Gessner's Hyena and the Telephone Game

WITH FOURTEEN ILLUSTRATIONS

by

Manda Clair Jost

2002 Winning Paper
Bowdoin Graduate Prize in Natural Sciences
Harvard University
Cambridge, MA

"Post-Renaissance zoology as a metaphor for the nature of science"

Word Count: < 5500

1. Bessie and Victoria

It comforts me to know that my office building is guarded by two gigantic rhinoceroses -- my building, and that of several hundred researchers and students who work in the Biological Laboratories at the end of Divinity Avenue. The two textured and patinaed bronzes by Katherine Ward Lane are truly intimidating yet magnificent to behold. In addition to being larger than any rhinoceros I've seen in the flesh -- it's said that the statues equal the size of the largest recorded specimen -- each sculpture is set atop a meter-high pedestal, aloofly gazing down the paths which lead to the building's entrance, seemingly in wait of an approaching enemy. If such enemies knew anything about the temperament of wild rhinos, they would be rightfully deterred; and if experienced in such things, would know that the best defense against a charging rhino is not to flee -- for a rhino is faster by far -- but rather, to stay in place and side-step the attack at the last moment. The rules are different for lions: with a lion, one is supposed to behave threateningly, by running towards it while making a lot of noise and swinging the arms about like a windmill. With bears, the best known strategy is to simply play dead. Although I generally feel empowered by this knowledge I've amassed on what to do when endangered by wild game, there is another problem to consider when faced with ornery rhinos: their vision is terrible. Thus any reassurance I may get by having twin rhinoceroses guarding my workplace is incomplete, since a day may well come when I, on my hapless way to work, am mistaken for the enemy.

It takes no more than a keen eye and a moment to realize that the bronze rhinoceroses in front of the Biological Laboratories are *not* twins. While it would have been more parsimonious for Ms. Lane to cast both statues from the same forms, this is not the approach that was taken. Instead, each rhinoceros is an individual work of sculpture with its own chirality, making the two more akin to a *pair* of gloves, than to two left or two right gloves. Note that I am talking here about proper gloves such as one might wear in the garden or to a funeral, and not the latex exam gloves used by researchers in the Biological Laboratories, which are identical and thin and can fit either hand. Had Ms. Lane been employed by a research supply company in her time, we biologists might be blessed today with the availability of work gloves designed to fit one hand or the other. Katherine Ward Lane understood chirality, let it be known, and as

well as the best organic chemist. The uniqueness of her two statues is further reflected by the fact that each of the rhinos has its own name. One is called Bessie, the other, Victoria -- but the origins of those names and which rhino is which are unknown to me at this time.

To realize that the bronze rhinoceroses in front of the Biological Laboratories are a bit *unusual*, however, would take more than a keen eye and a moment: it would take a zoologist, or at least one familiar with animals. Though studies for the two statues were made at the New York Zoological Park -- now undaintily known as the Bronx Zoo -- one cannot help but feel that there is something vaguely grotesque about them. They are gargoyles, Bessie and Victoria: intimidating icons which, despite being for the most part anatomically correct, are nevertheless caricatures of their species -- a freedom which is permissible in the visual arts, yet less so in the unforgiving realm of science. I believe, however, that Ms. Ward designed those sculptures with an homage in mind: an homage to the centuries-long tradition of zoological art and rendering, of which the Indian rhinoceros is the indisputable mascot. For no other creature has been represented in so many woodcuts and engravings with as much careful, loving detail -- a passion for detail, in fact, which would have rivaled biologists of today had the artists of old been as concerned with accuracy as they were with precision. To their credit, they did the best that they were able with the resources they had, for we are speaking of a tradition which began with sixteenth-century European illustrators who had never seen a rhinoceros, or much of any other exotic animal, for that matter. The saga of the Indian rhinoceros is widely known and has been skillfully told elsewhere, but as the beginning of my own story, it is appropriate to present it here.

2. Dürer's Rhinoceros

In the early 16th century, the Portuguese staged a battle between two strange animals they had acquired abroad and brought to Europe by ship: an Indian elephant, and an Indian rhinoceros. When the rhino was declared the victor after the elephant fled -- what it *should* have done was step aside at the last moment -- King Manuel I of Portugal graciously decided to send both animals to Rome as a gift to Pope Leo X. Although the true intentions of Manuel I remain questionable and the subject of some

debate, the elephant and rhinoceros were loaded onto a ship and sent on their way, until the ship capsized in the Mediterranean (some said it was a storm, others that the rhino had done it), and the rhinoceros, tragically, met its death in the sea by drowning . The corpse, however, was recovered and stuffed, and sent back to Lisbon for display; and at about the same time that Raphael was rendering his likeness of the elephant that survived the journey to Rome, Albrecht Dürer, the famous painter and engraver from Nuremberg, made his drawing and woodcut of the rhinoceros (Figure 1). It was the year 1515.

Historians say that Dürer never really saw the specimen, but only a sketch and description made by a Portuguese artist who had seen the exhibit in Lisbon. Still, the image he produced is spectacular: for who could imagine so fantastic a beast, with that penetrating gaze and that dagger for a snout, and encased in a hide of plates like the best Medieval armor? It is true that the anatomy in the drawing is incorrect -- an embellished rendering based on memory, doodling, and verbal descriptions from those who had seen the animal, or at least *knew* someone who had seen it. The horn on the shoulder, for instance, is nonexistent in real rhinoceroses. Dürer's illustration, however, was truly scientific in that it represented the best information that was available at the time, and was intended as a representation of fact. It is therefore not surprising that the first major illustrated work on zoology, Konrad Gessner's four-volume *Historia Animalium* (1560), included a copy of Dürer's rhinoceros amongst the scientific figures. But in the mid 16th century, if a printer wanted to incorporate an earlier drawing into a book, he had to commission an artist to make a new engraving based on some previously published original. It was plagiarism, of course, but it was common and accepted and the only known method of perpetuating graphic works. For this reason, the rhinoceros in Gessner 1560 is a reverse image of a print made from Dürer's woodcut -- which, in turn, was a reverse image of Dürer's own original drawing. Looking at the rhinoceros which appears in Gessner 1560, one can see that the artist was commendably faithful to Dürer's original (Figure 2). It is, however, a slight departure from Dürer in that certain lines are darker and deeper as a result of the coarseness of the wood medium, and many of the features of the armor (already inaccurate) have been over-emphasized. Such was the nature of many of the woodcuts in Gessner's work, but in the words of art historian S. Peter Dance:

