

TALES OF TRUTH AND SENTIMENT
Valedictory Lecture A.S. Troelstra
Monday September 18, 2000, 2 P.M.

Ladies and gentlemen,

Although this lecture has been announced as a ‘valedictory lecture’, it has little or nothing in common with the sort of lectures I have held for my students during so many years. You are not requested to do exercises, since I would not correct them anyway, and I don’t dare to ask much concentration from you. I shall be pleased if I will have been able to amuse you for three quarters of an hour.

As a mathematician I have always felt regret that it is so difficult to convey to non-mathematicians what one is doing, not to mention transmitting something of my own fascination and enthusiasm. In some branches of mathematics this is somewhat easier than for other branches, but it is never simple.

Judging from the final product of mathematical activity, the publications, one would not guess that a mathematician harbours emotions. Every personal element has been banned from the presentation. Nevertheless the mathematician knows elation and disappointment, jealousy and admiration, and he can experience beauty. In the sciences it is the same: the emotions of the scientist are left out of the picture.

If one wants to know the emotional background, the subjective experience of the discipline, one should interview the scientist, or read biographies of scientists, or turn to the popular literature — since there emotions and subjectivity are not taboo.

But I can give you at least one example of a type of publication, which has been considered to belong to the scientific literature for at least part of its history, and in which the emotions of the author become sometimes visible: the natural history travel story.

By this I mean the narratives of natural historians relating their travels with scientific goals. Nowadays we speak of biologists, geologists, ethnologists rather than natural historians — however, the 18th century natural historian is often everything rolled into one: botanist, zoologist, mineralogist, geologist and ethnologist.

The humaniora, the natural sciences and the social sciences constitute areas of knowledge which are mutually independent, each with their own methods. But there are connections. For example, mathematical techniques are used in linguistics and the social sciences, and in writing the history of a discipline, one combines the methods of the historian with knowledge of the discipline. And one of the nice things of natural history travel stories is, that besides the natural history aspect there is also a historical and a literary side to them.

Introduction

In what follows I want to highlight two aspects of the natural history narrative: its truth content and the occurrence of emotions. I shall do this by choosing certain authors as examples, telling you something about the authors in passing. The choice of subject was dictated by personal motives: mathematics and botany constitute two poles of my scientific interest. My interest in botany induced me to read natural history travel stories and stimulated my interest in the history of biology.

Let me start with the emotions. It is early Romanticism in particular, where emotions become an issue for the first time, and it is only natural to try and discover emotions in scientific travel stories precisely in that period.

Early Romanticism — some prefer the term pre-Romanticism — as a cultural trend is not sharply delimited; I take as its starting point 1761 — the reason of this choice I shall explain below — and I let it end in 1800.

Early Romanticism does not take the place of the Enlightenment; rather, it supplements and modifies it. The Enlightenment strongly emphasises reason, is anti-authoritarian, and subscribes to the optimistic view that the spreading of knowledge will remove wrongs and evils. Early Romanticism adds to this: appreciation of the beauty of unspoilt nature (nature not influenced by man), attention to feelings and emotions, and a belief in the uncorrupted mores of the countryside, against the corruption of city culture.



First I want to spend a moment on a precursor of Romanticism, Albrecht von Haller (1708 –1777). As suggested by his portrait, not a man to be taken lightly. In fact, I think I detect that his picture has a slightly depressing effect on you.

Where Linnaeus brilliantly completed a development which had started long before him, Haller, in his time as famous as Linnaeus, and in his mentality rather a man of the seventeenth century, represented nevertheless an ampler and more modern concept of science. Haller belonged to one of the fifty governing families of the republic of Bern. He studied in Tübingen, Leiden and Basel; he then first became town-medic in Bern, and was later enticed to the new

university of Göttingen as a celebrity and living advertisement.

He was exceptionally many-sided: medic, physiologist, botanist, numismatist, linguist, diplomat and poet. As a poet, he does not attain the top, but he has an acknowledged place in the history of German literature and in anthologies. In any case he is the author of a few beautiful poems, moving and appealing even to a modern reader. If I don't admire Haller unconditionally, it is because of a total absence of humour.

