

## Robert Jacob Gordon's original account of the African Black rhinoceros

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(With 7 plates and 2 figures in the text)

An account is presented of the memoranda and drawings comprising the description of the African Black rhinoceros prepared at the Cape of Good Hope in 1778 by Robert Jacob Gordon (1743–95) and now incorporated in the Gordon Atlas preserved in the Rijksmuseum Amsterdam. Gordon's rhinoceros information was placed at the disposal of contemporaries, whereby part of it entered zoological literature and occasioned the temporary recognition of a "Gordon's rhinoceros". His material never attained independent publication and its historical and anatomical merit has thus escaped recognition. Impressive in standards of observation and delineation it represents a pioneer investigation of African rhinoceros morphology.

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### Introduction

The general investigation of the morphology of the Rhinocerotidae was largely a 19th century accomplishment made possible in great measure by the Zoological Society of London and conducted under its aegis. From its inception (1826) the Society sought assiduously examples of all available rhinoceros forms and ensured the maximal utilization of such prosectorial material as these ultimately provided. This policy resulted in the appearance, in the Society's *Transactions* and *Proceedings*, of classic memoirs on rhinoceros splanchnology which, though necessarily not exhaustive, remain the principal—sometimes the only—source of information on this subject. (In minor particulars they are in process

of supplementation by 20th century notices, chiefly in the Society's *Proceedings*). These classic memoirs include those of Owen (1852) on the Indian rhinoceros, those of Garrod (1877) and Beddard & Treves (1887) on the Javan rhinoceros and those of Garrod (1873, 1878), Forbes (1881) and Beddard & Treves (1889) on the Sumatran rhinoceros. The African forms (*Diceros*, *Ceratotherium*) were unavailable to these 19th century investigators and still await an anatomical attention comparable to that bestowed upon the Asian forms.

In England in the 18th century sporadic investigation of rhinoceros structure had already been undertaken, e.g. by Parsons (1743) and Leigh Thomas (1801) on the Indian species and by Bell (1793) on the thereby newly recognized Sumatran species. The observations, often anatomically incomplete, of these 18th century pioneer investigators were duly preserved and made generally available by publication, such publications testifying to the early interest of British zoologists in rhinoceros morphology and representing its initial study.

Equally pioneer 18th century rhinoceros investigation was, however, undertaken outside England—by Vicq D'Azyr in Paris (1793) and by Sparrman (1775) and R. J. Gordon (1778) at the Cape. Unfortunately the information assembled by the first and last of these workers never achieved publication and thus escaped recognition of its importance in the history of mammalian morphology. The scope and fate of Vicq D'Azyr's unpublished memoir on the Indian rhinoceros have been summarized elsewhere (Cave, 1976): Sparrman's observations on *Diceros* were duly published (1778, 1779). Attention is therefore presently directed to the less known work of Gordon on the Black rhinoceros, a pioneer and commendable attempt at the anatomization of an African species.

#### Gordon and the Gordon Atlas

Robert Jacob Gordon was born in Doesburg, Holland, in September 1743. In 1759 he joined his father's regiment (the Scottish Brigade) and was duly appointed Captain of the Dutch garrison at the Cape of Good Hope. Here he dwelt from 1777 until his death by suicide 5 October 1795, during which period he carried out two long expeditions into the interior, making maps, drawings and notes upon the hinterland physiography, ethnology, flora and fauna. His first expedition (October 1777 to March 1778) took him to the Orange River, the second (October 1778 to 1779) through the Roggeveld to the Hantam district. Near the source of the Gamka (Leeuwen) River on 2 November 1778 he shot his first (African Black) rhinoceros and made a study of its external and internal characters preserved in various drawings and manuscript notes made in the field. During the remainder of this second journey he shot some dozen further rhinoceroses, of which nothing is recorded, and made observations upon the habits of the living animal. (Barnard, 1950; Tuijn, 1966; Mohr, 1967 and Forbes, 1965, provide fuller information on Gordon's biography).

The materials which epitomized Gordon's field work—and which include some 456 drawings of scientific interest—were brought to England by his widow, who solicited (1797) the assistance of Joseph Banks in connexion with Customs formalities (Britten, 1914; Dawson, 1958). They are presently contained in the Gordon Atlas preserved in the Prints Room of the Amsterdam Rijksmuseum. This Atlas consists of six large bound volumes, spine-inscribed with the words "The/Gordon/African/Collection" and the arms of the Duke of Sutherland. The fate of this Gordon material is obscure from the time of its

arrival in England until 1802 when it was purchased by the Marquis of Stafford. (Gordon's unpublished travel journal has recently come to light in the Staffordshire Record Office (D593/U/4) and awaits appropriate attention). The Gordon drawings passed later to the Duke of Sutherland who presumably determined their present arrangement and binding.

Four volumes of the Atlas were purchased (for £690) by Maggs Bros. at the Sotheby sale (30 October 1913) of the Stafford Library. The purchasers immediately put up for sale the complete Atlas at a price of £1250, issuing a catalogue containing a summary of its contents and an appreciation of Gordon's work (Britten, 1914; Maggs Bros., 1914). The Atlas was duly secured for the Rijksmuseum in 1914 through the instrumentality of Prof. E. C. Godée Molsbergen and the co-operation of the Netherlands Government.

The natural history and anatomical drawings in the Atlas were executed either by Gordon himself or under his close supervision. In a letter (10 April 1778) to Hendrik Fagel (State Archives, The Hague, Fagel-archief. No. 2515: 2) Gordon mentions assistance received in his work by "a soldier of my company". Forbes (1965) has sought inconclusively to identify this anonymous assistant with Johannes Schumacher who served in Gordon's company (1778-81) and who had executed drawings for Hendrik Swellengrebel's expedition of 1776-77. The anatomical drawings (of rhinoceros organs) and their accompanying manuscript notes in Gordon's own handwriting are strongly suggestive, however, of field memoranda made by the same observer. Whoever their draughtsman, these rhinoceros drawings reflect an observant eye and a competent pencil and are remarkably faithful to nature. They are clear evidence of a serious investigation of the anatomical constitution of that then morphologically unknown animal, the African Black rhinoceros.

Herein these pioneer rhinoceros drawings and their legends are reproduced, Gordon's original observations on the living rhinoceros are set out and Gordon's contribution to the morphology of the Rhinocerotidae is evaluated.

