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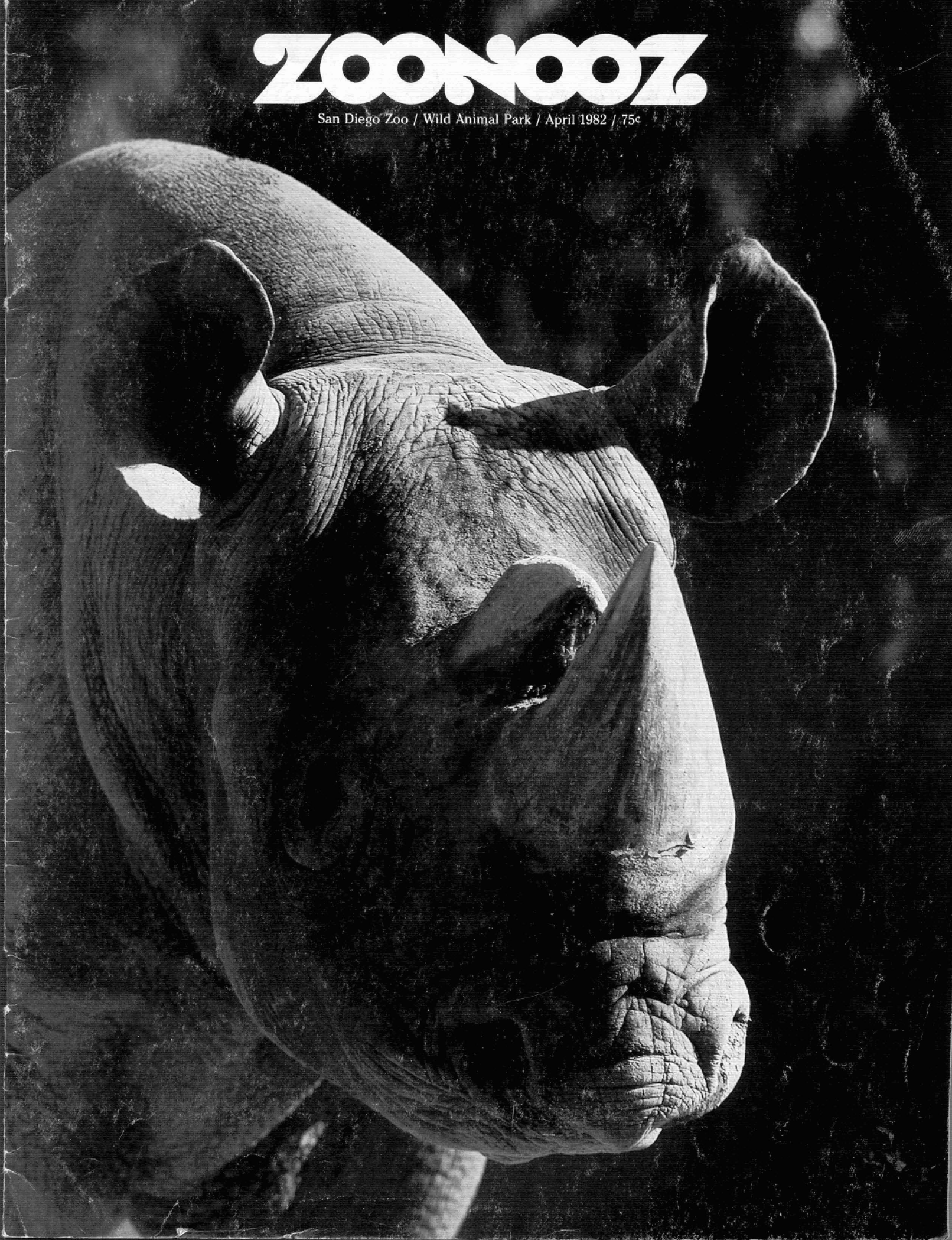

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COVERS

Front: Black rhinoceros *Diceros bicornis*

Back: Slow loris *Nycticebus coucang*

Opposite: Renauld's ground cuckoo *Carpococcyx renauldi*

The cover story for April explores the history of the rhinoceros after its introduction to Europe in the 16th century, and the scholarly conjecture that surrounded the majestic beast for several succeeding centuries. This month, ZOONOOZ will also introduce readers to a host of springtime babies—from honeyeaters to elephants.

