A HISTORY OF SCIENTIFIC ENDEAVOUR IN SOUTH AFRICA

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Edited by

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SOME SCIENTIFIC MATTERS IN EARLY WRITINGS ON THE CAPE

by VERNON S. FORBES

The variety and number of references to matters of scientific interest in the writings of early visitors to the Cape are beyond expectation. Rare and scattered in the earlier accounts, their occurrence increases progressively with the accretion of knowledge in the various branches of natural philosophy and with the growth of specialization. From the random remarks of visiting mariners, merchants, officials, soldiers and clerics during the first half-century of the settlement, we come to the longer and far more comprehensive general accounts of the Cape by such as P. Kolb, F. Valentyn, Abbé de la Caille and O. F. Mentzel. There followed works, of which some were written with a bias towards a special interest, such as those by the zoologist A. Sparrman,[1] the botanist C. P. Thunberg and the ornithologist F. le Vaillant.

With the advent of the nineteenth century an ever-increasing number of books on the Cape made their appearance, which provide a body of material too large for treatment in this essay. Accordingly the limits of this survey are placed in the vicinity of 1800, when the settlement was nearly 150 years old though this arbitrary date will not always be strictly observed. Even within these limits there are more topics than can be compressed into the space available. Hence the matters touched upon here have been chosen by subjective selection and personal bias.

When the early voyager had arrived in Table Bay, he inevitably described its majestic attendant mountains, the settlement at their feet and the governmental, economic and social aspects of its White population. He was then able to entertain his readers with an account of the appearance, language, manners and customs of the Hottentots. There often followed a section on the beasts, birds, reptiles and fishes. Practically no attempts were made at first to describe these creatures, which were merely listed, often with the larger and more spectacular named first, such as the lion, elephant and rhinoceros. In Europe, the mental pictures of even these animals

[1] Also spelt 'Sparman', particularly in the Botanical Literature (ed).

were crude, since they depended upon illustrations by artists who usually had not seen the animals alive but at best worked from inadequately stuffed skins. At worst they depended on written or verbal descriptions, from which the artist built up the creatures by real or fancied resemblances to salient features of other animals. It is not surprising that very few wild animals survived the voyage of some three months' duration, to appear in menageries in Europe, where they could be drawn by competent artists.

The colonists themselves often applied the names of familiar European species to new species which they found, because these at first summed up their shape and size better than new names, which in any case first had to be invented and then become generally accepted. Very few colonists encountering the eland or gemsbok, for example, can have taken careful note, back in Europe, of the appearance of the elk or the chamois, after which the two South African animals were named. There can have been few, if any, competent artists at the Cape at that time who were interested in drawing animals in their natural surroundings, perhaps far from Table Bay. So the early representations of Cape animals were usually drawn inexpertly from skins and captive young animals, or by the methods described above. Since very few artists had ever visited the Cape, the general character of the scenery depicted in their animal studies tended to be essentially European, with perhaps the introduction of palms to signify foreign parts.

Mammals. P. Kolb's original German edition of 1719 (Dutch ed. 1727) was the first to publish a comprehensive list of the Cape fauna. In the Dutch edition his descriptions of the mammals cover 45 pages, the birds 22 pages, the fishes 24 pages, and the snakes, insects and other animals 20 pages. He was an astronomer and seems to have had no special training for, or interest in, zoology. Thus his compilation of these descriptions is particularly praiseworthy, though the impression given by writers on Kolb, right up to the present day, is of criticism for inaccuracy and for the inclusion of irresponsible tales he had been told. It would be just, however, to regard these lapses indulgently and to emphasize instead the debt we owe him for his industry and perseverance.

Of all animals in the Cape, the greatest interest probably attaches to the discovery here of the giraffe. It is said that the first of these seen in Europe was brought to Rome by Julius Caesar about 46 B.C. Accounts of the animal appear thereafter by writers in, or visitors to, Mediterranean countries, to which stories of their existence had probably been brought by Arabs from Africa's east coast. But these almost fabulous tales transmitted to Western Europe through a chain of intermediaries neither conveyed a clear picture of this rather improbable creature nor engendered strong convictions that it actually existed. Its discovery in the Cape interior therefore authenticated a myth and aroused intense interest, especially as it is the tallest and among the heaviest of living land animals.

The first recorded sighting was by the party of Sergeant Jonas de la Guerre, on 28 November 1663 (Molsbergen 1916) near the Spoeg River, according to Mossop (1947), but possibly even farther south. From the tone of the report, which expresses

no surprise, it seems that giraffe had been seen previously in this district. The first recorded killings were nearly a century later, in 1760, and north of the Orange River, when J. Coetsé shot two and captured a young one, which soon died. C. F. Brink in the following year described the shooting of two and the capture of a young one, also north of the Orange River (Mossop 1935). The skin of the latter was sent to Professor J. N. S. Allamand, who had it stuffed and exhibited it at the University of Leiden (Forbes 1965). One of the other five could have provided the dried head seen by Sparrman at Cape Town in 1775–6 (Sparrman 1785, II), or it could have been an unrecorded killing. S. van Reenen shot one in 1778 (Paterson) and Wikar one in 1779 (Mossop 1935). It is uncertain whether in this same year R. J. Gordon shot two or only one south of the Orange River (Cape Archives VC.593; Forbes 1965); but he is only known to have sent one skin to Prof. Allamand, to be mounted for exhibition in the Cabinet of Natural Rarities of the Prince of Orange. It was accompanied by a poor drawing of the skeleton, made by Johannes Schumacher (Le Vaillant 1973, II).

Thus at least seven of these magnificent animals had been shot by the time François le Vaillant grandiloquently exclaimed, 'I was the first to kill this; with this I was about to enrich natural history; I was about to destroy romance, and establish truth in my turn' (Le Vaillant 1796). This claimed priority may indeed merely have signified that he was the first of his own party to shoot one (Le Vaillant 1973, I); but his following words about natural history, romance and truth certainly suggest that his claim was to an absolute priority. The date of this exploit was probably 1783 and the place at an unascertainable distance north of the Orange, probably not exceeding 200 km.

Some of his contemporaries said that the giraffe had been shot by a Coloured hunter, while Lichtenstein wrote that 'when Le Vaillant asserts that he has seen the giraffe trot, he spares me any further trouble in proving that this animal never presented itself alive before him' (Le Vaillant 1973, II). He meant that anyone who had actually seen a giraffe at speed could not fail to mention its singular gait, the fore- and hind-limbs on the same side being moved simultaneously in the same direction. These old controversies are now unimportant and to Le Vaillant's lasting credit is the fact that he probably disseminated a knowledge of the giraffe more effectively than any of his contemporaries. He provided two illustrations of the animal, with accompanying description and discussion at the end of volume II of his travels into the eastern Cape (Le Vaillant 1790). This work, due to the large number of translations and editions in which it appeared, enjoyed a wider circulation and a more numerous audience than those of his detractors.

Because of the time, expense and effort involved in shooting giraffes, their skins fetched high prices and one was on sale in Cape Town in 1822 for 400 rix-dollars (Karsten 1939), at a time when 3 or 4 rix-dollars a day, together with subsistence and lodging, was the average wage paid to 'mechanics and useful tradesmen' (Thompson 1968).

A rhinoceros was killed in 1655 near the Salt River mouth, by Van Riebeeck's men. His journal records that the beast was stuck in the mud and that over a hundred

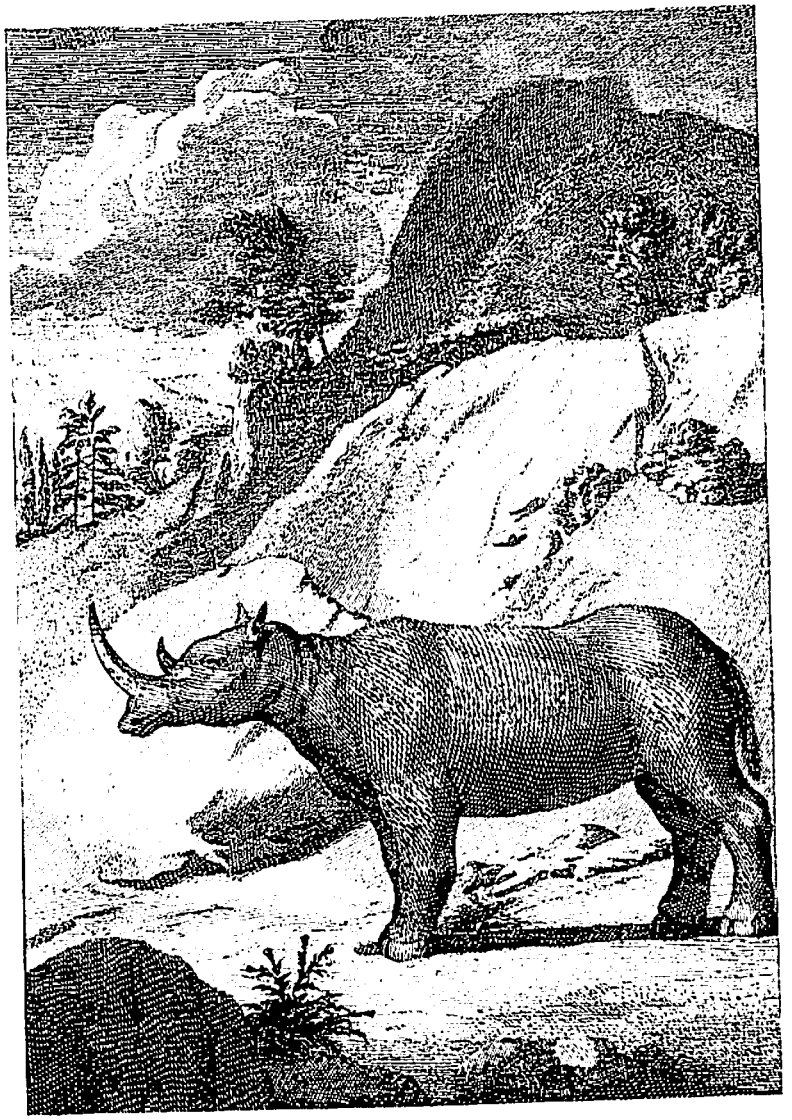
shots were fired at it, at point-blank range, without killing it, as many of the bullets rebounded. So 'we had a piece hewn out of its side with axes and then, by shooting it between the ribs and into the guts, we managed to kill it' (Van Riebeeck 1952). Commander Van der Stel's coach was charged by a rhinoceros during his expedition to the copper mines in 1685 (Valentyn 1971).