With friends he made many tours of the Alps on foot, mainly to collect plants. Of some of these tours he wrote a scientific travel report. Generally speaking, in Haller's times one travelled in the Alps out of necessity only, but Haller apparently enjoyed it. Inspired by his first big tour in 1728, he wrote the next year a long didactic poem, 'Die Alpen' in which the appreciation of uncorrupted nature is obvious. Also, Haller painted the life of the inhabitants of the Alps as an ideal, disadvantageously comparing it with the way of life in the cities. This is actually a form of self-criticism. It is likely that Haller had a too rosy view of life in the Alps, since he writes in his poem:

*Here the conjugal bed stays pure, it does not need watchmen,
Since chastity and sense stand guard over it.
Their curiosity does not long for the forbidden fruit,
What has been loved, remains beautiful after marriage.*

However, in his scientific travel reports his romantic attitude is reflected in a weakened form only. But it was not Haller, who stood at the cradle of Romanticism in Literature, but Jean-Jacques Rousseau. In *Julie*, his long novel in letters (738 closely printed pages in my edition) he shows himself the apostle of sentiment. In fact, the book wallows in sentiment, at times approaching kitsch. Of the novel a few pages only are spent on the description of the wild nature of the Alps of Wallis, so familiar to Rousseau. But these few pages have been very influential, since Rousseau manages to make the scenery mirror the mood of the author of the letters.

To our theme more relevant is another romantic author, popular in his time, (Jacques-Henri) Bernardin de St.Pierre (1731–1814) with his short novel *Paul et Virginie*, published in 1787, a real sob story, relating the love between two young people, against the background of the tropical nature of Mauritius.

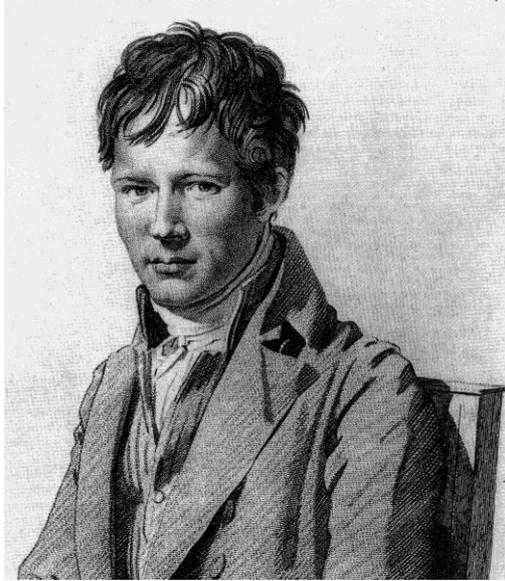


Paul and Virginie grow up together and love each other; to increase Virginie's chances she is sent to France, where she will stay with a great-aunt, in order to complete her education. When Virginie rebels against a distasteful marriage strongly promoted by her great-aunt, the egoistic bitch sends Virginie back to Mauritius. Already in view of the island, she drowns in a storm and her body is washed ashore. A short quote suffices to give a sense of the atmosphere:

[...] she was half covered with sand; her eyes were closed, her expression peaceful, but the pale purple of death mingled on her cheeks with the rosy colour of modesty. One of her hands rested on her clothing; the other one, which she held pressed against her breast, was firmly closed and rigid. With difficulty I extracted a small box from it; great was my surprise, when I saw it to be Paul's portrait, which she had sworn never to leave behind as long as she lived. At this final proof of the faithfulness and love of this unhappy girl I shed bitter tears.

Remaining in style, after this dramatic happening Paul ceaselessly murmurs the name of his beloved Virginie and dies after two months.

Alexander von Humboldt



It is precisely 'Paul et Virginie', a novel which is scarcely read by anyone these days, and which presumably will not leave a deep impression on a modern reader, which has influenced one of the greatest scientific travellers of all times, Alexander von Humboldt. Where his brilliant elder brother William primarily devoted himself to the humaniora, the equally brilliant Alexander (1769-1859) concentrated on the sciences, in particular physical geography, of which he is regarded as one of the founding fathers.