IN THIS ISSUE

LETTERS

I recently had the opportunity to read an article in your Jan.'82 issue entitled "Nomads of the Steppe Country" by Sally Lahm. I found the article to be informative and well written. I am glad to hear that there are steps being taken to insure the protection of the wild species of horse and ass. The Equine played a very important part in the development of human culture and should be afforded all the protection we can give. However, Ms. Lahm's remarks on inbreeding have prompted me to write this letter.

. . . the author writes "The propagation of unrelated secondary herds is important as a means of increasing a species gene pool for reproductive purposes. This greatly reduces the possibility of inbreeding and its harmful effects. For example, individuals can be traded between herds without the risk of producing weak or defective offspring due to inbreeding." With this single paragraph Ms. Lahm has branded every purebred line of livestock, and most of the world's food crop as "weak or defective."

It should be pointed out that inbreeding does not produce weak or defective offspring. The undesirable traits alluded to must be present in the gene pool of the species and may crop up regardless if inbreeding is practiced or not. Inbreeding is neither harmful or beneficial but simply increases the possibility of the offspring containing homozygous gene pairs. . . .

A publication as respected as yours can carry a lot of weight. By denouncing inbreeding as harmful you only support the unfounded idea that outcrossing is the only method that should be used in breeding. One has only to look at the record of the United States Government Morgan Horse Farm. During its operation the Farm produced some of the greatest names in the Morgan world. The Farm's breeding program was based on the use of inbreeding. The consistency of type and quality of the horses produced by the Farm is proof positive of the benefits of inbreeding. The work of the Farm is still being carried out by several eastern universities.

I do not wish to sound as if inbreeding is the only method to be used. Outcrossing, inbreeding and heterosis are all methods used successfully today. They each have advantages and should all be considered in the establishment of a breeding program. Each also has its drawbacks and may produce undesirable offspring. I only hope that in the future you will be a little more careful before you brand any form of breeding as harmful.

Richard L. Trower
Richill Morgan Horse Farm
San Bernardino, CA

Ms. Lahm's article dealt with wild equines, not domestic animals. When breeding pure lines of domestic animals, the object is to breed to a type, thus creating an artificial subspecies, and inbreeding can be a useful method to achieve this. Such standards can't be set with wild animals—the wild populations exhibit more variation, and when breeding wild species the aim is to keep that variability. There are strong indications that among wild populations inbreeding can produce negative effects such as infertility, high infant mortality, and shorter lifespans for adult animals. Ms. Lahm's remark was not intended to denounce accepted methods for developing purebred lines of domestic animals, she was writing about efforts to produce viable and variable populations of endangered wild species. **ed.**

Indian rhinoceros ***Rhinoceros unicornis*** **in the Basel Zoo, in Switzerland.**

J. Bacon

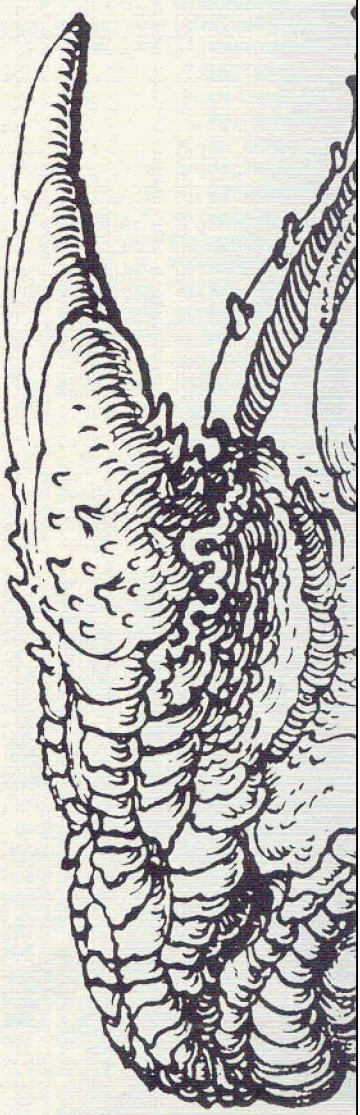
A STORY OF HORNS:

Early views on rhinoceros classification

L. C. Rookmaaker

Taxonomists today recognize five species of rhinoceros. Three of these occur in Asia. The Indian rhinoceros *Rhinoceros unicornis*, living in northeast India and Nepal, is characterized by deep skin folds and the presence of a single nasal horn. Rather similar in appearance is the Javan rhinoceros *Rhinoceros sondaicus* of Southeast Asia. The smaller Sumatran rhinoceros *Dicerorhinus sumatrensis*, with two horns, at one time inhabited roughly the same regions as the Javan species. Two species occur in Africa, both distinguished by the absence of skin folds and by the presence of two horns on the nose. The black rhinoceros *Diceros bicornis* is found in most of southern, eastern, and central Africa. The range of the white rhinoceros *Ceratotherium simum* is more restricted, with separate subspecies in southern and in central Africa. It took a long time to establish even the outline of this classification and distribution, as is indicated by the literature published on this subject before 1785.

