fall within the Early Oligocene. The Orellan precedes the Whitneyan and follows the Chadronian NALMA stages. The Orellan is contained within the Rupelian and shares the lower boundary." https://en.wikipedia.org/wiki/Orellan

[56] https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43198&is_real_user=1

Adding now *Subhyracodon* and *Diceratherium* to the list above, we find that *Subhyracodon* was contemporaneous *with Diceratherium* for about 18 Ma and both were coexisting with *Trigonias* for about 600000 years (0.6 Ma.)

Genus *Hyrachyus* (Family Hyrachyidae):	Eocene	56.0 to 33.9 Ma. **Constancy/stasis** up to	22.1 Ma.
Genus *Teletaceras* (Family Rhinocerotidae):	Eocene	48.6 to 33.9 Ma. **Constancy/stasis** up to	14.7 Ma.
Genus *Trigonias* (Family Rhinocerotidae):	Eocene/Oligocene	40.4 to 33.3 Ma. **Constancy/stasis**	8.7 Ma.
Genus *Subhyracodon* (Family Rhinocerotidae):	Eocene/Miocene	37.2 to 15.97 Ma. **Constancy/stasis**	21.23 Ma.
Genus *Diceratherium* (Family Rhinocerotidae):	Oligoc. to Mioc.	33.9 to 5.3 Ma. **Constancy/stasis**	28.57 Ma.

Now Prothero and Schoch have assured us that "…The ***first horned rhino*** was the ***direct descendant*** of *Subhyracodon* named *Diceratherium* ("two horned beast")".

Well, "direct descendant" sounds almost as if a cow of the Genus *Subhyracodon* suddenly gave birth to "the first rhinoceros representative with clearly formed horns. *Diceratherium* had two horns, but these were only found in males and, unlike today's two-horned rhinoceroses, they sat in pairs on the nose."

Direct macromutation? Extremely improbable! This would be a hypothesis, which even the punk eek theorists would reject – recall please the quotation above (Stephen C. Meyer):

> "…where do these traits [like the two horns of *Diceratherium*] come from? When pressed, Gould eventually acknowledged that the origin of anatomical traits themselves result from ***good, old-fashioned natural selection acting on random mutations and variations***—that is, from the neo-Darwinian mechanism acting over long periods of time on large relatively stable populations. But that meant that punctuated equilibrium, to the extent it relies on mutation and natural selection, is subject to the same evidential and theoretical problems as neo-Darwinism."

See as well http://www.weloennig.de/ElephantEvolution.pdf pp. 14-18 several captivating points also on the revised theory.

Does Gould's statement that "***species*** form over hundreds or thousands of generations and through a series of intermediate stages"[57] and/or "50,000 to 100,000 years" actually help us here to calculate realistic time frames for the origin of new rhino genera? But what about new genera and families?[58] Due to the ***waiting time problem***[59], the origin of new species, genera and families as well as new synorganized anatomical features on the basis of random mutations and natural selection generally need much more time – usually even much more time than is stipulated by the neo-Darwinian theory and even much more than is geologically possible at that.

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[57] See above. Let us keep in mind that Gould speaks of the origin of new **species**. Then, what about the time needed to evolve a new **genus** and a new **family**? Under evolutionary presuppositions S. Blair Hedges et al. found (2015) "We found consistency in time-to-speciation among plants and animals, **~2 My**, as measured by intervals of crown and stem species times." And they calculated "**12.6 ± 1.2 Ma for** [the origin of] **a genus of eukaryotes**" See please details and problems at https://academic.oup.com/mbe/article/32/4/835/1078218?login=false *Cf.* on the differences between different groups of organisms also M. Dhar (2022) https://www.livescience.com/how-long-new-species-take-to-evolve

[58] For the example of the horse, evolutionist W.E. Swinton (1947) estimated **100,000 generations** for the origin of a new horse **species** and on this basis D. Dewar (1957) inferred **3 million years** for a new horse **genus** and "**30 million years**, for the evolution of a new **family**" (The Transformist Illusion 1957, p.151). Famous **G. G. Simpson** (1944) had already stipulated **5 to 6 Ma** (on average) for the evolution of a new horse **genus** (cited according to Dewar 1957 same page).

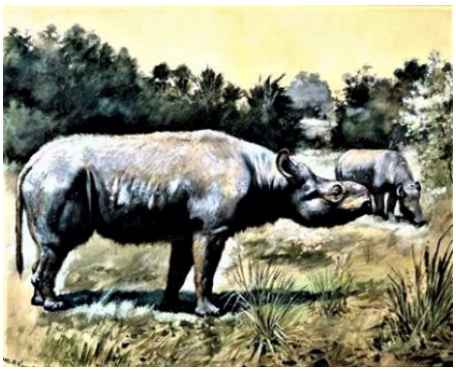
[59] See, for example, Sanford J, Brewer W, Smith F, and Baumgardner J (2015) The waiting time problem in a model hominin population. Theoretical Biology and Medical Modelling 12(18): 1-29. LeMaster JC (2018) Evolution's waiting-time problem and suggested ways to overcome it—A critical survey. BIO-Complexity 2018 (2):1-9 (p. 3 for instance: "Three teams of researchers touch upon the question of ***waiting times for a series of two mutations*** *in creatures with long generation times and small initial populations* (such as hominins). Lynch and Abegg estimate the waiting time at about 500 million years [28?], Durrett and Schmidt at 216 million years [22], and Sanford, et al., at 84 million years [30]. Estimates of the time available for the divergence of humans from chimps are far shorter, ranging from 6 to 13 million years [30–33]." (Additionally, the problems are aggravated by the present tendency to shorten/reduce the time frames for the origin of higher systematic categories of, for example, the mammals and angiosperms – see http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf pp. 357-369 and http://www.weloennig.de/AngiospermsLivingFossils.pdf)

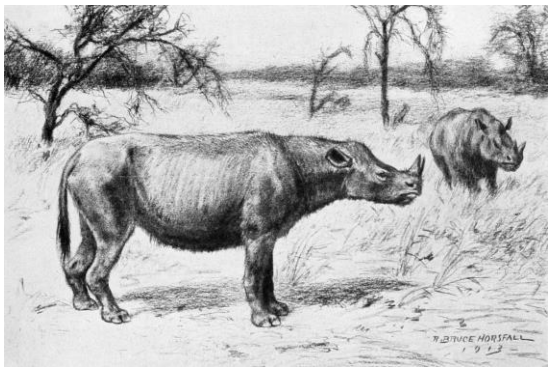
Casey Luskin (2021): A new peer-reviewed paper in the Journal of Theoretical Biology, "On the waiting time until coordinated mutations get fixed in regulatory sequences," is authored by three key scientists in the intelligent design (ID) research program: Ola Hössjer, Günter Bechly, Ann Gauger. The paper is part of the "Waiting Times" project, spurred by Discovery Institute as part of its ID 3.0 initiative, and it investigates a question of vital interest to the theory of intelligent design: ***How long does it take for traits to evolve when multiple mutations are required to give an advantage?*** A previous peer-reviewed publication from this team appeared as a chapter in the 2018 Springer volume Stochastic Processes and Applications. This latest paper is lengthy, technical, and math intensive. In other words, it's not for the fainthearted, but it's open access and free to read here. https://uncommondescent.com/intelligent-design/id-theorists-publish-new-paper-in-journal-of-theoretical-biology/ (Incidentally D. Dewar calculated (1957) 300 Ma for the evolution of a new order and 3000 Ma for a new class.

Now, what do the neo-Darwinians and punk eek theorists teach us?

First, I'm going to convey the key points of the present main evolutionary theory by applying Darwin's (and in his wake the neo-Darwinians'[60]) "extremely slight variations" and "infinitesimally small inherited variations" etc. (see above) as well as Dawkins' ideas on the evolution of the elephant's trunk ("a smooth, gradual succession of steadily longer noses") now on the origin of the "***first clearly formed horns***" ("Es war der erste Nashornvertreter mit **deutlich ausgebildeten Hörnern** of the rhinos"). "The precursor of this rhino genus was most likely *Subhyracodon*, ***from which it continuously evolved***."[61]

Thus, let's take a long series of thousands of generations – all being descendants of *Subhyracodon* – evolving into *Diceratherium* ("two horned beast") "by a smooth, gradual succession of steadily longer" horns and also additional anatomical features[62]".





Left: *Subhyracodon* (see previous pages). Right: *Menoceras*: https://commons.wikimedia.org/wiki/File:Diceratherium_cooki.jpg "It was originally classified as *Diceratherium* sp. due to the paired nasal horn[63]
https://nl.wikipedia.org/wiki/Diceratherium (Retrieved 31 January 2023)
"By the late Oligocene (about 30 million years ago), *Subhyracodon* had evolved into the first horned rhino, *Diceratherium* ("two-horned beast"). With paired horns on the tip of its nose, ***Diceratherium* represents one of two different groups of rhinos that independently evolved paired nasal horns**."[64]

How long were the horns of *Diceratherium*? Nobody seems to know exactly. "In extinct rhinoceros species, the horns can usually only be identified from the attachment points on the skull. ... Fossil horns have so far only been preserved from woolly rhinoceroses, but in principle they have the same structure as recent horns"[65].

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[60] As for references to the neo-Darwinians see please the long series of links on p. 4 of http://www.weloennig.de/ElephantEvolution.pdf and for Dawkins p. 1 of that document.

[61] https://de.wikipedia.org/wiki/Diceratherium Original German Text: „Der Vorläufer dieser Nashorngattung war höchstwahrscheinlich Subhyracodon, aus dem sie sich kontinuierlich entwickelte." https://de.wikipedia.org/wiki/Diceratherium (Retrieved 31 January 2023.)

[62] "*Diceratherium* is well known for being one of the first rhinos to exhibit sexual dimorphism in horn and tooth form, so it may have had a complex social life (or, a more complex social life than earlier kinds of rhino, anyway)." Darren Naish (2013) https://blogs.scientificamerican.com/tetrapod-zoology/mysteries-of-the-diceratheriine-rhinos/ "*Diceratherium* has few characters to distinguish it from other rhinoceroses, the most important being ***upper premolars that are fully molarized***. *Diceratherium* is a large rhinoceros characterized by paired flanges on the upper side of the nasal bones in males. The elongated flanges probably supported **some type of narrow "horn"**, unlike the more conical "horns" of other rhinoceroses."
https://commons.wikimedia.org/wiki/File:Diceratherium_skeleton.jpg (Retrieved 31 January 2023.)

[63] *Menoceras*: "It was originally classified as *Diceratherium* sp. due to the paired nasal horn, however, in 1921, Troxell proposed a new slightly smaller species, *Menoceras arikarense*, when slight differences were discovered. As characteristic of *Menoceras*, the skull exhibits a saddle-shape from the side, a frontal convex, and the paired knob-like horns at the tip of the nasals.
Menoceras ("Crescent Horns") was a small rhinoceros the size of a sheep that could be found throughout North America during the Miocene roughly 30 to 20 million years ago. It is believed they lived in large herds because many *Menoceras* fossils have been discovered in one area--particularly Agate Springs and Cady Mountains Horse Quarry in California. Males exhibited two horns at the top of the nose, but females had no horns at all. Both genders grew to the same length of 5 feet and weighed an **average 830 pounds**. *Menoceras* was a grazer and probably a quick runner. https://pastpres.com/pages/rhinoceros-skull

[64]However, according to Donald R. Prothero *Menoceras* was **sheep sized**. Although it also had paired horns on the tip of its nose, they were very different from those of *Diceratherium*. Instead of the long nasal ridges seen in true *Diceratherium*, rounded knobs on the tips of its nasal bones supported *Menoceras*'s horns. Additional anatomical evidence shows that *Diceratherium* and *Menoceras* were not very closely related. The paired horns on the nose are a good example of evolutionary parallelism. Nevertheless, confused by the similarity, most scientists erroneously called *Menoceras* "*Diceratherium*"."
A sheep weighing 830 pounds? Prothero's story may not be the last word on that genus. Also, one may ask where did *Menoceras* come from.
https://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjk49_N0_L8AhU59bsIHT9fAh4QFnoECA0QAQ&url=http%3A%2F%2Fwww.rhinoresourcecenter.com%2Fpdf_files%2F129%2F1299902723.pdf&usg=AOvVaw0oUEPBx7QRb5Au7t9DxCkX

[65] German original text: "Bei ausgestorbenen Nashornarten können die Hörner meist nur anhand der Ansatzstellen am Schädel nachgewiesen werden. … Fossiles Horn ist bisher nur vom Wollnashorn überliefert weist aber prinzipiell den gleichen Aufbau auf wie rezente"
https://de.wikipedia.org/wiki/Nash%C3%B6rner#H%C3%B6rner (Retrieved 1 February 2023.)

Structure and Functions of the Rhino Horns

What did these horns consist of? We have already quoted the Britannica above explaining that the rhinos' horns are "growths of keratin, a fibrous hair protein" and that "these horns are not true horns but are composed of keratin, a fibrous protein found in hair." And in the mostly excellent Wikipedia articles on rhinos we are further informed:

> "The **horn** consists of **agglutinated keratin**, a fibrillar protein that also occurs in hair, and despite its strength contains neither bone substance nor, as is sometimes erroneously claimed, ivory. It is composed of **numerous long thread-like strands**, called horn columns or filaments, **whose interstices are solidified with horn substance** [well – what does the author mean by "horn substance"? See some points below]. These threads run through the entire length of the horn, but taper significantly towards the top. The core of the horn is clearly firmer and usually black in colour; towards the outside it becomes more fibrous and takes on a light grey colour. ... The horn wears off continuously over time due to rubbing against the ground or stones; it can also break off in fights with conspecifics or as a result of traumatic experiences, but **it grows back throughout its entire life**. The **largest horn** known to date has measured **1.58 m** across the anterior curvature."[66]

And as to that question "What is rhino horn made of?" "Save the Rhino" answers:

> "It's often mistakenly reported that rhino horn is made of 'compressed hair', arising from the fibrous appearance of the horn, particularly around the base. And indeed, **rhino horn is composed primarily of keratin, a protein also found in human hair and fingernails**. But rather than being made of hollow fibres, rhino horn grows in layers from specialized skin cells in layers, which are keratinized (invaded by keratin proteins), becoming hard and inert, with all cellular function ceasing. At the **centre** of the horn, there are ***layers of calcium and melanin***, two materials that help to keep it even tougher. Just like a horse's hooves or a turtle's beak, rhino horn is solid."[67]

However, the statement of Krishna et al. (2022) that the horns are "completely" made out of Keratin seems to be not entirely correct:

> "But where does this strength and durability [of the horn] come from? Unlike other animal horns, rhino horns do not have a bony core; instead, **they are made completely out of keratin**, the same material comprising nails, feathers and hair. The material properties of the horn thus **arise solely from the arrangement of its keratin fibers**. In this experimental study, we analyze the structure, orientation, and function the fibers play in this strength. We hypothesize that the structural integrity is built through entangled and intertwined fibers. Entangled and intertwined structures increase material strength evident by a nonlinear stress-strain relationship."[68]

Yet, Ruixin et al. maintain in their *Nature* paper (2019 – the entire article including all the figures being available on the internet[69]):

> "The horn of the rhinoceros (Rhinocerotidae) is not a horn in the traditional sense like the horn of a cow or the nail of a hoof although it does share some properties. Actually, the rhino's horn is a **tuft of hair growing, tightly packed and glued together by exudates from the sebaceous glands**, on the nose of the animal. Native rhinoceros horn has been examined in a several key research papers. Of specific importance for our study are Ryder et al. who clarify the **tubular structure** of the keratin hair filaments, Hieronymus et al. who examine histological sections of horn tissue by x-ray CT-scanning and light

[66] "Das Horn besteht aus agglutiniertem Keratin, einem fibrillären Protein, das auch in Haaren vorkommt, und enthält trotz seiner Festigkeit weder Knochensubstanz noch, wie stellenweise irrtümlich behauptet wird, Elfenbein. Es setzt sich zusammen aus zahlreichen langen fadenförmigen Strängen, Hornsäulchen oder Filamente genannt, deren Zwischenräume mit Hornsubstanz verfestigt sind. Diese Fäden verlaufen durch die gesamte Hornlänge, verjüngen sich aber nach oben hin deutlich. Der Kern des Hornes ist deutlich fester ausgebildet und meist schwarz gefärbt, nach außen hin wird es deutlich faseriger und nimmt eine hellgraue Farbe an. … Das Horn nutzt sich mit der Zeit durch Reiben am Untergrund oder an Steinen kontinuierlich ab, beim Kampf mit Artgenossen oder infolge traumatischer Erlebnisse kann es auch abbrechen, wächst aber das gesamte Leben lang nach. Das bisher größte bekannte Horn hat 1,58 m über die vordere Krümmung gemessen." https://de.wikipedia.org/wiki/Nash%C3%B6rner#H%C3%B6rner (Retrieved 1 February 2023.)

[67] https://www.savetherhino.org/our-work/protecting-rhinos/what-is-rhino-horn-made-of/ (1 Jan 2020)

[68] https://ui.adsabs.harvard.edu/abs/2022APS..MARN00229S/abstract

[69] Ruixin, Mi, ZZ Shao and F. Vollrath (2019): Creating artificial Rhino Horns from Horse Hair https://www.nature.com/articles/s41598-019-52527-5n (Retrieved 2 February 2023.)

Note please the **horns in all three photographs of the square-lipped rhinoceros** (*Ceratotherium simum*) of the African savanna – being the largest land mammal after the African elephant weighing more than 3 tons – *cf.* the quotation from Encyclopedia.com (Oxford University Press).

Photographs according to https://de.123rf.com/lizenzfreie-bilder/nashorn.html?imgtype=1

microscopy and Ling who identified rhinoceros horn comparatively through appearance and microstructure. Other studies examine the amino acid composition of different rhino horns or the composition of their inorganic elements. Table 1 compares the rhinoceros horn with a few functionally i.e. compact resistant animal bio-composites.

… "The horn of the rhino consists of hairs tightly packed in the bulk of the protuberance and more loosely arranged at the outer shell (Fig. 1). The ***matrix material filling between the hairs is a very dense packing of cornified dead skin keratocyte cells that can be heavily pigmented with melanin***. Melanin is an interesting pigment that not only provides black colour but *may also add to a material's structural integrity*. Thus, the native rhinoceros horn in essence is a **composite material**, structured by its growth, with the tubules of keratin hair forming 'fibres' that are **embedded in a matrix material** that may change in composition along and/or across the horn. Throughout the rhinoceros horn each hair filament retains much of its natural hair structure including the medullary cavity although it is lacking the outermost layers of scaly cuticle so typical for external hairs (Figs 1B,C and 2A,C)."[70]

… "As there is no detailed information on the composition of the rhino's nose-tip exudate and horn matrix material other than that ***it seems to be a sebatious gland exudate full of deceased highly melanised cells***[71]. Such cells would contain high levels of intra-cellular proteins as well as carrying along the rather adhesive **extra-cellular fibronectin glycoprotein**. Thus the matrix of the native rhino horn would in essence be a largely proteinaceous glue with inclusions of soil and plant sap where the animal has rubbed the growing horn."[72]

"…the fundamental structure of the rhino horn is a **highly evolved and tough fibre reinforced bio-composite** where the hair fibres provide great tensile strength while the silk-protein matrix provides great ductility."[73]

What does the rhino use its horn for in species without strong sexual dimorphism in horn formation?[74]

"It is known that rhinos use their horns for **several behavioural functions**, including defending territories, defending calves from other rhinos and predators, maternal care (including guiding calves) and foraging behaviour, such as digging for water and breaking branches.[75]

Other uses in Rhinos with horns also in both sexes:

"Female rhinoceroses use their horns to steer their young and guide them until they are capable of navigating on their own. Male rhinoceros sometimes use their horns to move their excrement into piles that demarcate the border of their territory. The Honolulu Zoo reports that white rhinoceroses use their horns and front feet to test the thickness of a mud hole before entering to cool down. If the mud is too thick, they will not risk becoming stuck."[76]

Now, let us turn back to our topic of the origin of the sexually dimorph *Diceratherium* and apply the neo-Darwinian method to explain it. Let's take for a possible comparison the Java rhino displaying the smallest horns of all rhino species. Also, as we have noted above, the "*one-horned Javan rhinoceros* (***Rhinoceros sondaicus***) is the *only species in which the* ***females are hornless***". "Its horn is usually ***shorter than 25 cm*** (9.8 in), and is smaller than those of the other rhino species. Only adult bulls have horns; cows lack them altogether."[77]

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[70] https://www.nature.com/articles/s41598-019-52527-5.
[71] "„..es scheint ein Talgdrüsenexsudat voller abgestorbener stark melanisierter Zellen zu sein."
[72] In German: "Da es keine detaillierten Informationen über die Zusammensetzung des Nasenspitzenexsudats und des Hornmatrixmaterials des Nashorns gibt [außer die oben erwähnten Punkte], scheint es sich um ein Talgdrüsenexsudat voller abgestorbener, stark melanisierter Zellen zu handeln. Solche Zellen enthalten einen hohen Anteil an intrazellulären Proteinen und tragen auch das eher klebrige extrazelluläre Glykoprotein Fibronektin mit sich. Somit wäre die Matrix des nativen Nashornhorns im Wesentlichen ein weitgehend eiweißhaltiger Leim mit Einschlüssen von Erde und Pflanzensaft an den Stellen, an denen das Tier das wachsende Horn gerieben hat. "
[73] "… Die Grundstruktur des Rhinozeroshorns ist ein hochentwickelter und widerstandsfähiger faserverstärkter Biokomposit, bei dem die Haarfasern für eine hohe Zugfestigkeit und die Seidenproteinmatrix für eine hohe Dehnbarkeit sorgen."
[74] In females the horns may nevertheless be somewhat smaller.
[75] https://www.savetherhino.org/thorny-issues/de-horning/
[76] https://sciencing.com/can-elephants-tusks-pulled-out-killing-animal-10058725.html
[77] https://en.wikipedia.org/wiki/Javan_rhinoceros

Their average length is calculated to be ca. 20 cm long[78] (see a photo of that species above).