### Gordon's rhinoceros drawings

The rhinoceros figures detailed herein refer exclusively to the African Black rhinoceros (*Diceros bicornis*), the sometime "Cape rhinoceros" or "Gordon's rhinoceros". They are in the "Quadruped Volume" of the Gordon Atlas and were made from the adult male animal killed 2 November 1778 on the Gamka River. Their accompanying manuscript notes are in 18th century Dutch (translated below) and relevant measurements are in "rijnlandse voet" wherein 1 foot=31.4 cm, 1 inch (duym)=2.62 cm, and 1 line=0.218 cm.

Atlas fig. 205. Sinistral aspect of adult male animal, standing, head horizontal: coloured blackish grey on a brownish ground. External characters (including perineum, umbilicus, mammillae) faithfully rendered. Scale above "scale of nine feet rijnlands". Above drawing: "Rhinoceros bull shot near/the source/ of the Gamka or Leeuwen River in the southern part of Africa. It is called *nabab* in the Hottentot language—the *na* being pronounced with a loud blow: in the Caffer language *kiomboe*. They/ usually/walk in groups of two or three, sometimes with more. They get only one young. One must travel some 150 hours before it can be seen because they have been exterminated in the Cape neighbourhood. The 2nd Nov: 1778, R. J. Gordon". On verso a long description (see below) of the rhinoceros and its habits, marginally obscured by the figure's method of mounting and (save for a footnote) in handwriting other than Gordon's (Plate I).

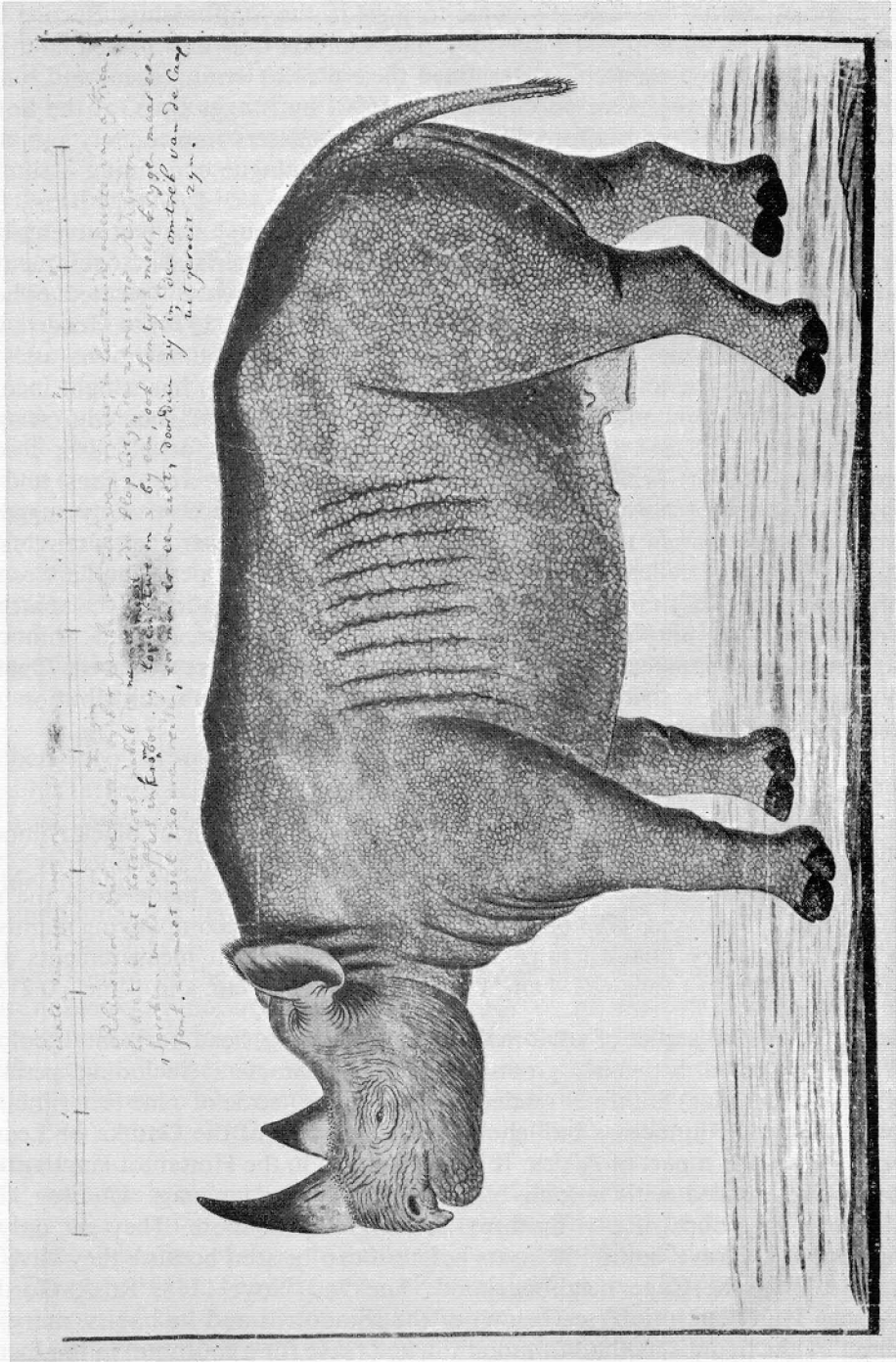


PLATE I. Gordon's original *Diceros bicornis* figure, the head extended. (Gordon Atlas, Fig. 205, Rijksmuseum, Amsterdam).