"On the 20th of the present month of May, 1515, there arrived at Lisbon, the noblest city of the whole of Luzitania, and at present an excellent emporium, an animal called *Rhynoceros* by the Greeks and



J. Bacon

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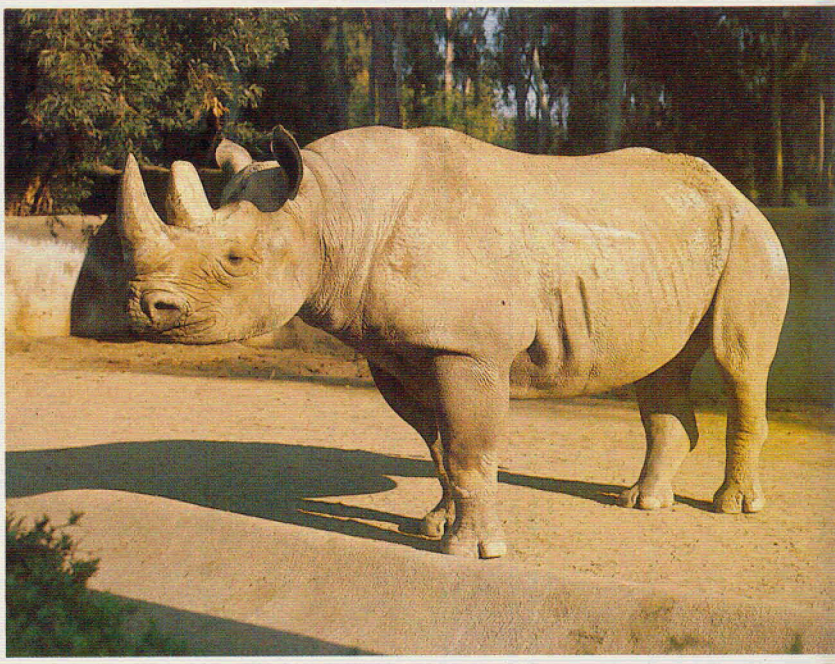
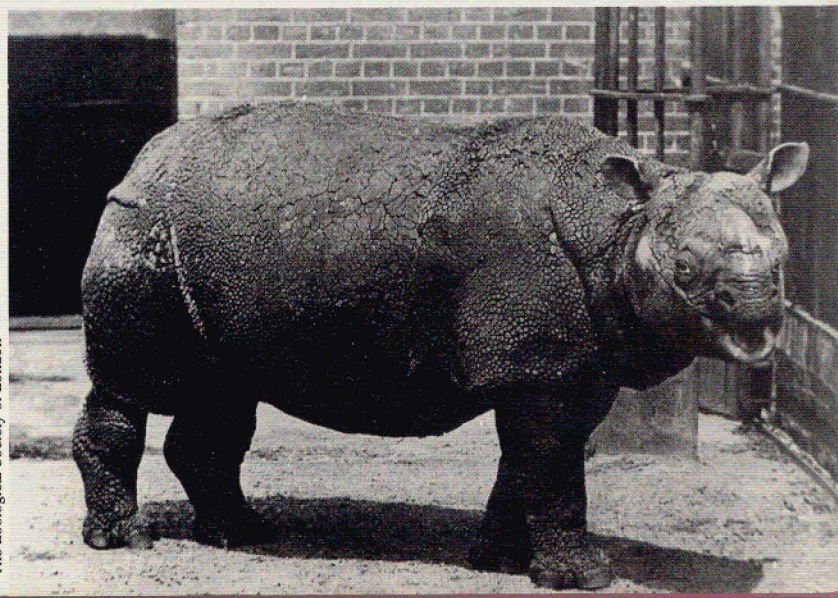
Southern white rhinoceros *Ceratotherium simum simum* at the Wild Animal Park.



Above: Female Sumatran rhinoceros *Dicerorhinus sumatrensis*, photographed at the Copenhagen Zoo in 1963.