> A glance at [Gessner's] woodcuts is enough to show that they [are meant to] instruct rather than bewitch. That is what Gessner wanted, and why they proved to be his most original and lasting contributions to science. He employed eminent artists to try to ensure that the woodcuts were as accurate -- and unemotional -- as they could be. In view of the state of zoology at the time, he succeeded remarkably well. (1978)

But now let us see what became of Dürer's rhinoceros -- now Gessner's rhinoceros -- in the following years as the field of zoology progressed in Europe. In the early and mid seventeenth century, two more versions appeared in English texts: one in Johann Johnston's *Historia Naturalis de Quadrupedibus*, a reverse image of Gessner's rhinoceros and thus in the same orientation as Dürer's woodcut (Figure 3) -- and another in Edward Topsell's *Historie of Foure-footed Beastes* (Figure 4). By this time, both of these engravings begin to show an alarming intensity in the structure and sectioning of the armor, while the nonexistent horn on the shoulder starts to appear longer and more robust than its published predecessors. By 1697, an incarnation in Gaspar Schott's *Physica Curiosa sive Mirabilia Naturae et Artis* had transformed the rhinoceros into a mechanical, inanimate monstrosity, seemingly wrought of flint and steel rather than flesh and blood -- one can almost see the clockwork churning inside a hollow metal shell, perhaps activated externally by way of the fictitious horn on the shoulder which has at this stage grown as long as the one on the face (Figure 5). Finally, in 1708, a plate in Leguat's *Voyage et aventures* (Figure 6) marks a complete departure from reality on this planet. Five versions of the rhinoceros appear: one clearly (yet poorly) reproduced from the chain begun by Dürer almost two centuries earlier, and the others presumably divined through some sort of congress with spirits. Two versions appear to be covered with fish scales; a third resembles those two, except for the addition of a dorsal armor structure which looks more like a riding saddle; and finally, in the center, a creature that could only be invented by a man. For what god would dare to craft a beast with an accordion for a neck, with a horn *in the middle of its forehead*, and encrusted with massive circular plates resembling the eyes of frightened toads?

The madness didn't end there, but it might as well have. Countless bastard grandchildren of Dürer's rhinoceros persisted in both scientific and popular culture throughout the eighteenth century, showing up on ceramics, carvings, tapestries, and other objects in addition to printed works. At some time near the beginning of the nineteenth century, perpetuation of the image as a true representation of a rhinoceros

ceased: the field of zoology, apparently, had become enlightened through new access to real rhinoceros specimens, and the chain of drawings which began with Dürer was discarded from the scientific literature. They are still common today in popular art, but are mainly cited with much chuckling and Great Knowing as dated and amusing examples of a quaint post-Renaissance science.

3. Gessner's Hyena

When I was a senior-year student at my undergraduate institution, I enrolled in what at the time was my third consecutive course in the biology and behavior of primates. It was a graduate level class with a group-discussion format, and one of the requirements was for pairs of students to give oral presentations to the rest of the group on a primatological topic of their own choosing. My classmate and I decided to present a historical overview of primatology from the middle ages to the present, focusing mainly on the chronic tendency for scholars from all fields to view primates as lesser, sinister versions of men, rather than as organisms in their own right with their own biology and natural history. We made a bit of a circus out of it, renting full-body gorilla suits in which we terrorized the entire Anthropology department immediately prior to the class.... But the content of our presentation was well-researched and solid. We argued that it has only been recently that primates have been accepted in zoology as genuine animals worthy of study, rather than as demons, savages, or more recently, the "little babies" of schooled primatologists from the 20th century who more often than not were female. We presented literature which demonstrated that some early naturalists believed that chimpanzees and African pygmy peoples were one and the same thing. We discussed the cultural origins (and impact) of films such as *King Kong* and *The Planet of the Apes*, and we showed that even the current primatological literature prefers to view primates as models through which to better understand the biology and behavior of human beings.

As part of that presentation, I showed a slide that I had copied from a book I own about the history of biological illustration, S. Peter Dance's *The Art of Natural History* (1978). I offered it to the class as a curiosity, as a little vignette of Science Gone Wrong. The image was a series of engravings intended to give an example of how post-

Renaissance printers routinely plagiarized earlier works -- the kind of thing which led to disaster in the case of Dürer's rhinoceros -- but in this example, the reproductions had all been faithful to the original (Figure 7). The images included engravings from Gessner 1560, Topsell 1658, and Schott 1693 -- which had also been three of the earliest links in the rhinoceros series. The three engravings all depicted the same creature, and were presented with a caption, "Three versions of the same curious image of a hyena".

Many of my classmates saw immediately that the animal depicted was in fact a baboon. The anatomy in the drawing was everything that a primate is, and everything that a hyena isn't. The ears are small and down by the jaw; the eyes are close together under a protruding brow; the first digits on the hands and feet are clearly opposable; the artist went through great trouble to twist the animal's spine in order to show the ischial callosities on the rump which are characteristic of Old World monkeys; and finally, the *pears* on the ground by the animal's *hands* do *not* constitute a standard part of a carnivorous savanna-hunter's *diet*. Even more bewildering was the fact that Schott's engraving clearly contained the inscription "*Papio*", which is used today as the name of one of the baboon genera. How then, we wondered, did this image come to be associated with a hyena? For no zoologist who has ever looked at a primate (or a hyena) could have possibly made such a mistake. At the time we chalked it up as an unsolvable mystery, and a few years later, I bought another book which contained the same set of drawings: Brian Ford's *Images of Science, a History of Scientific Illustration* (1992), which referred to them as a series plagiarized from "Gessner's individualistic publication of the hyena". At this point, faced with a second independent source, I concluded that Gessner had simply been wrong, and abandoned the puzzle until a few years ago.

4. Old Books, New Books

I come from the American Southwest, where a little creature known as the Jackalope is near and dear to everyone's heart. Depending on the taxidermist and the available parts, the Jackalope is either a jackrabbit or a cottontailed rabbit, crowned by the antlers of either a deer or an antelope. Old-timers swear that they're real, while most of us just enjoy the mounted chimeras on display in gas stations, bars, and truck

stops, and may occasionally send a Jackalope postcard to a friend in another state, insisting on the veracity of the thing. However, one detail unknown to American Jackalope enthusiasts -- and we'd better keep it that way -- is that legends of antlered hares and rabbits can be traced back to central Europe for centuries preceding our expansion west of the Mississippi, and even found their place as factual descriptions in the old zoology tomes. I knew that Gaspar Schott had published engravings of antlered hares in the seventeenth century, but I only knew that from Dance's 1978 book. I started wondering if the Jackalope could be traced even further back in history, which led me to the realization that Harvard owns original copies of most of those early works. And so, fueled by the excitement of actually *going to the library and looking at a sixteenth-century volume*, I went to the Ernst Mayr collection at the Museum of Comparative Zoology, and held no punches: I asked for Gessner.