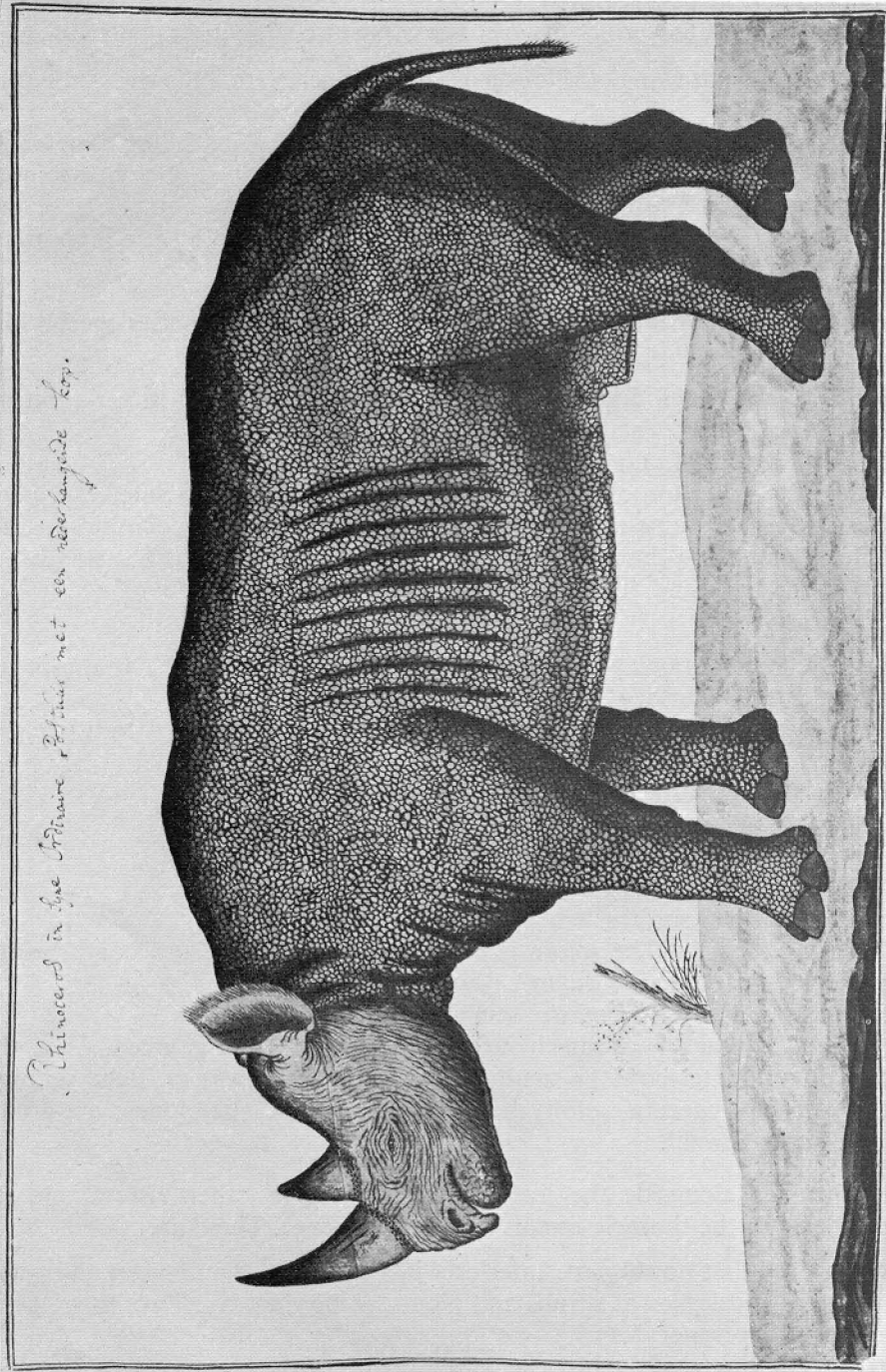


PLATE II. Gordon's second *Diceros bicornis* figure, the head more naturally poised. (Gordon Atlas, fig. 206, Rijksmuseum, Amsterdam).

Atlas fig. 206. Sinistral aspect of same animal but with head flexed: coloured brownish grey on a green, shrub-decorated, ground.

Superscription: "Rhinoceros in its customary posture with drooping head". (Plate II).

Atlas fig. 210. Pencil drawing of rhinoceros head in norma frontalis with scale (probably of two feet).

Below drawing: "Rhinoceros head seen from before. Thus he cannot see straight ahead. Its hide is  $\frac{3}{4}$  duym thick. But this animal was swollen after being shot in the great summer heat. The eyes are, as I found later in living animals, level with the eyelids, so that they are able to see straight ahead, but not so well as a hippopotamus". (Plate III).

The following figures, all pencil drawings, are strictly anatomical and of special historical interest.

Atlas fig. 207. Two pencil drawings of a rhinoceros cranium with superjacent notes in black ink traced over pencil. No scale.

(1) Sinistral aspect of cranium.

"Excavated skeleton of rhinoceros head, seen from the left side".

(2) Basal aspect of same cranium showing complete maxillary dentition *in situ*.

"Head length  $23\frac{1}{2}$  duym. Head at its widest point 14 duym. The smallest molars are at the back end. The length of the largest molars  $2\frac{1}{2}$  duym, width 2 duym." (Plate IV).

Atlas fig. 208. Pencil drawings of liver, tongue, bowel, spleen with manuscript notes.

(1) Liver: parietal surface, inscribed "23 duym long".

"The liver is in three parts, and every part is notched. From A to B [see drawing] 28 duym. It had no gall bladder".

(2) Liver: visceral surface [dextrad of first drawing].

(3) Tongue: dorsal surface.

(4) Tongue: ventral aspect of pars apicalis.

"The underside of the tongue tip".

(5) Spleen: parietal surface.

"Brown colour". "The spleen is located on the left side, the length being 3 feet of duym, the breadth 8 duym".

(6) Stomach and bowel *en masse*, semidiagrammatic.

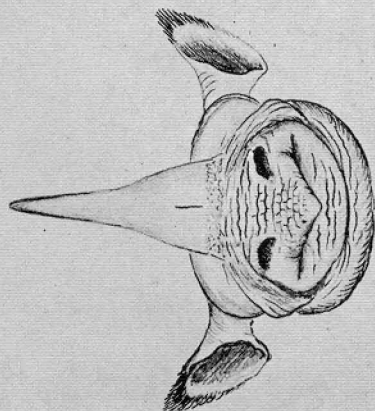
"First a dry sack [=stomach] with its food. The food is green. Then the long convoluted water-bowl [=small intestine] the food watery, light yellow. Then a dry sack [=caecum, colon] the food dark yellow. The kidneys are attached to long water-bowl".

Manuscript jottings alongside the liver drawings refer to other viscera and indicate inspection at least of the thoracic organs and thoracic cage. These are:

(*re* bowel)—"The first bowel part. Interiorly is more white than brown and was full of chewed twigs and leaves of shrubs and plants, somewhat dry. Two bowel parts were dry, the rest very watery".

(*re* heart)—"The length of the heart and the breadth of the heart 13 duym".

(*re* lungs)—"The lungs are thick, with four small lobes".



rindes kop van wra. Del be by metigt uit zee  
 syn ul drie quartmuidel. Doy die dier was opgeschrokken dooygedochoten zynde, in grote kette  
 De ogen klein, de alse naderhand in te vinden vord, gelyk met de leden so dat by  
 wel voor uit sien kinne  
 cyter niet so wel als de  
 hippopotamus.

PLATE III. *Diceros bicornis*, drawing of head. (Gordon Atlas, fig. 210, Rijksmuseum, Amsterdam).