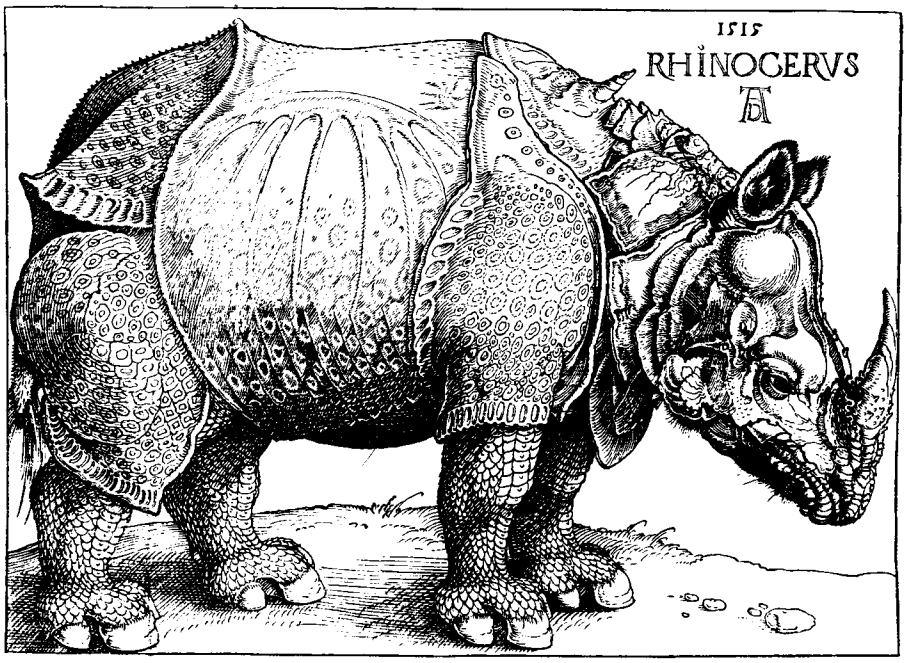
Above right: Black rhinoceros *Diceros bicornis* at the San Diego Zoo.

Right: This Javan rhinoceros *Rhinoceros sondaicus* lived in the London Zoo from March 1874 until January 1885.



The Zoological Society of London

ganda by the Indians. The beast was sent by the most powerful king of the city of Combaia, India, as a present to the most serene Emanuel, king of Portugal." Thus starts a long letter on the exploration of India written by the German trader Valentim Fernandez, in Lisbon, to friends in Neuremberg. The famous artist Albrecht Dürer (1471-1528) must have seen this account, which probably was accompanied by a sketch of the animal. Dürer did not hesitate long to depict the Lisbon rhinoceros in a drawing and subsequently in a woodcut, both dated 1515. These undoubtedly show a rhinoceros, notwithstanding the exaggerated armor plates and other embellishments. One typical feature of his rendition was the short and twisted horn on the shoulders, known as the Dürer hornlet. This was to become important in later debates about the number of horns in the rhinoceros.



The magnificent rhinoceros from Albrecht Dürer's woodcut of 1515. Photo courtesy British Museum.

Dürer's woodcut went through several states and was copied constantly wherever the appearance of a rhinoceros was required—in innumerable books, paintings, clocks, statues, tapestries, and other works of art. It is essential to realize that the animal shown in Dürer's drawing and woodcut doubtlessly represented what everybody thought to be "the rhinoceros" until well into the 18th century.

The external appearance of the rhinoceros now seemed established to the general satisfaction. Of course, the picture was bound to be challenged. Scholars soon found what seemed to them a conflicting remark in the 22nd Epigram of the *Liber de Spectaculis* by the Roman author Martial (40-102). In describing a festival in Rome in the year A.D.80, Martial referred to a rhinoceros *"with a double horn"* tossing up a heavy bear. Why did he provide the animal with this double horn? The question has been debated at intervals throughout the 16th and 17th centuries. A large group of commentators pointed to the Dürer hornlet, which they identified with Martial's second horn. This was an obvious and justified conclusion in light of the available evidence, and it became the generally accepted explanation of the epigram by Martial. Even some advocates of this theory, however, had their doubts. According to Nehemiah Grew, writing in 1681, the horn on the back is "in a place where it is immovable, and can no way be made use of for tossing up any thing, as the other on his Nose." Such considerations might have caused the disagreement of a second group, which suggested that the text of the epigram had not been preserved accurately. Grammatically, their emendations of the Latin text were extremely ingenious, but the poor rhinoceros (with just a single horn) was subsequently required to toss up an aurochs or two bears simultaneously.