So, how many links were necessary to evolve the two horns from zero[79] to 20 cm by "insensibly fine gradations" etc.– see also the basic discussion on natural selection at (1) http://www.weloennig.de/NaturalSelection.html, (2) https://evolutionnews.org/2016/07/in_terror_of_ch/ and (3) http://www.weloennig.de/jfterrorchipmunks.pdf and

For the elongation of the giraffe's neck[80], the evolutionary biologists Badlangana et al. (2009) stipulated for the many steps according to the microevolutionary scenario of the neo-Darwinian theory an average between 0.72 and 1.19 µm each per generation. And I asked:

> "Thus, are there really decisive selective advantages for the survival of giraffe populations of ***about 1 millionth of 1 meter or 1 thousandth of 1 mm higher in each generation***? And that for about 500,000 or so generations each reaching 1 thousandth of 1 mm higher than their ancestors into the canopy of the last leaves during a dearth? (Not to mention the smaller females, juveniles and Haldane's dilemma.)."

Applying these 0.72 to 1.19 µm elongations per generation to origin of the 20 cm (= 200 mm) long paired horns in *Diceratherium* from *Subhyracodon*, we need about 200 000 generations of rhinos to evolve the first rhino horns from scratch (zero to 20 cm). Since female rhinos giving birth to the later horned males become sexually mature at about 5 to 6 years of age (it varies somewhat between different species), would mean at least 5 x 200 000 = 1 million years.

Analogically to the giraffe I'm tempted to raise the following questions for the origin of the *Diceratherium* horns according to the neo-Darwinian/synthetic theory characterized by its strict gradualism:

> "Thus, are there ***really decisive selective advantages for the survival of only those rare rhino individuals in a larger population displaying horns about 1 millionth of 1 meter or 1 thousandth of 1 mm higher in each generation?*** And that for about 200,000 or so generations, each reaching 1 thousandth of 1 mm higher than the horns of their ancestors? (Not to mention the smaller females, juveniles and Haldane's dilemma.)."

So, for each of the 200 000 generations there applies the same formula: "Only the (few) animal(s), which by chance were thus altered (ca. 1 µm longer horns), survived in the struggle for life and reproduced!" In the words of Prof. Robert Nachtwey: "The theory only says that something survived in the struggle for existence, but to our question as to how this something actually came into being, it always has only one answer: "***By an accidental hereditary variation***!""[81]

Checking the different phylogenetic trees[82], apart from *Diceratherium* and *Menoceras* also several of the other one horned and two horned rhino species seem to have evolved their horns independently of each other according to the

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[78] The longest so far found displayed a length 27 cm. https://de.wikipedia.org/wiki/Java-Nashorn (both retrieved 4 February 2023.)
[79] Or from scratch to or from the beginning to…
[80] See the details in http://ad-multimedia.de/evo/long-necked-giraffe_mU.pdf especially pp. 129 and 116.
[81] *Cf.* the discussion at http://www.weloennig.de/AuIDa.html
[82] https://de.wikipedia.org/wiki/Nash%C3%B6rner (Retrieved again 8 February 2023.)

neo-Darwinian world view[83]. Applying the calculations of Badlangana et al. (2009) of the older (faster) punk eek theory on the rhinos, there was an average increase of 143.1-238.5 µm of horn length per generation and that independently of each other in several rhino groups.

Hence, one may also raise the question whether there were actually decisive selective advantages for the survival of rhino populations displaying horns just 0.2 mm higher in each generation? So, for the evolution of a 20 cm long horn some 100 or so generations? However, for the revised punk eek with its return to "good, old-fashioned natural selection acting on random mutations and variations" "***species*** form over hundreds or thousands of generations and through a series of intermediate stages" (again Gould) many more generations would have been necessary[84]. See, additionally, **the waiting time problem** mentioned above, which is constituting a huge problem for punk eek as well as neo-Darwinism.

Things which should also be considered in this context: Horn formation in the rhinos constitute a very special intertwined network of genetic and environmental factors, including behavior/conduct/comportment of the males in the sexually dimorph species (i. e. those in which only the males develop horns) and in the rest (both sexes) also of the females.

> "In rhinos, the horn is not attached to bone, but grows from the surface of a dense skin tissue, anchoring itself by creating bone irregularities and rugosities. The outermost layer cornifies. **As the layers age, the horn loses diameter by degradation of the keratin due to ultraviolet light, drying out, and** [by?] **continual wearing**. However, melanin and calcium deposits in the center harden the keratin there, which gives the horn its distinctive shape.[85]

The horn "grows throughout the rhino's life as does your hair or fingernails and breaks and wears down and abrades quite easily."[86]

A Brief Look into the Molecular Genetics of Heir Formation

Our hair and fingernails would not be formed and exist without a complex genetic basis consisting of numerous regulatory and target genes. To realize the genetic complexities involved in the development of hair and fingernails, let's have a look at some recent research results on keratin and hair formation in

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[83] "Most Eocene and Oligocene rhinocerotids were small, hornless browsers, although *Diceratherium* and *Menoceras* **independently** developed paired horns in the late Oligocene" – Donald R. Prothero (1993): Fifty Million Years of Rhinoceros Evolution. In: Ryder, O.A. Rhinoceros biology and conservation: Proceedings of an international conference, San Diego, U.S.A. San Diego, Zoological Society, pp. i-v, 1-368 (Article pp. 82-91) http://www.rhinoresourcecenter.com/index.php?s=1&act=pdfviewer&id=1216650893&folder=121
"Although they are very different in their size and ecology, black and white rhinos are closely related. Members of the tribe Dicerotini, they first appear in the middle Miocene deposits of Ft. Ternan, Kenya … All dicerotins have tandem horns, one anchored on the nose, and the other on the forehead. ***Since these horns are made of compressed hair-like fibers, they grow continuously (at about the same rate as your fingernail grows),*** *but are constantly worn by rubbing against the ground and trees*. Occasionally they are torn off during digging, or during fights or other accidents. Then the animal must slowly grow another. The frontal horn is usually shorter than the nasal horn. Before heavy poaching, horns were typically 2-3 feet long, but are shorter in most living rhinos due to poachers. In the days before heavy poaching, the record holder had a horn 6 feet 6 inches (2 m) long, and it was probably a very old individual." Prothero and Schoch, p. 282.
"Some had a pair of horns on the nose side-by-side (***evolved independently in two different lineages***), while others had horns in tandem, one behind the other on the nose and forehead (the living African rhinos). Prothero, Donald R. Rhinoceros Giants (Life of the Past) (S.54). Indiana University Press. Kindle-Version.
[84] Recall please also the comments on the time calculations for the origin of **genera and families** above.
[85] https://en.wikipedia.org/wiki/Elasmotherium (Retrieved 5 February 2023.)
[86] D. R. Prothero (2013, p. 53): Rhinoceros Giants: The Paleobiology of Indricotheres (Life of the Past). Indiana University Press.

humans and some animals – being most likely similar to the rhinos (on which later the so far unknown specific molecular intricacies for horn development have to be added by further investigations).[87] Just a few glimpses:

> "Skin is a highly complex tissue that can be affected by numerous genetic diseases. It consists of many different cell types and structures, such as the **hair follicles (HF)**, that contain and surround hair roots. **HFs serve as a reservoir of stem cells and can be considered a dynamic mini-organ**."[88]

In humans 54 keratin genes have been detected:

> **"**All in all, **out of the 54 human keratin genes, at least 26** (~50%) are specifically expressed in the **hair follicle**. In the human genome, the keratin genes are clustered at two different chromosomal sites: chromosome 17q21.07.05.2008."[89]

From a recent paper just on hair follicle development in Merino sheep:

> "We identified **7879 differentially expressed genes (DEGs) and 12623 novel DEGs**, revealed different expression patterns of these DEGs at six stages of hair follicle development, and demonstrated their complex interactions"[90]

Apart from the Sumatran rhino (*Dicerorhinus sumatrensis*), which grows "still partly a very dense coat of hair"[91], none of the other 4 extant rhino species develop a thick/dense fur as did the Woolly rhinoceros (*Coelodonta antiquitatis*) and possibly some other extinct rhino species. Further research will reveal whether, and if so, to what extent the following observations shown in the *Science* paper of Chen et al. of 2023 will also be relevant for the rhinos, among them the rhinos with hardly any body hair – to be extended for horn development:

> "Execution of lineage-specific differentiation programs requires ***tight coordination between many regulators*** including Ten-eleven translocation (TET) family enzymes, catalyzing 5-methylcytosine oxidation in DNA. Here, by using *Keratin 14–Cre*–driven ablation of *Tet* genes in skin epithelial cells, we demonstrate that ***ablation of Tet2/Tet3 results in marked alterations of hair shape and length followed by hair loss***. We show that, through DNA demethylation, *Tet2/Tet3* control chromatin accessibility and Dlx3 binding and promoter activity of the *Krt25* and *Krt28* genes regulating hair shape, as well as regulate interactions between the *Krt28* gene promoter and distal enhancer. Moreover, *Tet2/Tet3* also control three-dimensional chromatin topology in Keratin type I/II gene loci via DNA methylation–independent mechanisms. These data demonstrate the essential roles for Tet2/3 in establishment of lineage-specific gene expression program and control of Dlx3/Krt25/Krt28 axis in hair follicle epithelial cells and implicate modulation of DNA methylation as a novel approach for hair growth control."[92]

Or Natarelly et al. (2023) in their article on *Integrative and Mechanistic Approach to the Hair Growth Cycle and Hair Loss* – perhaps relevant to some extent for the rhinos' behavior especially during horn formation[93]:

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[87] So far I did not find any molecular genetic data dealing directly with the horns of the rhinos.

[88] Naboulsi et al. (2023): The Enrichment of Specific Hair Follicle-Associated Cell Populations in Plucked Hairs Offers an Opportunity to Study Gene Expression Underlying Hair Traits. https://www.mdpi.com/1422-0067/24/1/561

[89] Moll et al. (2008): The human keratins: biology and pathology. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2386534/
From the Abstract: "The keratins are the typical intermediate filament proteins of epithelia, **showing an outstanding degree of molecular diversity**. Heteropolymeric filaments are formed by pairing of type I and type II molecules. In humans **54 functional keratin genes exist**. They are expressed in highly specific patterns related to the epithelial type and stage of cellular differentiation. **About half of all keratins**—including numerous keratins characterized only recently—are **restricted to the various compartments of hair follicles**. As part of the epithelial cytoskeleton, keratins are important for the mechanical stability and integrity of epithelial cells and tissues. Moreover, some keratins also have regulatory functions and are involved in intracellular signaling pathways, e.g. protection from stress, wound healing, and apoptosis."

[90] Junmin He et al. (2022): Gene network analysis reveals candidate genes related with the hair follicle development in sheep. BMC Genomics volume 23, Article number: 428 (2022): https://bmcgenomics.biomedcentral.com/articles/10.1186/s12864-022-08552-2

[91] https://de.wikipedia.org/wiki/Nash%C3%B6rner

[92] Chen et al. (2023): DNA dioxygenases Tet2/3 regulate gene promoter accessibility and chromatin topology in lineage-specific loci to control epithelial differentiation. Full article here: https://www.science.org/doi/full/10.1126/sciadv.abo7605

[93] "Rhino species use their horns in social interactions but also when accessing resources, rubbing and in interspecific defence" (Penny et al. 2021: https://brill.com/view/journals/ab/71/3/article-p243_1.xml?language=en). "Die afrikanischen Nashornarten, die kein Vordergebiss aufweisen, setzen ihre häufig wesentlich längeren Hörner – vor allem das Nasalhorn – neben Drohgebärden auch aktiv als Waffe zur Selbst-, Revier-, aber auch zur Futterverteidigung ein, um damit den Gegner mittels Aufspießens zu schwächen." See for example above: "Since these horns are made of compressed hair-like fibers, they grow continuously

> "A 2016 study assessed the effect of a 4-min standardized daily scalp massage for 24 weeks among nine healthy men [91]. Authors found scalp massage to increase hair thickness, **upregulate 2655 genes, and downregulate 2823 genes;** hair cycle-related genes including NOGGIN, BMP4, SMAD4, and IL6ST were among those upregulated, and hair-loss related IL6 was among those downregulated. The authors thereby concluded that a standardized scalp massage and subsequent dermal papilla cellular stretching can increase hair thickness, mediated by changes in gene expression in dermal papilla cells."[94]

So, it would be rather naïve to expect horn formation by just a few fortunate gene mutations and ready are the horned rhinos (one or two horns). – Otherwise one may ask why only some of the rhinos and these few of all the 6,495 presently recognized different mammal species[95] had evolved such special "horn" structures as the rhinos!

Now, let's return to the fossil record.

The Superfamily Rhinocerotoids (With Its Four Families Hyracodontidae, Amynodontidae, Paraceratheriidae And Rhinocerotidae) *Appeared Abruptly* In The Eocene

The English version of Wikipedia article on the rhinos (retrieved 28 January 2023) starts with the following evolutionary assertion on the origin of the superfamily of the Rhinocerotoids[96]:

> "Rhinocerotoids diverged from other perissodactyls by the early Eocene."

How, then, does the author *know* that? Well, he doesn't. He simply presupposes his materialist evolutionary world view as the only possible, correct and true one, so that (absolutely without exception) any new animal form/group has to be derived from other (previous) animals by mutations and natural selection.

However, we may ask: Which were these "other perissodactyls"? Where is – as postulated by the present main evolutionary theories – the series of thousands of connecting links from these "other perissodactyls" leading to the new family Hyrachyidae with its genus *Hyrachyus* by an almost endless series of "accidental hereditary variations", by thousands of "insensibly fine steps" and "insensibly fine gradations" etc. due to random DNA sequence variations, "for natural selection can act only by taking advantage of slight successive variations; ***she can never take a leap***, but must advance by the shortest and slowest steps"? Also Darwin: ""***Natura non facit saltum***." This canon, if we look to the present inhabitants alone of the world, is not strictly correct; *but* ***if we include all those of past times***, *whether known or unknown, it must on this theory* ***be strictly true***" (see above).

(at about the same rate as your fingernail grows), The horn wears off continuously over time due to rubbing against the ground or stones." https://de.wikipedia.org/wiki/Nash%C3%B6rner. And "Their horns grow continuously during their lifetime – the white rhino's horn can grow 7cm every year – and the record length is 150cm long!" Here are our top 10 facts about rhinos - WWF-UK https://www.wwf.org.uk › learn › fascinating-facts › rhinos

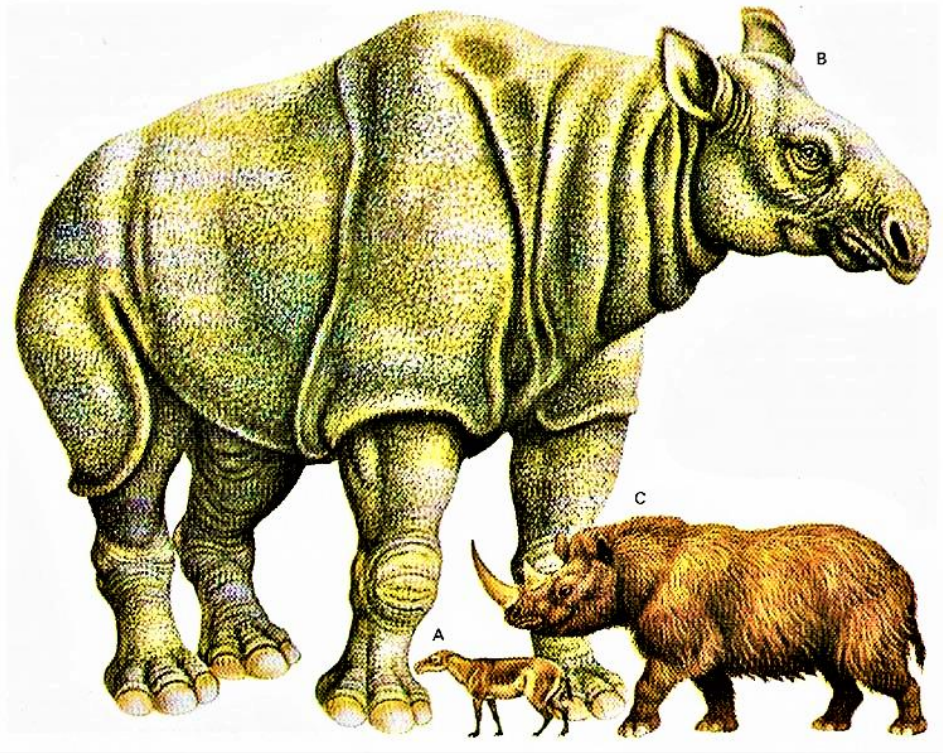
[94] https://www.mdpi.com/2077-0383/12/3/893. See also Gunilla Törnqvist et al. (2010): Cyclic Expression of Lhx2 Regulates Hair Formation https://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1000904

[95] Nathan S. Upham (2028): "We found 6,495 species of currently recognized mammals (96 recently extinct, 6,399 extant), compared to 5,416 in MSW3 (75 extinct, 5,341 extant) ... https://www.researchgate.net/publication/322962382_How_many_species_of_mammals_are_there? See also: Burgin et al. https://academic.oup.com/jmammal/article/99/1/1/4834091?login=false

[96] https://en.wikipedia.org/wiki/Rhinoceros

The article continues:

> "Fossils of *Hyrachyus eximus* found in North America date to this period. This small hornless ***ancestor resembled a tapir or small horse more than a rhino***."



From the *Encyclopedia of Science* by David Darling: "The rhinoceros group is a division of the perissodactyls (odd-toed ungulates) that has existed for a long time. The earliest known is *Hyrachyus* (A), a dog-sized creature from the Eocene. This developed into *Baluchitherium* (B), the largest land mammal ever, 5 m (16 ft) high. Later members, such as the woolly rhinoceros (C), achieved the more modest size of today's *rhinoceros*."[97]

Again: How does the author *know* that this species, *Hyrachyus eximus*, resembling "a tapir or small horse more than a rhino", was the ancestor of the superfamily Rhinocerotoidae with its four families Hyracodontidae, Amynodontidae, Paraceratheriidae and Rhinocerotidae? (For some information on the three of the families, see, please, the long footnote above – more later)[98].

The text goes on to say:

> "Four families, sometimes grouped together as the superfamily Rhinocerotoidea, evolved in the **late Eocene**, namely the Hyracodontidae, Amynodontidae, Paraceratheriidae and Rhinocerotidae."

According to the paleontological facts however, the four families did *not* "evolve in the late Eocene" but 3 of them **appeared abruptly** at the end of the **Lower Eocene** and 1 in the **Middle Eocene** – as has been afore stated for the lightly built *Hyrachyus* (Family Hyracodontidae) of the size of a German shepherd/sheep dog, displaying constancy/stasis up to 22.1 Ma). To recall:

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[97] https://www.daviddarling.info/encyclopedia/P/prehistoric_mammals.html More on the author: https://www.daviddarling.info/about.html (retrieved 19 February 2023.)

[98] Briefly on the fourth: "Paraceratheriidae is an extinct family of long-limbed, hornless rhinocerotoids, commonly known as paraceratheres or indricotheres, that originated in the Eocene epoch and lived until the early Miocene. https://en.wikipedia.org/wiki/Paraceratheriidae (Retrieved 17 February 2023.)

(1) Hyracodontidae (with *Hyrachyus*): "Fossil remains of *Hyrachyus* come mainly from North America and Eurasia and **date from the end of the *Lower Eocene***…"

(2) Amynodontidae

Total: **197 collections** including 239 occurrences[99]
"Age range: base of the Middle Eocene to the top of the Early/Lower Pleistocene or 48.60000 to 0.78100 Ma."
Checking the table, however: **Oldest** (two finds): **Ypresian** – Lutetian (**56.0 – 47.8**/41.3)
"Ypresian 56.0 – 47.8 Kyrgyzstan (Osh) Lushiamynodon kirghisensis (28490)"
"Ypresian – Lutetian 56.0 - 41.3 Hungary Amynodontidae indet. (52670)"[100]

Ypresian: *So, the Family Amynodontidae also appears abruptly in the **Lower Eocene**.*[101]

(3) Paraceratheriidae (= Indricotheriidae)[102]

Total: **86** collections including 111 occurrences
Age range: "Maximum range based only on fossils: base of the Early/Lower Eocene to the top of the Burdigalian or **55.80000** to 15.97000 Ma
Minimum age of oldest fossil (stem group age): 48.6 Ma
Oldest: **Early/Lower Eocene** 55.8 - 48.6 China (Nei Mongol) *Forstercooperia huhebulakensis* (174920) *Pappaceras meiomenus* (176542)"[103]

*Hence, the Paraceratheriidae also appear abruptly in the **Lower Eocene**.*

(4) Rhinocerotidae

Total: **1890** collections[104]
Age Range: "Maximum range based only on fossils: base of the Bartonian to the top of the Holocene or 41.30000 to 0.00000 Ma Minimum age of oldest fossil (stem group age): 40.4 Ma"

*Oldest occurrence: **Middle Eocene** 48.6 - 37.2 USA (Oregon)*
*Teletaceras radinskyi and several additional finds appearing abruptly in the **Middle Eocene**.*

Before we continue with our family Rhinocerotidae we would like to take a detour to family number (3) in the series quoted above, the Paraceratheriidae (= Indricotheriidae) – the largest mammals that ever lived.