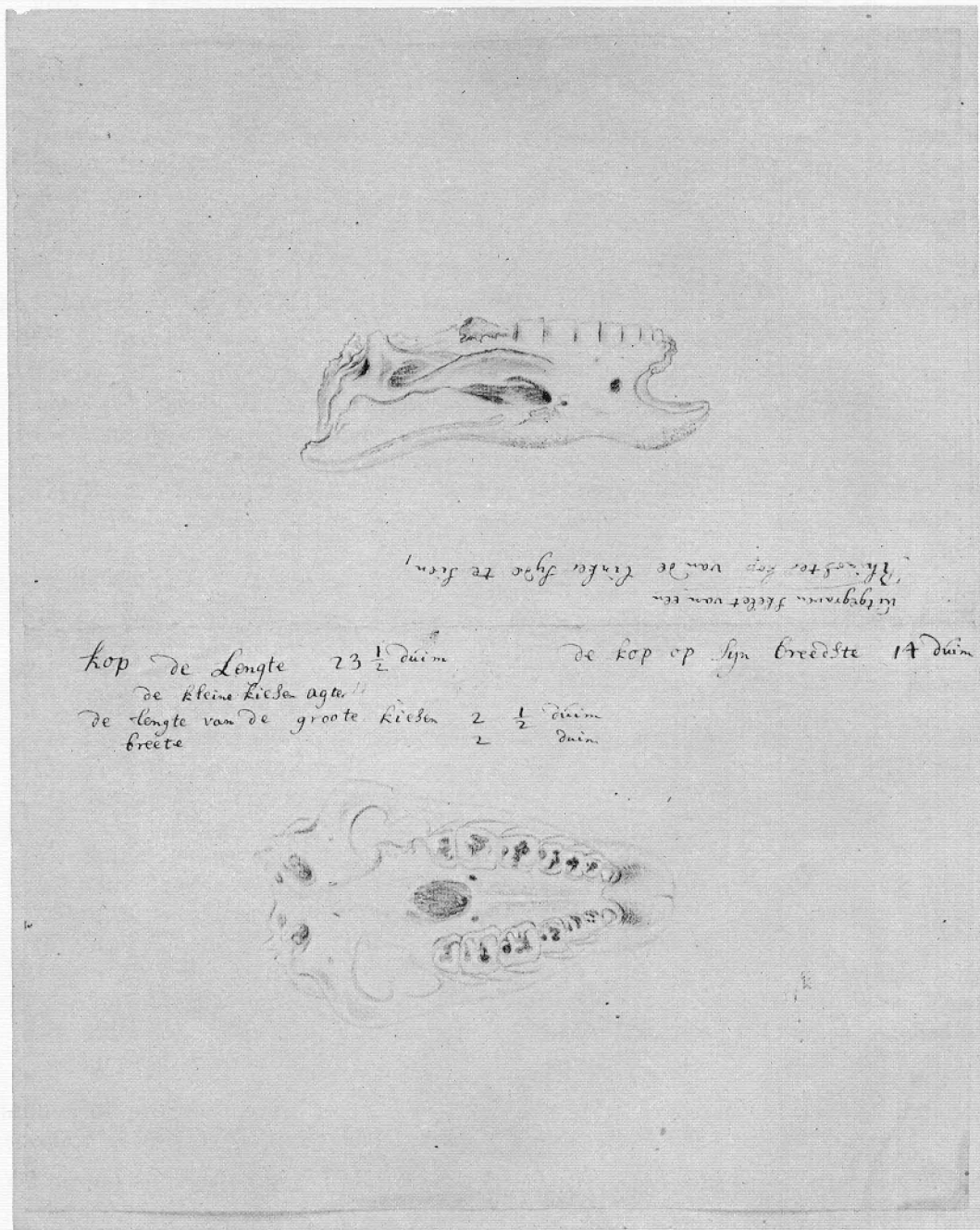


PLATE IV. *Diceros bicornis*, drawings of cranium. (Gordon Atlas, fig. 207, Rijksmuseum, Amsterdam).