Humboldt strove for an overall picture, for insight in the connections between factors such as soil, climate, height above sea level, flora, fauna, chemical composition of the

soil, and soil relief. This made him into one of the founders of plant geography. Humboldt's achievements in his long and industrious life border on the unbelievable, but his achievement with the widest appeal, also the best known, is his voyage through Spanish South America, from 1799 till 1804. This voyage he made with the French botanist Aimé Bonpland as a companion. It was preceded by six years of preparations. After his return Humboldt spends, in collaboration with others, more than twenty years on the processing of the positively gigantic amount of data he had brought home from his travels. I don't want to suggest that during that time he exclusively occupied himself with the publication of the results of his travels; Humboldt was always involved in many enterprises.

As part of his travel report in 34 volumes, with more than 1200 plates, many of them handcoloured, Humboldt also published a travel narrative, the 'Relation Historique' in three sizeable quarto volumes. In these volumes the purely narrative parts incessantly alternate with scientific excursions and explanations connected with his own experiences. Although Humboldt takes much trouble over the literary form of his excursions and explanations, the patience of the reader is nevertheless occasionally severely tried. All in all, the narrative covers not more than one third of the whole voyage. The last installment was published in 1831; at that time Humboldt had spent almost the whole of the fortune inherited from his mother on his travel report, and he decides to stop publication.

In Humboldt we meet a representative of the Enlightenment and of early Romanticism. He belongs to the Enlightenment by his rational, optimistic ideas concerning the progress of mankind, and by his liberal, anti-authoritarian views. All his life he remained faithful to the principles of the French revolution; notwithstanding the fact that in his later life he acted as advisor on scientific matters to a feudal lord, namely the king of Prussia. In that role Humboldt has done much for the promotion of the sciences, aided by the fact that in his time scientific progress became an ever more important economic factor. This not mean, however, that von Humboldt, had he lived in our days and country, would have been the darling of the Dutch cabinet; for on occasion he also forcefully pleaded for science regardless of utility.

Humboldt is a Romantic in his appreciation of the beauty and sublimity of unspoilt nature. It is also apparent from his appreciation of 'Paul et Virginie'; he carries it along on all his peregrinations through South-America.

What made this book so important to Humboldt? Possibly he liked the sentimental story; but in any case he was particularly impressed by a passage of at most two pages long, which describes the environment of a man living as a recluse in a wood in the centre of the island. In these pages Humboldt discovered a word-picture of nature ("Natureschilderung"), a portrait in words of unspoilt nature evoking a landscape with its flora and fauna, describing it in such a way that the reader can see it in his mind. It is this example which Humboldt tries to follow everywhere in his own narrative. In doing this, he strove for simplicity; in his own words:

The more sublime and impressive nature is [...], the more the word-pictures must retain the simplicity, which is the main, and sometimes the only merit of first sketches.

Regrettably, I must restrict myself to a single quotation, as an illustration of a Humboldtian word-picture.

The forest clothing the steep slope of the mountain of the holy virgin Maria is one of the most dense I have ever seen. The trees are stupendously tall and thick. Under their luxuriant dark green foliage there reigns an everlasting twilight, the kind of darkness of which our pine-, oak-, and beech-forests cannot give an idea. One might say that the high temperature notwithstanding, the air cannot absorb all the vapour exhaled by the soil, the foliage of the trees, and their trunks, covered as they are with an ancient layer of many years, of orchids, Peperomias and other plants. The aromatic scent of the flowers, the fruits and even the wood mingles with the smell we notice in foggy weather in autumn. Just as in the forests of the Orinoco, one often sees, when looking up at the tops of the trees, wisps of vapour, where a beam of sunlight penetrates and descends through the thick air.

Maybe now you think "what is so special about this?" But it is a fact that graphic descriptions of this kind are not found before Humboldt. No less a person than Charles Darwin was very much impressed by precisely this feature of Humboldt's narrative. On the nature of the tropics Darwin writes:

As the force of impressions generally depends on preconceived ideas, I may add, that mine were taken from the vivid descriptions in the 'Personal Narrative' of Humboldt, which far exceed in merit anything else which I have read. Yet with these high-wrought ideas, my feelings were far from partaking of a tinge of disappointment on my first and final landing on the shores of Brazil.