When Kolb wrote his three-page account of this creature at the Cape, the Indian rhinoceros had long been known, while its existence in Africa had been briefly asserted by Dapper. Kolb supplies a large engraving showing it as traditionally represented, with one horn, its lower parts covered with scales and its upper parts by large plates, like the iron armour worn by horses. These imaginary trappings derive from the deep skin folds of the Indian and Javan species. An improvement on his first, Kolb gives another and more realistic engraving depicting a two-horned species, which unfortunately shows the beast too slender and without the prehensile upper lip which is characteristic of the Black Rhinoceros. Kolb's account is probably based on hearsay, as he is believed to have travelled only as far as Caledon and Mamre. It seems to follow that, if his claim frequently to have eaten its flesh is not false, then it can only have been as biltong.

Sixty years later, in 1778, Allamand's illustration of the Cape rhinoceros is in fact the Indian or Javan species, both of which have only a single horn and deep skin-folds (Allemand, II). This is the same plate that is used in the Dutch edition of Buffon & Daubenton's *Natuurlyke Historie* (1779). The lack of clarity in the descriptions then printed arose largely from the fact that there was confusion and uncertainty regarding the characteristics of the several species in Africa and Asia. However, in volume XVI of the above work (1785), the description and engraving of the Cape rhinoceros have at last avoided most of the misconceptions regarding its appearance. The new information is attributed to R. J. Gordon.

The first scientific account of the Black Rhinoceros was by Dr Anders Sparrman, who encountered it in 1775 near Kommadagga, some 60 km SSE. of Somerset East. He dissected a specimen and filled about twenty pages of his book with his findings (Sparrman 1785, II). This account also appeared in *Kongl. Svenska Veten. Acad. Handlingar* in 1778. While Sparrman was engrossed in anatomizing this rhinoceros, another one abruptly charged out of the bush and put to flight his travelling-companion, D. F. Immelman. His headlong gallop must have appeared the more ludicrous in that this handsome youth usually 'figured on horseback in a long night-gown, with a white night-cap and large wide boots'. This incident so seized Sparrman's imagination that he commemorated it upon his map with the legend, 'Rhinoster jagt D. Immelman vluckt'.

It has been said that the one-horned Indian rhinoceros gave rise to the legend of the unicorn. Be that as it may, about two centuries ago there were rumours that this creature had been seen in the Cape interior. After all, it could well be argued that the one-horned animal depicted in heraldry was not as improbable an animal as the giraffe—and the existence of these had recently been proved. Sparrman tells of reports he had received of a Bushman painting of a unicorn in the basin of the Great Fish River. The Bushmen were said to have described this creature as resembling a horse



The two-horned rhinoceros of Kolb referred to in the text.

and that it was 'rare, extremely swift of foot, furious and dangerous'. Barrow (1801) has reproduced an engraving of a unicorn's head that he saw in a cave in the same area, and told the colonists who were his guides that 5 000 rix-dollars would be paid to anyone who produced the original. The renegade Coenraad Buys averred that they were plentiful and Commissioner De Mist offered for one a reward of a complete ox-wagon and twelve good oxen (Van Reenen 1937; Molsbergen 1932).

Because the springbok has been chosen as the South African emblem in sport, special interest attaches to early mentions of this graceful little antelope. No description of it is recognizable in Kolb (1705–13), written when the interior plains where this animal abounded had scarcely been reached by the colonists. In 1784 it was described and figured in Vosmaer (Part 19), where it is called 'Hartebok, genaamd *Pronkbok*'. He notes that it was first described in print as springbok by E. A. W. Zimmerman in *Specimen Zoologiae Geographicae* in 1777 followed by T. Pennant in the *History of Quadrupeds* (1781). It was named *Gazelle a Bourse sur le dos* by Allamand in Buffon's *Histoire Naturelle, Suppl.* vol. 4 in 1778, the pouch referred to being the fold in the long glandular area in the mid-line of the back. This fold is lined with long white hair, which is exposed momentarily as the hair is raised in a conspicuous ridge as the animals leap and display (*pronk*). Drawings of the animal had been made at the Cape by J. R. Forster during the visit of the *Resolution* in 1775, in the closing stages of Captain Cook's second voyage. Professor Allamand acknowledges information received from R. J. Gordon, who returned to Holland in 1774 after his first visit to the Cape, where he had travelled extensively. He brought with him twelve springbok, of which only one survived the voyage to be exhibited in the menagerie of the Prince of Orange. This animal lived there for three years, until it died an accidental death.

Already the animal was sometimes called the *Trekbok*, as Vosmaer records, when they migrated to avoid the effects of drought, though the numbers involved are not mentioned. Masson described migrations of 'many hundred thousands', a figure which his contemporary Mentzel (1944) could not credit, ascribing it to an error in translation. Masson's companion, Thunberg, however, actually increased the estimate by referring to them 'arriving in troops of millions'. What is claimed as the last great springbok migration took place in Namaqualand in 1892 and was graphically described by Scully (1913).

Birds. The encyclopaedic Kolb devotes a chapter of twenty pages to the birds of the Cape and illustrates seven species, of which, however, he frankly labels two as Indian birds and does not discuss them in the text. Of the five Cape birds illustrated, two particularly claim attention—the spoonbill or pelican and the Gnat- or Honeybee-eater. An engraving illustrates the spoonbill, while the text states that by the ignorant it is called the Pelican and by the inhabitants of the Cape the Snake-eater (*Slangenvreeter*), which he supports by saying that its diet consists of snakes, frogs, toads and other poisonous worms. In fact this name was applied to the Secretary Bird by the Hottentots and translated into Dutch by the colonists, according to Sparrman.

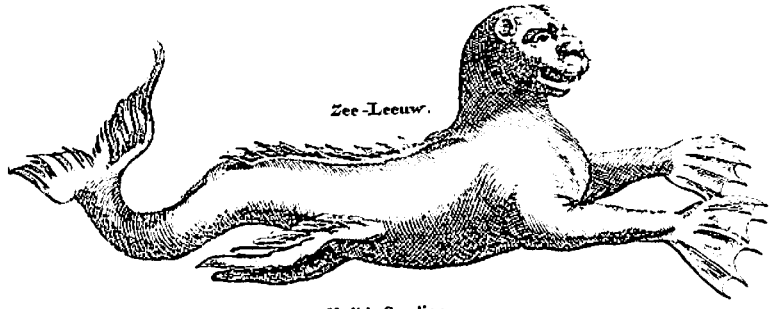
Kolb's figure of the Honeybee-eater has a curved beak, like one of the bee-eaters, whereas his text says the beak is long and straight, He gives its colour above as blue, with a pale shade below, and with black feathers in the wings and tail. These colours do not fit either the bee-eaters or the Greater Honeyguide, with which he confuses his bird when he writes, 'this bird often shows the Hottentots the way where they can find honey that the wild bees have stored in cracks in the rocks'. It was only in 1777 that the Greater Honeyguide was described scientifically by A. Sparrman in *Phil. Trans. Roy. Soc. Lond.* The accounts of the environment, habits and appearance of the bird are in English, followed by a two-page formal description in Latin. Some of this material is repeated in his book (vol. II). He errs, however, in describing their nests as resembling those of certain finches and being bottle-shaped, with the neck hanging downwards. In fact these birds parasitize the nests of other species.

To return to Kolb, it must be remembered that there were no articles, books or illustrations to which he could refer for his facts on Cape birds. To fill his chapter he probably observed a few details for himself, garnered some particulars from other people, who gave him inaccurate or false information, and for the remainder depended on his own imagination. The strict rules of behaviour which now govern scientific writing were not then universally observed, and less opprobrium attached to the use of imaginative material. Moreover, this practice was then the greater temptation because the deterrent fear of being found out was far less.