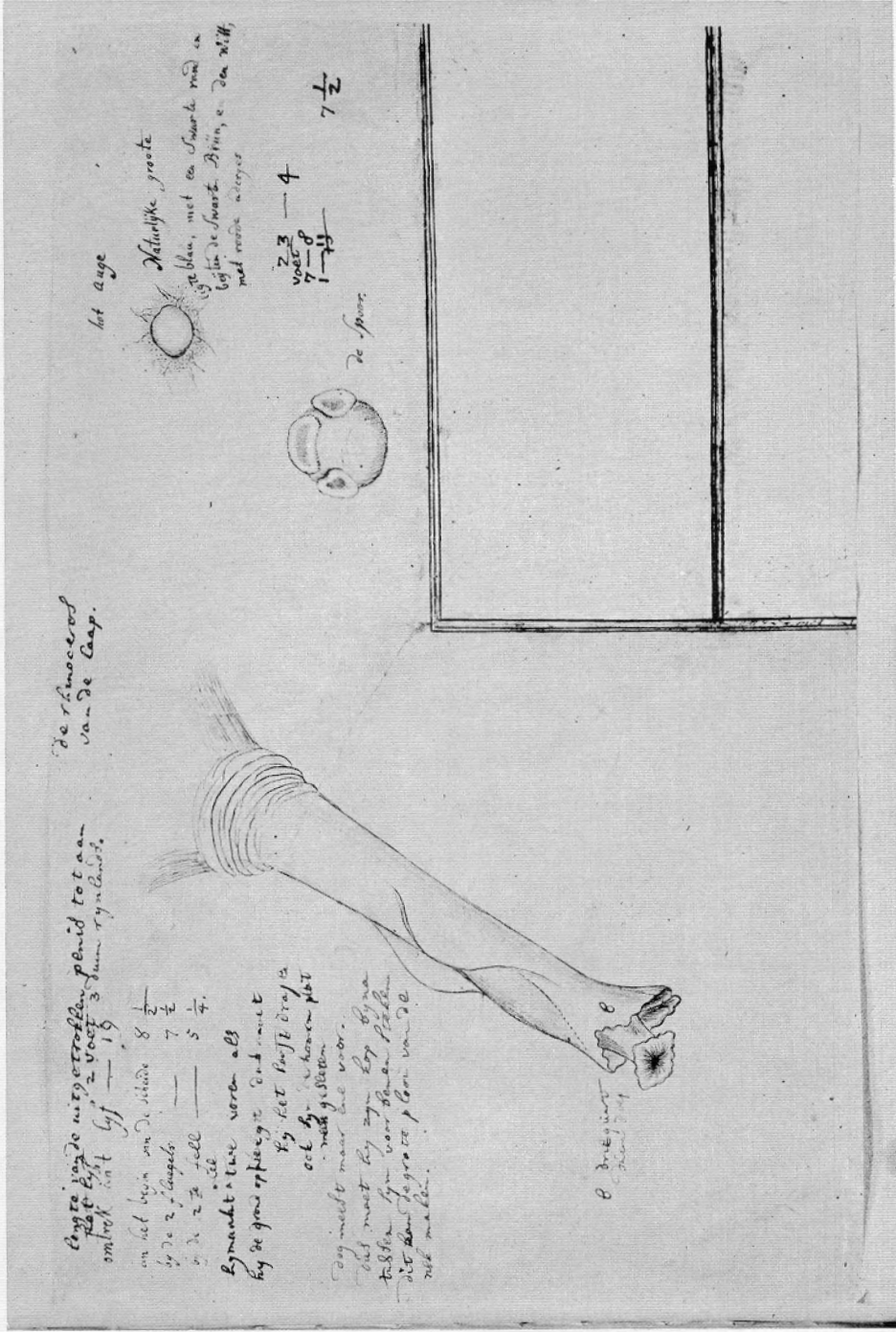


PLATE V. *Diceros bicornis*, drawings of eye, penis and "spoor". (Gordon Atlas, fig. 211, Rijksmuseum, Amsterdam).



(*re* kidneys)—“The kidneys are as in a beest [?Wildebeest], somewhat larger”.

(*re* ribs)—“16 large and 4 small ribs on both sides, of which the two at the end of each side were very small”. (Plate V). Ⅴ

Atlas fig. 211. Pencil drawings of extruded penis, eye and “spoor” with comments on organs and animal’s habits.

Note on eye: “The eye, natural size. Light blue with a black edge and outside the black it is brown and the white has small red veins”.

Note on penis: “Length of the penis extended against the body, 2 feet 3 duym rijnlands.”

Circumference at the body 19 [duym].

Circumference at the beginning of the sheath  $8\frac{1}{2}$ .

Circumference at the two wings  $7\frac{1}{2}$ .

Circumference at the second skin  $5\frac{1}{4}$ ”.

Opening at b [in figure] “ $\frac{3}{4}$  duym deep”.

The drawing labelled “de Spoor” resembles more an illustration of the foot sole than of a foot print.

Other notes on this sheet: “It/often/makes two furrows when scraping the ground. Thus it must carry its head [?low]. Also the horns are flattened, often worn off. But usually it makes one furrow only. Therefore it must put its head almost between the forelegs. This may produce the great neck-crease”. (Plate VI). Ⅴ

#### Gordon’s rhinoceros description

A long description of the “Cape rhinoceros” and its habits appears on Atlas fig. 205, verso. Save for a corrective footnote it is not in Gordon’s handwriting and was probably dictated or copied from notes made in the field. Marginally the text is obscured from the mode of mounting of the figure. The descriptive text reads:

“Stiff black hairs, 2 lines long, here and there between skin grooves and some around the eye. On the upper edge of the ear they are stiffer and  $2\frac{1}{2}$  duym long. The differences between bull and cow resemble the hippopotamus condition and that is all. Its eye is 8 lines only in longest diameter, and is located  $\frac{3}{4}$  duym deep in its wrinkled eyelids, for which reason it cannot look ahead\* and sees only what appears in its restricted field of vision. When it hears something, it turns its head in that direction, seemingly trusting its smell and hearing more than its sight. However it often turns and swings its head when walking, which it can do faster than a horse. But one easily avoids it by staying downwind, because they are very dangerous otherwise. When it ploughs the ground it often makes two furrows because it swings its head sideways, walking and jumping to and fro madly with tail outstretched. I have never heard anything about its fighting with the elephant. Its sound is a grunt and strong blowing almost like a flute.

Its hide is not so thick as that of the hippopotamus, being only  $\frac{3}{4}$  inch thick. Many wrinkles run through the hide in all directions, forming roundish [surface] areas, where the hippopotamus forms square ones, only 1 line deep. It has a groove, 3 duym deep, near the groin

\*Footnote in Gordon’s hand: “I have found, on further examination, that this was caused by the bloating of the dead rhinoceros. A living one has its small eyes on the same level as the eyelids, so that it can look straight ahead. I also found that its upper lip is extremely moveable so that it uses this lip to grasp its food. Among 13 rhinoceroses killed during my trip in 1779, none had so many skin grooves as this one”.



and one 1 duym deep behind the shoulder blade near the beginning of the ribs. There is a groove  $1\frac{3}{4}$  duym deep behind the ears, nine grooves on the ribs,  $\frac{1}{2}$  duym deep: further two small grooves above the heel and four below the breast: all these grooves are formed by the animal's movements.

I have been surprised by the difference between the Cape rhinoceros and the one shown in Buffon [—*Rhinoceros unicornis*]. This animal's upper lip\* has no movement other than that of most animals' lips. It has no teeth in the front part of its mouth, and seven teeth in every jaw, thus 28 in all. The upper teeth have somewhat longer outer sides so that they seem to fit over the lower. Its hide is used to make whips and the meat is eaten and said to be tasty when the animal is not too old. It has 3 nails or rather hooves upon each foot and a loose under-sole. This animal at first recalls a hippopotamus save [for] the head the snout of which more closely resembles [the head of] a turtle. The horns are attached to the hide  $\frac{1}{2}$  duym apart at their bases, on the convex summit of its smooth forehead. But it can be moved a little by force. It does as much harm with its legs as with its horns. Its tail is round above and flattish underneath and has a seam around which the hairs are disposed as in the hippopotamus. Its colour is dark brown and flesh-coloured in the belly grooves but it often wallows in mud and so resembles the ground on which it lives. It was killed at a distance of 118 paces with a 10-to-the-pound bullet".

The following list of measurements accompanies this description:

	feet	duym	line	rijnl.
"Body length from before the horns to origin of tail along the curve .. .. .	11	0	3	
Circumference of head between the horns .. ..	3	6	3	
Circumference of head behind the ears .. ..	5	0	6	
Circumference in front of the forelegs .. ..	7	4	9	
Circumference in the middle of its thick neck ..	6	6	3	
Circumference behind the forelegs .. .. .	8	5	$\frac{3}{4}$	
Circumference in the middle of the body .. ..	9	9	10	
Circumference in front of the hind legs .. ..	7	11	0	
Breadth in front, at the breast .. .. .	2	1	0	
Breadth behind, all in straight line .. .. .	2	4	0	
Circumference, the forelegs near the body .. ..	3	6	3	
Circumference at the wrist joint .. .. .	1	9	6	
Circumference at the narrowest point .. .. .	1	6	0	
Circumference, the hind legs near the body ..	3	9	9	
Circumference around the heel .. .. .	1	10	0	
Circumference at the narrowest joint .. .. .	1	4	0	
Circumference of the larger horn, at base .. ..	2	1	6	
Circumference of the smaller horn .. .. .	1	6	6	
The scale shows the rest". (Plate VII).				