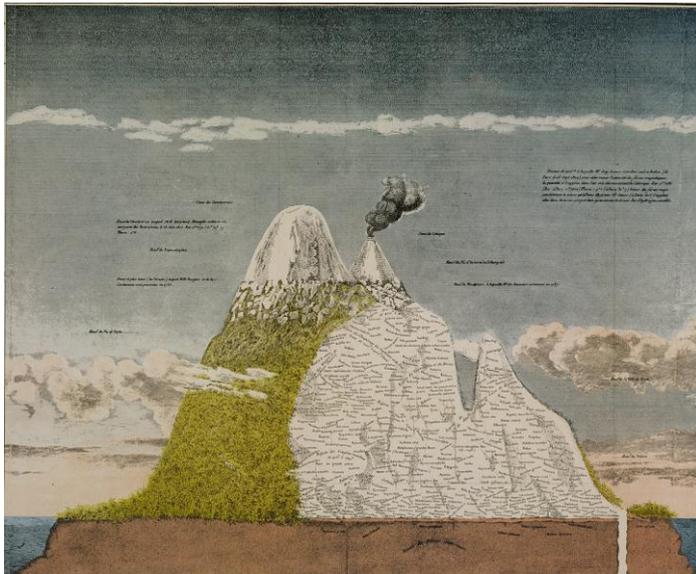
Without doubt, Darwin is one of the most influential and original researchers in the history of biology; but where his travel narrative is concerned, he is simply a follower of Humboldt.

The endeavour to combine aesthetic experience with scientifically accurate description is characteristic for Humboldt; in his case the aesthetic-emotional aspect is closely linked with the empirical-scientific viewpoint. For this reason Humboldt takes pains to achieve a clear, literary polished presentation of his work. A typical quote is the following, taken from his book on plant geography of 1807, the first volume to appear of his travel report.

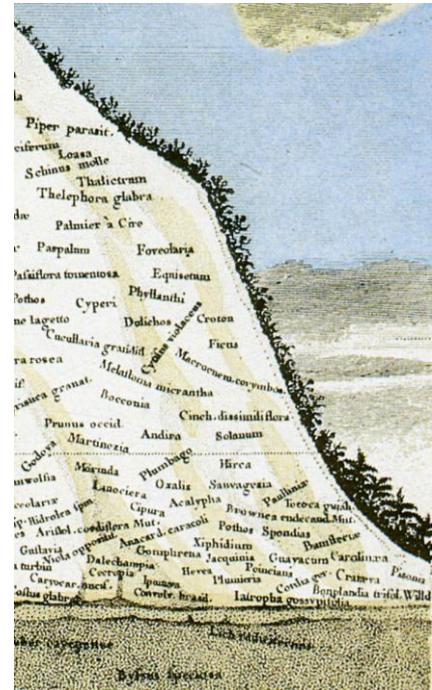
Thus, on the other hand I believe, that my design might feed the imagination, and provide it with part of the enjoyment, which arises from the contemplation of such a

miraculous, magnificent, often awe-inspiring and nevertheless always benevolent nature.

The endeavour to combine aesthetic appeal and scientific information is also apparent from the commentary to the big plate accompanying the book. The plate shows a profile across South-America, from the Atlantic to the Pacific, cutting through the Andes at the Chimborazo.



In



part of the profile the vegetation has been drawn, in another part the names of plant families and genera have been inscribed in the slope of the mountain, in order to indicate at what heights these genera and families occur. Humboldt remarks on this plate:

The whole might have turned out in better taste, if it had not been necessary to write numbers and observations around the contours of the chain of the Andes. However, in this geographic representation two usually mutually exclusive conditions have to be fulfilled: accuracy of the projection and picturesque effect.

Humboldt clearly realizes that there is a tension between the requirement of presenting text and illustrations in an attractive literary, or visual form, and the desire to present a lot of detailed scientific information. In his own words:

It is virtually impossible to connect so many different materials with the narration of events, and the narrative proper is being replaced by purely descriptive parts.

It is therefore not surprising, that the specific form of Humboldt's narrative has not, or only in part, been followed by those travelers, who in other respects clearly stand in his tradition, and who consider him to be a prime example of a scientific traveler: men such as Martius, Poeppig and Darwin. With Humboldt's followers a development starts in which the narrative of a scientific expedition is published for a wide, but well-educated audience, separate from the scientific report in the strict sense.