One of the earliest passages expressing aesthetic appreciation of a bird's appearance occurs rather surprisingly in the usually dry and factual report of F. Masson (1776): 'There is one bird in particular which has a wonderful effect among the green reeds; its body being a bright crimson, with black and grey wings; and by the brightness of their colours, when sitting among the reeds, they look like so many scarlet lillies: this is the *Loxia orix* of Linnaeus.' This was in fact the Red Bishop Bird, now named *Euplectes orix*.

That sometimes flamboyant and inventive traveller and author, F. le Vaillant, whose five well-known volumes describe his travels in the Cape from 1781 to 1784, was the outstanding pioneer here in ornithology. His monumental and beautifully illustrated work *Histoire Naturelle des Oiseaux d'Afrique* (6 vols, 1796–1808) describes and figures 284 species in 300 coloured plates, which are copper engravings printed in colour. Of these it has been stated that 134 species (or something less than half) are accurately, and nine imperfectly, described and illustrated South African birds. There are 71 species which he plainly states are not found in South Africa and 50 species which he claims occur here but in fact do not. Ten species are unidentifiable, while a further ten are almost certainly artefacts (Le Vaillant 1973). According to Sundevall, these latter were all obtained from the same Paris taxidermist, who was skilled in the production of composite birds made of heads, bodies, wings and tails of different species. A possible explanation of their inclusion in Le Vaillant's great work is that they were shown to him as having come from the Cape, whereupon he was led by vanity to declare that he had seen them here. Accordingly he invented and published field observations purporting to have been made by him at the Cape. All these imperfections, however, are outweighed by the authentic work that he published and he was indisputably the founder of South African ornithology.

Marine life. Kolb's chapter XIII, comprising 24 pages, deals mainly with sea fish but also with whales, seals, marine Crustacea and Mollusca. He treats these in his usual rambling, conversational style. He discusses about two dozen fish in very general terms, without mentioning size, shape, colours or any other distinguishing features. Three plates illustrate this chapter but do not show at all accurately the eight species represented. It is questionable whether he would have had drawings made at the Cape for his engraver in Europe to follow, though it is possible that he could have used dried specimens for some of them. In either case he cannot have checked the drawings for accuracy. It seems more likely that some or all of his figures were copied or adapted from works on other regions that were already in print. On his plate illustrating the skate and the electric ray, there is also a ridiculous picture of a sea-lion, having the head and neck of a lioness, a dorsal fin, long flippered forelegs and a dolphin's tail. This does nothing to stimulate confidence in his other engravings.



Kolb's Sea-lion.

La Caille (1763) describes in 160 words and two small engravings a fish-like creature, 19 cm long, found in a dried-out state at Hout Bay. It was without scales, had a beak, a horizontal tail, a small fin on its back and two at the top of its chest. This was probably the foetus of a dolphin with its lower jaw missing, as can be seen in the engraving. La Caille's book has also a fairly exact engraving of a fish 50 cm long found on the beach of Table Bay. He calls it the Sunfish, and this identification is correct, its scientific name now being *Ranzania typus*. Oddly enough it is printed upside down, presumably because the printer was puzzled how to place this unusually shaped fish and could not consult the Abbé who died the year before his book appeared.

Freshwater fish are even less frequently mentioned, because their existence was of no importance to the average traveller, who looked to the game along the river's banks, and not to the fish, to augment his food supply. Brink's journal of 1761 records that the Orange River is 'full of fish. Among these carp like those of the Fatherland are found' (Mossop 1947). H. J. Wikar, who travelled extensively along the lower Orange River between 1775 and 1779, says he saw three kinds of fish in it (Mossop 1935). 'One kind, which is almost like the white fish in the Olifants River,

but with fewer bones, is really fat and tasty; the second kind has no scales and an enormous head' and reaches 3½ feet or more in length. 'Then there is a third kind resembling a small carp.' Of these the second has been identified as the Mud Barbel *Clarias gariepinus*, by Mossop.

Sparrman knew of only two species of river fish, 'a small kind of carp . . . and the *Cyprinus gonorhynchus* about the size of an ordinary herring', which was commonly called the 'bastard springer' (Sparrman 1785). These have recently been identified tentatively, the carp as *Sandelia capensis* and the other as *Labeo umbratus* (Sparrman 1975).

Botany. Probably the first plant from the Cape to be figured in print is *Protea neriifolia*, in the book by Carolus Clusius entitled *Exoticorum Libri Decem* (1605). Crude engravings of five Cape plants are also to be found in Part 1 of the *Florilegium* of E. Swertius, published in Frankfort in 1612 (Reynolds 1950). Nowhere, however, is there any record of the persons responsible for providing the material illustrated.

The first person known to have sent to Europe drawings and descriptions of Cape plants was the Dutch missionary Justus Heurnius, outward bound for the East Indies in 1624 (Karsten 1963). The vessel stopped at Table Bay to replenish supplies of water and no doubt to barter livestock from the Hottentots. After months at sea in an overcrowded and underprovided vessel it must have been a great relief to get ashore, where Heurnius collected plants and made drawings and descriptions of ten species. Some time after he had reached the East Indies he sent them to his brother Otto in Leiden, who in turn passed them to J. B. Stapelius, by whose father, E. B. Stapelius, they were printed in *Theoprasti Eresii de Historia Plantarum* (1644). Thus even before the foundation of the Cape settlement by Van Riebeeck, a few of its plants had been made known to botanists in Europe. Thus was initiated a recognition of the floral wealth of the Cape that would grow steadily over the ensuing centuries.

The first recorded sizeable collection made here after the foundation of the settlement was twenty years later, in 1672, by Paul Hermann, a surgeon in the employ of the Dutch East India Co. but only a visitor to the Cape. Other assiduous collectors at this period were H. B. Oldenland, Company's Gardener, and J. A. Auge, who at a later date occupied the same position (MacOwan 1886; Hutchinson 1946).

Kolb devotes a chapter of 27 pages to the Cape's indigenous plants. About four hundred species are discussed in alphabetical order, though none are illustrated. Kolb disclaims any botanical expertise but says that he learnt something of the subject from the Company's Gardener, Johan Hartog, as well as from certain works in manuscript and print, whose authors and titles he gives. Naturally he attempts no improvement on these, and the value of the chapter lies in its compilation of hitherto scattered enumerations.

The arrival in Table Bay in 1772 of the young Swede C. P. Thunberg, who later earned the sobriquet 'the Father of Cape Botany', marked the opening of a phase of intensified investigation of our flora. He was not only the first university-trained botanist to travel here but he had enjoyed the unrivalled advantage of having studied under the great Linnaeus at Uppsala. Linnaeus was successfully leading a movement

to replace the old, cumbersome botanical names by his binomial nomenclature and he urged his pupils to scour the world for new species. Thunberg was one of those to give effect to this exhortation.

He spent the years 1772–5 at the Cape and covered no less than 4 000 km in the course of three journeys in the interior. These expeditions were momentous, for previous collections had been gathered by gardeners and amateurs who exported them to professional botanists in Europe. Thunberg not only collected with an expert eye but also described the specimens himself, back in Sweden. In his preliminary *Prodromus Plantarum Capensis* (1794–1800) and the several editions of *Flora Capensis* (1807–20) he described in Linnaean terms some 3 100 species, all based on his own collecting.

His book describing his travels at the Cape (English ed. 1793–5) contains a mass of interesting and reliable information but is in the concise, impersonal style of field notes. One of the rare passages in which the author vividly expresses his botanical enthusiasm concerns also his companion, F. Masson, when they were near Heerenlogement. 'In my way to the Gentlemen's Hotel, I found a scarce and long-sought for plant, viz the *Codon Royeni*, but did not see more than one shrub of it, which however I think I never shall forget. It was one of the hottest days in summer. . . . The bushes we met with were covered all over with white, brittle and transparent prickles which, when my fellow traveller and I suddenly fell upon them and strove which should pluck the most flowers with our naked hands, scratched them in such a terrible manner that for several days we experienced great pain and inconvenience.'

The young Scots gardener, Francis Masson, made several other collecting journeys in the Cape besides two in company with Thunberg. Masson's very considerable collections were sent to Sir Joseph Banks at the then private Royal Garden at Kew where many were cultivated, besides being described and illustrated in various publications. Among these are W. Aiton's *Hortus Kewensis*, 3 vols., 1789, and F. A. Bauer's *Delineations of exotick plants cultivated in the Royal Garden at Kew*, 1796. Masson's own work on the Cape was the richly illustrated *Stapeliae Novae* 1796. His appreciation of natural beauty shines out in his journal where he records the words of a farmer who dwelt by the Olifants River near Klawer. 'The peasant told us that in winter the hills were painted with all kinds of colours; and said it grieved him often that no person of knowledge in botany had ever had an opportunity of seeing his country in the flowery season' (Masson 1776). The man who expressed this admirable sentiment was probably Pieter van Zyl, the ferryman (Forbes 1975), whose heart would have rejoiced had he known that two centuries later thousands of visitors would annually throng to see the multisplendent mantle of colours flung by floral spring across the Namaqualand hills. Karsten (1958) has written an appreciative appraisal of Masson's botanical work at the Cape, while Forbes (1965) has discussed his itineraries and some other facets of his work.