### The Supplement to Buffon

Gordon generously placed his information at the disposal of others and in 1779–80 sent to Holland a description of the African Black rhinoceros with accompanying copies of his original drawings. This material was passed to Allamand and by him employed in a Supplement to the 1782 French edition and the 1785 translation of Buffon's *Histoire Naturelle*. Allamand supplemented his text by a plate depicting "Le rhinoceros du Cap" obviously copied from Gordon's figures (Atlas, 205, 206) though less well executed.

The precise extent of this material received by Allamand from Gordon remains unknown but it most probably included a picture of the standing animal and a detailed account of the animal's structure together with drawings of the penis and other organs. Its fate is obscure. It appeared as item 51 in the sale (1800) of Arnout Vosmaer's library thus:

"51. Drawing in colour and exact description of a rhinoceros shot near the source of the Gamka River in Southern Africa by R. J. Gordon 1778. Also naturalistic description of some parts and entrails. 3 pieces. Original drawings".

Tuijn (1966) states that this item was purchased by Willem Leurs, then surgeon at the Hague: its subsequent history is unknown but the material may still be extant.

Allamand's text in the Buffon Supplement follows Gordon's description of the Cape rhinoceros very closely: it includes not only the memoranda on the verso of Atlas figure 205 but also some of the notes inscribed on the other drawings. He altered however Gordon's sequence of items and deleted virtually all the anatomical detail, remarking merely that the penis corresponds in all details to the figure given by Parsons (1743) for the Indian rhinoceros: he inaccurately gave the Hottentot name as *nabal* (for *nabab*), located two dermal creases below instead of above the heel, gave 12 as the total number of rhinoceroses shot by Gordon during the Gamka River expedition and, more seriously, overlooked the corrective footnote concerning vision and the prehensile upper lip added by Gordon to his original description. He did, however, add certain rhinoceros measurements, either deduced from the scale of the drawings or, more probably, supplied directly by Gordon himself. These measurements (Allamand, 1785) are:

Body length, lip to tail root, in a straight line ..	9	3	0
Height at the shoulders, in a straight line .. ..	5	3	0
Height at the hind legs .. .. .	4	8	0
Length of the longer horn .. .. .	1	4	0
Length of the smaller horn .. .. .	0	8	0
Circumference of upper part of mouth (?muzzle)	1	6	0
Circumference of its lower part .. .. .	1	2	6
Length of nostril opening .. .. .	0	2	6
Length of the ears .. .. .	0	9	0
Circumference of ears (along outer border) ..	2	0	0
Distance between ear bases .. .. .	0	11	0
Length of foreleg sole (manus) .. .. .	0	9	0
Its breadth .. .. .	0	9	0
Length of hind leg sole (pes) .. .. .	0	8	6
Its breadth .. .. .	0	7	9"

It was through the medium of Buffon's Supplement that Gordon's observations were brought to the notice of European zoologists.

#### "Gordon's rhinoceros" or "*Rhinoceros gordonii*"

Gordon's account of the "Cape rhinoceros" attracted contemporary attention but effected no general association of his name with *Diceros bicornis*. Such French zoologists as de Blainville, Desmarest, Lesson and Cuvier did however make occasional reference to "*Rhinoceros gordonii*". Thus de Blainville (1817) speculated on the relationship of "Gordon's rhinoceros" to Burchell's (1817) rhinoceros (*Rhinoceros simus*) and, misled by

Allamand's adoption of Gordon's uncorrected account of the upper lip, wrongly concluded that the two forms were identical. Desmarest (1822) followed de Blainville closely and repeated the measurements of the Cape rhinoceros provided by Allamand. Lesson (1827) originally shared de Blainville's doubts concerning the specific identity of "Gordon's rhinoceros" but later (Lesson, 1842) considered "*Rhinoceros gordonii*, Blainv." to be a variety (B) of *Rhinoceros bicornis* and Burchell's rhinoceros (*Rhinoceros simus*) to be another variety (C).

The term "*Rhinoceros gordonii*" never however gained general acceptance and was duly relegated to the synonymy of *Diceros bicornis*.

Curious misunderstandings arose among some French authorities respecting the dentition of the "Cape rhinoceros". Gordon, and Allamand after him, had correctly described the dental complement as seven cheek teeth in each maxillary and mandibular moiety and an absence of incisor teeth. Yet Cuvier (1812) could state "Je sais aussi que Gordon attribue à son rhinocéros du Cap quatre dents incisives à la partie antérieure des mâchoires" and Lesson (1827) could proclaim the dental series to comprise "24 molaires en tout, 2 incisives à chaque mâchoire". The basis of such misunderstanding remains obscure.

#### Gordon's contribution to rhinoceros morphology

Gordon's investigation of *Diceros* morphology was performed in the field under very adverse conditions, rendering the fullness of his findings the more creditable. Some three years earlier (1775) Sparrman had independently examined the *Diceros* major viscera, but his anatomical account (Sparrman, 1778, 1779), though more terminologically exact than Gordon's, is brief, unillustrated and less informative. Significantly Burchell (1817) attempted no anatomization of his new *Rhinoceros simus*, being content with drawings of the animal and the skull and with the retention as paratype material of a few horns and teeth (Cave, 1947, 1962): and Heller (1913) likewise undertook no splanchnological examination of the 14 White rhinoceroses collected by the Smithsonian Expedition to the Lado enclave.

That Gordon's Gamka River animal was chest-shot dextrally may be inferred from its left side only being depicted and none of the thoracic organs. Its examination involved a meticulous scrutiny of the external features, detailed inspection of the dentition, evisceration of mouth- and body-cavities, inspection of the alimentary canal contents and a careful rib count—accompanied by mensuration and delineation of parts and organs.

Record was made of the *Diceros* body measurements, the surface pattern, thickness and flexure lines of the skin, the general distribution of body hairs, the prehensile nature of the upper lip, the pigmentation of the eye and the details of penis, mammillae, horns and hooves. Brief reference was made to the anatomy of the tongue, heart, lungs and kidneys: fuller and illustrated observations were made of the gut, spleen, liver and penis. The pancreas was curiously overlooked and the pelvic uro-genital apparatus was unmentioned, since doubtless left *in situ*.