I don't know what it is about ancient books which can fill me with so much awe... I've held fossils in my hand that are millions of years old, which never made me feel the way I did that afternoon with Gessner. I found that the act of asking the librarian at Special Collections to handle a book from 1515 tends to be met with a silent look which says, "you'd better know what it is that you're doing". In the climate-controlled room I sat turning pages of old vellum bound in tooled leather: Gessner's *Historia Animalium*, the quadruped volume, full of the illustrations that I had only seen in facsimile, but here, before my eyes, with illustrations *printed from the original woodcuts*. I abandoned my quest of searching for Jackalopes and just sat there gingerly turning the pages, dreading that they would crumble at my fingertips as the watchful librarian pretended to mind her own business. I saw Dürer's rhinoceros in its first published incarnation, and nearly cried: it had been beautifully hand-colored ages ago, giving it a depth and dimension which was missing from the simple black line drawing I knew from modern reproductions. Occasionally poring over Latin I could barely read, I marveled over the woodcuts of real animals mixed with satyrs, sea serpents, and monsters. This was a scientific text where caribou and unicorns were depicted and discussed, mere pages apart. A gradient of accuracy began to emerge where woodcuts of common European species, such as horses and dogs, were perfectly correct -- while camels, chameleons, and crocodiles were considerably more bizarre. At one point I turned a page, and there on the table was Gessner's "hyena" -- or at least, the woodcut I

had presented to my primatology class several years back. It was the first incarnation of the drawing I just *knew* was a baboon -- and to my surprise (and relief), I discovered that Gessner had known it too. There, in brownish-black ink nearly 500 years old, on page sixty-four, were the inscriptions: "*Papio, Babion, Babian, Cynocephalum*", names we still use for baboons today. No mention of hyenas anywhere. Someone had been wrong, but who?

I decided to go back to the original texts of all of the versions of the "hyena" that I knew about, which totaled to four. They were the three versions cited in both Dance 1978 and Ford 1992 as either "curious" or "individualistic" representations of hyenas: Gessner 1560, Topsell 1658, Schott 1693, and a fourth mentioned in Ford 1992 from Johann Johnston's *Historia Naturalis de Quadrupedibus* 1650. Gaspar Schott's book *Physica Curiosa* turned out to be a jumbled collection of peculiar writings, profusely illustrated with nightmarish engravings of human birth defects and creatures which could not possibly exist -- among them, my beloved Jackalope -- but in the zoology chapters I found Schott's rendition of Gessner's "hyena", which was correctly labeled with baboon names: "*Papio, Babian, Cercopitheco*". This was a damning bit of evidence, as Schott's book was the last in the series of seventeenth-century texts, showing that, unlike Dürer's rhinoceros, I was not dealing with a case of ancient plagiarism gone wrong. Checking both Gessner and Schott for references to hyenas, I found that both authors discussed the animals properly elsewhere in their texts: Schott on page 888, and Gessner referring to a woodcut on page 31 which is clearly a spotted hyena at a kill.

I had thus narrowed my search to Topsell and Johnston, whose texts proved more difficult to find. Johnston was not kept at the Ernst Mayr Library in the Museum of Comparative Zoology, and I soon found out why when I pulled up *de Quadrupedibus* on microfilm at Lamont, and read the second sentence of the introduction:

> Now under the denomination of Theſe are to be conſidered Thoſe Animals, which being of a middle nature between the airy and the waterish, are for the moſt part covered with hair, ſometimes with shells, and do go upon four feet.

By "a middle nature between the airy and the waterish", Johnston meant *terrestrial*. Like this, his language throughout the book is elitist, absurd, and distinctly English -- much like the essay you are reading now -- as when he gives the following information about baboons that gamble for drink-money:

> It if ſtrange how they can handle merchandiſe. They play with the ſavages for mony, and winning, invite [them] to the Tavern, and pay [for] the ſhot.

The most "scientific" information Johnston offers on baboons is the remedy he describes, to "ease the French pox" by drinking "brayed" baboon bones, thus "provoking sweat". On the positive side, Johnston's book is filled with beautiful engravings by artists with a talent for three-dimensionality which is absent from the other texts; there are several quite impressive engravings of hyenas, one of which depicts a throng of people clad as Europeans fleeing a howling pack which has just downed a man (as far as I know, the best strategy when dealing with attacking hyenas is to flee, but it is apparently not a reliable technique.) Oddly, I could not find "Gessner's hyena" in Johnston, nor any other drawing of a baboon. Ridiculous as Johnston's book was, it could not have been the culprit in a historical misidentification of Gessner's baboon as a hyena.

That left Edward Topsell as the only individual who could have mislabeled the engraving of the baboon from Gessner, and the following quotes from Dance's 1978 work led me to suspect that I was on the right track:

> [Edward Topsell was] an English divine whose lively imagination amply compensated for his abysmal ignorance of natural history... [His] two books were reissued in 1658 under the title *The History of Foure-footed Beastes and Serpents*, one of the most notorious, most popular, most scientifically worthless, most plagiarized and most fascinating of all books purporting to deal with members of the animal kingdom. A good nine-tenths, maybe more, of its contents are pure fiction... Topsell was perhaps the only seventeenth century writer on natural history whose ignorance of the subject is conspicuously evident in almost every line he wrote, but there were other men who were so fond of tall stories about fabulous animals that they could not resist the temptation to repeat them... one such man in the mid-seventeenth century was Johann Johnston.

Topsell's book -- also unavailable in the Mayr Library -- has a section on baboons which begins with a wonderful engraving of an obviously male animal with a smile as mysterious as *La Joconde* (Figure 8). Among other extremely interesting bits of information about baboons, Topsell informs us that

> Some there are which are able to write, and naturally to diſcern letters

and

> Their voice is a ſhrill whizing, for they cannot ſpeak, and yet they underſtand the Indian language; under their beard they have a chin growing like a Serpents, and bearding about the lips like a Dragon.