Humboldt has little to say on emotions other than the aesthetic experience. Also he gives scant attention to the difficulties and dangers of the voyage; he does consider this as irrelevant to his aims.

Burchell

Emotions, other than the aesthetic experience we do find in the work of an author who travelled not much later than Humboldt, namely William Burchell (1781-1863). He voyaged in South Africa from 1810 till 1815, to places far outside the boundaries of the Cape Colony as it was then.

Burchell, son of a florist from Fulham near London, applies himself to botany, without entering a University. He goes to St. Helena as participant in a trading firm; after liquidation of the firm, he earns his living as a schoolmaster and director of the botanical garden of the island.

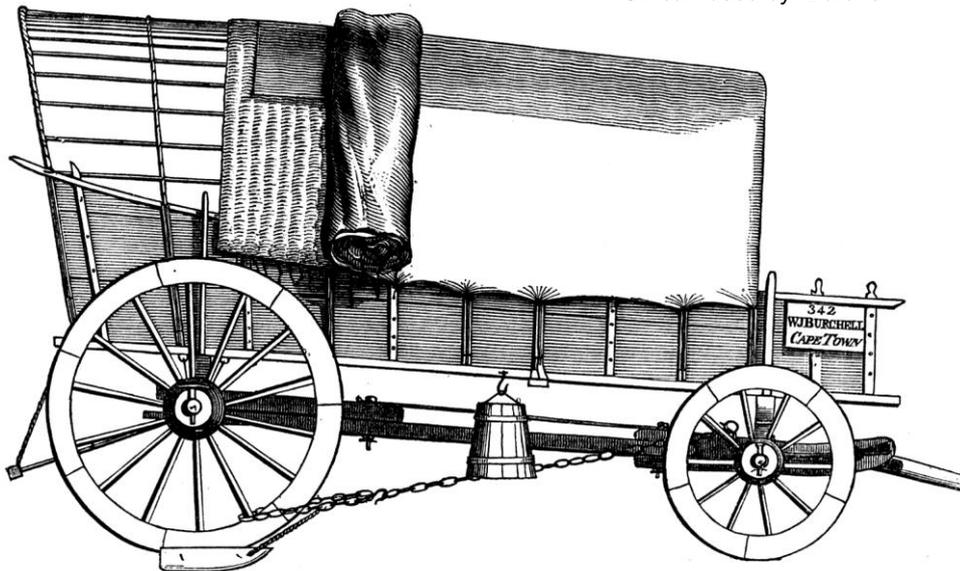


He lets his beloved, Lucia Green, travel to the island in order to marry him; but on arrival of the ship, it turns out she has fallen in love with the captain. The disappointment leads to Burchell's decision to travel in South Africa. Lucia has probably been spared a lot of boredom by her fickleness, since Burchell intended to take her to Tristan da Cunha; greater isolation is scarcely imaginable.

Burchell published a still very readable travel narrative full of information, an enjoyable read; and it certainly deserves to be called a scientific travel report. In his appreciation of unspoilt nature, Burchell agrees with Humboldt; moreover, for Burchell nature is the standard of beauty and harmony, he nearly equates 'natural' and 'beautiful and harmonious'. But

also other emotions are expressed in Burchell's writing, such as when he visits a kraal of Bushmen who possess literally nothing:

Ox-cart used by Burchell



Never before had I beheld, or even imagined, so melancholy, so complete, a picture of poverty. "Here;" said they, as they pointed to the huts, "this is our home" — and having paused a few moments, they seated their thin emaciated bodies on the ground,

and looked up to me with such speaking expression of humility and want, that I felt a tear, which could not be suppressed, trickling down my cheek.

Abstracted from every other thought, my whole mind was absorbed in the contemplation of what was before me. Well! I involuntarily exclaimed to myself, and is this the home of human beings! Have I been sleeping on the bed of ease, and pampered with a thousand useless luxuries, while my fellow-creatures have been wandering the burning plains from day to day, and have returned at last to their wretched huts to pass the painful night in hunger, and unsheltered from the storm!