According to https://en.wikipedia.org/wiki/Paraceratheriidae (retrieved 20 February 2023):

> "Paraceratheriidae is an extinct family of long-limbed, hornless rhinocerotoids, commonly known as paraceratheres or indricotheres, that originated in the Eocene epoch and lived until the early Miocene. …

[99] https://paleobiodb.org/classic/basicTaxonInfo?taxon_no=43168 (slightly different: https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43168&is_real_user=1 196 collections
[100] Same source: https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43168&is_real_user=1
[101] In contrast again: https://www.mineralienatlas.de/lexikon/index.php/FossilData?lang=de&fossil=Amynodontidae. This source reads: Startalter: 47,8 Ma - Endalter: 0,781 Ma
[102] Checking Indricotheriidae in PBDB (21 February 2023) the reader is informed that Indricotheriidae is a "subjective synonym of Paraceratheriinae" and he is passed on/forwarded to/directed to the latter. However, "The name Indricotheriidae was introduced by the Russian-Soviet palaeontologist Alexei Alexeyevich Borissiak (1872-1944) in 1923, initially under the name Indricotheriinae as a subfamily of rhinoceroses,] then in 1939 he raised it to family level. The names Baluchitheriinae or Paraceratheriinae, also proposed in 1923 by the US geologist Henry Fairfield Osborn (1857-1935), were in use for a while, but are invalid." (https://de.wikipedia.org/wiki/Indricotheriidae). Well, in contrast to this statement, Wang et al. (2016) https://www.nature.com/articles/srep39607 as well as Bai et al. (2020) https://www.nature.com/articles/s42003-020-01205-8 only Paraceratheriidae is used as the valid term.
[103] https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=348085&is_real_user=1 " (According to http://www.fossilworks.org/cgi-bin/bridge.pl?a=taxonInfo&taxon_no=348108 Forstercooperia huhebulakensis "Belongs to Pappaceras according to H. Wang et al. 2016"
[104] https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43187&is_real_user=1

> The first paraceratheres were only about the size of large dogs, growing progressively larger in the late Eocene and Oligocene. … The largest genus was *Paraceratherium*, which was more than twice as heavy as a bull African elephant, and was one of the largest land mammals that ever lived."[105]
>
> Or: "Largest land mammal: *Paraceratherium* (8.7 metres, 20 tonnes)."[106]

As for the formulation "growing progressively larger in the late Eocene and Oligocene" sounds as if at least within this family the criteria of Darwin and his followers have been fulfilled – evolution by natural selection of "infinitesimally small changes", "infinitesimally slight variations", "insensibly fine steps" and "insensibly fine gradations", natural selection "can never take a leap, but must advance by the shortest and slowest steps" etc. – but far from it: 8 (of the 9) genera, for which further details are known, appear abruptly/suddenly in the fossil record:

(1) ***Forstercooperia***: Middle Eocene to Late/Upper Eocene
48.60000 – 37.20000 Ma" ("The average size of the genus is about equal with a large dog, even though later genera like *Juxia* and *Paraceratherium* reached sizes of a cow and even much larger.")

(2) ***Pappaceras***: "Age range: base of the Early/Lower Eocene to the top of the Arshantan or **55.80000 to 37.20000 Ma**" (The largest species is *P. confluens*, followed *P. minuta*.[3] The average size of all species, is about equal with a large dog,…")

(3) ***Aralotherium*** (= *Paraceratherium sui*): "Age range: base of the Late/Upper Eocene to the top of the Late/Upper Oligocene or
37.20000 to 23.03000 Ma" ("Based on the teeth, a weight of around 13.4 tonnes could be determined." German: Anhand der Zähne ließ sich ein Gewicht von rund 13,4 Tonnen ermitteln.")

(4) ***Dzungariotherium turfanensis***: "Age range: base of the Early/Lower Oligocene to the top of the Late/Upper Oligocene or
33.90000 to 23.03000 Ma" ("Weights of up to 18.3 tonnes are reported for large individuals, but up to 24 tonnes are also mentioned-" German: "Gewichtsangaben gehen bei großen Individuen von bis zu 18,3 Tonnen aus, es werden aber auch bis zu 24 Tonnen genannt".)

(5) ***Juxia***: "Age range: base of the Middle Eocene to the top of the Late/Upper Eocene or
48.60000 to 33.90000 Ma" ("*Juxia* was around the size of a horse." "The weight was estimated at 759 kg but could also have been 1.1 to 1.4 t)." German: "Das Gewicht betrug schätzungsweise 759 kg, könnte aber auch bei 1,1 bis 1,4 t gelegen haben".)

(6) ***Paraceratherium***: "Maximum range based only on fossils: base of the Late/Upper Eocene to the top of the Rupelian or
37.20000 to 28.10000 Ma" ("Early estimates of 30 tonnes (66,000 lb) are now considered exaggerated; it may have been in the range of 15 to 20 tonnes (33,000 to 44,000 lb) at maximum, and as low as 11 tonnes (24,000 lb) on average.")

(7) ***Pristinotherium***: "No collection or age range data are available."

(8) ***Turpanotherium***: "Age range: base of the Early/Lower Oligocene to the top of the Early/Lower Miocene or
33.90000 to 15.97000 Ma" (Possibly identical with genus *Urtinotherium* according to Prothero 2013).

(9) ***Urtinotherium***: "Age range: base of the Arshantan to the top of the Late/Upper Eocene or **48.60000 to 33.90000** Ma"[107] ("*Urtinotherium* was a large representative of the Indricotheriidae and almost reached the dimensions of smaller members of the genus *Paraceratherium*. Weight data vary from 2.7 to 6.1 t").German: "*Urtinotherium* war ein großer Vertreter der Indricotheriidae und erreichte nahezu die Ausmaße von kleineren Angehörigen der Gattung *Paraceratherium*. Gewichtsangaben variieren von 2,7 bis 6,1 t.")

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[105] More in https://bioone.org/journals/american-museum-novitates/volume-2018/issue-3897 and a fine recent overview including history of the discoveries of several different species of Pappaceras in the German version of https://de.wikipedia.org/wiki/Pappaceras (retrieved 20 February 2023).

[106] https://de.wikipedia.org/wiki/Liste_der_Gr%C3%B6%C3%9Fenrekorde#S%C3%A4ugetiere or with a discussion of some former candidates for the "Largest land mammal ever": https://www.guinnessworldrecords.com/world-records/70329-largest-prehistoric-mammal ("In 1993, the partial skeleton of an even larger *Paraceratherium* was discovered in the Xinjiang region of north-west China. The Xinjiang *Paraceratherium* skull is 1.33 m (4 ft 4.4 in) long, making it the largest indricothere skull found. Together with preserved parts of the spine, the Xinjiang *Paraceratherium* was estimated to have been around **7.2 m (23 ft 7 in) long**. Comparisons with modern rhino and horse skeletons produced an estimated weight of **18.5 tonnes (20.4 tons)** for the Xinjiang *Paraceratherium*. By comparison, a modern African white rhino, the largest of the living rhinos, can achieve a body length of 3.77 m (12 ft 4.4 in) and weigh 3.6 tonnes (4 tons), standing up to 1.85 m (6 ft) at the shoulder.)

[107] All Data without brackets from PBDB (retrieved 22 February 2023). Data within brackets from Wikipedia articles on the respective genera (retrieved 25 February 2023).

Although evolution within the boundaries of the systematic category of a family[108] appears to be not only possible in several cases but also definitely probable (see details in http://www.weloennig.de/Artbegriff.html – *cf*. some points on the Paraceratheriidae below), a strict correlation of geological age with size ("growing progressively larger in the late Eocene and Oligocene") seems to be an illusion. The genus "*Paraceratherium*, which was more than twice as heavy as a bull African elephant" appears already at the base of the Late/Upper Eocene (**37.20000 to 28.10000** Ma.) So, it lived contemporaneously with all the genera (with small as well as large representatives) also *appearing or living within this assumed geological time period*: *Aralotherium, Dzungariotherium, Juxia, Turpanotherium, Urtinitherium*.[109]

Nevertheless: One may point out that as known so far (but this could change by further fossil discoveries) some of the (also abruptly/suddenly/unexpectedly appearing) smallest 'beasts' seem to have been the oldest. If true, the model of polyvalent basic types unfolding their genetic potential over time (partly perhaps through adaptation to different environmental conditions including free space/area, food resources and niche possibilities) could be relevant here for further research.[110]

The case of *Turpanotherium* ("33.90000 to 15.97000 Ma") possibly being identical with the genus *Urtinotherium* ("48.60000 to 33.90000 Ma") could be of special actuality/relevance and importance for these questions.

"In 2013, Donald R. Prothero provisionally synonymised *Turpanotherium* with *Urtinotherium* due to **nearly identical molar sizes**, but at the same time pointed out the need for necessary new studies to be conducted."[111] In fact, Prothero stated:

> "Qiu and Wang (2007) also argued for the distinctiveness of *Dzungariotherium*, *Aralotherium*, and their new genus *Turpanotherium*. They gave a number of anatomical characters that supposedly distinguish these genera. As we shall see below, however, **the crucial factors are those of size and the snout and front teeth**. Most of the other "diagnostic features" listed by Qiu and Wang in the skull region seem to be **highly variable and subject to distortion and other post-mortem deformation and breakage on the bones**. About the only valid reasons for distinguishing them would be if their sizes are distinctly different from typical *Paraceratherium* or if they have unique combinations of teeth or snout features. Based on the diagram of these snout features shown in Fig. 4.13, only *Dzungariotherium* has a unique combination of front teeth. On the other hand, *Aralotherium* and *Turpanotherium* have the typical upper and lower jaw condition of *Urtinotherium* and *Paraceratherium*—large conical lower first incisors that are procumbent (to various degrees, possibly influenced by post-mortem distortion). We will consider the issues of size below."[112]

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[108] Concerning the term and concept of the family in systematics, see also http://www.weloennig.de/AngiospermsLivingFossils.pdf p. 25 footnote.

[109] In the figure "Phylogenetic relationships of *Paraceratherium* with other rhinos, according to Tao Deng and colleagues, 2021" the geological time period for *Paraceratherium* is too late and and too short. However, even if it were correct there would not be a strict correlation between age and size/weight. https://en.wikipedia.org/wiki/Paraceratherium#/media/File:Phylogenetic_relationship_of_giant_rhinos.jpg

[110] See, for example, http://www.weloennig.de/Gesetz_Rekurrente_Variation.html#cichlidae ("Wenn wir einen Blick auf die Frage werfen, welche genetisch-molekularbiologischen Möglichkeiten für das postulierte größere genetische Differenzierungspotential derzeit zur Debatte stehen, so stoßen wir auf derzeit mindestens vier Möglichkeiten (vgl. weiter Lönnig 1993, Artbegriff [wie oben zum großen Teil schon zitiert] pp. 473, 545, 587/588).

Erstens: Das Vorhandensein alternativer Promotoren (je nach Bedarf werden Genfunktionen raumzeitlich unterschiedlich exprimiert).

Zweitens: Alternative Leserahmen (ein und dieselbe DNA-Sequenz kodiert mit Start- und Stopcodons an verschiedenen Stellen völlig unterschiedliche Gene).

Drittens: Gesteigerte Transposonaktivitäten (DNA-Transposons, die durch ihren „Cut-and-Paste"-Mechanismus Gene für alternative morphologische Merkmale und Verhaltensweisen an- und abschalten können) (Details zu Transposonfunktionen vgl. R. Kunze, H. Saedler und W.-E. Lönnig 1997: Plant Transposable Elements. Advances in Botanical Research 27, pp.331-470)´[and many recent papers.]

Viertens: Die 'normalen' Mutationsprozesse schalten im Laufe der Zeit in den Cichliden-Populationen unterschiedlich funktionsfähige, aber für die Existenz der Gattung redundante Gene ab (also Abschalten durch die bekannten, häufigen Verlust-Mutationen). Das führte zu unterschiedlichen Differenzierungen, welche Tendenz noch durch die Rekombination mutierter Gene verstärkt werden konnte." See also http://www.weloennig.de/AesVII.html point 9.

Also, recombination of different alleles of the genes involved in the hormone system including their often strong effects on the so affected phenotypes. Generally: Mendelian genetics involved especially in production of **growth hormones –** regulators and target genes). See examples in http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf / ***If only the bones of the different dog races were known, many paleontologists would create an entire new family with many different genera and species*** (see especially pp. 40/41: bones; hormones pp. 55, 56 footnote, 83, 123, 129… 349. 385). Several similar things can also happen in the wild. See examples in the book by Michael J. Behe (2020): Darwin Devolves. HarperOne, New York. *Cf.* also http://www.weloennig.de/Artbegriff.html As for the **rhino**, Liu et al. report (2021): "...we uncovered **frameshift mutations in IFT43** (intraflagellar transport 43) that could contribute to rhinoceroses' poor eyesight. IFT43 is involved in the formation and maintenance of cilia, which are important for the development and function of the light-sensitive tissue at the back of the eye (the retina) (Arts et al., 2011). https://www.sciencedirect.com/science/article/pii/S0092867421008916

[111] https://de.wikipedia.org/wiki/Urtinotherium (retrieved 26 February 2023). Source: "Donald R. Prothero: Rhino Giants: The Palaeobiology of Indricotheres. Indiana University Press, 2013, S. 1–141 (S. 81) ISBN 978-0-253-00819-0

[112] Prothero, p. 79.

Further, on p. 81, Prothero states:

> "Looking closer at the lower first molar dimensions (Fig. 5.3C), it is clear that the Mongolian and Dera Bugti *Paraceratherium* and *Aralotherium* form a **single cluster with complete overlap**. *Dzungariotherium*, with its distinctive front teeth (Fig. 4.13) tends to be on the large end of this cluster, so it is potentially distinguishable on these features. Only Qiu and Wang's (2007) taxon *Turpanotherium* is distinct from this cluster, but seems to group with *Urtinotherium*. **Thus, I will regard *Turpanotherium* as a likely junior synonym of *Urtinotherium* until further study is conducted**."[113]

After several comments and figures on a statistical analysis of "the entire large indricothere data set" (pp. 81 – 87), Prothero concludes: "...it is impossible to make a statistical argument that these allegedly different genera are truly different in size, *since their variability can be better explained as coming from **a single variable population***" and he continues (p. 87):

> "Lucas and Sobus (1989, p. 372) further support the single-genus argument by pointing out that there is a small population sample of skulls from the Turpan Basin, Xinjiang, China, originally described by Xu and Wang (1978). Xu and Wang (1978) had placed these specimens into two species, *Paraceratherium lipidus* and *Dzungariotherium turfanensis*, since they represent the two different skull shapes already mentioned. Yet the fact they come from a single locality suggests ***they are all one population and should be in the same highly variable species***, just like the co-occurrence of the *Paraceratherium* and "*Baluchitherium*" specimens in Dera Bugti suggests that these two genera are synonyms."

Moreover, "it is revealing that those paleontologists most actively involved in current indricothere discovery and research (P.-O. Antoine, J.-L. Welcomme, G. Métais, and others in the French paleontological community) accept the argument that **these fossils are all *Paraceratherium***, even as they discover new specimens in Turkey, Pakistan, and elsewhere. The evidence from the size of the teeth (Figs. 5.2, 5.3) seems compelling that these creatures could not be distinguished by size" (Prothero, p. 87).

Also, the home range has to be considered as follows (pp. 87/88):

> "The home range, or territory, of a mammal is directly related to its body size, **so each species of indricothere must had a home range that was larger than that of any living mammal**. Based on modern examples, large-bodied land mammals require large areas to find enough resources to survive. Lowland gorillas have home ranges of roughly 100 square km. Giraffes require individual ranges of about 280 square km. As du Toit (1990) showed, for large-bodied African mammals, the home range (Ahr) scales by body mass (M) in the following formula: $A_{hr} = 0.024 M^{1.38}$. Thus, indricotheres would have had home ranges of at least 1000 square km and maybe much more if their desert scrub habitats (see Chapter 7) had only limited trees and other resources. **There would not have been enough room in Asia in the Oligocene to support more than a few populations of them, let alone many species and genera**. In addition, if these large Oligocene indricothere specimens are all **approximately the same size**, it is difficult to imagine that such huge creatures capable of roaming such large distances across Asia (i.e., large home range) belonged to several different genera.
>
> In addition, if these large Oligocene indricothere specimens are all approximately the same size, it is difficult to imagine that such huge creatures capable of roaming such large distances across Asia (i.e., large home range) belonged to several different genera."

"***A single variable population***" appears to speak much more for an intelligently designed basic type with a large genetic potential for the realization of a range of more or less different life forms within the family (probably including Mendelian recombination, including different alleles of growth hormones and more: *cf.* footnote on previous page) – all clearly differentiated

[113] Prothero, Donald R. Rhinoceros Giants (Life of the Past) (p.81). Indiana University Press. Kindle-Version. See also Gould on "oversplitting" p. 15 in http://www.weloennig.de/ElephantEvolution.pdf and Lönnig http://www.weloennig.de/Artbegriff.html

genera appearing abruptly in the fossil record (interestingly often several genera simultaneously) – than for evolution by natural selection of "infinitesimally small changes" etc. The principle is beautifully illustrated in the excellent Fig. 2 by the evolutionary biologists Deng et al. (2023)[114].

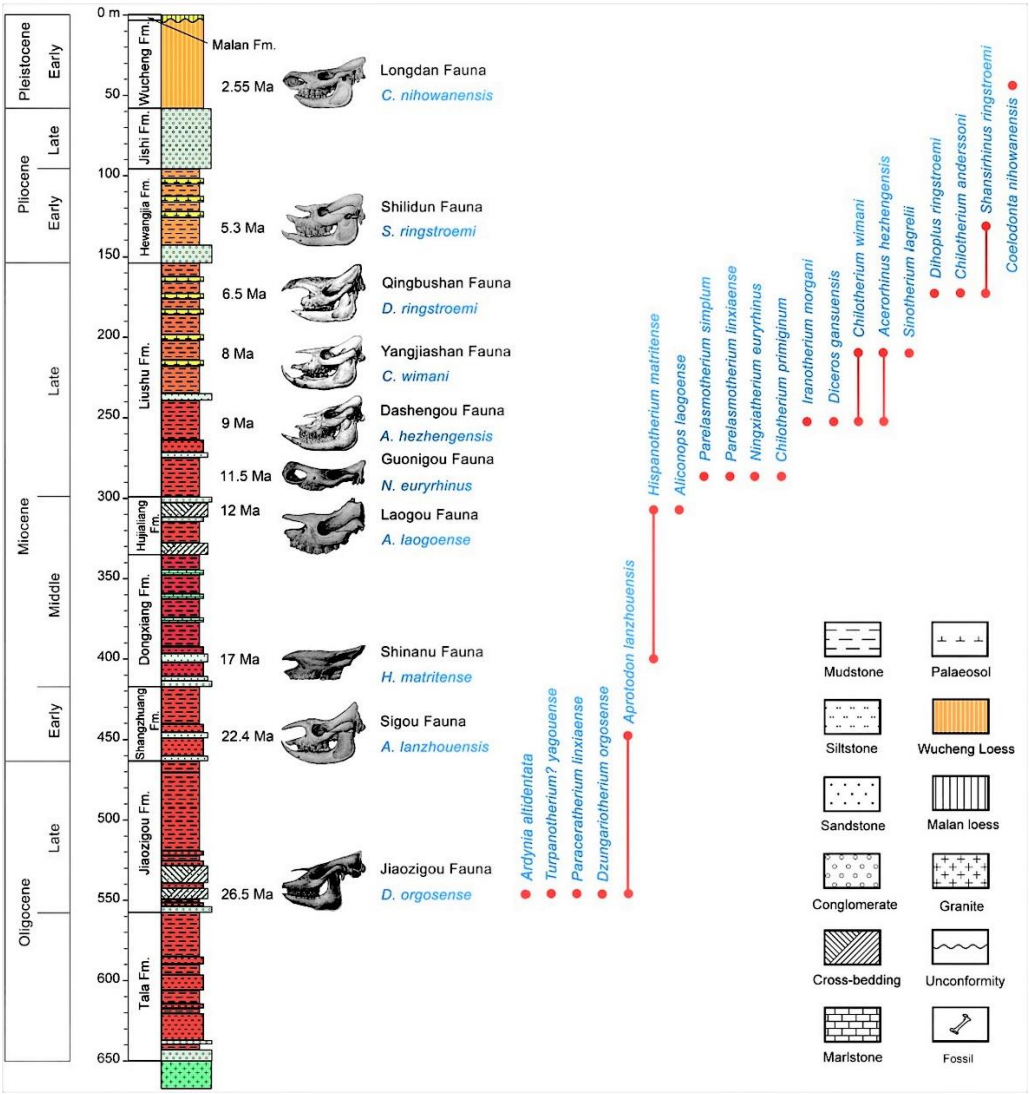


Fig.2 according to Deng et al. (2023) "Fig. 2. Stratigraphical section of the Cenozoic deposits of the Linxia Basin with chronostratigraphic range and absolute dates[115] based on Fang et al. (2003, 2016), Deng et al. (2013a), Zan et al. (2016), Zhang et al. (2019), Sun et al. (2022) and Zheng et al., 2023 of rhinocerotoid fossils."

Some points from their *ABSTRACT* (see the link to their full paper below): "As a result of their high diversity, wide geographical distribution and **rapid evolution** [so rapid that the most links postulated by gradualism are missing], rhinoceroses are good markers for stratigraphic division and may be used for intercontinental correlations. The Late Oligocene fauna [including the giant *Paraceratherium linxiaense* dated to be **26.5 Ma**[116]] of the Linxia Basin occurs in the lower part of the Jiaozigou Formation. Among 12 species of large mammal fossils, nine are of the superfamily Rhinocerotoidea, and **giant rhinos are dominant**."

[114] Tao Deng, Xiaokang Lu, Danhui Sun, Shijie Li (2023): Rhinocerotoid fossils of the Linxia Basin in northwestern China as late Cenozoic biostratigraphic markers. *Palaeogeography, Palaeoclimatology, Palaeoecology* **614**: 1 – 12 (see full paper on the internet)

[115] I have not checked the papers cited for the absolute dates.

[116] P. 11: "The Paraceratheriidae were the most representative family in this period, and include three species, *Dzungariotherium orgosense*, *Paraceratherium linxiaense*, and *Turpanotherium? yagouense*, **all of which were giant-sized and among the largest land mammals that ever lived** (Prothero et al., 1989; Qiu et al., 2004b; Qiu and Wang, 2007; Deng et al., 2021)."

Back to the Family Rhinocerotidae

Above we have mentioned 5 Genera of Family RHINOCEROTIDAE so far:

Genus *Rhinoceros* (one-horned rhinoceros): Oligocene (Rupelian 33.9 – 28.1 Ma) to present. LIVING FOSSIL: CONSTANCY/stasis up to almost 34 Ma.

Genus *Teletaceras* (Family Rhinocerotidae): Eocene 48.6 (41.3) to 33.9 Ma. CONSTANCY/stasis up to 14.7 Ma.

Genus *Trigonias* (Family Rhinocerotidae): From Duchesnean 42.0 to Orellan 33.3 Ma. CONSTANCY/stasis up to 8.7 Ma.

Genus *Subhyracodon* (Family Rhinocerotidae): Eocene 37.2 to 15.97 Ma. CONSTANCY/stasis up to 21.23 Ma.

Genus *Diceratherium* (Family Rhinocerotidae): From Orellan (Early Oligocene) 33.9 to Late Miocene 5.333 Ma. CONSTANCY/stasis up to 28.57 Ma.