With regard to hyenas, Topsell presents an engraving which is clearly reproduced from Gessner's image of a spotted hyena at a kill (Figure 9). His first two pages on hyenas are filled with a mix of fact and myth, including the following warning to would-be hyena hunters:

> If a Man meet with this Beaſt, he muſt not ſet upon it on the right hand, but on the left, for it hath been often ſeen, that when in haſte it did run by the Hunter on the right hand, he preſently fell off from his Horſe ſenſeleſs.

This kind of thing goes on and on until finally, on the third page of hyenas (342,) there is the picture of Gessner's baboon, with the caption: "The Second kinde of Hyaena, called *Papio*" (Figure 10).

• Conclusion #1: Edward Topsell was the **only** author to ever mislabel an engraving of a baboon as a hyena;

• Conclusion #2: Two late 20th century art historians who wrote lengthy, scholarly books on the history of scientific illustration had no idea that the "curious" and "individualistic" hyenas were in fact depictions of baboons;

• Conclusion #3: Neither modern author even bothered to read the Latin captions in either Gessner or Schott, which would have referred them to taxonomic

names which are still associated with baboons today. Instead, at least one of the writers relied on the caption from an English version which was written by a man whom he himself described as having an "abysmal ignorance of natural history";

• Hypothesis #1: B.J. Ford, the 1992 historian, never even looked at any of the ancient texts, and instead relied on S.P. Dance's 1978 work as the source for the "hyena" series.

• Question #1: Does this sound familiar?

5. The Telephone Game

Consider the following sentence:

> Nineteen monkeys argued in Jerry's sandbox.

While this sounds like a standard tidbit of scientific information from Edward Topsell's *History of Foure-footed Beastes*, it is the kind of thing that happens when the following sentence gets whispered from ear to ear down a long chain of children at summer camp:

> Ice cream sundaes are good with cherries and nuts.

At my childhood camps in Texas, this was called "The Telephone Game", and it was usually played in large groups while sitting around a campfire charring marshmallows. One person would think of a sentence and whisper it into the ear of the person next to him or her, so that nobody else could hear the original sentence. The second person whispered it to the third, the third to the fourth, and on and on until the sentence came full circle. The last person, who was sitting immediately next to the first, would announce what he or she had heard. This was followed by the first person repeating the original sentence out loud, resulting in a great deal of laughter at the discrepancy between the two, and a ten-way bombardment of marshmallows. The game never fails; it works every time. And more often than not, the final sentence at the end of the cycle makes a fair bit of sense in that it is grammatically correct and not the result

of purely random changes. The changes that do happen to the sentence happen because the minds of the players try to make sense out of a whispered phrase which comes to their ear as hearsay and partial nonsense; the mind makes of it what sense of it can, and the effect is amplified the longer the game continues.

The detective story I have given here is more than just a case of me going back to original literature to find out who was wrong; the fact that the *most recent modern scholars* were wrong because they either plagiarized an earlier source (Ford taking after Dance), or because they didn't properly examine the art and literature they were writing about (both authors), is testament to the fact that the telephone game is alive and well in academia. In the case of Dance and Ford, we are not talking about coffee-table book authors who slop together picture folios on the history of science in a couple of months. Brian J. Ford is a true scholar who has written over twenty books on the history of science that have been translated into multiple languages, and his honors and memberships include Chairman of the History Committee at the Institute of Biology, a seat on the council at the Linnean Society in London, and a Fellow of the Philosophical Society of Cambridge University. Dance has written numerous natural history books which have been published in English, and he was employed for many years by the British Museum of Natural History in London. If we can't trust our scholars to get the facts straight, then who can we trust at all?

The famous case of Dürer's rhinoceros was indeed a telephone game, but it was one which could not be avoided or helped. Specimens of real rhinoceroses were simply not available to zoologists in the sixteenth and seventeenth centuries, and with the exception of some of the final incarnations, the persistence of Dürer's inaccurate image was nothing more than the persistence -- and gradual evolution -- of the best information that was available at the time. When I first discovered Gessner's "hyena", I thought that I had stumbled upon a second example of a telephone game from the seventeenth century, when in fact I had uncovered one from the twentieth -- sparked by a Topsellian failure to look at (and *read*) an original reference with which the author should have been wholly familiar. One of the professors who will sponsor my postdoctoral research is a neurobiologist who recently told me about the first publication on the role of the hippocampus in memory formation. The first paper on the subject had the phrase "hippocampal formation" in the title and perhaps in the abstract,

but the Results section of the paper dealt with lesions in the deep temporal lobe in which the hippocampus and other structures reside. Subsequent authors got in the habit of emphasizing the role of the hippocampus in memory formation -- presumably through frequent citations of the seminal paper -- and only recently have researchers come to look more closely at other structures in the deep temporal lobes, realizing that some of them are involved in memory formation as well.

Rather than placing the blame on scholars and writers, I believe that these stories serve to remind us of the true nature of scientific knowledge. In actuality, "science" is nothing more than an inconceivably vast and diffuse literature of descriptions, experiments, results, and analyses, compiled and distributed by an mind-boggling number of scientific workers, most of whom are dead. It is fundamentally and necessarily an anecdotal tradition, although the principles of falsifiable hypotheses and experimental repeatability have become central to the method. But in addition to being anecdotal, science is by its very nature a house of cards: an endless trail of papers and books largely based on earlier papers and books, so that in the end, nothing holds the literature together except the literature itself. When I write a scientific paper with thirty references, the ethics of my profession demand that I actually retrieve and read those thirty references with enough attention to cite them fully and accurately, retaining as much of the original meaning as if I were quoting from the Old Testament. The reason for this burden lies in the fact that each of my thirty sources will have its own bibliography of other sources. Assuming for the moment an average of thirty references per bibliography in each source I refer to, I would be required to retrieve and read nine hundred sources for my one paper, in order to be absolutely faithful to the first and second "generations" of the literature alone. Given the speed at which research progresses and papers are published today, the "generations" of scientific literature can be separated by as little as a few months -- and while there is some degree of redundancy in the works that are cited, it quickly becomes impossible to do any research at all without resorting to blind faith in those which have gone before.