Anders Sparrman, university classmate of Thunberg and another pupil of Linnaeus, also travelled here at about the same time. His collection of plants of the Cape Peninsula and vicinity made during his first visit is preserved at the Linnean Society, London. At Uppsala now is the comparatively small collection of plants

that he made during his second and far longer stay here in 1775–6 when he reached the vicinity of the present Cookhouse. On this journey his interest seems to have been drawn away from botany by the large wild animals he anatomized and described in such detail in his book. His travels and some of his letters have been discussed by Forbes (1965) and by Karsten (1957) respectively, and a new edition of his book on the Cape is being published by the Van Riebeeck Society.

W. Paterson, another young Scots gardener, was at the start of a career of some distinction when he made four plant-collecting journeys, totalling 8 000 km, in the Cape in the years 1777–9 (Forbes 1965). These travels are outlined in his book, which is disappointingly short, individual and laconic in style but generally reliable. His botanical observations are so terse and arid that his pages provide no passage worthy of quotation. Plants do, however, figure in his observations on the composition and persistent after-effects of Bushman arrow poison.

He says that 'their method of making this pernicious mixture is by first taking the juice extracted from the Euphorbia, and a kind of caterpillar peculiar to another plant which has much the appearance of a species of Rhus, though I could find none in flower. They mix the animal and vegetable matter, and after drying it they paint their arrows with this composition.' Elsewhere he tells of, 'an European woman who had been wounded in the arm by a poisoned arrow. Great pains had been taken to cure her, but to no purpose; for at different periods of the year an inflammation came on which was succeeded by a partial mortification. She informed me that the wound was not long in healing up; but that in two months afterwards there was a certainty of its breaking out again; and this had been the case for many years.'[1] It was this mention of a poisoned woman that was recorded on Le Vaillant's map deep in the Tanqua Karoo as *Huttes de l'Européenne Empoisonnée* and ludicrously mistranslated in the English edition as 'Huts of the European Fishermen'.

Paterson's collection of about 300 watercolours, mainly of Cape plants, is in the Brenthurst Collection of Mr H. F. Oppenheimer, in Johannesburg. Similarities between a few of these and drawings associated with the work of R. J. Gordon and F. le Vaillant have been pointed out by Dyer (1948). Paterson's drawings should also be compared with Masson's in case this should throw further light upon the artist or artists who made botanical drawings at the Cape in the years 1772 to 1784.

Medicine. Comment on medical matters in the early writings is usually confined to a few remarks concerning the Company's hospital just west of and across the street from the Groote Kerk. But Mentzel, who was at the Cape from 1733 to 1741, described at some length the buildings and the treatment of patients, as well as the salaries of the staff. Its overcrowded and insanitary condition in 1768 is described by Stavorinus and supported by the account of Thunberg in 1773. Thunberg relates that on a ship bound for the Cape a sailor presumed dead of the scurvy was about to be committed to the deep when he exclaimed, 'Master Boatswain, I am alive still!' To which the boatswain, with unseasonable jocularity, replied, 'You alive indeed!

[1] In fact the poison would have dispersed within days. The effects described may have been due to the arrowhead, or part of it, remaining trapped in the body, or else the wound had infected a bone.

What, do you pretend to know better than the surgeon?'

Although on the whole Thunberg found the climate healthy, he declares that he 'never knew disorders of the throat more common or refractory than they are at the Cape, and especially in the town. They are occasioned by the sudden changes of weather from heat to cold. The glands of the throat swell with such violence that the patient is in danger of being suffocated, and they almost always come to suppuration. Some are infested with this malady several times in a year, and neither sex is exempted from it.' Perhaps the lack of sanitation, the dust from unsurfaced streets and the swarms of houseflies caused this affliction to be commoner and worse than it is now.

An innovation in the history of preventive medicine at the Cape was Dr M. H. K. Lichtenstein's vaccination tour, which occupied three weeks in 1805, during the period of Batavian administration of the colony. Smallpox had appeared in the regions far to the north and, to prevent its spread southwards to Cape Town, Lichtenstein travelled from Tulbagh as far as the Fish River, some 20 km west of Sutherland. On his return journey he made two wide detours from his outward route. The vaccinations were made with cowpox serum, which conferred a certain degree of immunity from smallpox or considerably reduced its virulence. Cowpox had been brought to the Cape by a Portuguese slave ship from Mozambique in 1803 and there were still occurrences from which the vaccine could be prepared. At Tulbagh and on his 600 km journey, Lichtenstein vaccinated about 300 people and to this, perhaps, may be ascribed the fact that no smallpox epidemic was experienced at the Cape until 1812 (Lichtenstein 1930; Forbes 1959; Sandler 1974).

Astronomy and cartography. The first land-surveyor and cartographer at the Cape was Pieter Potter, who arrived from Amsterdam in 1655 and served the Company until 1661. He made the surveys and diagrams of the land grants to the first free burghers and also began mapping the Peninsula and charting its coasts, as well as those of Robben Island and Dassen Island. He was surveyor on the expeditions into the interior led by A. Gabbema in 1657 and by Jan van Hawarden in 1658. A map made on the latter expedition, almost certainly by Potter, is the first to show the route to the Paarl Valley and Tulbagh Kloof. Mossop (1927) reproduces it in his *Old Cape Highways* and remarks that 'its general accuracy stirs our admiration for the correctness of the draughtsman's observations'. To modern eyes this is a curious production because, contours not having been invented, the mountains are drawn in profile, as seen from the surveyor's viewpoint, regardless of the fact that any change of the latter must also produce an alteration in the appearance of the former.

Father Tachard and five other Jesuits bound for Siam called at Table Bay in 1685, when they made astronomical observations to ascertain the true longitude of the Cape. Peter Kolb also actually came here (in 1705) to make astronomical observations; but his enthusiasm for these lapsed, which was posterity's gain as he has received far more attention and recognition as an author than he could ever have earned as an astronomer.

Commander Van der Stel's journey to the copper deposits of Namaqualand in 1685 was, as far as is recorded, the deepest exploratory thrust made up to that time. A compass traverse, supported by instrumental observations for latitude, was maintained and worked up into a large map, possibly by Heinrich Claudius, the apothecary and artist who was an expedition member.

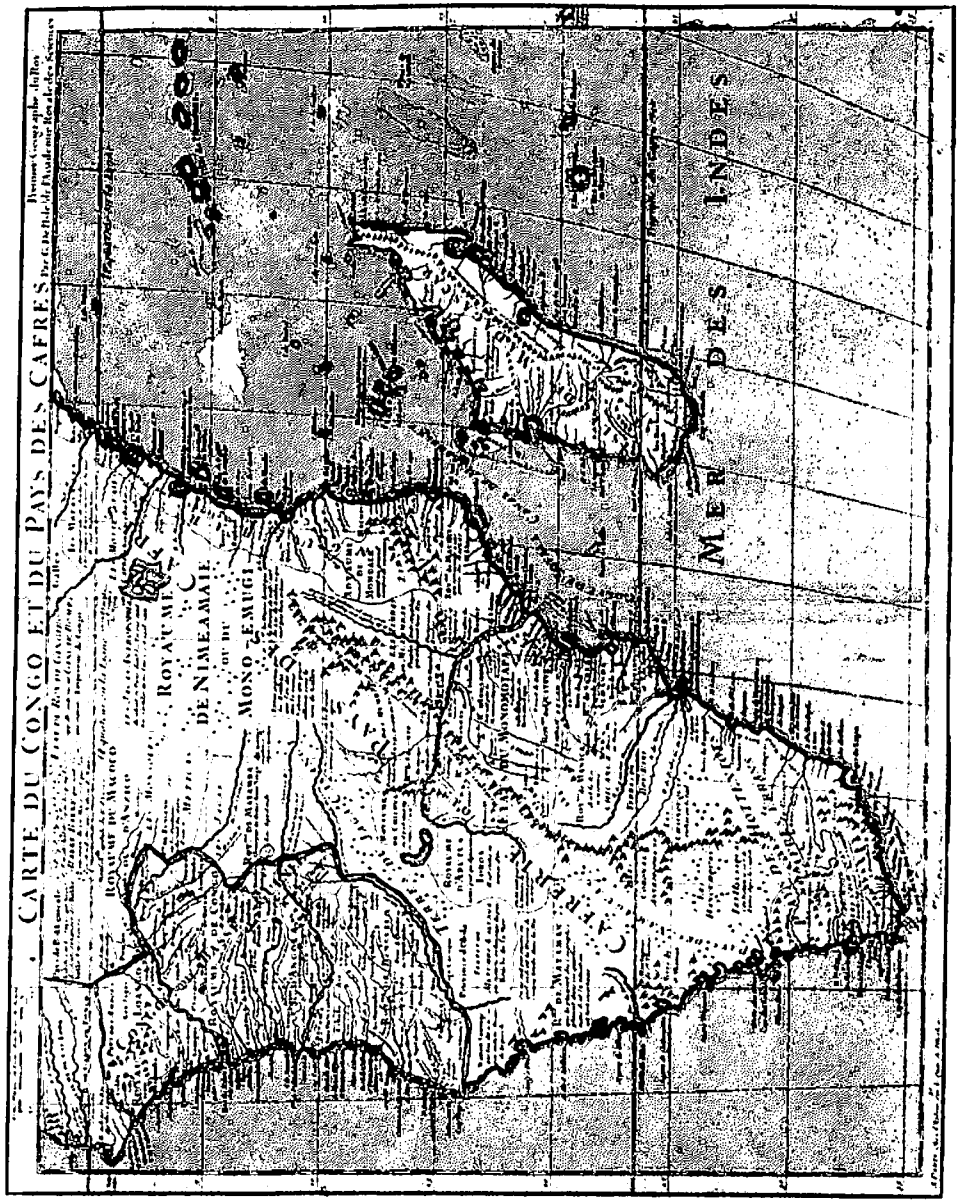
Standard maps of Africa of the seventeenth and eighteenth centuries were almost all in fault in depicting the southern parts of the continent too narrow in their west–east dimension. For example, the highly regarded and much copied map of the southern half of Africa by G. de l'Isle (1708) shows the width of the continent in latitude 30°S as 10 degrees of longitude, which is some 4°, or about 380 km, less than it actually is (Tooley 1969, plate 53). This manifested itself in the work of Surveyor C. D. Wentzel and his assistant Second Mate P. Clement, who accompanied Ensign A. Beutler's expedition from the Cape in 1752 to the vicinity of the present Butterworth, in the Transkei.