Concerning the extant genera we have to add the ensuing ones including some data on the fossil record:

Genus *Didermocerus*[117] (Family Rhinocerotidae), with species: *D. sumatrensis* (Asian two-horned rhinoceros or hairy rhinoceros): Late/Upper Oligocene (up to 27.82 Ma) to present. LIVING FOSSIL: CONSTANCY/stasis up to almost 28 Ma.

Left: Sumatran rhinoceros *Dicerorhinus sumatrensis* at the Cincinnati Zoo in Cincinnati, Ohio (Author: Ltshears 2010: https://commons.wikimedia.org/wiki/File:SumatranRhino3_CincinnatiZoo.jpg)
Right: "Sumatran Rhinoceroses at the Cincinnati Zoo & Botanical Garden (Sumatran Rhinos: "Emi" and 14 month old son "Harapan"" Author: Charles W. Hardin 2008: https://commons.wikimedia.org/wiki/File:Sumatran_Rhino_2.jpg) Both photos retrieved 18 March 2023

Encyclopedia Britannica (2023): "The smallest of the three Asian rhinoceroses (also ***the smallest living member of the family***) is the Sumatran, or Asiatic, two-horned rhinoceros, *Didermocerus* (or *Dicerorhinus*) *sumatrensis*, standing 1 to 1.5 metres (3 to 5 feet) at the shoulder. It was originally found in the foothills of the eastern Himalayas, mainland Southeast Asia, and the islands of Sumatra and Borneo. Small isolated

[117] "Oldest: Oligocene to Miocene of Kazakhstan (1) Total: 69 collections including 74 occurrences" https://paleobiodb.org/classic/basicTaxonInfo?taxon_no=43199
"It is **the smallest rhinoceros**, although it is still a large mammal; it stands 112–145 cm (44–57 in) high at the shoulder, with a head-and-body length of 2.36–3.18 m (7 ft 9 in – 10 ft 5 in) and a tail of 35–70 cm (14–28 in). The weight is reported to range from 500–1,000 kg (1,100–2,200 lb), averaging 700–800 kg (1,500–1,800 lb). Like both African species, it has two horns; the larger is the nasal horn, typically 15–25 cm (5.9–9.8 in), while the other horn is typically a stub. A coat of reddish-brown hair covers most of the Sumatran rhino's body."

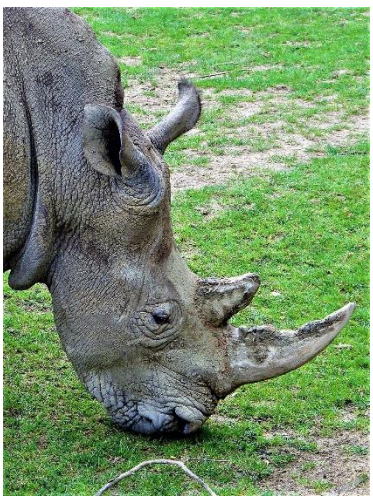
populations still occur in a few widely separated localities in (Myanmar) Burma, Thailand, West (Peninsular) Malaysia, Sumatra, and East Malaysia (Sabah) and possibly in other nearby territories. The total population is thought to number between 100 and 170. Some of the survivors in Sumatra are protected in reserves.

Both the Sumatran and Javan rhinoceroses inhabit ***forests as well as marshy areas and regions of thick bush and bamboo, climbing actively in mountainous country***. They are mainly browsers."[118]

Wikipedia (2023): "…Another striking feature is the ***relatively strong hair on the body***, which is very dense in young animals, but also still present in young adults and also has a reddish-brown colour. In older individuals the hair often turns black and becomes sparser. Further tufts of hair are found at the tips of the ears and at the end of the tail. Subcutaneous fat is extremely rare in wild animals. The pointed and mobile upper lip, which serves to pluck plant food, is also conspicuous.

Unlike the other Asian rhinoceros species (Java rhinoceros, armoured rhinoceros), the ***Sumatran rhinoceros has two horns***, which are usually dark brown or blackish brown in colour. The front horn (nasal horn) is 15 to 25 cm long and has a conical shape with a partly backward point. The longest horn ever found had a length of 81 cm measured across the curvature. The rear horn (frontal horn), on the other hand, is usually only a blunt elevation."[119]

Genus *Ceratotherium*[120] (Family Rhinocerotidae): Square-lipped or white rhinoceros. Vallesian (11.6 Ma)[121] to present. LIVING FOSSIL: CONSTANCY/stasis up to 11.6 Ma.



Encyclopedia Britannica (2023): "The much larger white rhinoceros [compared to the black rhinoceros] is a grazing species with a broad square muzzle. It prefers short grasses 7 to 10 cm (about 3 to 4 inches) high. The animal makes much use of shade trees for resting and is dependent on surface water. The range of the white rhinoceros is markedly discontinuous. South of the Zambezi River it was once extremely common over a fairly large area of bushveld. It has since become confined to the game reserves in South Africa, where the population has risen; some of the animals have been redistributed to several other parks and reserves in Southern Africa."[122]

Encyclopedia.com (Oxford University Press 2019): Description and biology. The northern white rhinoceros is also called the northern square-lipped rhinoceros. The animal derives its common name from the Afrikaans (language of white South Africans of Dutch descent) word weit, meaning "wide." The reference is to

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[118] https://www.britannica.com/animal/perissodactyl

[119] https://de.wikipedia.org/wiki/Sumatra-Nashorn Original German text: „Auffällig ist weiterhin die verhältnismäßig **starke Behaarung** des Körpers, die bei Jungtieren sehr dicht, aber auch bei jungen Alttieren noch vorhanden ist und ebenfalls eine rotbraune Färbung besitzt. Bei älteren Individuen färbt sich das Haar häufig schwarz und wird spärlicher. Weitere Haarbüschel befinden sich an den Ohrenspitzen und am Ende des Schwanzes. Unterhautfett tritt bei wild lebenden Tieren nur äußerst selten auf. Auffällig ist auch **die spitz zulaufende und bewegliche Oberlippe**, die zum Abrupfen der Pflanzennahrung dient.

Im Unterschied zu den anderen asiatischen Nashornarten (Java-Nashorn, Panzernashorn) hat das Sumatra-Nashorn **zwei Hörner**, die in der Regel dunkelbraun oder schwarzbraun gefärbt sind. Das vordere Horn (Nasalhorn) ist dabei 15 bis 25 cm lang und weist überwiegend eine konische Form auf mit einer teils rückwärts gerichteten Spitze. Das längste jemals gefundene Horn besaß eine über die Krümmung gemessene **Länge von 81 cm**. Das hintere Horn (Frontalhorn) dagegen ist meist nur eine stumpfe Erhöhung." Translated with www.DeepL.com/Translator (free version)

[120] "Total: 206 collections including 223 occurrences" https://paleobiodb.org/classic/basicTaxonInfo?taxon_no=43195
"Maximum range based only on fossils: base of the Vallesian to the top of the Holocene or 11.60800 to 0.00000 Ma Minimum age of oldest fossil (stem group age): 8.7 Ma. https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43195&is_real_user=1

[121] "The Vallesian age is a period of geologic time (11.6–9.0 Ma) within the Miocene used more specifically with European Land Mammal Ages." https://en.wikipedia.org/wiki/Vallesian

[122] https://www.britannica.com/animal/perissodactyl/Rhinoceroses#ref239656

the animal's wide snout. However, the word weit was mistranslated as "white," and so the animal is now known as the white rhinoceros. The white rhinoceros is not actually white but light gray in color. … The northern white rhinoceros has a large, square-shaped mouth that allows it to graze on short grass. The **second largest land mammal (only elephants are larger)**, an average northern white rhinoceros has a head and body length of 12 to 13 feet (3.7 to 4 meters) and stands 5 to 6.5 feet (1.5 to 2 meters) tall at its shoulder. Its tail measures 20 to 28 inches (51 to 71 centimeters) long. The animal may weigh between 5,000 and 8,000 pounds (2,270 and 3,630 kilograms). Despite its large size, the northern white rhinoceros can gallop as fast as 25 miles per hour (40 kilometers per hour).[123]

Genus *Diceros* [124] **(Family Rhinocerotidae): The hook-lipped rhinoceros or black rhinoceros. Langhian (15.98 Ma) to present. LIVING FOSSIL: CONSTANCY/stasis almost 16 Ma.**

Above: "Two black rhinos (mother and calf) in Lewa, central Kenya" (Harald Zimmer 2006: https://commons.wikimedia.org/wiki/File:Black_Rhinos_Kenya.jpg)
Below left: "My 13 year-old daughter feeds this huge male Black Rhino at the Ol Pejeta Conservancy, Kenya" (Steve Garvie 2010: https://commons.wikimedia.org/wiki/File:Flickr_-_Rainbirder_-_Meeting_monsters.jpg)
Below right: "Black rhino in the Maasai Mara" (Markrosenrosen 2018: https://commons.wikimedia.org/wiki/File:Black_rhino_maasai_marai.jpg)

Encyclopedia Britannica (2023): "black rhinoceros, (*Diceros bicornis*), the third largest rhinoceros and one of two African species of rhinoceros. The black rhinoceros typically weighs between 700 and 1,300 kg (1,500 and 2,900 pounds); males are the same size as females. It stands 1.5 metres (5 feet) high at the shoulder and is 3.5 metres (11.5 feet) long. The black rhinoceros occupies a variety of habitats, including open plains, sparse thorn scrub, savannas, thickets, and dry forests, as well as mountain forests and moorlands at high altitudes. It is a **selective browser, and grass plays a minor role in its diet**. Where succulent plants, such as euphorbias, are abundant in dry habitats, it can survive without flowing water. Where water is available, drinking is regular and frequent; black rhinoceroses **also dig for water in dry riverbeds**. They are normally **ill-tempered and unpredictable** and may charge any unfamiliar sound or smell. Four subspecies are recognized, including one from Namibia that lives in near-desert conditions.[125]

[123] https://www.encyclopedia.com/environment/applied-and-social-sciences-magazines/rhinoceros-northern-white
[124] "Total: 96 collections including 98 occurrences" https://paleobiodb.org/classic/basicTaxonInfo?taxon_no=43200 "Maximum range based only on fossils: base of the Langhian to the top of the Holocene or 15.97000 to 0.00000 Ma" https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43200&is_real_user=1
Minimum age of oldest fossil (stem group age): 13.82 Ma
"Maximum range based only on fossils: base of the Vallesian to the top of the Holocene or 11.60800 to 0.00000 Ma Minimum age of oldest fossil (stem group age): 8.7 Ma. https://paleobiodb.org/classic/checkTaxonInfo?taxon_n=43195&is_real_user=1
[125] https://www.britannica.com/animal/black-rhinoceros

Encyclopedia.com (Oxford University Press 2019): **"**Description and biology: The black rhinoceros is one of two species of rhinoceros found in Africa (the other is the white rhinoceros). Despite its name, the animal is ***actually gray in color***. An average black rhinoceros has a head and body length of 9 to 12 feet (2.7 to 3.7 meters), stands 4.5 to 5.25 feet (1.4 to 1.6 meters) tall at its shoulder, and weighs between 2,000 and 4,000 pounds (908 and 1,816 kilograms). The animal's huge size is deceiving, as it **can move quite quickly** when it decides to charge. It has very poor eyesight—it can see clearly only up to 30 feet (9 meters) away—but acute senses of hearing and smell. Rhinoceros means "horn nosed." The black rhinoceros has two horns on its snout. The front one is longer and can measure up to 53 inches (**135 centimeters**). The animal uses its horns (made of keratin fibers, the same substance as in human fingernails) to dig in the ground for mineral salt, to defend its territory against other rhinos, and to defend itself against predators such as lions and hyenas."[126]

"The black rhinoceros, black rhino or hook-lipped rhinoceros (*Diceros bicornis*) is a species of rhinoceros, native to eastern and southern Africa including Angola, Botswana, Kenya, Malawi, Mozambique, Namibia, South Africa, Eswatini, Tanzania, Zambia, and Zimbabwe. Although the species is referred to as black, its ***colours vary from brown to grey***. It is the only extant species of the genus *Diceros*."[127]

On 10 March 2023, after I had also finished the geological time scales here on the last few pages for the additional extant 3 genera *Didermocerus*, *Ceratotherium*, and *Diceros*, I checked the scientifically intriguing monograph of Donald R. Prothero: *The Evolution of North American Rhinoceroses*. (First published 2005, first paperback edition 2018) Cambridge University Press. 218 pp. (Format almost DIN A 4).[128]

At 18:37 (6:37 pm), I noted the following captivating comment on p. 208 by that staunch evolutionary scientist distinguished by an especially long list of paleontological investigations and publications on the rhinos ("my favorite group"[129]) – scientific and popular ones:

"However, ***the most striking thing about the overall pattern of rhinocerotid evolution is that of stasis***. Consistent with the predictions of the punctuated equilibrium model **most rhinocerotid species appear suddenly** with few transitions between other species, **and they are unchanged through most of their history**. This is true of nearly every genus described in this volume (Fig. 6.13), and especially so of long-lived but static species such as *Amphicaenopus platycephalus* and *Penetrigonias dakotensis*, *Diceratherium armatum* and *D. annectens* (both of which range through almost 11 m.y. of the Arikareean with no visible change from beginning to end), and all three species of *Peraceras* (Fig. 4.31). As Figures 4.27 und 6.13 show, *Aphelops megalodus* is extremely stable through entire Hemingfordian, Barstovian, and Clarendonian before the transformation kicks in to *A. malacorhinus* und *A. mutilus* in the Hemphilian.

Thus, although some limited examples of gradual change[130] can be documented in the rhinocerotids, ***the overwhelming pattern is one of stable species which show no measurable change over long periods of time***, consistent with the predictions of Eldredge and Gould (1972).

In case of any doubts, I would like to invite the mindful reader to carefully check my text presented above on the abrupt appearance and CONSTANCY/stasis the different rhino genera whether it is in agreement with this comment just quoted of the leading evolutionary biologist/paleontologist and specialist on the rhinoceroses.

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[126] https://www.encyclopedia.com/environment/applied-and-social-sciences-magazines/rhinoceros-black

[127] https://en.wikipedia.org/wiki/Black_rhinoceros (retrieved 10 Marcxh 2023)

[128] "Only scientists from before personal computers (let alone laptops) can realise how much work is in the book 'The evolution of North American rhinoceroses' of Prothero. It is impressive!" Book review www.PalArch.nl, webbased Netherlands scientific journal (2005) Book review by J. de Vos Dr. John de Vos Naturalis National Museum of Natural History. P.O. Box 9517, 2300 RA Leiden, The Netherlands. www.PalArch.nl, webbased Netherlands scientific journal (2005).

[129] Donald R. Prothero (2017): Evolution. What the fossils say and why it matters. Second Edition. Columbia University, New York (p. 329).

[130] Donald R. Prothero (2005/2018): The Evolution of North American Rhinoceroses, pp. 207/208: "Ever since the proposal of punctuated equilibrium by Eldredge and Gould (1972), paleontologists have looked at their perspective groups of fossils to see what they could contribute to the debate. **The excellent records of the rhinocerotids** in North America [as well as Europe and Asia] provides a fertile ground for testing such hypothesis.

Classically, paleontologists have looked at the transformation series of molarizing premolars seen in *Hyracodon*, *Trigonias*, and *Subhyracodon*, and interpreted this a gradual change through time (Fig. 7.6). But as Prothero (1996, fig.3) and Figure 2.8 in his volume show, there **is no progressive change through time**. Instead, **almost the full range of variants is present in a single population at a single time horizon**. There is no clear trend through time so that each successive population has only one possible premolar state, and the next population sample is a slightly more progressive state. Although there is a net change from unmolarized upper premolars at the beginning to fully molarized at the end, it is not a steady gradual progression, but a long period of stasis with high variability until the molarization process is concluded, and the upper premolars are static through the rest of their history. [W.-E. L. It seems that Mendelian recombination is involved.]

On the other hand, there are some gradual size changes in lineages through time, although Gould and Eldredge (1977) excluded size change from the debate about evolutionary patterns. There are some other changes that might be touted as gradual. In the male nasals of *Subhyracodon occidentalis*, *Diceratherium tridactylum* and *D. armatum*, there is a gradual increase in the ***number of individual specimens*** which show more robust nasals trending toward ridge-like rugosities and finally culminating in full-blown nasal ridges with rugose surfaces. Indeed there are even specimens (Fig. 7.7) which show the intermediate condition between classic nasals of *D. tridactylum* and *D. armatum* in beds found between both species [W.-E. L. Mendelian recombination within species and genera has been documented by Lönnig: http://www.weloennig.de/Artbegriff.html, see figs. in http://www.weloennig.de/AesIV2.A.1.html, http://www.weloennig.de/AesIV2.B.1.html, http://www.weloennig.de/AesIV2.B.7.html, http://www.weloennig.de/AesV1.1.Dege.html]. The increase in hypsodonty through time in *Aphelops* and *Teleoceras* might also be considered gradual. So would the increase of robustness of limbs (Fig. 7.5), although this could be plotted as a series of static populations with rapid changes in between."

Now: Where do all these Forms Come From?

According to most evolutionary authors not only the entire Family Rhinocerotidae with all its subfamilies, subtribes, genera and species[131] but also all the taxa of the other three families of the superfamily Rhinocerotoidea (see above) have evolved by natural selection of random/accidental/haphazard DNA mutations with "slight or even invisible effects on the phenotype" (as for Mayr, see also this footnote[132]), i.e. by "insensibly fine gradations" etc. ***from a clearly different family*** – the Family Hyrachyidae, Genus *Hyrachyus*[133] – the basic type generally described as "a lightly built animal", "resembling a tapir or small horse more than a rhino" having "relatively long necks" and displaying a "fast walking (cursorial) gait" – into the "heavy-boned later odd-toed ungulates":

Genus *Hyrachyus* (Family Hyrachyidae): Eocene 56.0 to 33.9 Ma.
CONSTANCY/stasis up to 22.1 Ma.

However, as has been pointed out above, the genera *Hyrachyus* and *Teletaceras* (the geologically first genuine/true rhino) lived ***contemporaneously*** for at least 14.7 Ma and that there is absolutely no proof that the one (*Hyrachyus*) slowly evolved into the other (*Teletaceras*) – neither by strict gradualism nor by the revised punk eek theory. And the idea that *Hyrachyus* generated *Teletaceras* by a macromutation directly, i.e. the appeal "to saltation as the source of the sudden origin of new perfections" (see footnote below) has also no scientific basis.

Moreover, the next genus mentioned above, the genus *Trigonias* – it also lived ***contemporaneously*** with the genus *Hyrachyus* for more than 8 Ma and 'any series of connecting/intermediate/continuous transitional links in the neo-Darwinian sense between these three genera has/have never been found'.

Now, *Subhyracodon* displayed a CONSTANCY/stasis up to 21.23 Ma. "Age range: base of the Chadronian to the top of the Hemingfordian or 37.20000 to 15.97000 Ma." It ***coexisted*** with *Trigonias* for almost 4 Ma.

Where does *Subhyracodon* come from? So far I could not find any thoroughly researched evolutionary hypothesis for the origin of this genus. "*Subhyracodon* first appeared in the late Eocene, about 37 million years ago (local

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[131] *Cf.* the long list in https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=43187&is_real_user=1

[132] https://de.wikipedia.org/wiki/Ernst_Mayr: "Ernst Walter Mayr (* July 5, 1904 in Kempten (Allgäu); † February 3, 2005 in Bedford (Massachusetts)) was a German-American biologist and **the main proponent of the modern synthetic evolutionary theory**" together with Dobzhansky, Ford, Simpson and Stebbins. "He received several major awards and is considered by many colleagues to be one of the most influential naturalists of the 20th century."

Some quotations of Mayr and Kutschera: "In due time it was realized that the spectacular De Vriesian mutations were exceptional phenomena and that the normal genetic changes were "small" mutations (Baur, East, Johannsen, Morgan) which […] have **only slight or even invisible effects on the phenotype**" (Mayr 1970, p. 169). Kutschera: "Macroevolution (evolution between species) is composed of numerous small microevolutionary steps (additive typogenesis)" – Kutschera 2001, p. 250. Or: "**Uncountable successive small microevolutionary steps have led to large changes in the body forms of organisms** in the course of millions of years (macroevolution, concept of additive typogenesis)" – Kutschera 2006, p. 204. Nach Hinweis auf Bergson und Driesch schreibt Mayr (1997, p. 33): "Others have appealed to **saltation** as the source of the sudden origin of new perfections. Such capitulations to the unknown have **had a paralyzing effect on the spirit of scientific inquiry**. They have proven themselves **utterly sterile pseudo-solutions and are unanimously rejected** by those who have a grasp on modern evolutionary theory and of modern genetics" (*Evolution and the Diversity of Life*, 1976, Fourth Printing 1997). Mayr, 1997, pp. 34, 35, 308/309 (Auszüge): "It is now believed that many, if not most, mutations have only slight effects **or are entirely invisible** because they affect only nonmorphological characters." […] "**The smaller the effect of a mutation, the greater the probability that it will be advantageous.**" […] "…indeed, there is **no difference between mutations and and the so-called small variations which Darwin** and the naturalists **had regarded as the principal material of evolution**."
http://www.weloennig.de/Hunderassen.Bilder.Word97.pdf p. 124.

[133] According to https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=58233&is_real_user=1 There are only two genera in this family – *Hyrachyus* (with 10 species) and *Subhyrachyus* (one species?)

stratigraphically outgoing Chadronian). It belongs to the oldest rhinoceroses of North America, older are largely only *Teletaceras* and *Uintaceras*."[134]

I have already pointed out that (as has also been mentioned by another author on the Middle and Late Eocene) "here *Subhyracodon* **occurs together** with its relative *Trigonias*" (and he adds) "but also frequent are finds of the early horse *Mesohippus* and the huge, almost 2 t heavy *Brontops*, which belongs to the Brontotheria (originally Titanotheria)".

As far as we know, neither *Trigonias* nor *Uintaceras*[135] have given rise to the tridactyl ("hands and feet") *Subhyracodon*.