Regardless of our visceral discomfort with the idea, it is nevertheless true that science is a storyteller's tradition, and can be no other way. The only information that an academic writer can report with certainty are personal accounts of things that he or she did, saw, or observed as part of a first-hand experience. Anything else is second-

hand information, hearsay, or a telephone game, the value of which rests entirely on the credibility of the reporter -- just like my collection of strategies for dealing with attacks by wild animals. While they may be myths or confabulations from sources unknown, I have selected a criterion by which to judge them and those they came from. If the methods and information work, and accomplish the things they are meant to -- namely, deliver me from the clutches of untamed beasts -- then they will remain a part of my own Universe of Fact; and until they fail, neither I nor science will ever know the difference.

REFERENCES (really!)

Dance, S. P. 1978. *The Art of Natural History*. Cameron Books, Arch Cape Press, New York NY.

Ford, B. J. 1992. *Images of Science: A History of Scientific Illustration*. The British Library, London, U.K.

Gessner, Konrad. 1560. *Historia Animalium*. C. Froschover, Tiguri and Zurich.

Johnston, Johann. 1650. *Historia Naturalis, De Quadrupedibus*. Heirs of M. Merian, Frankfurt.

Leguat, Francois. 1708. *Voyage et aventures*. David Mortier, London U.K.

Schott, Gaspar. 1693 and 1697. *Physica Curiosa sive Mirabilia Naturae et Artis*. Hertz-Wolfgang-Endteri, Wurzburg.

Topsell, Edward. 1658. *Historie of Foure-footed Beastes*. E. Cotes, London, U.K.