While the scholars were debating these heavy problems in their studies, some travelers returned with information about the rhinoceros in Asia and Africa. In the course of time, they reported the animals from Asian countries such as Bengal, Malaya, Java, Sumatra, and Cochin China, and although less frequent, reports from Africa especially mentioned the Cape of Good Hope. The majority of these descriptions were purely traditional, being copied from the earlier, rather unsatisfactory accounts. André Thevet (1502-1590), one of the first to note the presence of the rhinoceros at the Cape of Good Hope, wrote in 1557; "In this region there is an abundance of Rhinocerons, so called because they have a horn on the nose. Some call them Ethiopian ox. The animal is quite monstruous & it is in perpetual war and enmity with the elephant." There is not even the slightest suggestion that the Cape rhinoceros looked different from the animal on Dürer's woodcut, a plate which Thevet copied to illustrate his remarks. In general, the early travelers contributed little to the knowledge of the external appearance of the rhinoceros. It is unlikely that many of them ever saw a living specimen in the wild or even in captivity. Their notes on distribution and appearance were largely based on hearsay, and sometimes horns could be bought in local markets. Many of these trophies, including both single and double horns, reached Europe, where they were usually incorporated into private collections.

Only two books published before 1740 included somewhat more original information about the rhinoceros. One of these was written by Jacob Bont (1596-1631), a Dutch physician who lived on the island of Java during the last four years of his life. His observations on natural history were first published posthumously in 1642 and were later appended to the widely read book *De Indiae* by G. Piso (1658). Bont says that he frequently saw rhinoceroses, both in the wild and in captivity, but his description of the animals certainly gave no reason to his contemporaries to suspect that the rhinoceros of Java differed from that of India. Bont himself certainly never contemplated that possibility.

The second original description of the rhinoceros is found in the monumental work on the Cape of Good Hope by the German Peter Kolb (1675-1726). He lived near Cape Town from 1705 until 1712 and collected all kinds of information about that part of Africa. His book was first published in German in 1719 and contained one of the first comprehensive treatments of the flora and fauna of the Cape region. His article on the rhinoceros is largely traditional, but the animal is clearly provided with two nasal horns. The rhinoceros, Kolb wrote, has a horn on the nose, black or dark gray in color and up to two feet in length. "Just behind this horn,

Opposite: A copy of Dürer's woodcut showing the "Rhinoceros as it is usually depicted" was included in Peter Kolb's description of the Cape (1719 and 1727). Photo courtesy Rijksmuseum Amsterdam.

and straight towards the forehead, it carries another quite small horn, which is about the height of a slanting hand in young specimens and up to half a foot in adults." This text is illustrated by a copy of Dürer's rhinoceros, which certainly was no help in clearing up the confusion. In the Dutch edition of Kolb's book (1727), however, the publishers added the first recognizable plate of an African black rhinoceros. It was drawn by Jan Wandelaar (1690-1759) after a stuffed specimen in a collection in Leiden, Holland. Unfortunately, this acceptable plate was not seen by many contemporaries.

In 1739, an Indian rhinoceros arrived alive in London. It was the fourth of its kind in Europe, following Dürer's ganda of 1515, another Portuguese specimen which lived from 1579 until 1585, and a rhinoceros shown for a short period in London in 1684. The 1739 specimen was exhibited in Red Lyon Square, London, near the house of the physician James Douglas (1675-1742). Douglas asked his assistant, James Parsons (1705-1770), to prepare some drawings of the rhinoceros and to take notes on its appearance and behavior. The results of this enquiry were reported by Douglas in a meeting of the Royal Society on June 21, 1739, but they remained unpublished. After the sudden death of Douglas in April 1742, Parsons continued his study of the rhinoceros and published a thorough description of the animal in the *Philosophical Transactions* of 1743. Parsons had consulted the book by Kolb and added some comments concerning the number of horns in the rhinoceros. He implied the existence of two geographically separated species, one with a single horn in Asia, another with a double horn in Africa. While this suggestion was rather speculative, it was significant because it could be tested, and it thus invited further investigations.

During the period to follow, the simultaneous occurrence of rhinoceroses with single horns and with double horns was generally acknowledged. There was, however, much debate about the status of these forms—whether they were distinct species, or subspecies, or local variations. The first proposal verbalized by Parsons in 1743 was attractive in its simplicity but difficult to maintain, as single-horned animals had also been reported from Africa, and double-horned specimens from Asia. If both forms lived possibly sympatrically on both continents, the distinction of two species was untenable and even unnecessary. The Count de Buffon declared in his authoritative *Histoire Naturelle* (1764) that there were two varieties, the number of horns depending on environmental influences such as the climate. The other explanations for a variable number of horns within a single population sometimes were quite ingenious. The librarian Ladvocat saw a female Indian rhinoceros in Paris in 1749; he knew Dürer's woodcut, which showed a male (at least according to tradition), and he had read Kolb. He explained his observations as follows: females are always one-horned; males in Africa have horns on the nose, the second immediately behind the first (Kolb), while males in Asia show the second horn on the shoulders (Dürer). Alternatively, the number of horns could increase with age, from none at birth to two or more in adults.