They plotted their route by a compass traverse checked occasionally by astronomical observations for latitude, while longitude was merely estimated. The magnetic variation seems to have been ascertained at widely-spaced time intervals, on rest days when they were encamped in suitable terrain, without high hills in the directions of sunrise and sunset. The sightlines to these phenomena were cleared of trees and bush, and on the line marking the direction of sunrise a pole was erected. At the same distance from the central point of observation another pole was placed along the sightline to the sunset. The angle between these two sightlines bisected gave an approximation to true north, with which the line of magnetic north could then be compared. Results were adequate in view of the crude instruments and methods used.

In order to keep the trace of their traverse within coastlines drawn insufficiently far east by cartographers in the seats of authority in Europe, Wentzel and Clement had to compress their mapped route both in longitude and latitude, to prevent it from going out to sea in the standard atlas maps of the period. It was a matter of considerable satisfaction to the present writer, two centuries later, to vindicate these findings of two humble on-the-spot surveyors, against the opinions of the exalted chair-bound cartographers in Europe (Forbes 1965).

The year of Beutler's expedition was the centenary of the foundation of the settlement at the Cape by Jan van Riebeeck. One of those present at the centenary celebrations in 1752 was the French astronomer, the Abbé N. L. de la Caille, as related in his posthumously published book *Journal Historique du Voyage fait au Cap de Bonne-Espérance* (1763). He had been sent by the French Academy of Sciences to supplement by investigations in the southern hemisphere work in progress in the northern hemisphere. For example, an accurate catalogue of the southern stars was required; and an arc of meridian was to be measured to throw further light upon the size and shape of the globe and to assist in the determination of the distance to the moon.

He established an observatory in Strand Street and, in the course of a stay of two years, spent about half his time determining the positions of nearly 10 000 southern stars, which he ranked for the first time in gradations of brightness, He also added a number of new constellations and drew up a catalogue of 42 nebulae. He



Map of southern Africa and associated islands by De l'Isle 1708.

improved the accuracy of the longitude of the Cape, made observations on the planets and the moon, carried out a survey of Hout Bay and ascertained the elevations of the summits in the immediate vicinity of Cape Town (McIntyre 1951).

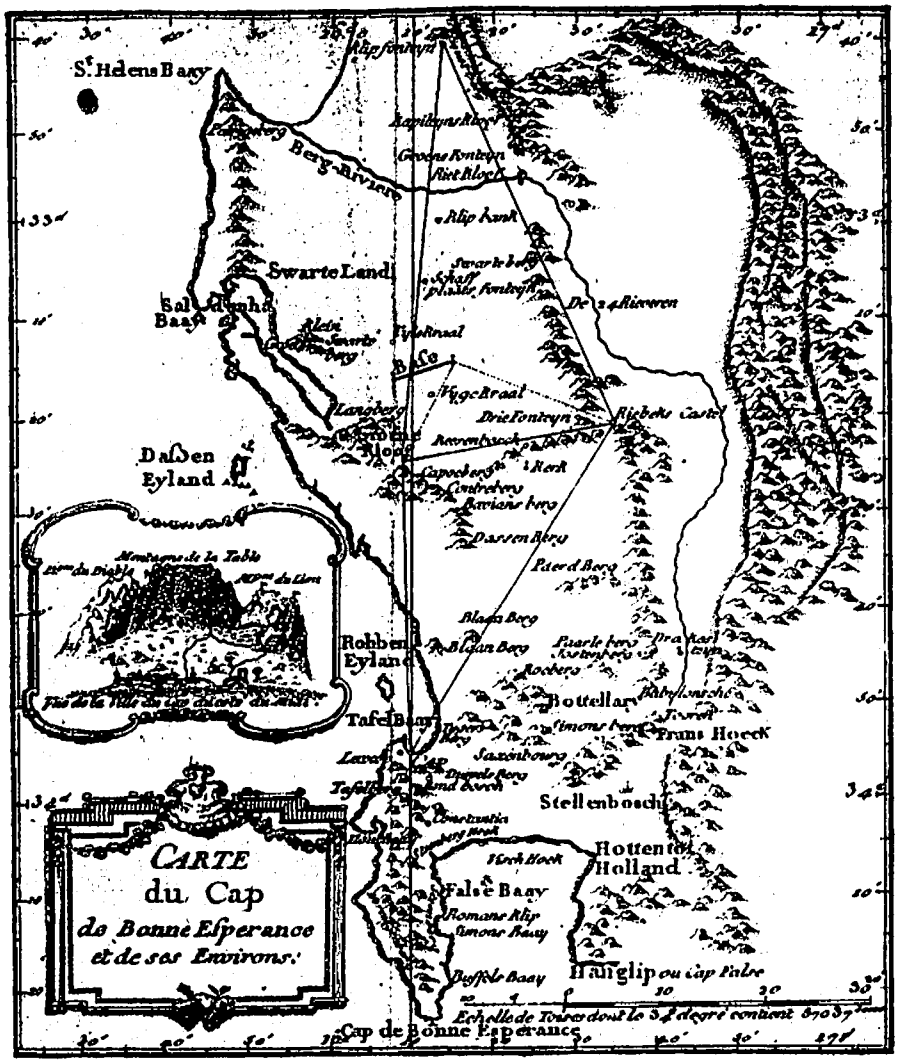
His major labours in the field, which initiated geodetic survey in the southern hemisphere, comprised the measurement of a base and the construction of a related triangulation to measure the length of 1° of latitude along an arc of meridian. These activities were centred on a line roughly between the present towns of Darling and Riebeek West, and extended as far north as Aurora. A subsidiary of these operations was the appearance in his book of a little map of the region covered by the triangulation. This is the first map of an area of this size in southern Africa to be constructed around a trigonometric survey of this scale and accuracy. His visit to the Cape was summed up by Sir David Gill as 'one of the most memorable, successful and useful scientific expeditions ever undertaken', for he 'laid the foundations of exact sidereal astronomy in the southern hemisphere'.

In 1761 the transit of Venus across the sun's disc was successfully observed in Cape Town from Concordia Gardens, a social club on Bouquet Street behind St Mary's Cathedral (Evans & Deeming 1969). The observers were Charles Mason and Jeremiah Dixon, who had been sent by the Royal Society for this purpose to Sumatra but, being delayed on their voyage, made their observations here instead. Subsequently they surveyed the boundary between Maryland and Pennsylvania, which became famous as the 'Mason and Dixon Line'. In 1772 the astronomers William Wales and Francis Baily, sailing with Captain Cook on his second voyage, fixed their instruments within a few yards of the spot in the Concordia Gardens used for this purpose by Mason and Dixon (Forster 1777).

A route traverse by Surveyor C. F. Brink enabled him to produce a creditable map of the journey he undertook in 1762 with H. Hop's expedition to the vicinity of the present Keetmanshoop. An interesting feature of the equivalent copies of this map is that the coastline, which their route paralleled but did not encounter, is drawn with hugely exaggerated bays and inlets. These were derived by faithful proportionate enlargement from an atlas map or maps, of which one could have been De l'Isle's *Carte du Congo et du Pays des Cafres* (1708). Indeed, there was at that time no better representation of that inhospitable shoreline. Two versions of Brink's map appear in Koeman's *Tabulae Geographicae* (1952).

Also in the *Tabulae Geographicae* is a more important map which, though not attributed there to Brink, owed much to him. This is Map 222 of the Van de Graaff Collection, identical with Map 221 compiled by Brink in 1768 from his own work and that of others (Forbes 1965). These two maps show for the first time, on a scale sufficient for the insertion of much detail, the entire Cape Colony and beyond, from the Olifants River mouth in the north-west to the Great Fish River in the east, while inland the boundaries are the Nieuweveldsbergen and Sneeuwbergen. These maps, and particularly the better-finished Map 222, constituted an impressive new achievement in the cartographical history of the Cape.