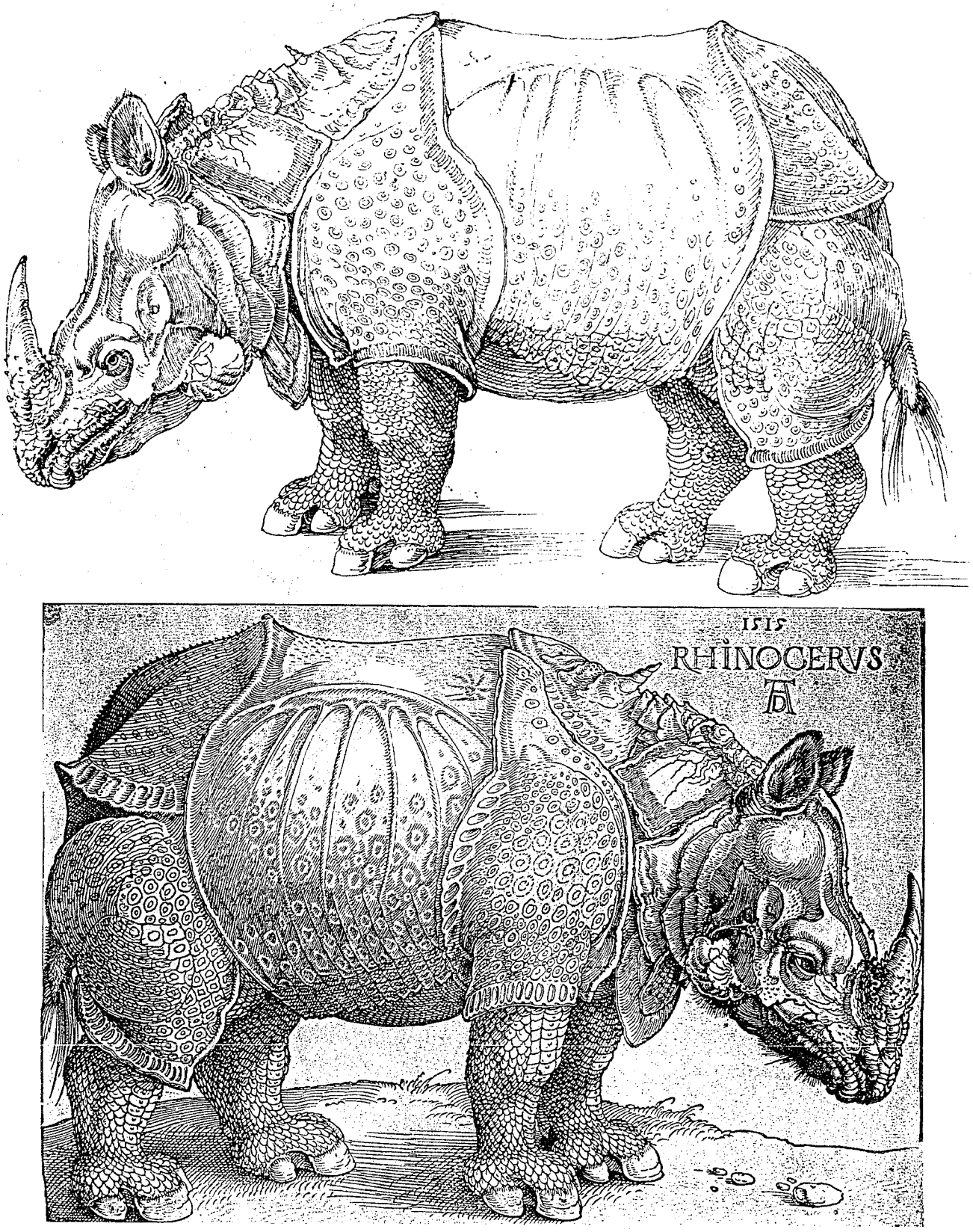
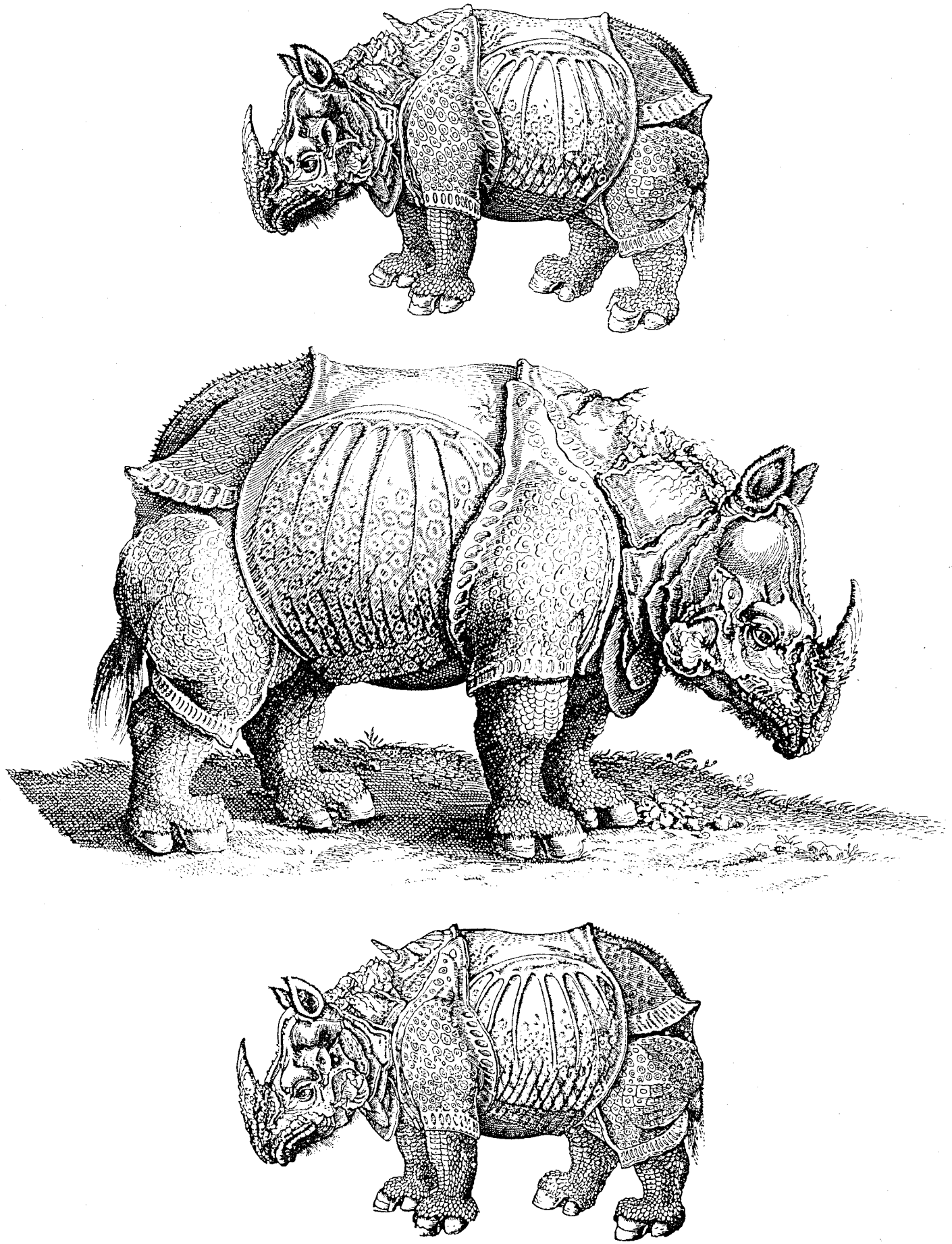
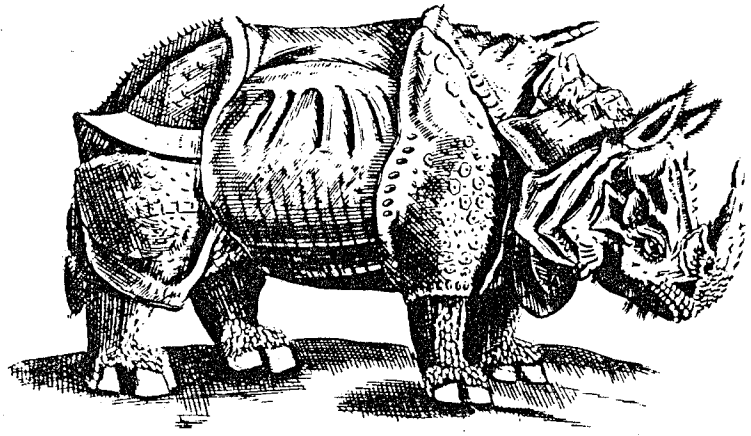
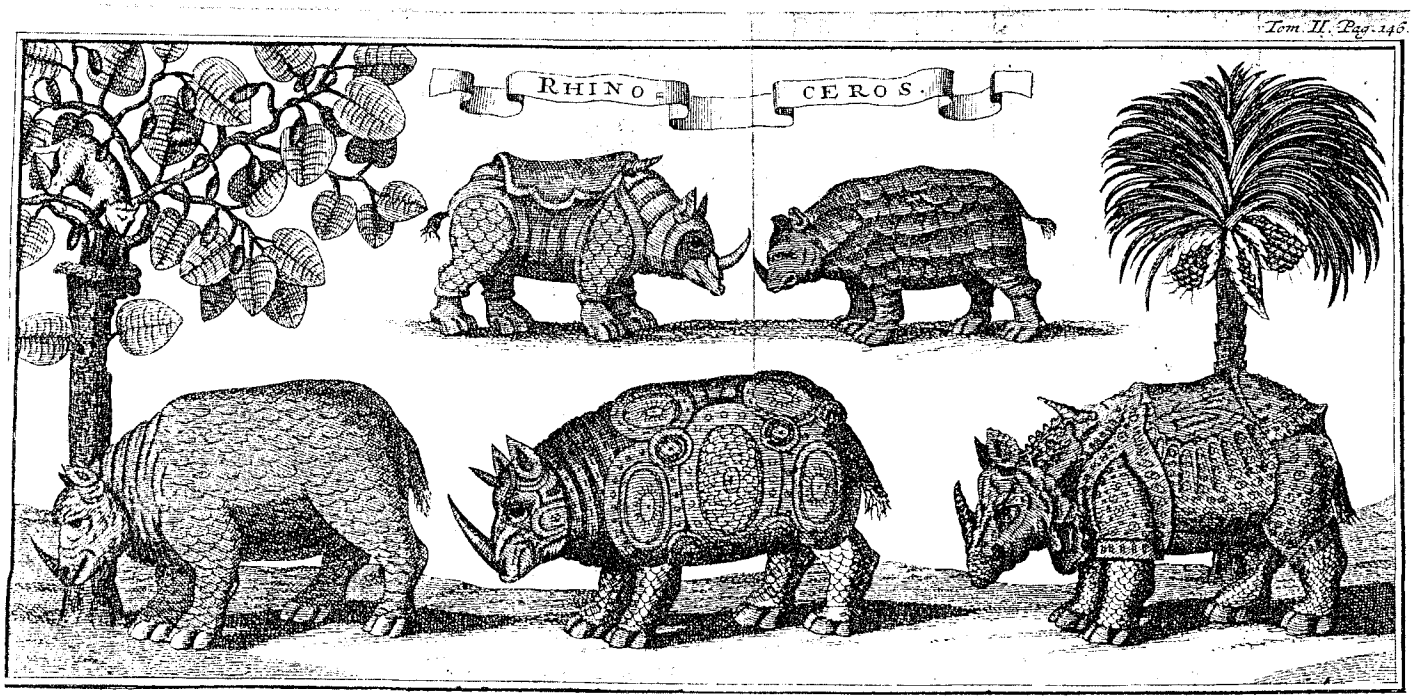


Figure 1: Rhinoceros by Albrecht Dürer, 1515: Drawing (above) and Woodcut (below)



Figures 2, 3, and 4: Rhinoceros woodcuts from 2. Gessner 1560 (top), 3. Johnston 1650 (center), and 4. Topsell 1658 (bottom).