And we have also discussed the problematic statement that "…the first horned rhino was the direct descendant of *Subhyracodon* named *Diceratherium* ("two horned beast")" and given reasons to reject this hypothesis ('natural selection acting on random mutations and variations' in the context of the waiting time problem and many additional points referred to or discussed above (including the molecular genetics of hair formation) and in articles enumerated on my homepage[136] as well as hundreds of commentaries elsewhere[137] being for a long series of different scientific reasons unconvincing/implausible/erroneous.

For *Diceraterium* (subfamily Diceratheriinae) an age range from Orellan (Early Oligocene)[138] 33.9 to Late Miocene 5.333 Ma (CONSTANCY/stasis of more than 28 Ma) is given, for the **first extant/'modern' genus *Rhinoceros*** (one-horned rhinoceros; subfamily Rhinocerotinae) Oligocene (Rupelian[139] 33.9 – 28.1 Ma) to present is noted – hence they lived ***simultaneously*** for >28 Ma (though *Diceraterium* in North America, but *Rhinoceros* in Europe and Asia).

So, where does the first extant/'modern' genus *Rhinoceros* (one-horned rhinoceros) come from? And from where originated *Diceraterium*?

Above I have cited Prothero and Schoch (Horns, Tusks, & Flippers 2002, pp. 263/264) in a longer footnote that "Life in the Oligocene looked very different

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[134] Original German Text: "*Subhyracodon* trat erstmals im späten Eozän vor rund 37 Millionen Jahren auf (lokalstratigraphisch ausgehendes Chadronium). Es gehört zu den ältesten Nashörnern Nordamerikas, älter sind weitgehend nur *Teletaceras* und *Uintaceras*." https://de.wikipedia.org/wiki/Subhyracodon (retrieved 17 March 2023). Und: "Ablagerungen … die dem mittleren und späten Eozän angehören. Hier tritt Subhyracodon zusammen mit seinem Verwandten Trigonias auf, häufig sind aber auch Funde des frühen Pferds Mesohippus und des riesigen, knapp 2 t schweren Brontops, welches zu den Brontotherien (ursprünglich Titanotherien) gehört."

[135] "*Uintaceras* is an extinct genus of medium-sized rhinoceros [see however below] that lived in North America (Wyoming and Utah) during the Middle Eocene, with only the type species *U. radinskyi*, named in 1997, currently contained within the genus. *Uintaceras* is the oldest and most primitive species of the Rhinocerotidae known to date, although it may have belonged to its own, currently unknown, separate family. […] *Uintaceras* weighed about 220 kilograms (490 lb) when fully grown.[…] It was a relatively slender animal and *Uintaceras* resembled a typical hyracodontid (e.g. *Hyracodon*), but differed from the hyracodonts due to the presence of a primitive **four-fingered hand** and a number of other features of the structure of the legs, which were clearly not intended for fast and long running." https://en.wikipedia.org/wiki/Uintaceras (As for the term "primitive" see notes and links above.) The genus is "differing from all other rhinocerotoids in possessing buccolingually compressed upper incisors with triangular profile" (Holbrock and Lucas 1997, p. 384 quoted from Prothero 2005/2018, p. 25). These specimen "have several synapomorphies (especially in the buccodistally compressed upper incisors, ***and in many parts of the postcranial skeleton***) which place them as ***sister-taxa of the rhinocerotoids***. However, *Uintaceras* appears to lack the crucial rhinocerotid synapomophies of the chisel-like I1 and tusk-like i2 and the loss of the M3 metastyle that Radinski (1966) and most later workers (e. g., Prothero et al., 1986; Prothero, 1998) used to define the Rhinocerotidae" (Prothero 2005/2018, p. 25). See please in this context also the comment above on "**heterobathmy**".

[136] See http://www.weloennig.de/internetlibrary.html and http://www.weloennig.de/literatur1a.html

[137] For instance https://evolutionnews.org

[138] "The Orellan North American Stage on the geologic timescale is the North American faunal stage according to the North American Land Mammal Ages chronology (NALMA), 34-32 million years ago. It is usually considered to fall within the Early Oligocene. The Orellan precedes the Whitneyan and follows the Chadronian NALMA stages." https://en.wikipedia.org/wiki/Orellan

[139] "The Rupelian is, in the geologic timescale, the older of two ages or the lower of two stages of the Oligocene Epoch/Series. It spans the time between 33.9 and 27.82 Ma. It is preceded by the Priabonian Stage (part of the Eocene) and is followed by the Chattian Stage." https://en.wikipedia.org/wiki/Rupelian

from what we have seen in the Eocene". Directly after the text quoted (until "the most abundant of ungulates") the authors continue as follows[140]:

> "In the midst of this the true rhinoceroses (Family Rhinocerotidae) make their appearance (Fig. 1 4. I). They were first known from the **middle Eocene of Asia and North America**, and looked very much like hyracodonts. The oldest known species is *Teletaceras radinskyi*, recently described from the middle Eocene of Oregon. Two features distinguish true rhinoceroses from other rhinocerotoids. The last upper molar has completely lost the crest along the back (Fig. 1 4.3). In addition, the **front teeth** are no longer simple pegs or spatulas, but developed into a ***shearing upper incisor and tusk-like lower incisor*** (Fig. 1 4. 11). This blade-tusk combination is not only efficient for feeding, but also served as an effective weapon. The living Indian rhino can use its tusks to slash very effectively, and elephants fear its tusks more than its horn. *Trigonias* typified the early Rhinocerotidae. Known from the late Eocene, it was cow-sized and had a very saddle-shaped head. Although it had developed the advanced blade-tusk incisors, it still had the rest of the incisors and the canines in the upper j aw. Later rhinos would lose these useless, peg-like teeth, so that only the tusks and the cheek teeth remained. Although *Trigonias* died out by the early Oligocene, one of its close relatives, ***Subhyracodon* survived until the late Oligocene and gave rise to later North American rhinos** (Fig. 1 4. 1 2). *Subhyracodon* is usually found in the ancient river channel deposits, so it was probably semi-amphibious like *Metamynodon*. Apparently, the amphibious lifestyle was popular among the rhinos. The teeth of *Subhyracodon* are not so high-crowned as those of *Metamynodon*, so it was probably a browser, not a grazer. *Subhyracodon* is not often found with *Hyracodon*, which lived on the grassy, open floodplains."

"*Subhyracodon* survived until the late Oligocene and ***gave rise to later North American rhinos***." Now, how could the second statement of this sentence be tested in agreement with the criteria formulated, for instance, by Sir Karl R. Popper?[141] So what do we really know?

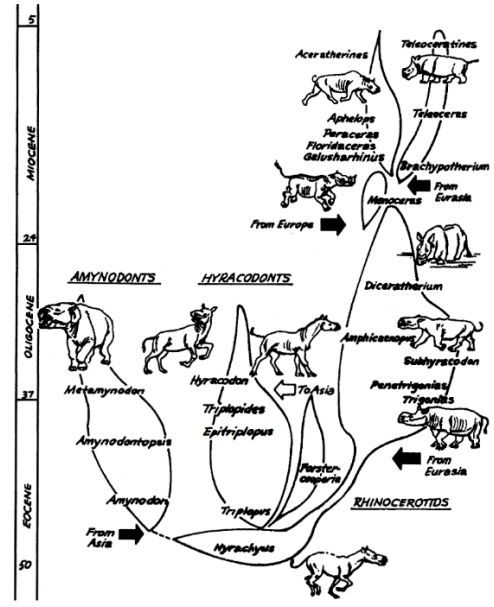

Figure 14.1. Family tree of rhinocerotoids in North America. (Drawn by C. R. Prothero).

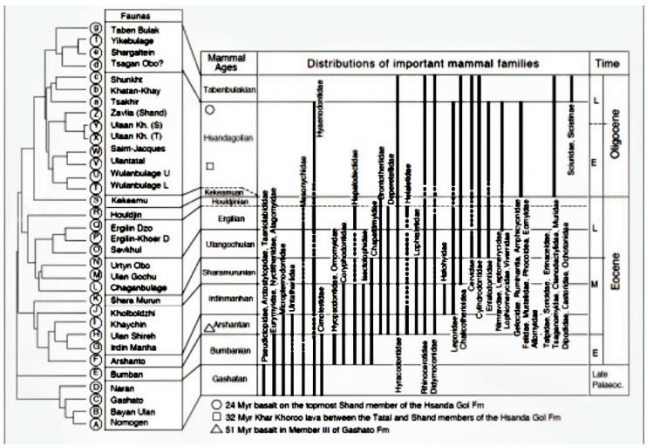

Figure 7.2. Dramatic drop in diversity of mammals in eastern Asia from the late Eocene (Ergilian) to the Oligocene (Hsanda Golian), which mirrors the transformation in Eocene-Oligocene mammal faunas from Europe and North America. (From Meng and McKenna, 1998; courtesy Meng Jin.)

In several of his books Prothero has reproduced the figure on the evolution of the rhinocerotoids shown on the left above (and already referred to in the context of *Teletaceras radinskyi*), but on the right he reproduced from Meng and McKenna the "dramatic drop in diversity of mammals in eastern Asia from the late Eocene (Ergilian) to the Oligocene (Hsanda Golian), *which mirrors the transformation in Eocene-Oligocene mammal faunas from Europe*" – which is in my view much more in agreement with his statement cited above that "most rhinocerotid species appear suddenly with few transitions between other species, and they are unchanged through

[140] First sentence already cited above.
[141] See please http://www.weloennig.de/OmnipotentImpotentNaturalSelection.pdf and http://www.weloennig.de/Popper.html

most of their history" – being also true for all the additional animal groups shown by Meng and McKenna.

Studying more closely Prothero's figure above on the evolution of the rhinocerotoids one may remark that it clearly demonstrates that his phylogenetic philosophy exists largely in contrast to his paleontological discoveries. As already pointed out above, he and many others view *Hyrachyus* as the progenitor and ancestor evolving in an almost continuous stream of descendants into all the other rhinocerotoid families (apart from some minute gaps not constituting real evolutionary problems) – so that this figure mostly consists of fantasy not knowledge.

Now let's contrast that figure with the true paleontological discoveries on the rhinocerotoids detected so far (surpassing the figure by Meng and McKenna concerning rhino details and the geological time frame according to PBDB 2023):

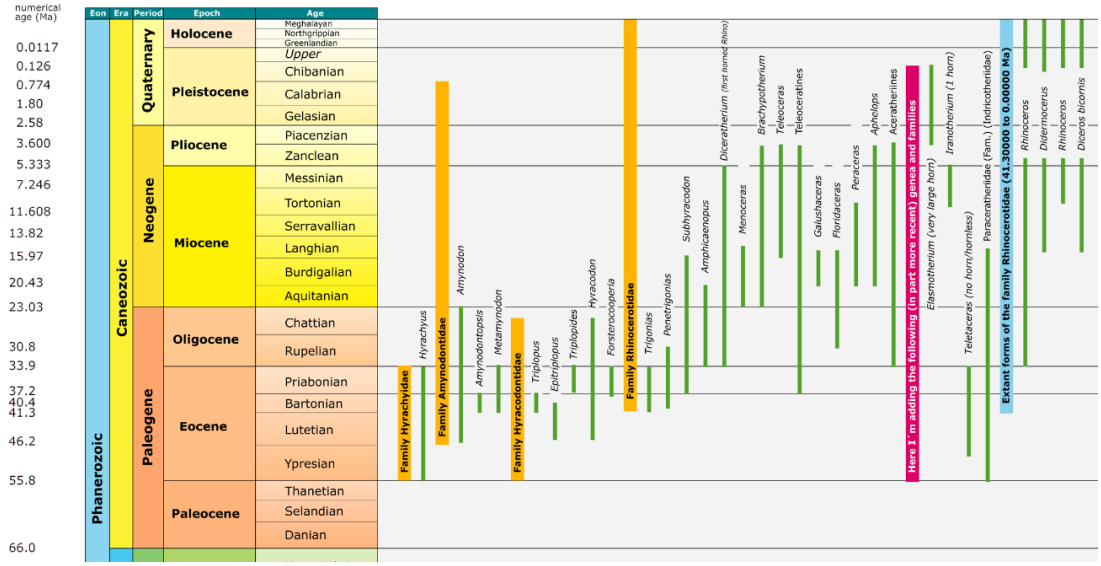

Figure on the chronological occurrence of the four families of the Rhinocerotoids: Hyracodontidae, Amynodontidae, Paraceratheriidae and Rhinocerotidae by Roland Slowik (Dietzenbach, Germany) for the present article (3 May 2023). The order follows the evolutionary representation in a figure given by Donald R. Prothero in several of his books (*cf.* figure above).

Family Hyrachyidae	**55.80000 to 33.90000 Ma**
Hyrachyus	56.00000 to 33.90000 Ma
Family Amynodontidae	**48.60000 to 0.78100 Ma**
Amynodon	46.20000 to 23.03000 Ma
Amynodontopsis	41.30000 to 37.20000 Ma
Metamynodon	41.30000 to 33.30000 Ma
Family Hyracodontidae	**55.80000 to 26.30000 Ma**
Triplopus	41.30000 to 33.90000 Ma
Epitriplopus	46.20000 to 40.40000 Ma
Triplopides	37.20000 to 33.90000Ma
Hyracodon	46.20000 to 26.30000 Ma
Forsterocoooperia	38.00000 to 33.90000 Ma
Family Rhinocerotidae	**41.30000 to 0.00000 Ma**
Trigonias	40.40000 to 33.30000 Ma
Penetrigonias	40.40000 to 30.80000 Ma
Subhyracodon	37.20000 to 15.97000 Ma
Amphicaenopus	33.30000 to 20.43000 Ma
Diceratherium	33.90000 to 5.33300 Ma (first horned Rhino/two horns)
Menoceras	23.03000 to 15.97000 Ma (two horns)
Brachypotherium	23.03000 to 3.60000 Ma
Teleoceras	16.90000 to 3.60000 Ma (one small horn)
Teleoceratines, subtribe Teleoceratina	37.20000 to 3.60000 Ma[142]
Galushaceras[143]	20.43000 to 15.97000 Ma

[142] https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=432605&is_real_user=1

[143] Could not find *Gelusharhinus* (?) presented in Figure 14.1, p. 26 (and repeatedly elsewhere) in Prothero's works (Drawn by C. R. Prothero), but D. R. Prothero noted a *Galushaceras* in his Fig. 4.1 of *The Evolution of North American Rhinoceroses*. Also, there he added ***Gulfoceras***, ***Skinneroceras***, ***Woodoceras*** for the Rhinocerotidae.

Floridaceras	30.80000 to 15.97000 Ma
Peraceras	20.43000 to 10.30000 Ma
Aphelops	20.43000 to 0.30000 Ma

Aceratheriines, tribe Aceratheriini 33.90000 to 3.20000 Ma[144]

Here I'm adding the following (in part more recent) genera and families

Elasmotherium	3.60000 to 0.12600 Ma[145] (1 very large horn[146])
Iranotherium	11.60800 to 5.33300 Ma (1 horn)
Teletaceras	48.6 (41.3) to 33.900 Ma[147] (no horn/hornless)
Paraceratheriidae (Fam.)	55.80000 to 15.97000 Ma (Indricotheriidae; no horn)[148]

Extant forms of the Family Rhinocerotidae (41.30000 to 0.00000 Ma)

Rhinoceros	33.9 Ma to present (LIVING FOSSIL) (1 horn)
Didermocerus	15.98 Ma to present (LIVING FOSSIL) (2 horns)
Ceratotherium simum	11.6 Ma to present (LIVING FOSSIL) (2 horns)
Diceros bicornis	15.98 Ma to present (LIVING FOSSIL) (2 horns)

Rhinoceros Hybrids

Annie P. Gray's (1971): *Mammalian Hybrids. A Check-List with Bibliography*[149] – being the most complete listing of all mammalian hybrids to that date – does not contain any examples of rhinoceros hybrids

However, there is a rather recent paper by Robinson et al. (2005): Interspecific hybridisation in rhinoceroses: Confirmation of a Black × White rhinoceros hybrid by karyotype, fluorescence in situ hybridisation (FISH) and microsatellite analysis. *Conservation Genetics* **6**: 141-145.

The geneticist Dr. Eugene M. McCarthy has excellently summed up the case as follows:

> "*Ceratotherium simum* [White Rhinoceros] × *Diceros bicornis* (♂) [Black Rhinoceros] These animals come into potential breeding contact in eastern and southern Africa, but it seems that no natural hybrids have been reported.
>
> Captive rhinoceroses in South Africa's National Zoological Gardens Game Breeding Centre produced a ***female hybrid*** (pictured at right, a, b and c [see original article by McCarthy]). ***The sire was a black rhino and the dam, a white rhino***. Because it was a hybrid, it was intentionally killed (often the policy at zoos in recent years) before maturity, so no data on its fertility could be collected. *D. bicornis* is critically endangered. The white rhinoceros has a diploid chromosome count of 2n=82, the black, 2n=84. The count in the hybrid was 2n=83. It had ears shaped like those of *D. bicornis* (see picture at right, a), but its upper lip was wide like that of *C. simum*, though it did have a upper-lip protrusion similar to, but smaller than the prehensile upper lip of the black rhinoceros (see picture, b). Robinson et al. 2005."[150]

From purely genetical species concept[151] these two genera could perhaps belong to just two *primary* species – unfortunately the hybrid was killed, so that most of the decisive further genetical data are missing.

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[144] https://paleobiodb.org/classic/checkTaxonInfo?taxon_no=96583&is_real_user=1 *Cf.* also fossilworks: http://www.fossilworks.org/cgi-bin/bridge.pl?a=taxonInfo&taxon_no=96583 "tribe Aceratheriini Dollo 1885 (rhinoceros)" …"Alternative spelling: Aceratherini …. Age range: 28.4 to 4.9 Ma"

[145] "*Elasmotherium* is an extinct genus of large rhinoceros endemic to Eurasia during Late Miocene through the Pleistocene, existing at least as recently as 39,000 years ago in the Late Pleistocene.[2] A more recent date of 26,000 BP is considered less reliable.[2] It was the last surviving member of Elasmotheriinae, a distinctive group of rhinoceroses separate from the group that contains living rhinoceros (Rhinocerotinae). The two groups are estimated to have split at least 35 million years ago according to fossils and molecular evidence." https://en.wikipedia.org/wiki/Elasmotherium (retrieved 11 April 2023)

[146] "A 2021 study challenges assumptions of *Elasmotherium* having had a horn by comparing its cranial dome and neck musculature to those of modern rhinos. The study finds that both are ill-suited for a large horn and more likely are indicative of a smaller horn, and that the dome could function as a resonating chamber of some sort, akin to that of *Rusingoryx* and hadrosaur crests." https://en.wikipedia.org/wiki/Elasmotherium Original paper: Titov V.V., Baigusheva V.S., Uchytel' R.S. 2021. The experience in reconstructing of the head of *Elasmotherium* (Rhinocerotidae) // Russian J. Theriol. Vol.20. No.2. P.173–182. doi: 10.15298/rusjtheriol.20.2.06 "A relatively small narrow terminal horn-like cornified pad was attached at nasal and intermaxillary bones' end, it served to loosen and dig up soil for lants' succulent underground parts searching."

[147] Which – as pointed out above – was not mentioned in the Figure.

[148] Details on the genera: see above

[149] Published by Commenwealth Agricultural Bureaux, Farnham Royal, Slough SL2 3BN, England.

[150] http://www.macroevolution.net/rhinoceros-hybrids.html

[151] *Cf.* http://www.weloennig.de/Artbegriff.html See http://www.weloennig.de/AesIV3.html IV.3. DER GENETISCHE ARTBEGRIFF. See also http://www.weloennig.de/AesIV3.Fr.html ("Die Unterschiede zwischen Maultier (Mutter: Pferd) und Maulesel (Mutter: Eselin)")

Nevertheless, concerning the paleontological data presented above these preliminary results on the hybrid between *Ceratotherium simum* [11.6 Ma to present] × *Diceros bicornis* [15.98 Ma to present] remind me of Gould's verdict on some of the systematic practices of "oversplitting" obviously still applied in recent paleontology – could the following comments not also be relevant for further rhinoceros species and even some genera?

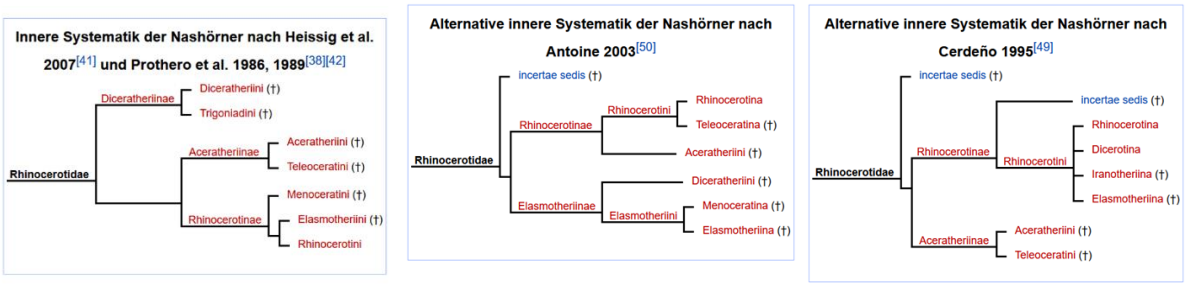
> "I don't doubt, of course, that past taxonomic practice, ***often favoring the erection of a species name for every morphological variant*** (even for odd individuals rather than populations), has greatly inflated the roster of legitimate names in many cases, particularly for fossil groups last monographed several generations ago. (Our literature even recognizes the half-facetious term "monographic bursts" for ***peaks of diversity thus artificially created***. But this problem of past oversplitting cannot be construed as either uniquely or even especially paleontological, for neontological systematics then followed the same practices as well.) The ***grossly uneven, and often greatly oversplit, construction of species-level taxonomy*** in paleontology has acted as a strong impediment for the entire research program of the prominent school of "taxon-counting" (Raup, 1975, 1985). For this reason, **the genus has traditionally been regarded as the lowest unit of rough comparability in paleontological data** (see Newell, 1949). Sepkoski (1982) therefore compiled his two grat compendia – the basis for so much research in the history of life's fluctuating diversity – at the family, and then at the genus, level (***but explicitly not at the species level in recognition of frequent oversplitting*** and extreme imbalance in practice of research among specialists on various groups)."[152]

Interestingly, Prothero has already importantly revised the species numbers as summed up by J. de Vos in his book review of *The Evolution of North American Rhinoceroses* as follows:

> "In the 'History of investigation' (p. 18 and 19) all species are mentioned with the author, who created it and the present status. ***I counted 120 species***, which were created in the course of time ***from 1850 (author: Leidy) until 1999 (author: Albright)***. Al those species were reduced to ***37 species within 17 genera*** (if I counted well), based on good arguments."