In this manner the text continues for some time. Humboldt's descriptions of natural beauty contain subjective elements, but are nevertheless presented in an objective manner; on the other hand, in Burchell's story one also finds descriptions of his own inner feelings as in the example above.

From other examples too it appears that literary Romanticism makes itself more strongly felt in Burchell's writing than in Humboldt's narrative.

However, it is noticeable that Burchell in the more emotionally laden passages rhetorically moves into higher gear, so to speak. It is only in the twentieth century that I have found natural history travel authors who are able to express their inner feelings in a natural way, as for example, in the following quotation from the botanist Frank Kingdon-Ward (1885-1958).

The initial stage out of Bhamo is only nine miles, and it was undoubtedly this fact alone which caused me to feel extraordinarily lonely on the first evening of my journey. Arriving very early in the afternoon there was of course nothing to do but to take out a gun and look round for game, but, do what I would, there was no getting away from the sense of utter desolation which seemed to crush me. Even the mild excitement of putting up a barking deer amongst the reeds of the river failed to alleviate the depression and after dinner I was only too glad to crawl into bed and, weary in spirit, court oblivion in sleep. Never again did the sense of paralysing isolation come so vividly upon me as on that first night, when all the trials that awaited me seemed to take shape and rise in arms to mock my ignorance and febleness.

Kingdon-Ward collected both for scientific collections and herbaria, as well as for plant introduction. Initially he travelled in Yunnan in Southwest China, later mainly in northern Burma (Myanmar), Assam, and adjacent Tibet, and he wrote many still eminently readable books on his travels. His first expedition in 1911 he describes in "The Land of the Blue Poppy", which appeared in 1913. The quotation just given has been taken from this book.

Bartram and truth

The next author I want to discuss will lead us into reflections on the truth content of natural history travelogues. Where Humboldt provided us with an illustration of the influence of the "belles lettres" on the scientific travel report, we find in the work of William Bartram (1739-1823) an example going in the other direction: a travel report that has left its mark in literature.

William Bartram was one of the sons of John Bartram. John was a well-to-do farmer in a village just south of Philadelphia, self-taught, member of the Society of Friends (Quakers), and the most important botanist in the American colonies in the eighteenth century. He entertained friendly relations with a rich woollen-draper from London, Peter Collinson, also a Quaker as well as an enthusiastic amateur botanist. Via Collinson, John was brought into contact with other amateurs and scientists, among which Linnaeus. John travelled widely with the aim of collecting plants; his

most adventurous voyage was also his last one, to Florida with William in 1765 and 1766. John was practical, his hobby had to bring in money as well, and he collected and shipped American plants to English amateurs who had ordered them.

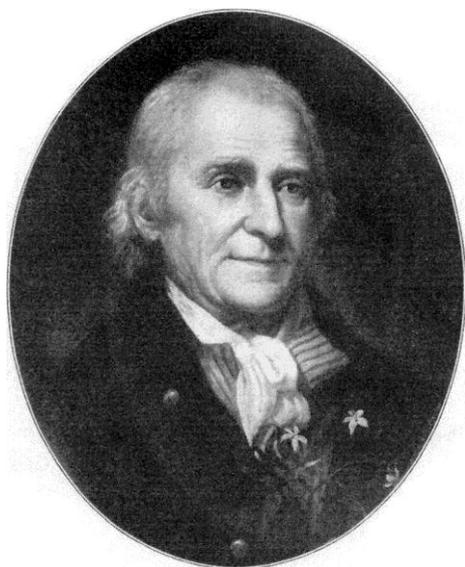
Bartram's drawing of a witch hazel (*Hamamelis virginiana*)



His son William was not practical, rather a dreamer, an artistic, sensitive soul, and a self-made Romantic; as far as we know, he was not directly exposed to European early Romanticism in literature. He was a self-taught draughtsman of plants and animals, and achieved considerable proficiency therein. After several failures, first as a trader, later as owner of a plantation, an opportunity arises for William. The medical doctor John Fothergill, friend of Collinson, amateur of the sciences, and a Quaker as well, promises him 50 pounds a year for travelling in Florida and the Carolinas; in return he expects drawings and plant material collected during the voyage.