Figures 5 and 6: Rhinoceros images from 5. Schott (1697), and 6. Leguat (1708).

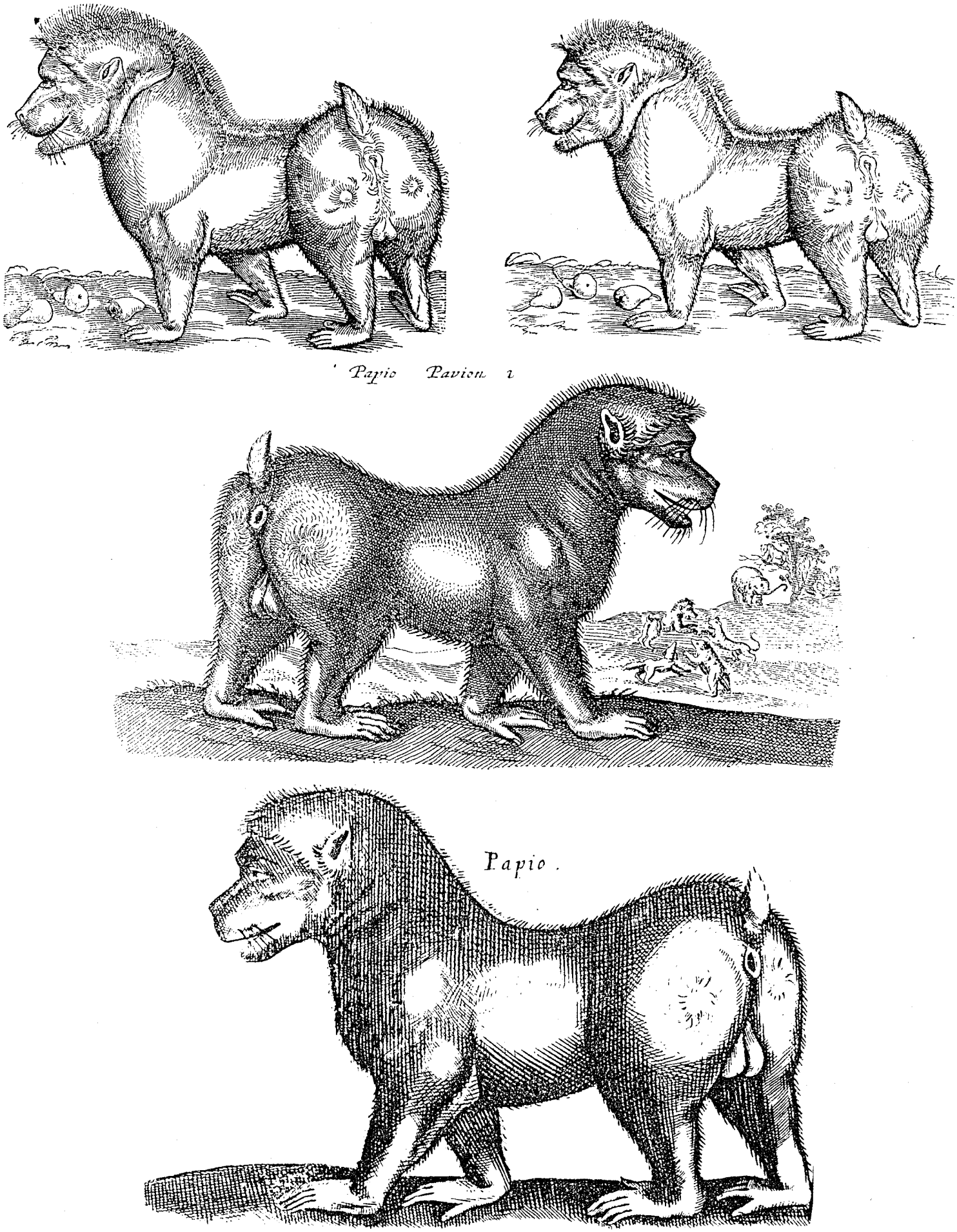
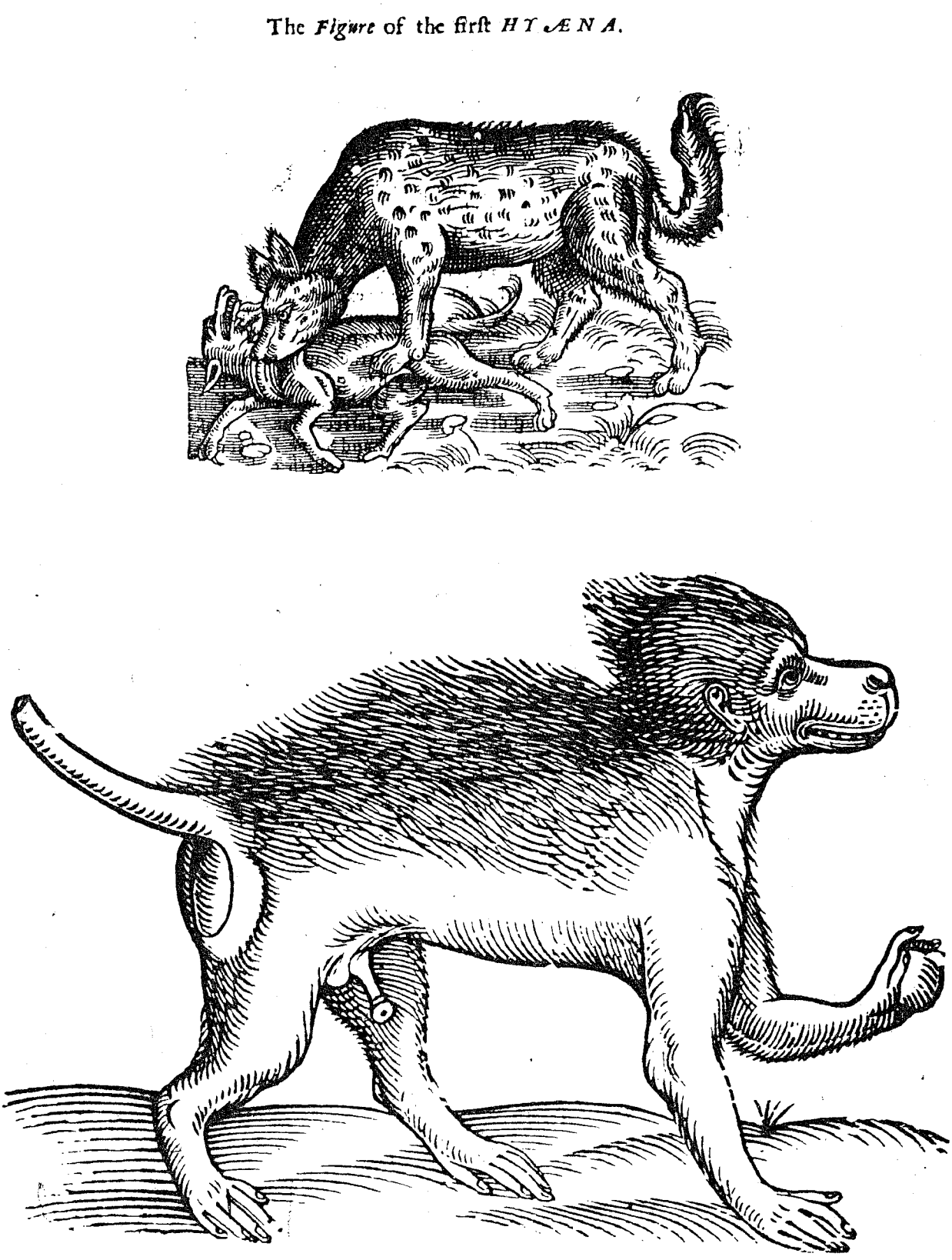