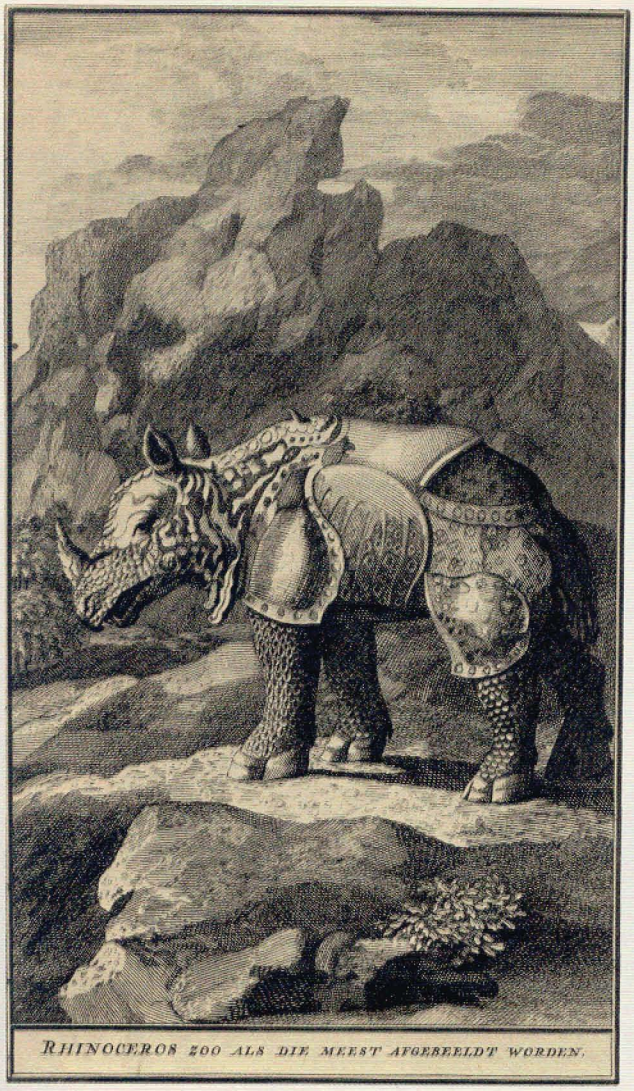
Until about 1770, there was too little evidence to reject one theory in favor of another, but the practical ignorance about the external appearance of the double-horned rhinoceros was recognized by Theodor Klein as early as 1751. There simply were no good illustrations of this species except for the little-known engraving by Wandelaar. In general, plates published during most of the 18th century were more confusing than clarifying. Travel books describing the African rhinoceros were illuminated by pictures of animals suspiciously resembling Dürer's rhinoceros. Some artists or publishers just added a second nasal horn to drawings of the Indian rhinoceros. Johann Elias Ridinger (1698-1767), for instance, went to see an African specimen which was on exhibit in Stuttgart in 1748—Europe's fifth rhinoceros, also seen by Ladvocat in Paris the next year. Ridinger made several drawings on this occasion, all exhibiting the typical skin folds of the Indian species. At least in one instance he added a second horn for reasons unknown. Another double-horned rhinoceros appears on a plate in James Bruce's *Travels in Ethiopia*. This animal was copied from a figure in Buffon's *Histoire Naturelle* of 1764, to which a second horn was added in an attempt to obscure the discrepancy between Bruce's text and the illustration.