The tongue drawings made (Atlas fig. 208) are a first-time and accurate representation of the shape, proportions and parts of the *Diceros* organ: the laterally compressed corpus linguae, the elevated pars elliptica, the triangular dorso-ventrally compressed pars apicalis are duly illustrated: a sagittally divided intermolar eminence is indicated as also the presence of a lytta within the pars apicalis.

Of the presumably mutilated heart the cranio-caudad and transverse overall dimensions (noted as equal) are alone recorded.

The lung is described as "solid", which may indicate Gordon's recognition of its unilobate nature: if so the pulmonary "four small lobes" described probably represent the azygos lobe plus the peninsular lappets of marginal lung tissue which result from the crenation of its cranial extremity.

The kidney's size is correctly indicated but it is erroneously stated to be attached to the small intestine: the adrenal gland appears to have been missed lying medial to the renal cranial pole, possibly because indistinguishable in an abundance of peri-nephric fat.

The penis drawing (Atlas fig. 211) is the earliest known extant figure of the *Diceros* organ and its realism is confirmed by 20th century observations (Lönnberg, 1912; Freund, 1930; Cave, 1964). With the drawings of the tongue and liver it represents Gordon's

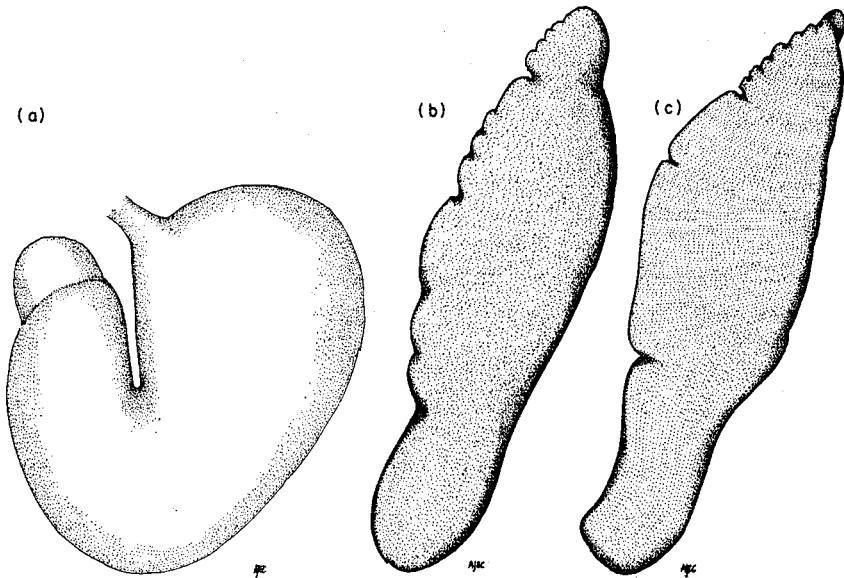


FIG. 1. *Diceros bicornis*. Stomach and spleens of recent specimens. (a) stomach of 4 years old male; (b) spleen of same; (c) spleen of 3 years old female.

principal contribution to rhinoceros splanchnology. It shows clearly the distinctive configuration of the glans and prepuce and the shape and disposition of the two erectile "wings" (*processus glandis*), the structures noted earlier (1775) by Sparrman and by him termed "*caroncules paraboliques*" (Sparrman, 1779).

The spleen (Atlas fig. 208) is depicted from its parietal aspect: the figure indicates an elongate organ, with slightly indented ventral margin, tapering to a narrower cranial rounded end and a broader, flatter caudal end, and compares favourably with drawings made of the spleen in recent young *Diceros* material (Fig. 1).

The alimentary canal is somewhat diagrammatically depicted (Atlas fig. 208) *en masse*, no component (identified by topography and nature of content) being illustrated separately. Nevertheless, the stomach outline is correctly shown (cf. Fig. 1) and there is even an indication of the typical acute reflexion cranialwards of the pyloric segment of the organ.



Gordon obviously opened and explored the stomach fully, for he correctly notes the greater relative extent of the "whitish" (stratified squamous) epithelial lining as compared with that of the "brownish" (columnar) epithelial lining of the pyloric region.

The bile staining and the fluid nature of the small intestine content is duly noted, as also the drier (faecal) content of the large bowel.

Gordon's liver drawings (Atlas fig. 208) are the earliest known representation of the *Diceros* organ and their anatomical accuracy is confirmed by comparison with recent figures of this viscus (Fig. 2). Correctly indicated are the hepatic parietal and visceral