The culmination of Dutch cartographical achievement at the Cape was the map made during the period 1777–88, largely by the personal observations of that skilful



The Abbé de la Caille's map of the Cape of Good Hope.

and indefatigable traveller and naturalist, Colonel R. J. Gordon, Commander of the Dutch Forces (Forbes 1965). Now designated Map 3 of the Gordon Collection at the Rijksmuseum in Amsterdam, it became accessible to public inspection only in 1914 and because of its large size has never been reproduced as a whole, though portions of it have been printed. Its limits lie along the Orange River except in the west,

where they are near Keetmanshoop, while in the east the site of Bethulie and Algoa Bay are near its margins. The scale is about 1 in 750 000. Its accuracy is high for its period and manner of construction, and latitudes are often within 5 min. of the reality. Naturally a similar accuracy is not to be found in his longitudes, and the Sundays River mouth is about 45 min. short of its true position (i.e. not far enough east). This is not a glaring error, however, when it is considered as less than 10% of its distance by ox-wagon from Table Bay.

Map 3 is moreover remarkable for including the barometrically ascertained heights of over 36 points in the remote interior, thus giving confirmation of and precision to the printed statements of such writers as Thunberg and Paterson regarding the step-like nature of the interior plateaux. The exact spots where he made his observations cannot usually be ascertained, so his results cannot be checked with precision. However, considering that he was unable to make corrections for fluctuations in temperature, pressure and humidity, he appears to have obtained results of a fair order of accuracy (Forbes 1965).

Not only does Map 3 depict a mass of topographical detail positioned within a graticule with as much precision as the methods he employed could fairly be expected to produce, but in addition there are the names of many farms and their occupants. Moreover, it is embellished with several charming representations of the activities of the tribes he encountered, as well as some three-score drawings of animals. Numerous explanatory descriptions add greatly to the value of these pictures. Gordon's other maps, as well as the great collection of drawings made by him and by his draughtsman, Johannes Schumacher, are also in the Rijksmuseum. These, together with the seven volumes of his travel journals and route books, which came to light only in 1964, form an unrivalled cartographic, pictorial and descriptive record of travel within and beyond the settled areas of the Cape in the closing decades of the eighteenth century.

A notable map was that constructed in 1789–90 by Lieutenant J. C. Friderici and Bombardier Josephus Jones (Koeman 1955). It measures no less than 4 metres west to east and shows the coast and adjacent interor from Cape Agulhas to Algoa Bay in considerable detail. Many names of farmers and of their farms are given. What seems to be a derivative of this map is reproduced in Koeman (1952).

The first printed map that showed the then settled and explored interior of the Cape with tolerable accuracy was that of John Barrow, made between 1797 and 1799, published in 1801 and reprinted by Koeman (1952). It was a great improvement on those printed by Sparrman, Paterson and Le Vaillant. Barrow's was virtually a one-man map, undertaken at the insistence of Lord Macartney. Data for it were collected on journeys from Cape Town to the mouth of the Great Fish River, to the Orange River near Colesberg, and finally to Namaqualand. He furnished himself 'with a sextant of six inches radius, by Ramsden; an artificial horizon; a good pocket chronometer; a pocket compass; and a measuring chain'. His latitudes were obtained by daily observations of the meridional altitude of the sun, while longitude was estimated by dead-reckoning based on the speed of his ox-wagon over various types of country. Detail on either side of his route was fixed by the intersection of compass bearings

(Barrow 1804). The coastline was mainly supplied by the Royal Navy and it is not surprising that there was a discrepancy between its longitude for Algoa Bay and that derived from the speeds of Barrow's ox-wagon. When the position of the mouth of the Great Fish River given in his 1801 text is checked against a modern map, it is seen that his latitude is 4 min. in defect and his longitude about 30 min. in excess, an excellent performance under the circumstances. He is not always equally accurate in other parts of his map, however.

Of all the manuscript maps mentioned above, only that of Friderici and Jones was available to Barrow, while the printed maps of Sparrman and Le Vaillant were too inaccurate for his purpose. Hence his achievement is the more meritorious in that he started virtually upon a blank sheet. H. Lichtenstein, for his printed map of 1811, had Barrow's work as a basis, and thus an easier task. These two maps, whose respective merits were often compared and contrasted, in fact are such as to supplement each other usefully.

Last of the 'one-man maps' was that of W. J. Burchell, who travelled in the years 1810–12, printing his map in 1822. Meticulously observed and constructed, his routes form a huge triangle from Cape Town almost to lat. 26°, due north of Kuruman; then SSE to Grahamstown and then westward, parallel to the coast, back to his starting point.

The last words on survey, however, must be of that talented polymath Francis Galton. During his travels in South West Africa, in 1850, he ingeniously and diplomatically accomplished the delicate procedure of measuring the outstanding features of a prodigiously steatopygous 'Venus among the Hottentots'. 'I profess to be a scientific man,' he wrote, 'and was exceedingly anxious to obtain accurate measurements of her shape; but there was a difficulty in doing this. . . . Of a sudden my eye fell upon my sextant; the bright thought struck me, and I took a series of observations upon her figure in every direction, up and down, crosswise, diagonally, and so forth, and I registered them carefully upon an outline drawing for fear of any mistake; this being done, I boldly pulled out my measuring tape and measured the distance from where I was to the place she stood, and having thus obtained both base and angles, I worked out the results by trigonometry and logarithms' (Galton 1890).

Geology. In the early history of geological ideas at the Cape there are only a few connected topics which can be followed from author to author. Of these topics the best developed is speculation upon the geological history of the Cape Peninsula and of the mainland mountains visible from it.

The formation of Table Mountain and its attendant summits was the most obvious topic for geological speculation, for this impressive mountain cluster was probably the first, as well as the last, feature travellers saw of the Cape. It was also the most arresting, the most spectacular element of Cape Town's surroundings. After its sheer bulk and steepness, its marked horizontal stratification was the characteristic that claimed attention and invited explanation. No doubt many must have pondered upon its origins, compared with the few whose ideas were committed to writing and preserved in that form or in print.

Father Tachard, during his second visit to the Cape in 1687, states that before he embarked on his first voyage (to Siam) he had been asked to investigate a theory which, however strange it might seem, he had been assured was true (Raven-Hart 1971). This was that upon the very summit of Table Mountain there were to be found scattered large numbers of seashells, which gave indubitable evidence of its former submergence beneath the sea. It is disappointing that Tachard does not again refer to this matter. We are only informed that some members of his party reached the summit and no further mention is made of the seashells.

The origin of this story has not been traced. It is possible that some traveller had found seashells left by Strandlopers on a dune or on the lower slopes of Signal Hill and that this story became exaggerated into the assertion that they had been found upon the very top of Table Mountain. It certainly did not originate from the finding of fossils, since Table Mountain Sandstone is almost entirely lacking in such remains. Whatever its origin, the preservation of this story in print provided a legacy of conjecture and hypothesis concerning past changes in sea-level at the Cape, and hence of an aspect of its geological history. However, nearly a century was to elapse before the topic seems to have been mentioned again in print.

Anders Sparrman, in his book published in 1783, discussed the relative positions of land and sea in the Cape Peninsula. He stated that Table Bay was growing shallower and that this process had already reclaimed from the sea the low isthmus between Fish Hoek and Noordhoek, as well as the sandy wastes of the Cape Flats. To support this hypothesis he described being shown numerous seashells at a locality between the Tygerberg and Table Bay, and well inland from the latter. (In fact these were probably freshwater mussels, *Unio caffer*, from the Diep River, and perhaps in middens.) These alterations in position of shorelines, however, he ascribed to filling in by debris washed down from the land, as well as by sand windblown from the sea.

When François le Vaillant climbed the Sneeuberg in 1782 he searched the summits in vain for seashells but did find 'pyramids of flints and sand exactly like those found upon the downs' (dunes). These he seems to have taken as evidence that the sea had once submerged these summits, in accordance with the then widely accepted Neptunian theory that an all-enveloping primeval ocean had fallen progressively to its present level; for he concludes elsewhere 'that not only the southern point of Africa [the Cape Peninsula] but also its interior mountains at a great distance within the land have in part been covered by the sea'. Consistent with this concept was his belief that in a former age the Cape Peninsula must have been three islands, divided by straits at Constantia Nek and between Fish Hoek and Noordhoek.

His contemporary and countryman, Count L. Degrandpré, approved and elaborated upon these hypotheses by predicting that in time Robben Island would become part of the mainland and the Agulhas Bank would become dry land. These views appeared in his book, *Voyage à la Côte Occidentale d'Afrique*, vol. II, Paris 1801, part of which deals with his visit to the Cape in 1793. His map of the Cape Peninsula, illustrating these effects, must be one of the first to be published on this theme, relating to any part of the world. On it is inscribed at Constantia Nek, 'the first col abandoned

by the sea'; at the Fish Hoek Valley, 'second area to be drained dry'; while across the Cape Flats is written 'the latest drying up'. He argued that when the Cape Flats were covered, so too must have been the Isthmus of Suez; but since the latter had been dry land from the very beginning of recorded history, the Cape Flats must have been exposed for the same period. Thus he argued that the Flats could not have been submerged recently, by which he meant at most a period of three to four thousand years; but this was a large part of the then generally accepted entire age of the earth, whose date of creation had been fixed at 4004 B.C. by the calculations of the ingenious and industrious Archbishop Ussher.