Probably the numbers will be further reduced when additional genetical data will be available in the future – data on hybrids that could be relevant for the creation of the names of rhino species and genera as coined also for the rhino fossil forms of the past.[153]

Contradictory Phylogenetic Schemes for the Family Rhinocerotidae



We could now almost endlessly discuss the differences and contradictions between these[154] and further phylogenetic schemes, but these are so directly obvious that I may be allowed to invite my readers to do it themselves. Although some recent

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[152] See references in http://www.weloennig.de/ElephantEvolution.pdf

[153] Perhaps for the case *Ceratotherium simum* [11.6 Ma to present] × *Diceros bicornis* [15.98 Ma to present] a genetic phenomenon similar to the horse/donkey crosses may be detected. Check please the chapter DIE FRAGE NACH DEN ANWENDUNGSMÖGLICHKEITEN DES LAMPRECHTSCHEN ARTBEGRIFFS IN DER SYSTEMATISCHEN PRAXIS http://www.weloennig.de/AesIV3.Fr.html - see there „Old Bec" or Chandley (somewhat after my comments on *Quercus* and *Ursus*).

[154] https://de.wikipedia.org/wiki/Nash%C3%B6rner (retrieved 15 April 2023). There are also further examples in the text and figures.

commentators are of the opinion that the research by Liu et al. (2021)[155] has produced the final answer for the relationships between the different groups within the Rhinocerotinae, there are still many open questions[156], even within this subfamily[157].

Bonebeds

Menoceras sp. bonebed (fossil rhinoceros) (Harrison Formation, Lower Miocene; Nebraska, USA)
Posted by James St. John (4 November 2019)[158]

Moreover, for this article I would like to draw the reader's attention to perhaps the most impressive facet of rhinoceros fossil bones. Prothero and Schoch commented (2002, p. 265; *cf.* reverence above) on the *Agate Fossil Beds National Monument*:

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[155] Shanlin Liu, Michael V. Westbury, Nicolas Dussex, Kieren J. Mitchell, Mikkel-Holger S. Sinding, Peter D. Heintzman, David A. Duchêne, Joshua D. Kapp, Johanna von Seth, Holly Heiniger, Fátima Sánchez-Barreiro, Ashot Margaryan, Remi André-Olsen, Binia De Cahsan, Guanliang Meng, Chentao Yang, Lei Chen, Tom van der Valk, Yoshan Moodley, Kees Rookmaaker, Michael W. Bruford, Oliver Ryder, Cynthia Steiner, Linda G.R. Bruins-van Sonsbeek, Sergey Vartanyan, Chunxue Guo, Alan Cooper, Pavel Kosintsev, Irina Kirillova, Adrian M. Lister, Tomas Marques-Bonet, Shyam Gopalakrishnan, Robert R. Dunn, Eline D. Lorenzen, Beth Shapiro, Guojie Zhang, Pierre-Olivier Antoine, Love Dalén, M. Thomas P. Gilbert (2001): Ancient and modern genomes unravel the evolutionary history of the rhinoceros family. *Cell* **184**: 4874 – 4885: https://www.sciencedirect.com/science/article/pii/S0092867421008916 (full article)

[156] "A study from 2021 sees the geographical variant confirmed. According to their results, today's two Asian and one African lineages split off from each other in the Middle Miocene around 15.6 million years ago. The formation of land connections between the African and Eurasian continental masses in the Lower Miocene is discussed as the cause for this. The Asian lineage, in turn, split into the Dicerorhinina and the Rhinocerotina only a little later, about 14.8 million years ago. [According to this opinion] The highly endangered Sumatran rhinoceros is the only surviving species of the Dicerorhinina. However, the rhinoceros genera *Coelodonta* with the well-known woolly rhinoceros and *Stephanorhinus*, to which the lesser-known forest rhinoceros belongs, which were widespread over large parts of northern Eurasia during the Pleistocene, are also assigned to these species.[46] Their diversification began in the Upper Miocene around 9.4 million years ago. The Rhinocerotina, which include two species, the endangered armoured rhinoceros (*Rhinoceros unicornis*) and the highly endangered Java rhinoceros (*Rhinoceros sondaicus*), did not complete their split until the Lower Pliocene, a good 4.3 million years ago. On the African continent, meanwhile, the lineages of the white rhinoceros (*Ceratotherium simum*) and the black rhinoceros (*Diceros bicornis*) as members of the Dicerotina had already genetically diverged from each other by the end of the Miocene, about 6.8 million years ago.[44] ***Other molecular genetic studies, however, yielded much older radiation data*** ["In evolutionary biology, adaptive radiation is a process in which organisms diversify rapidly from an ancestral species into a multitude of new forms…"]. According to this, *the split of the recent rhinoceroses already began in the Lower Oligocene about 29 to 30 million years ago*. ***Here, the Dicerorhinina formed first with a split of the Coelodonta-Stephanorhinus lineage a good 21 million years ago in the Lower Miocene.***[47] The African Dicerotina, in turn, formed today's lineages about 17 million years ago, while those of the Asian Rhinocerotina differentiated about 11.7 million years ago.[33][48] The Rhinocerotina of Africa, on the other hand, formed the Rhinocerotina of the Middle East and the Rhinocerotina of Asia." https://de.wikipedia.org/wiki/Nash%C3%B6rner (retrieved 15 April 2023).

Regarding the uncertainties of molecular phylogenetic trees, compare please also Stephen C. Meyer (2013): Darwin's Doubt (especially Chapter 5: The Genes Tell the Story? Pp. 98 -113 and Chapter 6: The Animal Tree of Life, pp. 114 - 135. HarperOne, New York.
Or: https://evolutionnews.org/2014/01/clocks_versus_r/
(Clocks versus Rocks) and pp. 190 – 193 of http://www.weloennig.de/Utricularia2011Buch.pdf

[157] https://www.mineralienatlas.de/lexikon/index.php/FossilData?fossil=Rhinocerotinae

[158] https://commons.wikimedia.org/wiki/File:Menoceras_sp._bonebed_%28fossil_rhinoceros%29_%28Harrison_Formation,_Lower_Miocene;_Nebraska,_USA%29_5_%2832387086042%29.jpg (retrieved 18 April 2023).

> "A typical slab of bones from Agate. It contains about 4300 bones and skulls, mostly of the rhino *Menoceras*." P. 266: One slab of sandstone with an area of 44 square feet contained 4300 skulls and separate bones (Fig. 1 4. 1 4C). **At that rate, one of the hills could contain 3,400,000 bones belonging to at least 17,000 skeletons! Over 16,000 of these belong to the little rhino, *Menoceras***."

Many geologists and paleontologists are still predominantly working with the paradigm of Lyell's uniformitarianism/actualism trying to interpret, if possible, everything in agreement with this concept.

Concerning the question: "How did such an incredible concentration of bones get there?" – The authors assert the following scenario (p. 266) (what Scott Kottkamp et al. (2020, p. 21) have called "***the current hypothesis***" put forth by Dr. Hunt 1992)[159]:

> "By looking at the wear on the teeth, the ***approximate age*** of each individual can be ***estimated***. Bob Hunt has studied the age structure of Agate *Menoceras* and finds that there are far more old individuals than could be expected if they were all killed by a single, catastrophic event, such as a flood. Instead, this kind of population structure occurs with normal attrition due to the death of older individuals, and so represents a long term accumulation of rhino bones around an ancient water hole, possibly due to droughts. If they had been killed by a catastrophic flood, there would have been far more juveniles and adults in the prime of their lives, and fewer old individuals."

Granted that the "approximate age of each individual" was correctly "estimated" and the investigations could justly be extrapolated to (best) both of the hills, this scenario of "***a long term accumulation*** of rhino bones around an ancient water hole, possibly due to droughts" – now, could that not mean (at least for certain periods of time) that many juveniles were malnourished and thus did not reach the prime of their lives[160], so that finally they would have been underrepresented even "if they had been killed by a catastrophic flood", "a single catastrophic event"?[161]

The paper(?) of Bob Hunt is not listed in the references of the book of Prothero and Schoch. Also, Kottkamp et al. speak of "***a mass mortality event*** around a watering hole caused by drought"[162]. Yet I have to add that Prothero listed Hunt's contribution in the references of his book *The Evolution of North American Rhinoceroses* 2005/2018, p. 212, as

> "Hunt, R.M., Jr. 1992. Death at a 19-million-year-old waterhole: the bonebed at Agate Fossil Beds National Monument, western Nebraska. *Museum Notes, University of Nebraska State Museum, 83, 1-6.*"[163]

Unfortunately, so far I could not detect & investigate the 6 pages of that report.

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[159] Scott Kottkamp, Vincent L. Santucci, Justin S. Tweet, Jessica De Smet, and Ellen Stark (2020): Agate Fossil Beds National Monument, Paleontological Resources Management Plan (Public Version). University of Nebraska – Lincoln, DigitalCommons@University of Nebraska – Lincoln, U.S. National Park Service Publications and Papers National Park Service.

[160] Kottkamp, p. 23: "Over time, several hypotheses were put forth by researchers to explain the bonebed's origin. … Of these hypotheses, the currently favored hypothesis is a prolonged drought exacerbated by the animals eating all vegetation within walking distance of the waterhole that would become the bonebed, which would have been one of the sole sources of water during the drought (Hunt 1992).

[161] Perhaps their emphatic exclusion of "a singe catastrophic event" was especially meant to critique statements of creationists like Morris and Whitcomb (1967) referring in their book *The Genesis Flood*, p. 161, by a picture and their comment to "the well known "bone bed" at Agate Springs, Nebraska, a stratum in which thousands of bones of fossil mammals have been found. **The bone layer** … **has evidently been water-laid**."

[162] P. 21: "Dr. Hunt also studied the stratigraphy and depositional environments of AGFO, putting forth the current hypothesis that the bonebeds of AGFO were created by a mass mortality event around a watering hole caused by drought (Hunt 1992)."

[163] https://museum.unl.edu/collections/publications/museum-notes.html Number 83. Death at a 19 Million Year-old Waterhole: The Bonebed at Agate Fossil Beds National Monument, Western Nebraska. Reports on the discovery and initial excavations of the bonebed, the people involved, and the University excavations from 1981-1990. (1992) (6 pages). (Retrieved 21 April 2023)

Several renowned (mostly 20th century) non-creationist authors, like Immanuel Velikovski[164], Heribert Nilsson, and also acknowledged paleontologists and/or geologists as Edgar Dacqué, Otto H. Schindewolf, Derek Ager, Kenneth J. Hsü, Alexander Tollmann and David M. Raup, have been criticized for their more or less pronounced departure from strict Lyellism.

However, there are also more recent exceptions to Lyell's uniformitarianism/actualism. See, for example, Philip J. Currie (2023): *Celebrating dinosaurs: their behaviour, evolution, growth, and physiology* (Canadian Journal of Earth Sciences 60: 263 – 293). Just a few glimpses (for the entire article see https://cdnsciencepub.com/doi/full/10.1139/cjes-2022-0131[165]): P. 266: "The Albertosaurus painting by Michael W. Skrepnick shows the aftermath of a different storm, where numerous bodies of the tyrannosaur have accumulated at the bottom of a stream after a catastrophic death event."

> And p. 283: "…we can assume that the gigantic monodominant bonebeds of Centrosaurus, Edmontosaurus, Maiasaura, Pachyrhinosaurus (Fiorillo and Tykoski 2022), Saurolophus, Styracosaurus, and other animals represent herds of these animals that encountered catastrophic conditions when they were passing through the regions. P. 284: "By the 1960s, a new approach emerged with the discovery of an ***iridium anomaly at the end of Cretaceous deposits in both marine and terrestrial beds around the world.*** It was assumed initially that the widespread occurrence of concentrations of this rare-earth element indicated a catastrophic event from an extraterrestrial source (possibly a supernova, or more likely an asteroid that collided with our planet)"…. "The idea of the collapse of Cretaceous faunas and floras being caused by an extraterrestrial event has received widespread but not universal support in the intervening years."[166]

Anti-creationist organizations like the NCSE commented:

> "Modern geologists are well aware that **violent events have played a part in the earth's history**. The earth bears the scars of numerous giant meteorite impacts. The Channeled Scablands of Washington were apparently eroded by a catastrophic flood caused by the failure of an ice-dam holding back a lakeful of glacial meltwater. Some scientists suggest that a comet struck the earth near the end of the Cretaceous era, resulting in the mass extinctions of species

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[164] Velikovski's conclusion "***On the Agate Spring Quarry***" (1956, p, 61): "Tens of thousands of animals were carried over an unknown distance, then smashed int a common grave. The catastrophe was most probably ubiquitous, for these animals – the **small twin-horned rhinoceros**, clawed horse, giant swine – , and gazelle camel – did not survive, but became extinct… And the very circumstances in which they are found bespeak a violent death at the hands of the elements, not slow extinction in a process of evolution."

And p. 94: "Evidence of great upheavals has been brought forth from the islands of the Arctic Ocean and the tundras of Siberia; from the soil of Alaska; from Spitsbergen and Greenland; from the caves of England, the forest-bed of Norfolk, and the rock fissures of Wales and Cornwall; from the rocks of France, the Alps and Juras, and from Gibraltar and Sicily; from the Sahara and the Rift of Africa; from Arabia and its harras, the Kashmir slopes of the Himalayas, and the Siwalik Hills; from the Irrawaddy in Burma and from the Tientsin and Choukoutien deposits in China; from the Andes and the Altiplano; from the asphalt pits of California; from the Rocky Mountains and the Columbia Plateau; from the Cumberland cave in Maryland and **Agate Spring Quarry** in Nebraska; from the hills of Michigan and Vermont with skeletons of whales on them; from the Carolina coast; from the submerged coasts and the bottom of the Atlantic with its Ridge, and the lava bottom of the Pacific.

With many other places in various parts of the world we shall deal in some detail in the pages that follow; but we shall not exhaust the list, for there is not a meridian of longitude or a degree of latitude that does not show scars of repeated upheavals."

Albert **Einstein** commented on Velikovski's theories; "**The proof of "sudden**" changes (p. 223 to the end) **is quite convincing and meritorious**. If you had done nothing else but to gather and present in a clear way this mass of evidence, you would have already a considerable merit. **Unfortunately, this valuable accomplishment is impaired by the addition of a physical-astronomical theory to which every expert will react with a smile or with anger**—according to his temperament; he notices that you know these things only from hearsay—and do not understand them in the real sense, also things that are elementary to him. …To the point, I can say in short: catastrophes yes, Venus no." ― Albert Einstein, The Pseudoscience Wars: Immanuel Velikovsky and the Birth of the Modern Fringe. Michael D. Gordon. https://www.goodreads.com/quotes/tag/immanuel-velikovsky

[165] One need not necessarily follow Curry uncritically on the ensuing point (p. 263, and later in more detail pp. 279 – 282): "Furthermore, it is now acknowledged by most biologists and palaeontologists that modern birds are the direct descendants of dinosaurs, and that they are classified as part of the Dinosauria." See the discussion of Are Birds Living Dinosaurs? A review of Alan Feduccia's most recent book (2020): Romancing the Birds and Dinosaurs: http://www.weloennig.de/Feduccia2020.pdf (Comment by Feduccia (mail of 20 February 2021): "Dear Wolf-Ekkehard, Your splendid review is well-written and among the most detailed, expansive critiques I have seen; it is a truly outstanding essay and I appreciate your attention to this important biological issue. After all, that "birds are living dinosaurs" is considered the most important paleontological breakthrough of the last century."

[166] More in the original paper.

> characteristic of that time. Indeed, the British geologist ***Derek Ager holds that violent events and processes are responsible for much of the geologic column***, and he calls himself "**an unrepentant neo-catastrophist**."[167]

United States National Park Service (January 4, 2018[168]): Agate Fossil Beds National Monument[169], Nebraska (on the "fossilized remains of life of 20 million years ago"):

> "**Whatever the pattern of dying might have been**, we know that *Menoceras* left untold numbers of skeletons on the broad, flat, and dry bottom of the ancient Niobrara.
>
> Finally, the rains fell in the mountains to the west. The river filled with water again and ran in sheets across the plain. At Agate the **millions of *Menoceras* bones** and lesser numbers of the bones of other animals were swept for a few hundred meters downstream and into some sort of backwater or river lake—possibly a great meander, or an oxbow lake. There, like a gigantic mass of jackstraws, they were piled in a tangled mat 30 centimeters (12 inches) 37 thick, covering an unknown number of hectares. All we really know is that they were moved far enough to get thoroughly jumbled, but not far enough to be badly broken or much eroded by the action of the water.
>
> The mass of bones was soon buried by the sands and silts dropped by the reborn river, and by wind-carried debris swept off the parched land. Once buried, the bones were partially petrified by mineral water flowing beneath the surface. The land was built up a few hundred meters by sediments continually brought down from the mountains to the west. Eventually, continued uplifts of the Rockies and the Great Plains combined with erosional cycles to leave the modern Niobrara River. The two erosional remnants known today as Carnegie and University Hills were produced by the cutting of the modern river system. On the sides of these hills were exposed **the tangle of bones which marked the site of ancient tragedy**."

Future research will show whether the present uniformitarian basics of the presentation on the Agate Fossil Beds by the United States National Park Service (as well as in several additional publications) will be the last word. At present any hint at Georges Cuvier's catastrophism[170] with the Biblical Flood in the background as the last worldwide cataclysm is usually rather uncritically rejected by all official societies of geology and paleontology known to me.

Rhinoceroses and Intelligent Design (ID)

In the "Background for this Article on Gradualism, Punctuated Equilibrium (Punk Eek) and ID", I have emphasized with Dembski that in this method of ID detection there is "no magic, no vitalism, no appeal to occult forces" involved (likewise Behe and others). And, indeed: "Inferring design is widespread, rational, and objectifiable." And "hardly a dubious innovation, Intelligent Design formalizes and makes precise something we do all the time. All of us are all the time engaged in a form of rational activity which, without being tendentious, can be described as inferring design. Inferring design is a perfectly common and well-accepted human activity" with reference to the details given in three of my articles (see please there).

I also cited Siegfried Strugger that "The cell is the most perfect cybernetic system on earth. In comparison to the cell, all automation of human technology is only a primitive beginning of man in principle to arrive at a biotechnology" and argued that "if the first steps on the way/the path to the ingenious level of cybernetic complexities of the cell, i.e. the "primitive beginning" in Strugger's formulation, demands

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[167] NCSE/National Center for Science Education (1983): https://ncse.ngo/scientific-creationists-are-not-catastrophists
[168] https://www.gutenberg.org/files/56303/56303-h/56303-h.htm#c3
[169] Given as "the author" without name(s).
[170] Nevertheless, Gordon L. Herries Davies mentioned in his review (in *Nature* **365**, p. 115) of Derek Ager's book The New Catastrophism: The Importance of the Rare Event in Geological History. Cambridge University Press (1993) that "**One of Ager's heroes is Cuvier**." "Georges Cuvier gilt als wissenschaftlicher Begründer der Paläontologie und machte die vergleichende Anatomie zu einer Forschungsdisziplin." ("Georges Cuvier is considered the scientific founder of palaeontology and led comparative anatomy to become a research discipline.") https://de.wikipedia.org/wiki/Georges_Cuvier (retrieved 29 April 2023)
"Cuvier … was instrumental in establishing the fields of comparative anatomy and paleontology through his work in comparing living animals with fossils." https://en.wikipedia.org/wiki/Georges_Cuvier

conscious action, imagination, perception, intelligence, wisdom, mental concepts, spirit and mind – *all being already absolutely necessary for the basic start*, – so ***how much more so does this have to apply to the origin of the infinitely more complex cybernetic systems of the life forms themselves***."

Later, with paleontologist Oscar Kuhn, I have referred to "one of the greatest morphologists that ever lived" Jean Louis Agassiz, who had attributed the different degrees in the gradation of the (typical) similarities of life forms to a creation plan [i.e. intelligent design], not to evolution by, in Darwin's words, "infinitesimally small changes", "infinitesimally slight variations" and "slow degrees" and "steps not greater than those separating fine varieties", "insensibly fine steps" and "insensibly fine gradations", for natural selection "***can never take a leap***, but must advance by the shortest and slowest steps" – "***natura non facit saltum***" (Darwin) see also Mayr[171] and Kutschera as cited above).

Moreover "A single variable population" – in this case for "the entire large indricothere data set" (Paraceratheriidae/Indricotheriidae) – appears to speak much more for an intelligently designed basic type with a large genetic potential for the realization of a range of more or less different life forms also within that family.

In the context of hybrid "*Ceratotherium simum* [White Rhinoceros] × *Diceros bicornis* (♂) [Black Rhinoceros] I have stated that from a purely genetical species concept these two genera could perhaps belong to just two *primary species* – unfortunately the hybrid was killed, so that most of the decisive further genetical data are missing.

As a side note, the waiting time until coordinated mutations get fixed in regulatory sequences, excludes all Darwinian theories.