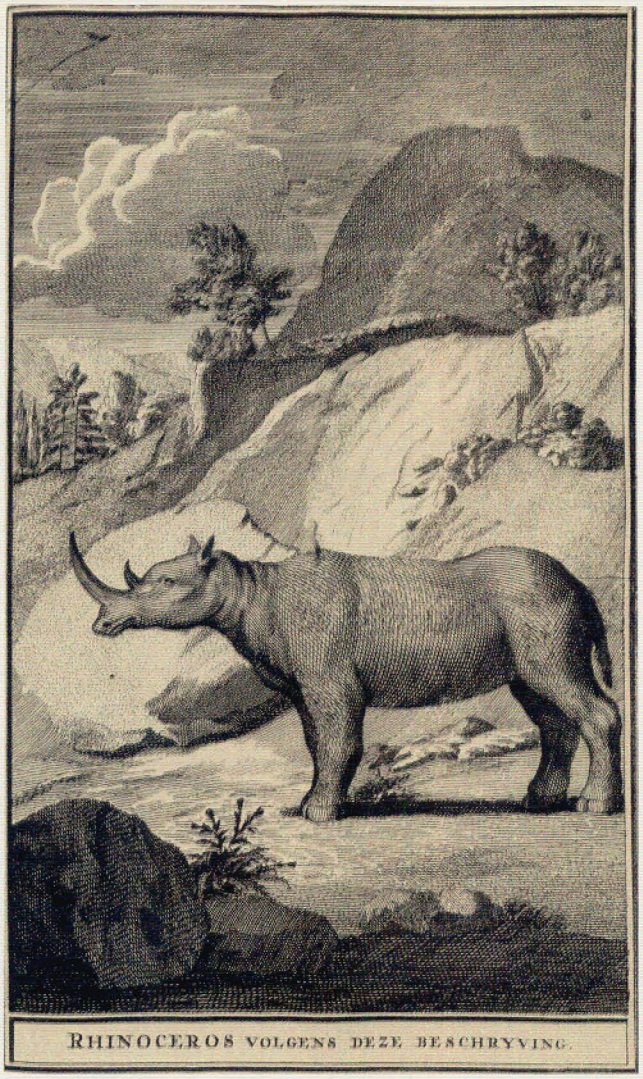
During the 1770s the interior of southern Africa was explored more extensively. Some travelers had great interest in natural history, including men like Anders Sparrman, William Paterson, and Robert Gordon. They proved beyond doubt that all rhinoceroses in the Cape region, both male and female, young and old, carried two horns on the nose, and their hide was much less folded than in the Indian specimens. Some of this significant new information reached Europe and helped to solve the problem of the number of rhinoceros species. An important analysis of all available evidence was made by Petrus Camper (1722-1789), a Dutch physician, paleontologist, and professor of anatomy. As early as 1772, Camper had received the complete head and skull of a black rhinoceros donated by the governor at the Cape, Joachim van Plettenberg. He demonstrated its morphology and discussed its implications during a public lecture delivered in the Anatomical Theatre of the University of Groningen, Holland, on Feb-

Opposite: A double horn in the collection of Hans Sloan was sketched by James Parsons circa 1740. Sloane was a botanist and physician of note, whose private museum collection and library formed the nucleus of the British Museum.

This picture, supposed to be an exact likeness of the live rhinoceros exhibited in London in 1739, is from a drawing by James Parsons.

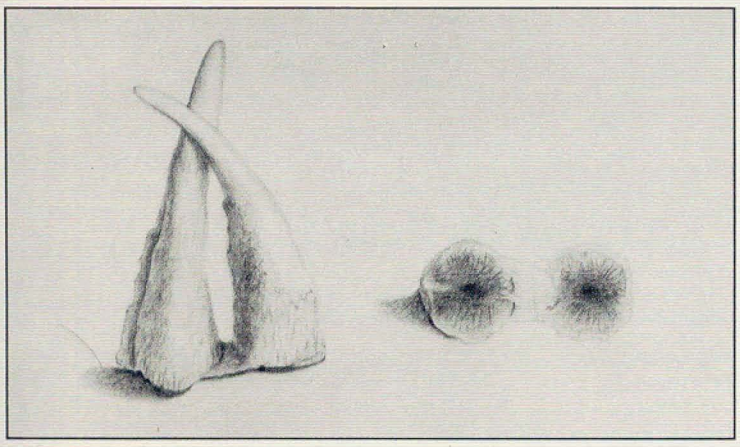
Rhinoceros tossing up a bear, from a book of emblems by Joachim Camerarius, published in 1595. Photo courtesy Rijksuniversiteit, Leiden.