Degrandpré's Suez argument seems to have been the unacknowledged source of John Barrow's discussion upon changes in sea-level at that isthmus related to those at the Cape (Barrow 1804; Forbes 1965). This need not be followed here; but Barrow returns us to the seashells with which this section opened, urging his case that those found at considerable elevations above sea-level were not evidence of oceanic retreat but had been carried there by birds. In reply Lichtenstein argued correctly that not birds but Strandlopers had been the agents of transportation (Lichtenstein 1928).

An explanation of the origin of Table Mountain and of the ranges of the Peninsula and the SW. Cape was first attempted by Thunberg. With commendable originality he propounded a theory based on personal observations of sand dunes near the shore, in the vicinity of Granger Bay (Thunberg 1793, I). He noticed that these had their longer axes roughly parallel to the direction of the near-by mountains and to the prevalent SE. and NW. winds. He suggested that the winds had in summer piled up sand derived from the sea into dunes that became indurated by the rains of winter and increased in height from SE. to NW. This process, operating over the millennia, had built up mere dunes to the stature of the adjacent mountains, which moreover increased in height from Cape Point to Table Mountain and from Cape Hangklip to the Hottentots Holland Mountains. The Blouberg hills he seems to have regarded as being at an intermediate stage in this progress.

Degrandpré, however, applied an adaptation of the Neptunian theory to the problem. He suggested that the mountain cores were composed of primitive granite 'thrust up by the movements of the earth at the epochs following the time when it was thrown into the tangent of its orbit' (Degrandpré 1801)—the latter phrase probably referring to Buffon's theory of the earth's formation due to collision between the sun and a comet. Around these primitive granites (Cape Granite) as nuclei, he believed the secondary rocks (Table Mountain Sandstone) had been deposited in horizontal layers by crystallization and later by sedimentation from the primitive, all-enveloping ocean (Forbes 1965).

Barrow, too, saw an impressive geological section on the Neptunian model in Cape Town's mountainous backdrop, which he seems to have regarded as entirely a water-formed succession subsequently elevated above sea-level by volcanic forces (Barrow 1801). He believed that the Cape Granite was not of igneous origin but had crystallized from solution in the sea; and he also exercised some ingenuity in trying to fit into his system the distribution, altitudes and composition of the Malmesbury Beds and the Table Mountain Sandstone.

What he observed around Cape Town he took to be the type-section for the entire colony and wrote, 'all the chains of mountains in the southern part of South Africa may be considered to be made up of a repetition of parts similar to those of the Devil's Hill, the Table Mountain and the Lion's Head, and of the same materials, but generally of a more gigantic size' (Barrow 1804). No doubt the widespread occurrence of sedimentary rocks, often in horizontal strata, that he saw exposed in mountains of the Karoo and the eastern Cape, provided him with some support for this belief. However he did note having also observed strata that dipped steeply. In several passages he shows dissatisfaction at the then generally accepted geological time-scale and makes the following frank statement of his views. 'Geological observations on the gradual decay, or rather mutation of the superficial form of our habitable earth, leave a doubt in the unprejudiced and unshackled mind of the popular Jewish notion that would limit its creation to the short period of six thousand years. The human mind appears lost and bewildered in attempting to form any conception of a beginning of the existence of matter, or of ought antecedent to it' (Barrow 1801). It is perhaps not surprising that this passage is omitted entirely in the second edition of 1806, no doubt in deference to prevalent conservative religious views.

Consistent with Neptunian belief that the sea had once covered Table Mountain is Barrow's account of a supposed anchor found upon its summit (Barrow 1804). He approaches this subject carefully and does not give the impression that he actually believed that the iron had been dropped there from a vessel floating above it, or that the object had indeed been an anchor. He says in fact that the much corroded iron mass had merely 'some faint traces of the shape of the flook' of an anchor which, it was supposed by some, had been left by Bartholomew Dias or some other early navigator and carried as a prize by Hottentots to cache it on the mountain top. Long after he had left South Africa he realized that the metallic mass was almost certainly a meteorite, and one of the last reports of its whereabouts placed it presumably in the upper part of Platteklip Gorge, where it had been abandoned no doubt in an attempt to remove it to the town. The reward of finding this historic object would seem to make it well worth while to search the gorge with an electrically-actuated metal detector.

The origin of the granite exposures on Paarl mountain provoked vigorous discussion in the period following their first description by Masson in 1776. He calls them 'two large solid rocks, of a roundish figure; each of which, I may positively say, is more than a mile about the base, and upwards of two hundred feet high above the ground. Their surfaces are nearly smooth, without chink or fissures, and they are found to be a species of *saxum* or granite, different from that which compose the neighbouring mountains.' Controversy centred on whether these rounded granite summits were prodigious boulders flung from afar by volcanic explosion, or whether they were formed *in situ* and were part of the granite which comprised the body of the hill on whose summit they had become exposed.

No more complete and rounded description of the geology of a small area is to be found in eighteenth-century writings on the Cape than Thunberg's paragraph on the Robberg at Plettenberg Bay. The accuracy of his descriptions is such that almost

all the phenomena to which he refers can now be identified confidently (Forbes 1965). The account merits repetition in full. 'The *Robbeberg* is a singular mountain, and different from any other that I have seen in Africa Its middlemost stratum is a very firm concretion of round and irregular pebbles, and indurated lime, about four fathoms broad. It perfectly resembles a piece of masonry. The uppermost stratum appeared to me to be a brownish rock. The lowermost is sand-stone. On another side of the mountain there is a heap of indurated sand, which the water has scooped holes into. In some places the sand has concreted with clay in a tubular form, and large masses of it had fallen down. The flat foot of the mountain, towards the sea, had various holes in it of different sizes, some of them as round as if they had been turned, and others oblong. On one side, the lowest stratum was a whitish-grey quartz, that was greasy to the touch. The mountain had, moreover, long clefts and crevices, in which hung a number of thick stalactites, covered with a fine down-like substance, which was sometimes quite green. The sand-stone was of a very fine grain.'

Fossils. The first fossils discovered in South Africa were described by W. Paterson, near Port Nolloth, in 1779. Their identity seems well established because they are distinguished by him from recent shells lying heaped in coastal middens. He and his companion, R. J. Gordon, travelling along the coast to the Orange River, found in the highest rocks 'several petrifactions of shells, some of which were about an hundred and fifty feet above the surface of the sea' (Paterson 1790). The fossils of *Ostrea prismatica* are among those now recognized as markers of raised-beach deposits containing diamonds, whose existence was undreamt of by Paterson and his companions.

The first mention of the finding of diamonds was over forty years later, in 1821, by the Rev. J. Archbell, who had then spent three years as a Methodist missionary in Namaqualand. He wrote an account of his travels in the territories centred on the Orange River which covers 48 closely-written foolscap pages (Manuscript Collection, S.A. Library). He wrote, 'diamonds have at different times been found here, we are informed from good authority, and the variety of the precious stones testifies that it is no impossibility'. He is referring to the course of the Orange River and, though we do not know on what evidence he based his claim, it does seem to show that there was at this surprisingly early date talk and speculation on this possibility, thus providing the background for the first official discovery of a diamond near Hopetown in 1867.

To return to fossils, however, their next mention seems to be by Lichtenstein who in 1803 saw, near Calvinia, 'the impressions of an innumerable multitude of fish'. These resembled eels and the largest measured about a metre. The next mentions seem to be by the Rev. C. J. Latrobe, who in 1816 found very singular fossils resembling screws in Attaquas Kloof and others of undescribed appearance at Addo Drift, on the Sundays River (Latrobe 1818).

In Cape Town there had long been a serious shortage of fuel, which was gathered as branches, roots and stumps by slaves on Table Mountain and on the Cape Flats. This shortage was particularly felt during the First British Occupation, when the

demand was increased steeply by the arrival of five thousand soldiers, and a large fleet. A search for coal was initiated by a barren boring of 7 metres on Wynberg Hill. This was discontinued when lignite was discovered outcropping in the banks of the Elsjeskraal River, near Bellville. However this source proved unsatisfactory as it is a thin, irregular and discontinuous vlei deposit of recent origin (Barrow 1801). This or similar deposits in this vicinity led to the romantic story of the discovery hereabouts of the timbers of an ancient Phoenician vessel buried deeply beneath the sand. Naturally this aroused considerable attention and some of the speculation and controversy concerning it survive in print (Sampson 1948; Forbes 1962).

Thermal springs. Several eighteenth-century accounts of the Cape mention the existence of hot springs and by the end of that century nine or ten had been recorded in print. Of these by far the best known and most visited were the springs at the Swartberg (Caledon), because of their high temperature of 48,8°C and their accessibility, being only 120 km from Cape Town on the main route to the east. Diaries have been printed of two high-ranking officials of the Dutch East India Company, Commissary Govert Cnoll and Junior Merchant Willem van Putten, who separately, but probably both in 1710, used the hot baths for medicinal purposes (Botha 1924). Both reported substantial improvement in their health from these immersions. Van Putten describes thus the ludicrous sight presented by his party, ranked in order of precedence, on these occasions. 'The Theologian first, with a serviette tied round his head, placed himself at the end of the bath; next the captain with a white cap and a lace pennon on the top; then the clerk with a cotton gingham cap, beside the first-named; and then the butcher with a red clown's cap with flaps beside the second-named. In this order they would seat themselves flat on the ground, immersed in hot water up to their chins; nor could we refrain from laughing when we looked at each other and saw the queer spectacle which each, with a cap on his head, presented.'