In a *Synopsis* Michael J. Behe and Stephen C. Meyer explain the inference to design as follows (2018):

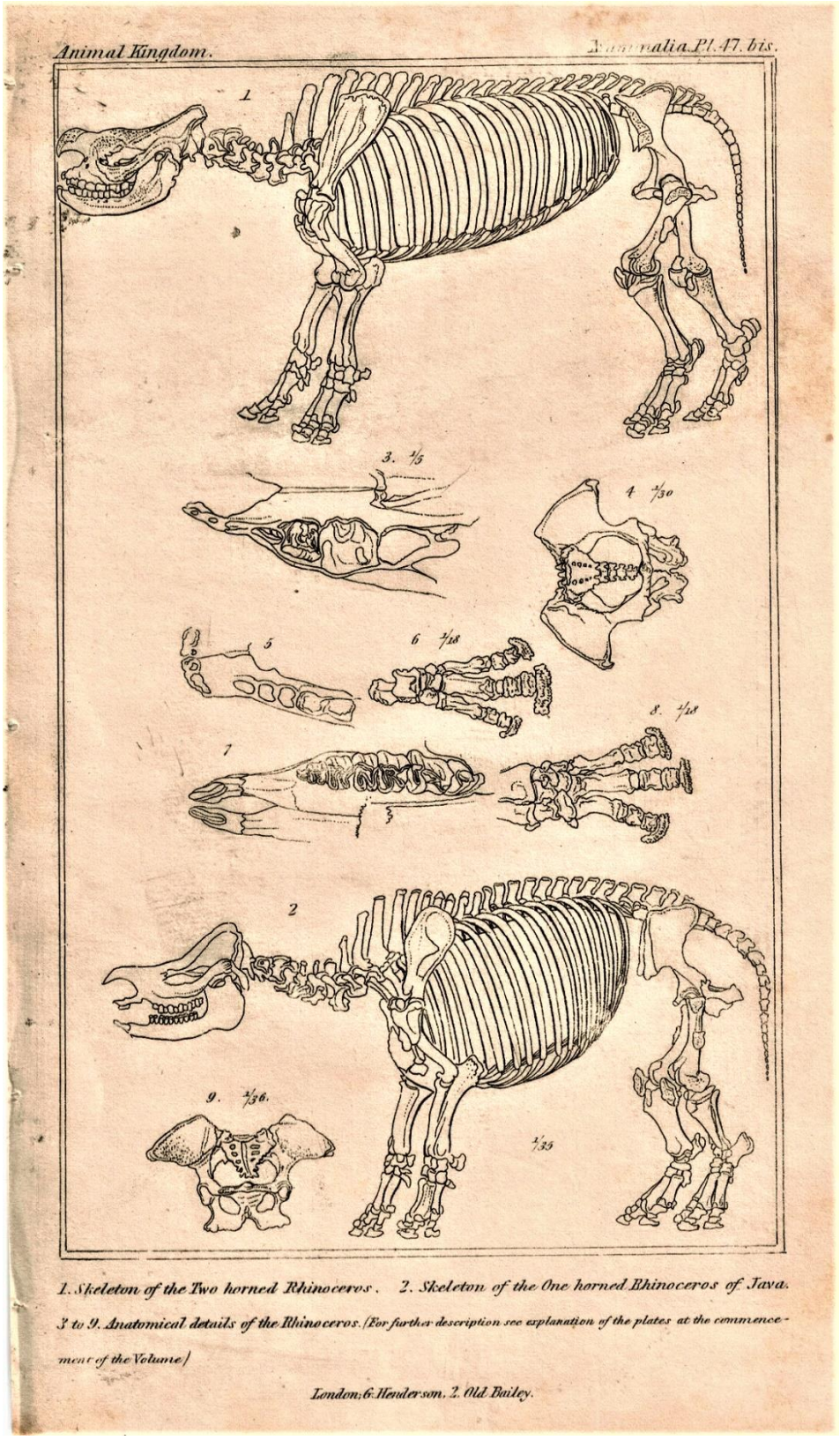
> "How do we recognize design? How do we realize that something has been put together intentionally by an intelligent agent? What is intelligent design? Our minds recognize the effects of other intelligent beings when we see ***the purposeful arrangement of parts***, such as the letters and words in a book. Or, the intentional design of something like Mt. Rushmore. *We know from our own experience that such things as books and art only come from one source, a mind. So, when we see* ***intentionally designed systems, purposeful arrangement of parts, we know that at an intelligent agent, a mind, must be the cause.*** The theory of intelligent design simply says that certain features of the universe and of living things **are best explained by an intelligent cause, not an undirected process such as natural selection**."[172]

Hence, the basic question for our topic is: are there certain features in the Rhinocerotidae speaking of a "purposeful arrangement of parts", of "intentional design", so that are "best explained by an intelligent cause, not an undirected process such as natural selection?" – Considering the ensuing facts, the reader is

[171] Also Mayr 1979, p. 84: "Es ist heute unbestritten, dass es keine saltatorische Evolution gibt" ("Today it is undisputed that there is no saltatoric evolution"). http://www.weloennig.de/AesLiM.html

[172] https://www.discovery.org/v/what-is-intelligent-design/ and https://www.youtube.com/embed/7ToSEAj2V0s?showinfo=0&start=781

invited to answer that question for him/herself. So, let's start with a figure by the ***scientific founder comparative anatomy and paleontology***, the design proponent Georges Cuvier:



https://historicaccents.com/products/8098-anatomy-and-skeleton-of-one-and-two-horned-rhino-1837-engraved-cuvier-print

As for the designation of the different skeleton parts (and also of the muscles), see please the figures by Gregg Hierholzer in the footnote below.[173]

Let's have a brief look at some of the distinguishing features of the Rhinocerotidae – which should be mentioned? (As for the horns – see above)

The leading evolutionary biologist of the Rhinos answers rather correctly:

> "So, if neither horns nor any rhino body shape are diagnostic of a fossil rhino, how can we tell if it's a rhino in the first place? There are ***many distinctive features of the skull and skeleton that allow a paleontologist to recognize a rhino***, **but the easiest and most distinctive features to recognize are its teeth**. More than any other anatomical structure, mammalian paleontologists study and use teeth to identify mammal fossils.
>
> …In the case of rhinos, they adopted a cheek-tooth pattern that became stereotyped very early in their evolution about 50 Ma. Most rhinos have **upper molars** (the last three cheek teeth that erupt without replacing a "baby tooth") with **three cross-crests forming a Greek letter pi (π)** (Fig. 4.2). In addition, most advanced rhinos have **premolars** (the first three or four cheek teeth, which replace the baby teeth when the animal grows up) **that also have a pi (π) pattern**, or something that approaches it. By contrast, the **lower molars** have crown pattern that looks like a set of the **letter L** attached to one another (Fig. 4.3). There are details of the cross-crests, as well as the presence or absence of additional crests or cusps, the shape and angle of the crest, narrow shelf-like structures ("cingula") around the base of the tooth, and so on that help a paleontologist recognize specific rhinos, ***but the general pattern is pretty consistent within the entire group***."

However, I think that it is not unimportant that he also notes the following points:

> There are **other details of the skull region** (especially the base of the skull and ear region) and the top of the skull (especially the **nasal region**) and **skeleton** (certain features of the limb bones) that help identify a fossil rhino, but the first thing that a good paleontologist notices is the teeth. If they show these characteristic patterns, they belong to a rhino and the paleontologist then needs to ask, "What kind of rhino is it?"[174]

So, do these features (not to mention the conforming/corresponding/correlative musculature and physiology) of the Rhinocerotidae speak of a "purposeful arrangement of parts", of "intentional design", so that they are "best explained by an intelligent cause, not an undirected process such as natural selection?"

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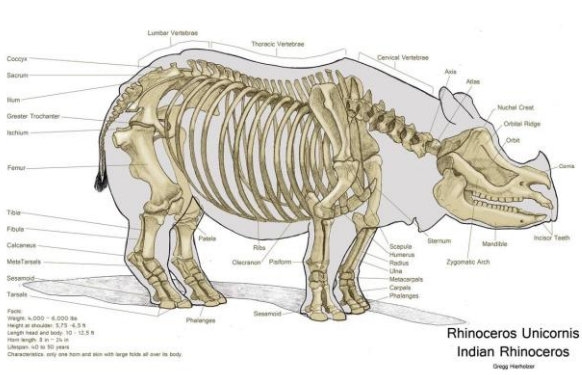
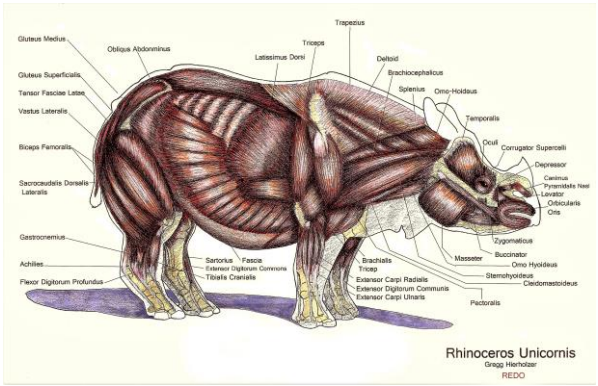
[173] *Rhinoceros unicornis* by Gregg Hierholzer (2013): Skeleton and the muscular system (the general anatomy of the one horned and two horned rhinoceroses is the same). https://www.pinterest.at/pin/337981147033977610/ and https://www.pinterest.at/pin/205687907965503019 / To be readable, this part of the PDF has **to be strongly enlarged or check the links to the original figures**.





Cf. please also the excellent *Rhino Anatomy Analysis* by Daniel Lin (Tien Yu): https://daniellin30.artstation.com/projects/xzQAJX

[174] Prothero, Donald R. p. 54 of *Rhinoceros Giants*. Indiana University Press. Kindle-Version.

It can hardly be doubted that an enormous amount of *specified complexity*[175] characterizes the rhinos (and, of course also any other animal group like the giraffes and elephants), and most probably also many systems of *irreducible complexity* (see research projects for ID for the giraffe, most of which can, in principle, also be applied to the rhinos: http://ad-multimedia.de/evo/long-necked-giraffe_mU.pdf pp. 63-66).

Back to Georges Cuvier. In the afore mentioned book on the giraffe I have discussed the reasons or the biological basis for the absence of Darwin's continuous evolutionary series (pp. 24 – 28). To put it now as a question: Could this absence be a consequence of the functional limits due to the law of correlation (Cuvier) on almost all biological levels, and to the related law of recurrent variation concerning mutagenesis (http://www.weloennig.de/Loennig-Long-Version-of-Law-of-Recurrent-Variation.pdf) corroborating Cuvier's insights. He defined the law of correlation as follows:

> "Every organized being constitutes a whole, a single and complete system, whose parts mutually correspond and concur by their reciprocal reaction to the same definitive end. None of these parts can be changed without affecting the others; and consequently each taken separately indicates and gives all the rest."[176]

Similarly, the eminent botanist Antoine-Laurent de Jussieu[177] stated (1789):

> "It is in this mutual dependence of functions, and this mutual help that they lend each other, that the laws which determine the relations of their organs are founded, and which are of equal necessity to the metaphysical or mathematical laws: for it is evident that the proper harmony between the organs which act upon each other, is a necessary condition of the existence of the being to which they belong, and that if one of its functions were modified in a manner incompatible with the modifications of the others, this being could not exist."[178]

Any scientist who has ever systematically worked with mutants will immediately be able to give a range of examples corroborating this verdict.

---

[175] *Cf.* William A. Dembski (2004): The Design Revolution. InterVarsity Press. Dawners Grove, Illinois. (for example Chapter 10, p. 81 – 93 on *Specified Complexity*:
"The term specified complexity is about thirty years old. To my knowledge origin-of-life researcher **Leslie Orgel** was the first to use it. In his 1973 book *The Origins of Life* he wrote: "Living organisms are distinguished by their specified complexity. Crystals such as granite fail to qualify as living because they lack complexity; mixtures of random polymers fail to qualify because they lack specificity" (189). More recently, Paul Davies (1999, 112) identified specified complexity as the key to resolving the problem of life's origin: "Living organisms are mysterious not for their complexity per se, but for their tightly specified complexity."
Neither Orgel nor Davies, however, provided a precise analytic account of specified complexity. I provide such an account in *The Design Inference* (1998b) and its sequel *No Free Lunch* (2002). In this section I want briefly to outline my work on specified complexity. Orgel and Davies used specified complexity loosely. I've formalized it as a statistical criterion for identifying the effects of intelligence. Specified complexity … incorporates five main ingredients: a probabilistic version of complexity applicable to events; conditionally independent patterns; probabilistic resources, which come in two forms: replicational and specificational; a specificational version of complexity applicable to patterns; a universal probability bound", which he then considers briefly. See also of 2014: https://uncommondescent.com/intelligent-design/on-specified-complexity-orgel-and-dembski/
See also Dembski (2002): No Free Lunch: Why Specified Complexity Cannot Be Purchased without Intelligence. Rowman & Littlefield Publishers. Incorporated. Lanham, Maryland .(One may check the Index on *specified complexity*, p. 401). P. XIII: "**What is specified complexity?** An object, event, or structure exhibits specified complexity if it is both complex (i.e., one of many live possibilities) and specified (i.e., displays an independently given pattern). A long sequence of randomly strewn Scrabble pieces is complex without being specified. A short sequence spelling the word "the" is specified without being complex. A sequence corresponding to a Shakespearean sonnet is both complex and specified."
S. C. Meyer: (Signature in the Cell; 2009, p. 359): "…we can [also] **detect design when we recognize that a complex pattern of events has a functional significance** because of some operational knowledge that we possess about, for example, the functional requirements or conventions of a system." May be viewed as **independent pattern by functional specification**. See also: https://intelligentdesign.org/articles/yes-intelligent-design-is-detectable-by-science/ (2018). Moreover, the topics of BIOMIMETICS and BIONICS appear to be of some relevance in this context – here the fully independent patterns are usually first detected in nature itself after inferior, imperfect, incomplete but often basically similar intentions, ideas, goals and projects in humans. *Cf.* brief introductions in https://en.wikipedia.org/wiki/Bionics (2023) and https://en.wikipedia.org/wiki/Biomimetics (2023) and the corresponding databases with thousands of examples.

[176] http://aleph0.clarku.edu/huxley/comm/ScPr/Falc.html Tout être organisé forme un ensemble, un système unique et clos, dont les parties se correspondent mutuellement, et concourent à la même action définitive par une réaction réciproque. Aucune de ces parties ne peut changer sans que les autres changent aussi; et par conséquent chacune d'elles, prise séparément, indique et donne toutes les autres" (Cuvier 1825): http://records.viu.ca/~johnstoi/cuvier/cuvier-f12.htm.
There are several English translations. This one is also fine: "Every organized being forms a whole, a unique and closed system, in which all the parts correspond mutually, and contribute to the same definitive action by a reciprocal reaction. None of its parts can change without the others changing too; and consequently each of them, taken separately, indicates and gives all the others." http://www.ansp.org/museum/jefferson/otherPages/cuvier_revolutions.php

[177] https://en.wikipedia.org/wiki/Antoine_Laurent_de_Jussieu "Antoine Laurent de Jussieu. 12 April 1748 – 17 September 1836) was a French botanist, notable as the ***first to publish a natural classification of flowering plants; much of his system remains in use today***. His classification was based on an extended unpublished work by his uncle, the botanist Bernard de Jussieu." (Retrieved 1 May 2023.)

[178] Quoted according to evolutionist Jean-Pierre Gasca (2006): "Cent ans après Marey: Aspects de la morphologie fontionnelle aujourd'hui, Comptes Rendus Palevol 5, 489-498). Original French Text: "C'est dans cette dépendance mutuelle des fonctions, et ce secours qu'elles se prêtent réciproquement, que sont fondées les lois qui déterminent les rapports de leurs organes, et qui sont d'une nécessité égale à celle des lois métaphysiques ou mathématiques: car il est évident que l'harmonie convenable entre les organes qui agissent les uns sur les autres, est une condition nécessaire de l'existence de l'être auquel ils appartiennent, et que si une de ses fonctions étoit modifiée d'une manière incompatible avec les modifications des autres, cet être ne pourroit pas exister."

Can anyone deny that living beings are, in fact, highly integrated, functional systems (all parts being correlated within limited space or tolerance concerning functional variation)?[179] Nevertheless, this limited space permits microevolution generating deviating forms, perhaps "intermediate" to a certain extent, but ***precludes infinite transformations***. The law of correlation may be illustrated by Pierre Paul Grassé's remark on the eye as follows:

> "In 1860 Darwin considered only the eye, but today he would have to take into consideration all the cerebral connections of the organ. The retina is indirectly connected to the striated zone of the occipital lobe of the cerebral hemispheres: Specialized neurons correspond to each one of its parts – perhaps even to each one of its photoreceptor cells. The connection between the fibers of the optic nerve and the neurons of the occipital lobe in the geniculite body is absolutely perfect."

As to the eye, see please http://www.weloennig.de/AuIn.html and for further examples of coadaptation/synorganization, see, for example:

> https://evolutionnews.org/2020/02/aquatic-bladderworts-michael-behes-irreducibly-complex-mousetrap-in-nature/
> http://www.weloennig.de/Utricularia2011Buch.pdf
> And/or https://evolutionnews.org/2023/04/do-plant-galls-falsify-darwinism/
> including the references https://idthefuture.com/1737 /
> https://www.youtube.com/watch?v=7ToSEAj2V0s

Every intermediate macroevolutionary step would thus necessitate the coordinated change of many genes and physiological and anatomical functions. How much faith is required to believe that random ('micro'-)mutations could really afford this task? What about intelligent design to implement such or similar steps? (From the book on the Giraffe p. 25)

Also, I think that it is very appropriate to repeat in this context the following part from the *Notes* of the Giraffe book on Arthur Lovejoy's on the *The Great Chain of Being*, to wit that for about 2,000 years any newly discovered intermediate link (real or imagined) was viewed to be another powerful proof for the truth of the entirely static Platonic world view ("the immutable essences of things", Lovejoy p. 34) for many philosophers and naturalists alike. And "the safest general characterization of the European philosophical tradition is that it consist in a series of footnotes to Plato" – Whitehead according to Lovejoy, p. 24.

(From the book on the Giraffe pp. 27/28) Lovejoy pp. 50/51 on Plato's myths, whose implications were taken seriously [even by most] high-ranking intellectuals like Gottfried Wilhelm Leibniz:

> "To the ... question – **How many kinds of temporal and imperfect beings must this world contain?** – the answer follows the same dialectic: ***all* possible kinds**. The "best soul" could begrudge existence to nothing that could conceivably possess it, and "desired that all things should be as like himself as they could be." "All things" here could consistently mean for Plato nothing less than the sensible counterparts of every one of the Ideas; and, as Parmenides in the dialogue bearing his name (I3oc, e) reminds the young Socrates, there are in the World of Ideas the essences of all manner of things, even things paltry or ridiculous or disgusting. In the *Timaeus*, it is true, Plato speaks chiefly of "living things" or "animals"; but with respect to these, at least, he insists upon the necessarily complete translation of all the ideal possibilities into actuality. It must not, he says, "be thought that the world was made in the likeness

[179] Even most contemporary materialists like **Richard Dawkins** admit this basic point (although they speak only of "apparent design"): "The complexity of living organisms is matched by the elegant efficiency of their apparent design. If anyone doesn't agree that this amount of complex design cries out for an explanation, I give up. No, on second thoughts I don't give up, because one of my aims in the book is to convey something of the sheer wonder of biological complexity to those whose eyes have not been opened to it." (The Blind Watchmaker 1986, p. XIII as well as in the many following editions and translations; also Audible 1997)

of any Idea that is merely partial; for nothing incomplete is beautiful. We must suppose rather that it is the perfect image of the whole of which all animals – both individuals and species – are parts. For the pattern of the universe contains within itself the intelligible forms of all beings just as this world comprehends us and all other visible creatures. For the Deity, wishing to make this world like the fairest and most perfect of intelligible beings, **framed one visible living being containing within itself all other living beings of like nature**," that is temporal and sensible. … It is because the created universe is an exhaustive replica of the World of Ideas that Plato argues that there can be only one creation; it includes the copies "of all other intelligible creatures," and therefore there is, so to say, nothing left over in the model after which a second world might be fashioned. So, in the form of a myth, the story of the successive creation of things is told. After all the grades of immortal beings have been generated, the Demiurgus notes that mortals still remain uncreated. This will not do; if it lack even these the universe will be faulty, "**since it will not contain all sorts of living creatures, as it must do if it is to be complete**." In order, then, that "the Whole may be really All," the Creator [in distinct contrast to Genesis 1 und 2, note also the offer for everlasting life to the first human pair; – for further differences see http://en.wikipedia.org/wiki/Timaios] deputed to the lesser divinities who had already been brought into being the task of producing mortal creatures after their kinds. And thus "the universe was filled completely with living beings, mortal and immortal," and thereby became "a sensible God, which is the image of the intelligible – the greatest, the best, the fairest, the most perfect." In short, Plato's Demiurgus acted literally upon the principle in which common speech is wont to express the temper not only of universal tolerance but of comprehensive approbation of diversity that **it takes all kinds to make a world**."

The following exposition of Lovejoy (pp. 231-233) on the application of Plato's ideas in science reads to a large extent ***like the program of modern evolutionary biology***:

"Even for those biologists [of the eighteenth century] who did not explicitly reject the belief in natural species, the principle of continuity was not barren of significant consequences. It set naturalists to **looking for forms which would fill up the apparently "missing links" in the chain**. Critics of the biological form of this assumption attacked it largely on the ground that many links which the hypothesis required *were* missing. But **the more accepted view was that these gaps are only apparent**; they were due, as Leibniz had declared, "only to the incompleteness of the knowledge of nature then attained, or to the minute size of many of the — presumably lower — members of the series. The metaphysical assumption thus furnished a program for scientific research. It was therefore highly stimulating to the work of the zoologist and the botanist, and especially to that of the microscopist, in the eighteenth century. Every discovery of a new form could be regarded, not as the disclosure of an additional unrelated fact in nature, but as a step towards the completion of a systematic structure of which the general plan was known in advance, an additional bit of empirical evidence of the truth of the generally accepted and cherished scheme of things. Thus the theory of the Chain of Being, purely speculative and traditional though it was, had upon natural history in this period an effect somewhat similar to that which the table of the elements and their atomic weights has had upon chemical research in the past half-century. The general program of the Royal Society, wrote its first historian (1667), in an interesting passage in which Platonistic and Baconian motives are conjoined, was **to discover unknown facts of nature in order to range them properly in their places in the Chain of Being**, and at the same time to make this knowledge useful to man.