Figure 7: Engravings believed by Dance 1978 and Ford 1992 to be hyenas.
Top left Gessner, 1560; top right Topsell, 1658; center Johnston, 1650; bottom Schott, 1693.



Figures 8 and 9: Illustrations from Topsell's *Historie of Foure-footed Beastes*, 1658.
8 (below) a baboon; 9 (above) a spotted hyena, copied from Gessner 1560.

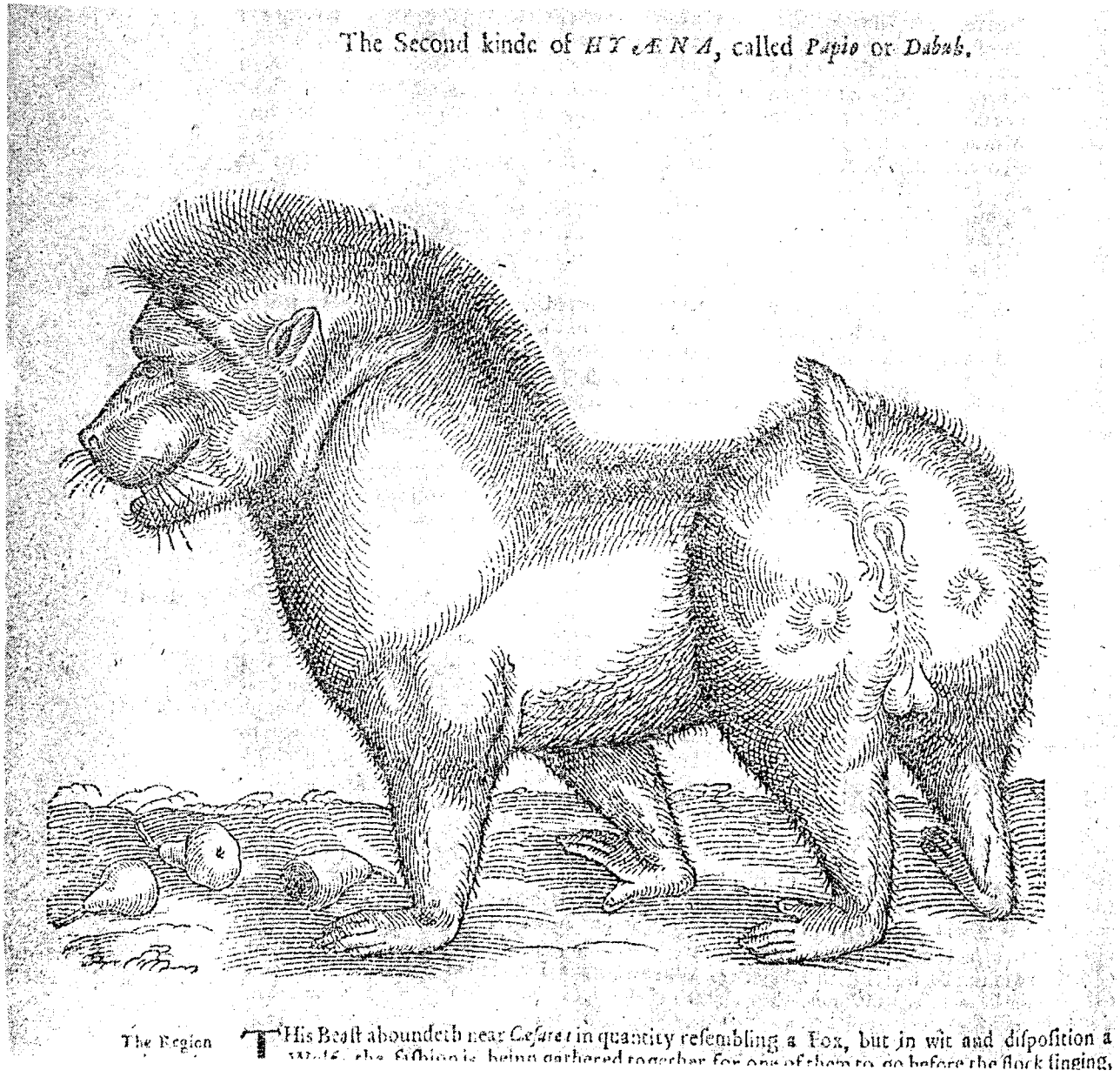


Figure 10: "The Second kinde of Hyaena" from Topsell's *Historie of Foure-footed Beastes*, 1658.