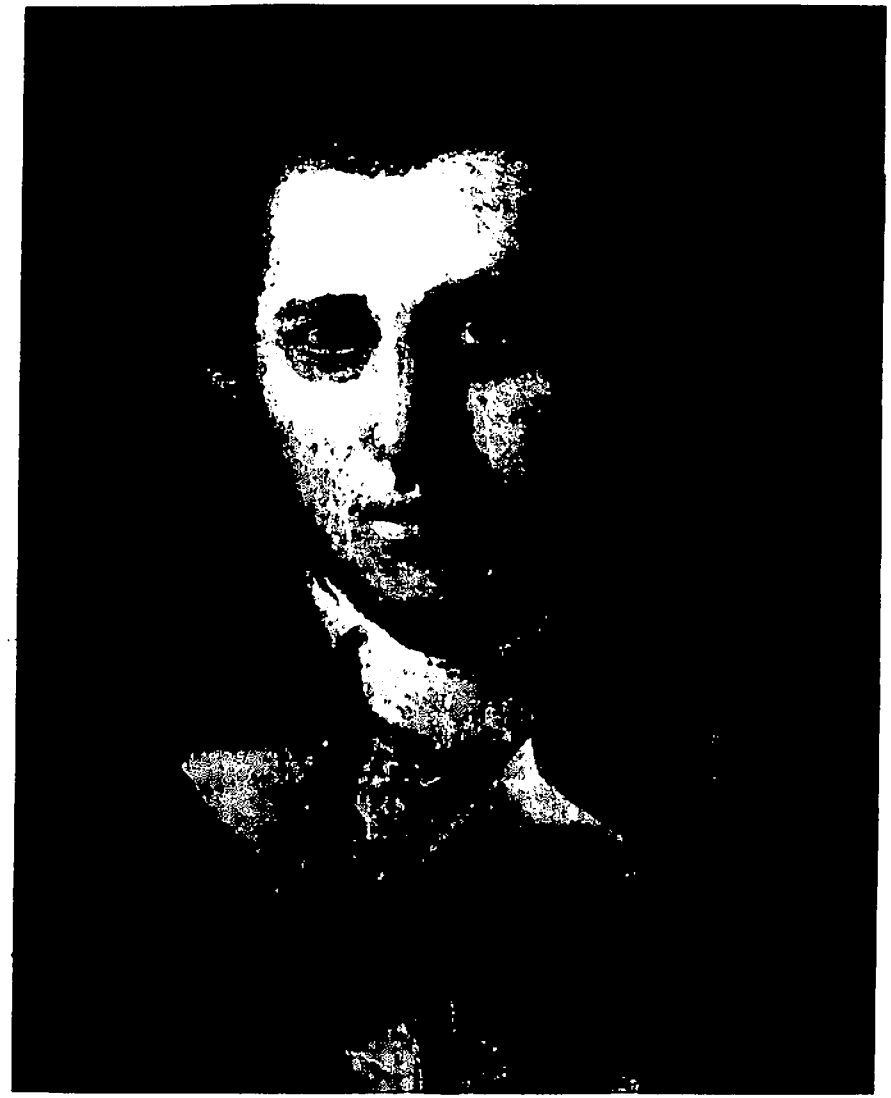
Sixty-five years later the young Swedish doctor Anders Sparrman used these waters, hoping to remedy the adverse effects of the Antarctic cold experienced during part of his circumglobal voyage aboard the *Resolution*. Like his contemporaries, he believed that the black rocks by the springs were of volcanic origin, whereas in fact they are coated with manganiferous tufa deposited by the thermal waters. With commendable curiosity and industry he carried out a series of tests upon these waters, though he was handicapped in respect of both shortage of chemicals and of apparatus. He remarks that, 'I was in want of many necessary helps, as well with respect to drugs as vessels; for the master of the bath's brandy-glass excepted, I had nothing here fit for the purpose but the two drinking-glasses I brought with me, the people here usually drinking the water of the well out of ladles'. To obtain pure water to make limewater for his experiments, he ingeniously improvised apparatus for distillation 'by means of several tea-kettles joined together'. Using potions and powders from his medicine chest as reagents, he carried out and recorded the results of a dozen tests. These were not contradicted by the next published analysis of these waters made by Professor P. D. Hahn, which appeared over a century later, in 1897 (Scholtz 1897).

Meteorology. Comments on the climate of the Cape usually stressed its temperate nature and mentioned the winter or *quaade mousson* (bad season), with north-westerly winds and much rain, as contrasted with the summer or *goede mousson*, with dry south-easters. The violence attainable by the winds in their respective seasons is dramatically illustrated by Thunberg's account of the heroism of Wolraad Woltemade in rescuing men from a ship wrecked by a winter storm (Thunberg 1793, I). On the other hand Thunberg says that the sou'easters 'blow up not only dust and sand but also gravel and small pebbles into the face of such as are exposed to it, who, being neither able to see nor go forwards, must either stand still or else throw themselves down upon the ground. On such occasions strangers frequently exhibit ridiculous scenes, their hats, wigs or hair-bags being carried away by the wind the whole length of the streets.'

It is not remarkable that very little was written on meteorology here in the first 150 years of the settlement's existence. The practical implications of the climate and weather were the only concerns of the mariner and the farmer. Theories based on the physics of the atmosphere had been discussed in the publications of learned societies but these were read by few and understood by even fewer. No textbooks on meteorology existed and no courses of instruction in it were given, so that dissemination of its findings was slow and difficult. There were also other handicaps, such as a shortage of instruments and observers. It is doubtful whether a rain-gauge had been used at all at the Cape during the eighteenth century.

Bearing in mind these obstacles we should be able to view with some tolerance such pretentious and ponderous statements as, for example, Sparrman's explanation of his incorrect assertion that it never rained in the lee of Table Mountain, on the plains between Wynberg and False Bay. This was, 'that the vapours which are driven up from the sea by the north-west wind, gather round the mountain in consequence of being attracted to it, and there remain as long as they preserve any degree of rarefaction; but when at length they become more and more dense and pressed together, so as necessarily rather to yield to the greater force of the wind than to the attractive power of the mountain, they are carried away too quick to fall in rain at the foot of the mountain'.

To his credit, Sparrman provides monthly summaries of the weather, which state the number of rainy days experienced and give an indication of the temperatures, e.g. 'the thermometer kept fluctuating between 53 and 63 degrees'. These readings were 'made in the shade in the open air between eight and nine o'clock in the morning'. Occasionally he mentions noon temperatures on hot days, the highest he recorded being 104°F. He was the first to print an account of the berg-wind, though he did not use this term or have any inkling that its warmth was of adiabatic origin. Writing about the plains near George in winter, he says that 'sometimes the wind veers about to the north and brings with it the warmth of summer; a change which frequently occasions the milch-cows in Houtniquas to grow stiff in the joints'. The next printed account of the berg-wind is in Barrow (1801), where nearly a page is given to a clear presentation of the circumstances attendant upon this phenomenon, experienced at the Great Fish River, when the temperature rose from 72° to 102° in an hour. One can



R. J. Gordon, from an oil painting in the William Fehr Collection at the Castle in Cape Town.

only admire his lucid endeavours to account for this sudden hot blast, when he rejects each self-provided explanation in turn as insufficient. Considering the state of knowledge, his conclusion that, 'these circumstances render it very difficult if not impossible, to account for so high a degree of temperature', was just.

An interesting document written in the closing decades of the eighteenth century is the unpublished manuscript of 6 000 words by R. J. Gordon, entitled *Korte Stellingen omtrent de Meteorologie in het Generaal: beneffens eene Schets van het Weer aan de Caap de Goede Hoop in het bysonder* (Cape Archives V.C.170; Forbes 1965). It is unlikely that there is any earlier comparable treatise on Cape meteorology, and it is another demonstration of Gordon's wide range of interests and searching curiosity. He is unchallengeably the outstanding scientific figure among Cape residents of his century.

The examples given above cover a wide range, and illustrate the chief subjects that occupied scientific attention relevant to the Cape during the first century and a half of the settlement. Unavoidably some subjects have been omitted, such an entomology, herpetology, agriculture and land use. What has been included and what left out is attributable only to the bias and limitations of the present writer who hopes that his choice sufficiently illustrates why, despite minor flaws, the researches and writings of our predecessors command our interest and respect. We recognize that they were necessarily limited by the bounds of contemporary knowledge, which each generation in turn has enlarged to the advantage of its successors.

Our own scientific writings probably share with those of our predecessors much the same mixture of characteristics and in the same proportions, and our faults viewed tomorrow will resemble theirs as seen now. Though we seem far apart in the short time-scale, we and they will appear contiguous in the longer view. In the same stream that they were, we are too, though for us the current flows wider and faster.

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