Such is the dependence amongst all the orders of creatures; the animate, the sensitive, the rational, the natural, the artificial; that the apprehension of one of them, is a good step towards the understanding of the rest. And this is the highest pitch of humane reason: to follow all the links of this chain, till all their secrets are open to our minds; and their works advanc'd or imitated by our hands. This is truly to command the world; to rank all the varieties and degrees of things so orderly upon one another; that standing on the top of them, we may perfectly behold all that are below, and make them all serviceable to the quiet and peace and plenty of Man's life. And to this happiness there can be nothing else added: but that we make a second advantage of this rising ground, thereby to look the nearer into heaven…[12]

The *Encyclopedie* in the middle of the eighteenth century also, though in a less devout tone, dwelt upon this as the program of the advancement of knowledge: Since "**everything in nature is linked together**," since "beings are connected with one another by a chain of which we perceive some parts as continuous, though in the greater number of points the continuity escapes us," the "art of the philosopher consists in adding new links to the separated parts, in order to reduce the distance between them as much as possible. But we must not flatter ourselves that gaps will not still remain in many places." It was, in the eyes of the eighteenth century, a great moment in the history of science when Trembley in 1739 rediscovered the fresh-water polyp ***Hydra*** (it had already been observed by Leeuwenhoek), this creature being at once hailed as the **long-sought missing link between plants and animals** – for which Aristotle's vague zoophytes were no longer considered quite sufficient. This and similar discoveries in turn served to strengthen the faith in plenitude and continuity as *a priori* rational laws of nature; and the greater credit, it was sornetimes remarked, was due to those who, not having seen, yet had believed in these principles. The chief glory, said a German popularizer of science, *à propos* of Trembley's work, is that "of the German Plato [Leibniz], who did not live to know of the actual observation" of this organism, "yet through his just confidence in the fundamental principles which he had learned from nature herself, had predicted it before his death."

The quest of organisms not yet actually observed which would fill these lacunae was prosecuted with especial zeal at two points in the scale: near the bottom of it, and in the interval between man and the higher apes. "Nature," remarked Bonnet, "seems to make a great leap in passing from the vegetable to the fossil [i. e., rock]; there are no bonds, no links known to us, which unite the vegetable and the mineral kingdoms. But shall we judge of the chain of

> beings by our present knowledge? **Because we discover some interruptions, some gaps in it here and there, shall we conclude that these gap's are real?** …The gap that we find between the vegetable and the mineral will apparently someday be filled up. There was a similar gap between the animal and the vegetable; the polyp has come to fill it and to demonstrate the **admirable gradation there is between all beings**."
>
> But the program of discovering the hitherto unobserved links in the chain played a part of especial importance in the beginnings of the science of anthropology."

Now, [a] creationist's assumption that there are no mosaic forms with some intermediate characters is as false as the evolutionary and Platonic views of the (living) world that there are only intermediates. The gaps at least between the higher systematic categories are real, but in many cases the distances are definitely not as large as once assumed by many creation scientists and on the genetic level also by almost all evolutionists (see the topic "genetic conservation" in http://www.weloennig.de/DynamicGenomes.html). Evidently, there was (and is) much more elegant simplicity, unity and order in complexity as well as an unfathomable abundance of thoughts in the ingenious and prolific mind of the Designer than humans have imagined or can ever envisage (*cf.* Psalm 139: 17-18) (From Giraffe p. 28.)

(Giraffe p. 24) And, of course, an absolutely ingenious and prolific mind having generated, and sustaining, the laws of physics (as, for example, also many Nobel laureates of science have inferred for the origin of the universe: http://www.weloennig.de/Nobelpreistraeger.pdf), has the potential to create as many mosaic forms with some intermediary characters as are imaginable ***within functional limits***, front-loaded or otherwise, but hardly so by "infinitesimally small inherited variations" etc.

As for all the cases of CONSTANCY/stasis in the family of the Rhinocerotidae – as shown in detail above – we may apply Thompson's verdict:

> "On the Darwinian theory, evolution is essentially undirected, being the result of natural selection, acting on small fortuitous variations. The argument specifically implies that nothing is exempt from this evolutionary process. Therefore, **the last thing we would expect on Darwinian principles is the persistence of a few common fundamental structural plans** [[for example] the phyla and within them the many equally well-defined subordinate groups]. Yet, this is what we find."

Concerning the systematic refutation of objections and criticisms (, raised mostly by scientific materialists/naturalists (the latter not seldom extraordinarily polemical) yet also by some other intellectuals against the theory of intelligent design, *cf.* check please rigorously the books and articles by Douglas Axe, Günter Bechly, Michael J. Behe, David Berlinski, Tom Bethell, William A. Dembski, Michael Denton, Marcos Eberlin, Phillip E. Johnson, Matti Leisola, Wolf-Ekkehard Lönnig, Casey Luskin, Stephen C. Meyer, J. P. Moreland et al. (eds.), Walter James ReMine, Paul Nelson, John C. Sanford, Siegfried Scherer, Granville Sewell, David W. Swift, James Tour, Jonathan Wells, and many others.

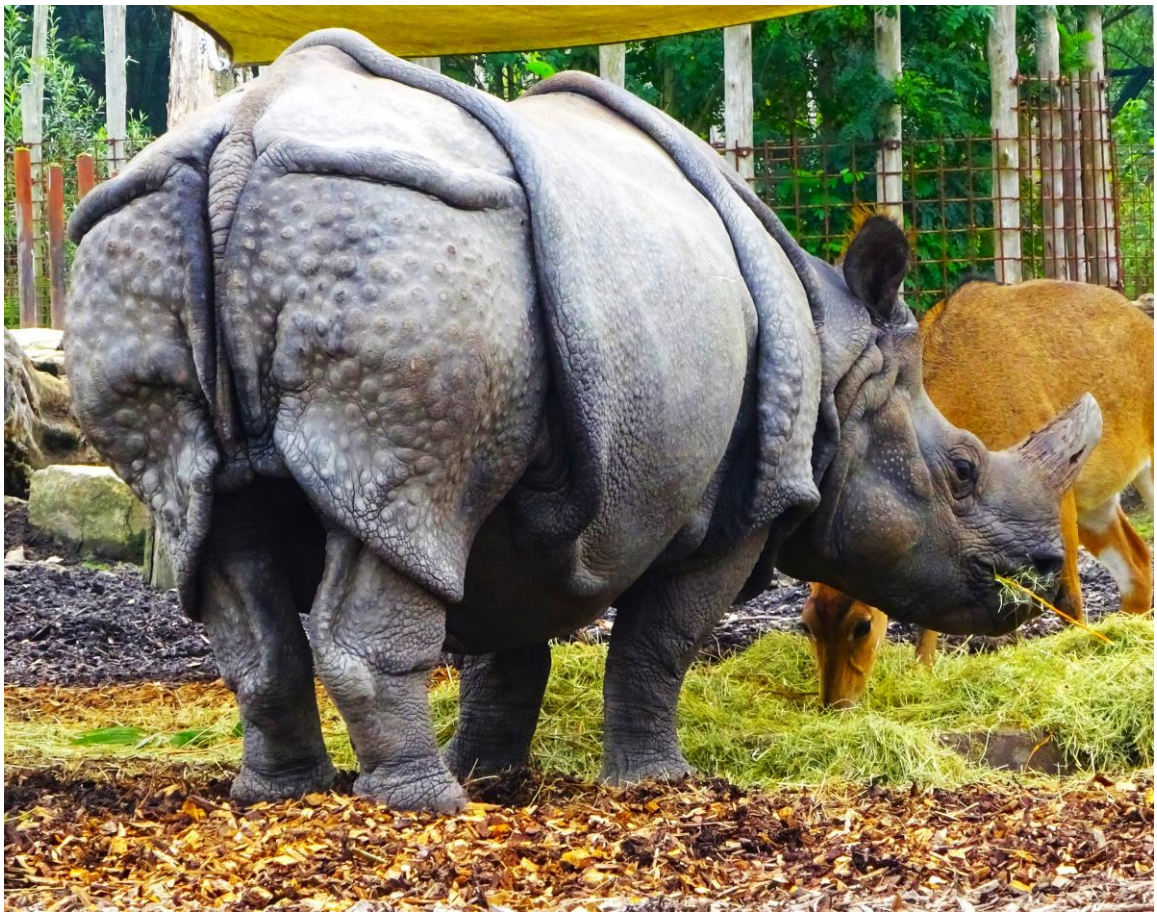
Supplement

In addition to the text and figures above, now these photographs of *Rhinoceros unicornis*: “The two-ton, one-horned Great Indian rhinoceroses (*Rhinoceros unicornis*) are shy and inoffensive animals that seldom act aggressively. These rhinos were once abundant in Pakistan, northern India, Nepal, Bangladesh, and Bhutan. Today, there are about 2,400 Great Indian rhinos left in two game reserves in Assam, India, and in Nepal.” LIVING FOSSIL – Constancy almost 34 Ma.

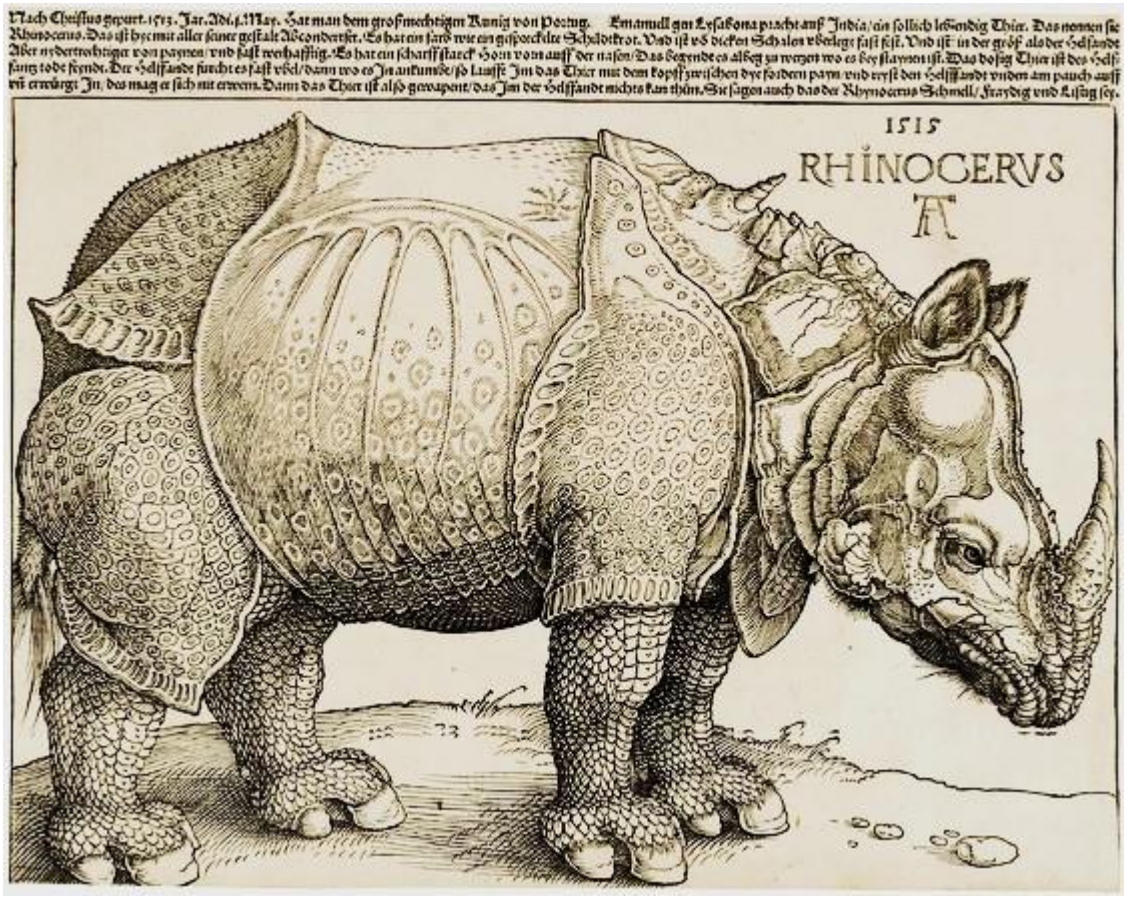
Photographs according to https://de.123rf.com/lizenzfreie-bilder/nashorn.html?imgtype=1
See same source also for *Diceros bicornis* on the first page of this article.

Side views of the head of the **bull** rhinoceros *Rhinoceros unicornis* in Dierenrijk at Mierno in Eindhoven/The Netherlands (species belongs to the LIVING FOSSILS: Constancy almost 34 Ma.)
Photographs 2 September 2023 by W.-E. L.
Its horn appears to be heavily worn.

Front view of the head of the **bull** rhinoceros *Rhinoceros unicornis* in Dierenrijk at Mierno in Eindhoven/The Netherlands (species belongs to the LIVING FOSSILS: Constancy almost 34 Ma.)
Note please especially the anatomy of its mouth.
Photograph 2 September 2023 by Josafat Rueda Rodriguez.



Above: Side view of the of the rhino **bull** of *Rhinoceros unicornis* in Dierenrijk at Mierno in Eindhoven/Netherlands (species belongs to the LIVING FOSSILS: Constancy almost 34 Ma.)
Below: Dorsal/side view of the of the rhino **cow** of *Rhinoceros unicornis* also in Dierenrijk at Mierno in Eindhoven of the Netherlands (Photographs 2 September 2023 by W.-E. L.)



Above: "*Dürer's Rhinoceros* is the name commonly given to a woodcut executed by German artist Albrecht Dürer in 1515. Dürer never saw the actual rhinoceros, which was the first living example seen in Europe since Roman times. Instead, *the image is based on an anonymous written description and brief sketch of an Indian rhinoceros brought to Lisbon* in 1515."
In German: Das Panzernashorn.
https://en.wikipedia.org/wiki/D%C3%BCrer%27s_Rhinoceros (retrieved 9 September 2023)

Below: side view of the of the rhino **cow** of *Rhinoceros unicornis* in Dierenrijk at Mierno in Eindhoven/The Netherlands (Photographs 2 September 2023 by W.-E. L.)

Front view of the of the rhino **cow** of *Rhinoceros unicornis* in Dierenrijk at Mierno in Eindhoven/The Netherlands. The rhino goes swimming. (Photographs 2 September 2023 by W.-E. L.)

Rhino **cow** of *Rhinoceros unicornis* in Dierenrijk at Mierno in Eindhoven of The Netherlands.
The rhino goes swimming: Next steps. (Photographs 2 September 2023 by W.-E. L.)
See please also the following two videos (the first one by Josafat Rueda Rodriguez,
the second by W.-E. L.): http://weloennig.de/JosaVideo.mp4 and
http://weloennig.de/WolfVideo.MTS
The videos were made handheld, i.e. without tripods.

Dorsal view of the of the rhino **cow** of *Rhinoceros unicornis* in Dierenrijk at Mierno in Eindhoven of the Netherlands. After swimming and diving for a whole hour it returned to the dry part of its enclosure. (Photographs 2 September 2023 by W.-E. L.

Rhino **cow** of *Rhinoceros unicornis* in Dierenrijk at Mierno in Eindhoven of the Netherlands. **Above**: Before diving. Below: After diving and digging in the mud now with some mire/sludge on its horn. (Photographs 2 September 2023 by W.-E. L.)

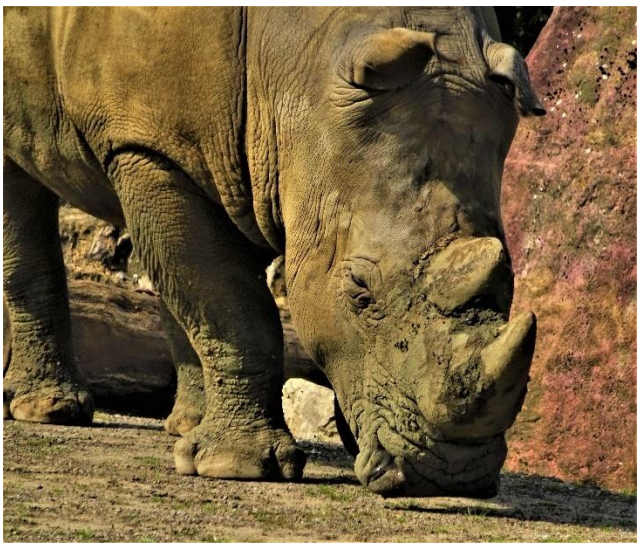
And some additional photos of the hook-lipped rhinoceros (*Diceros bicornis*)
LIVING FOSSIL – Constancy almost 16 Ma.

Hook-lipped rhinoceros (*Diceros bicornis*). Photos W.-E. L. (31 May 2023)

Hook-lipped rhinoceros (*Diceros bicornis*). Photos W.-E. L. (31 May 2023)

Hook-lipped rhinoceros (*Diceros bicornis*). Different perspectives.
Photos W.-E. L. (31 May 2023). Zoo Krefeld.

Some additional photographs of the two-horned, **square-lipped**, rhinoceros (*Ceratotherium simum*) LIVING FOSSIL – Constancy 11.6 Ma.
(Of the African savanna, “the largest land mammal after the African elephant, standing 7 ft (2 m) at the shoulder and weighing more than 3 tons.”)



Square-lipped, rhinoceros (*Ceratotherium simum*)
Different Perspectives
Photos W.-E. L. (11 August 2023). ZOOM Erlebniswelt Gelsenkirchen

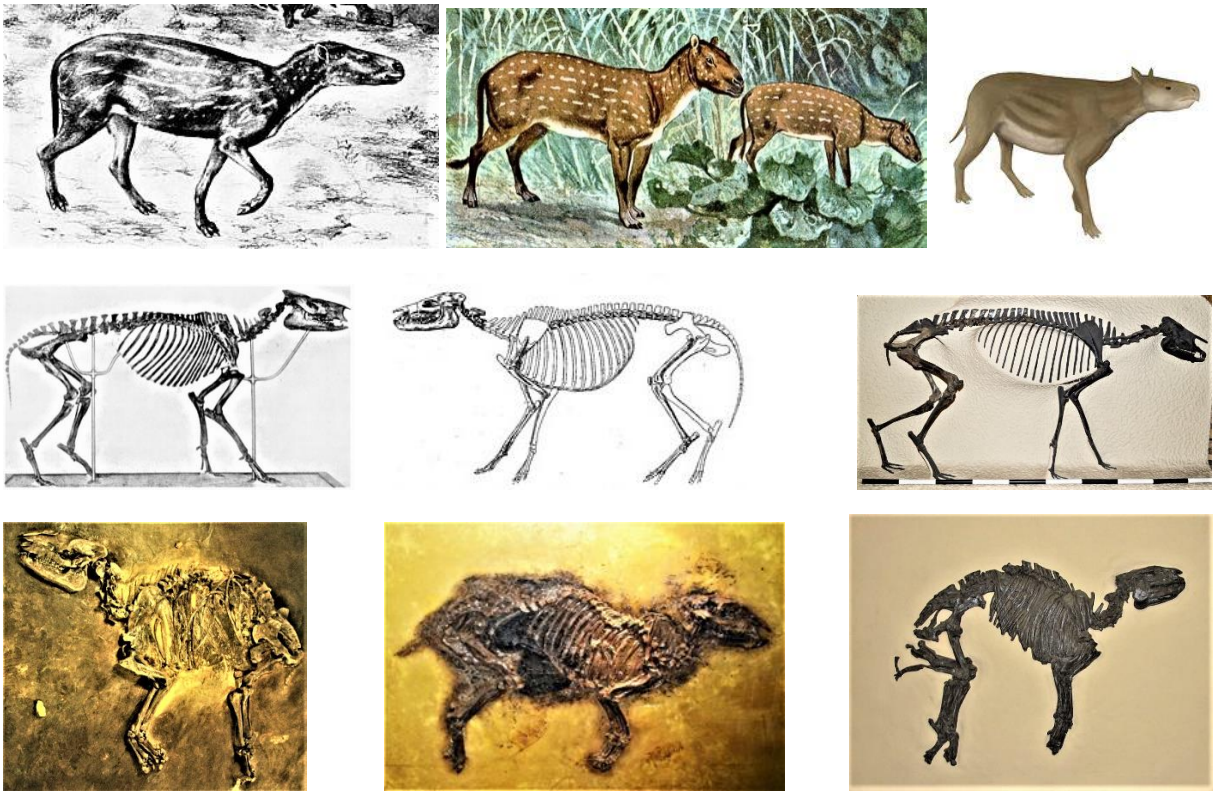
Square-lipped rhinoceros (*Ceratotherium simum*)
Side view (above) and head enlarged (below)
Photos W.-E. L. (11 August). ZOOM Erlebniswelt Gelsenkirchen

Square-lipped rhinoceros (*Ceratotherium simum*)
Front view
Photos W.-E. L. (11 August 2023). ZOOM Erlebniswelt Gelsenkirchen

Square-lipped rhinoceros (*Ceratotherium simum*)
Slightly further different perspectives
Photos W.-E. L. (11 August 2023). ZOOM Erlebniswelt Gelsenkirchen

Direct comparison between hook-lipped rhinoceros (*Diceros bicornis*) (above) and square-lipped rhinoceros (*Ceratotherium simum*) (below).
Photos W.-E-L. (2023)

Since *Hyrachyus* is regularly presented as the progenitor and ancestor of the Rhinocerotidae although it was “barely distinguishable from the earliest contemporary horses and tapirs”, thus resembling “a tapir or small horse more than a rhino”, displaying “relatively long necks”, being a “lightly built animal”, whose “relatively long lower leg sections of both the front and the hind limbs indicate a fast walking (cursorial) gait”, let us briefly compare it with these Eocene horses and tapirs by the following illustrations.



From left to right and top to bottom:

(1) https://es.wikipedia.org/wiki/Hyrachyus
(2) https://de.wikipedia.org/wiki/Hyracotherium#/media/Datei:Hyracotherium_Eohippus_hharder.jpg
(3) https://it.wikipedia.org/wiki/Heptodon#/media/File:Heptodon_posticus.jpg
(4) https://commons.wikimedia.org/wiki/File:Hyrachyus.jpg
(5) https://research.amnh.org/paleontology/perissodactyl/evolution/groups/equoidea
(6) https://en.wikipedia.org/wiki/Helaletidae#/media/File:Helaletes_nanus_(Marsh,_1871).jpg
(7) https://en.wikipedia.org/wiki/Hyrachyus
(8) https://de.wikipedia.org/wiki/Eurohippus#/media/Datei:Propalaeotherium_parvulum_1.jpg
(9) https://www.biologie-seite.de/Biologie/Tapire Again ***Hyrachyus***. Interestingly in this article it is called “Fossil representative of the **tapir** species, *Hyrachyus minimus*, from the Middle Eocene of the Messel Pit” (“Fossiler Vertreter der Tapirartigen, *Hyrachyus minimus*, aus dem Mitteleren Eozän der Grube Messel”).

See please the comment above on “*Hyrachyus*: Evolutionary Ancestor of the Rhinocerotids and Several Further Families?”

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