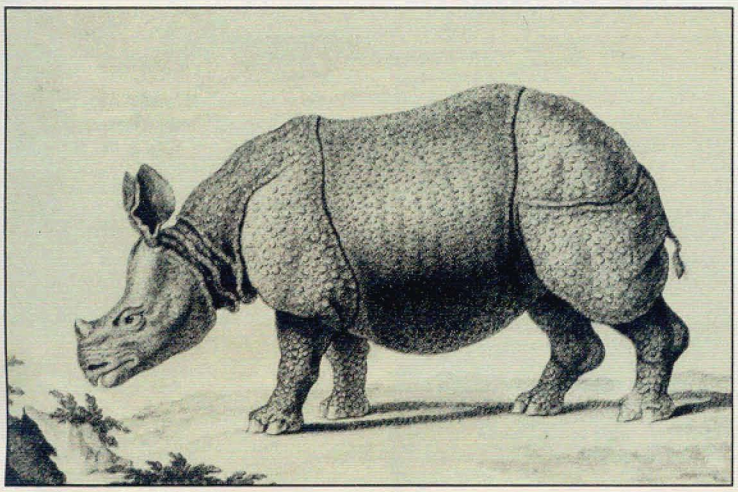




The black rhinoceros drawn by Jan Wandelaar and published in the Dutch edition of Kolb's book (1727). Photo courtesy Institute for Taxonomic Zoology, Amsterdam.

Below: The Indian rhinoceros depicted in the Count de Buffon's *Histoire Naturelle* (1764) was from a specimen exhibited alive in Paris in 1749. Photo courtesy Zoölogisch Museum Amsterdam.

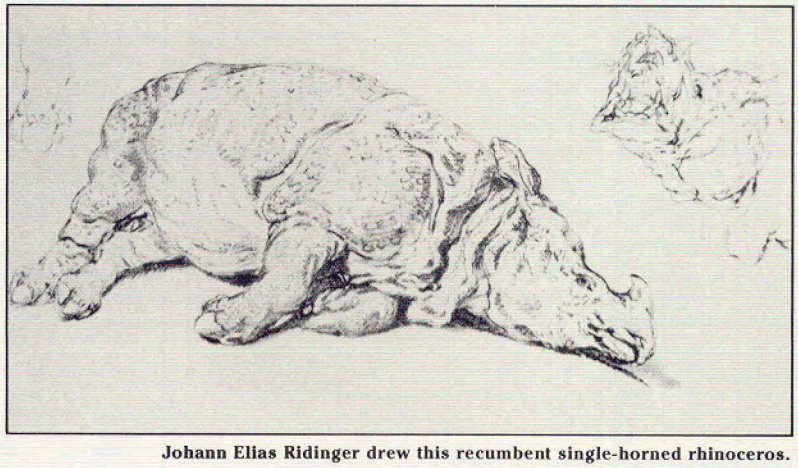




Buffon's rhinoceros barely makes its appearance in this plate from a second edition of T. Tasso, *La gerusalemme liberata*, volume 2, published in Paris in 1784.

ruary 6, 1772. Camper started this excursion into mammalian anatomy with an apology which shows how unconventional this talk was: "Whereas the persisting frost prohibits the acquisition of human bodies [then usually obtained from Amsterdam, across the Zuiderzee], and whereas the ardour to divert you with the delights of the astonishing Nature increases, and whereas you often try in vain to find suitable occasions, I considered it my duty to occupy you in the meantime with a consideration of one of the most curious objects produced by Nature, the knowledge of which deserves your careful attention in view of its impact on classical studies."

Camper proceeded with a full and thorough description of his specimen from the Cape. The results of his studies were first published in Latin in 1780, and later in more extended form in a Dutch monograph of 1782. Concerning rhinoceros classification, he accepted the reality of two distinct species—the first from India, single horned, the second from Africa, double horned. Of course, Parsons had suggested exactly the same 40 years earlier, but Camper's enquiry differed on two counts. He was able to base his observations on the examination of actual specimens from both continents, which was a great improvement over the intelligent speculation of his predecessors. Camper also stressed the importance of all morphological characteristics. He diagnosed his two species merely on the number of their horns, but he had some idea that their dentition might also be useful to distinguish them. This realization was necessary before more than these two species of rhinoceros could be recognized. Unfortunately, during the 19th century this led to quite excessive splitting. Some 62 species or subspecies were named between 1780 and 1965—a great contrast to the careful restraint of the preceding centuries. **Z**



Johann Elias Ridinger drew this recumbent single-horned rhinoceros.

Here the same rhinoceros has been provided with a second horn by Ridinger.

About the author:
L. C. (Kees) Rookmaaker has been a scholar of rhinoceroses since childhood. In addition to his absorption with the biology, history, and iconography of the rhinoceros, he is interested in mammalian taxonomy, the history of animal collections, and the exploration of southern Africa during the 18th century. He is widely published on a variety of natural history topics, but the bulk of his writings deals with the rhinoceros.