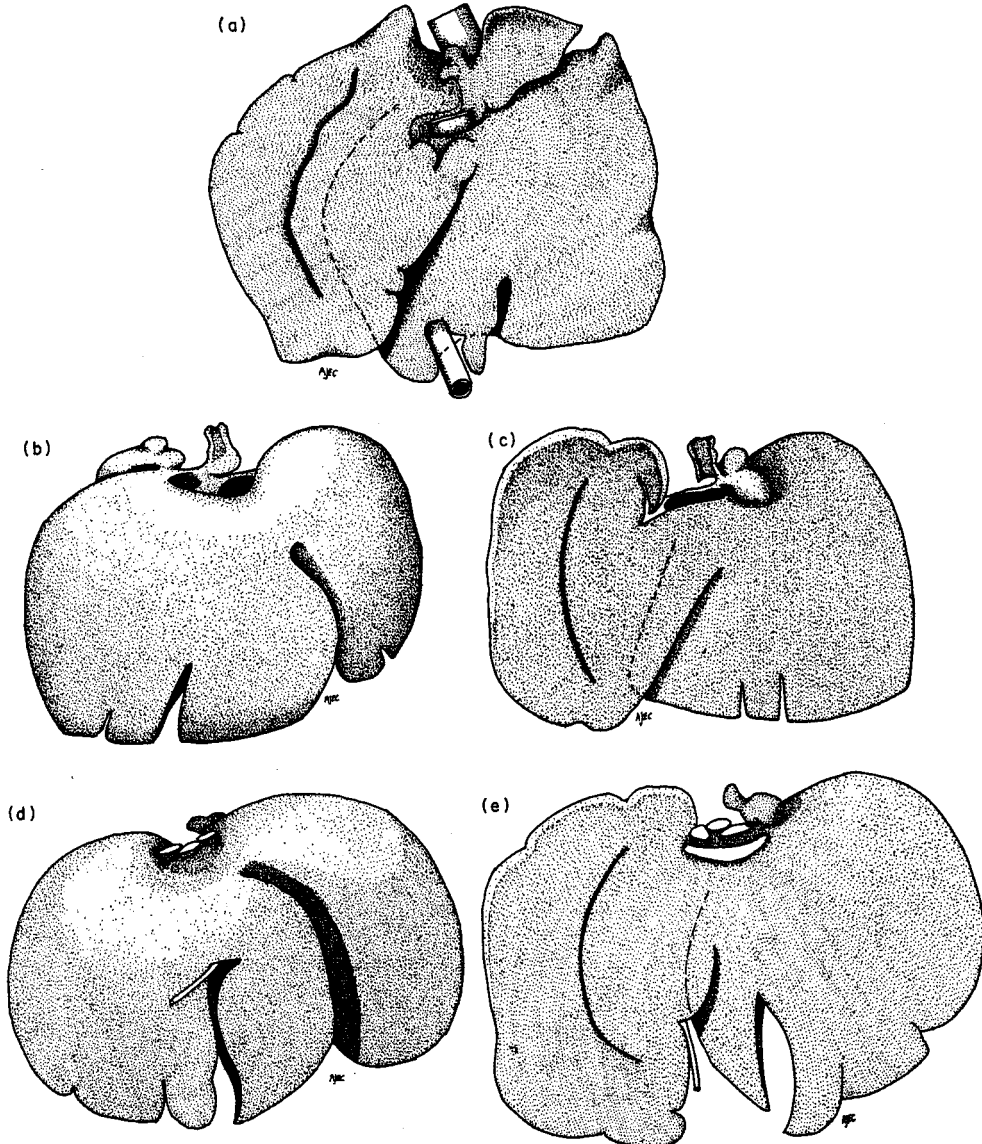


FIG. 2. *Diceros bicornis*. The liver in recent specimens. (a) liver of female foetus, visceral surface; (b) parietal and (c) visceral surface of liver of 4 years old male; (d) parietal and (e) visceral surface of liver of 20 years old female.

surfaces, the notched peripheral margin and the subdivision of the organ into three gross components, viz. dextral (the combined canonical right lateral and right central lobes), intermediate (canonical left central lobe) and sinistral (canonical left lateral lobe). The visceral surface drawing shows also the small mass of the confluent caudate and Spigelian lobes positioned correctly alongside an indicated vena caval fossa, also the long incomplete fissure which imperfectly separates the left lateral and left central lobes on this surface. Absence of a gall bladder is also noted.

Apart from an estimation of the rib complement, Gordon's osteological interest appears to have been confined to the skull. His Atlas fig. 207 illustrates the "excavated" cranium of the macerated head of his Gamka River animal. Curiously the mandible is not figured. The two cranium drawings are accurate in anatomical detail even to the rugosity of the supra-orbital process and of the site of horn attachment.

No bones, teeth or horns of this or of any other rhinoceros shot by Gordon appear to have been preserved and there is no record of his anatomizing any additional animal.

### **Sparrman and Black rhinoceros morphology**

The other 18th century investigator of *Diceros* morphology was Gordon's contemporary Sparrman, by whom he was anticipated in this respect. Before Gordon's coming to the Cape Sparrman had voyaged thither and had explored the country's interior. On 20 December 1775, at Quammadacka, on the Fish River, he shot and made examination of a Black rhinoceros, an event recorded in his published travels (Sparrman, 1786). Earlier he reported his *Diceros* anatomical findings (Sparrman, 1778), the penis being accorded separate reportage (Sparrman, 1779). His 1778 account includes a dextral illustration of the living animal and the skull (now No. 1572, Naturhistoriska Rijksmuseum, Stockholm) but otherwise is largely a nomination of the thoracico-abdominal organs and their dimensions with a brief reference to the features of some (stomach, lung, liver, penis): it ignores the tongue, the dentition, the gastric mucosa, the intestinal contents and the external characters, and thus, though it has priority over Gordon's account, is much less complete or informative.

Sparrman recognized the non-ruminant nature of the *Diceros* stomach which he considered to resemble the human or pig stomach rather than that of the horse, presumably on the criterion of the greater topographical separation in *Diceros* of the cardia and the pylorus. He gives the dimensions, with those of the small and large intestine, and comments upon the great size of the caecum: beyond mention of the colon attachment to the spine he gives no further particulars of alimentary canal anatomy. He states the length and breadth of the heart, spleen and kidney without further relevant information and does not illustrate these organs.

He correctly recognises the lungs to be unilobate despite an undescribed incisura in what he calls the "right lobe" of each, and he observes a small azygos lobe on the cardiac aspect of the left lung. The liver dimensions are recorded, as also the obtrusive subdivision of the hepatic mass into three distinct and virtually equal components and the presence of a "little lobe" [combined canonical caudate and Spigelian lobes] near the cranial border of the visceral surface. The horse-like absence of a gall bladder is also noted.

Sparrman made a drawing of the penis, the subject of a later special communication (Sparrman, 1779), and measured its parts, including the "caroncules paraboliques"

[processus glandis]. He compared his figure with that given by Parsons (1743) for the Indian rhinoceros and concluded correctly that the obvious anatomical difference between the two constituted additional proof of the separate specific identity of these two rhinoceros forms.

Whether Sparrman who was anticipated in *Diceros* skull definition by Camper (1777) made drawings of *Diceros* viscera and whether any such made have survived is unknown. He may certainly be accorded priority in the exploration of *Diceros* morphology, meagre though his anatomical findings are. Such priority, however, in no way detracts from the value and importance of Gordon's independent contemporary investigation, the accuracy of whose more thorough splanchnological findings and figures is confirmed by examination of present-day material.

### Commentary

The 18th century, pioneer, investigations of rhinoceros morphology were those conducted by Sparrman (1775) and Gordon (1778) on the African Black rhinoceros, those of Parsons (1743) and Vicq D'Azyr (1793) on the Indian rhinoceros and that of Bell (1793) on the Sumatran rhinoceros. (Only in the 19th century was the African White rhinoceros originally studied by Burchell (1817) and the Javan rhinoceros anatomized by Garrod (1873, 1877)).

Sparrman and Gordon thus laid the foundations of knowledge of African rhinoceros splanchnology, upon which the requisite edifice still awaits erection. In this context Sparrman enjoys an obvious priority. Yet his anatomical enquiry was less extensive and his findings are less informative than those of Gordon who, though not a professional zoologist, made a memorable pioneer contribution to the study of *Diceros* morphology.

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