William sets out on his travels in 1773. He uses only part of the money that Fothergill had put at

his disposal; but on the other hand, Fothergill received far less than he expected in drawings and material. When William finally comes home after four years, in 1777, his father has still nine months to live, and the American Revolution has started.



After his father's death, William lives with the family of his brother John in the parental home, never again travels far from home, works in the garden and writes the story of his peregrinations. The book appears, after much delay, in 1791 in Philadelphia. It becomes a success, and the next year there appear two English editions, and one in Dublin.

It makes a considerable impression on the English Romantic poets, in particular Wordsworth and Coleridge. There exists a notebook of Coleridge in which he has copied many passages of William's book. Ultimately, we may say that Fothergill had spent his money well.

Bartram's influence on the English Romantic poets is due to his compelling and appealing style, certainly, but above all to the exotic scenery he described; for an inhabitant of Europe at least the nature of Florida was sufficiently exotic. Many examples may be given to show how many images and scenes, in the poems of Wordsworth and Coleridge have been inspired, entirely or in part, by Bartram.

It is not so easy to decide whether we should regard William's book as belonging to the scientific travel literature, or rather to the belles lettres. De style is inspired, rhapsodic, with an ebullient enthusiasm, the text written with a poet's pen, things seen through a painter's eye. Dramatic and lyrical passages alternate with quiet descriptions; occasionally a mild rain of scientific plant names descends on the reader. Here is a typical lyrical fragment:

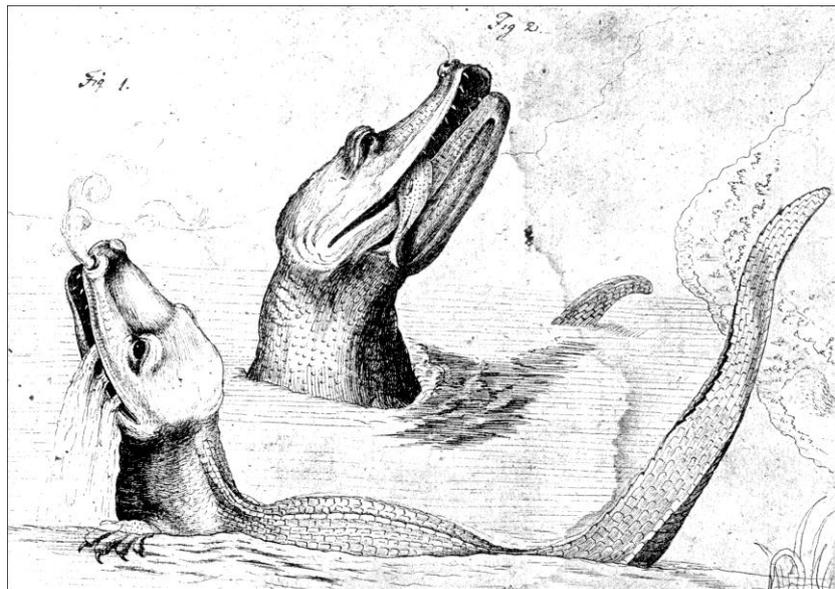
How gently flow thy peaceful floods, O Alatomaha! How sublimely rise to view, on thy elevated shores, yon magnolia groves, from whose tops the surrounding expanse is perfumed, by clouds of incense, blended with the exhaling balm of the liquidambar, and odours continually arising from circumambient aromatic groves of illicium, myrica, laurus and bignonia. [...]

My progress was rendered delightful by the sylvan elegance of the groves, cheerful meadows, and high distant forests, which in grand order presented themselves to view.

At other places Bartram reveals itself as a dramatic narrator, nowhere more than in his description of his encounters with alligators:

Behold him rushing forth from the flags and reeds. His enormous body swells. His plaited tail brandished high, floats upon the lake. The waters like a cataract descend from his opening jaws. Clouds of smoke issue from his dilated nostrils. The earth trembles with his thunder.

And so on. His own adventures with alligators are hair-raising as well:



My situation now became precarious to the last degree: two very large ones attacked me closely, at the same instant, rushing up with their heads and part of their bodies above the water, roaring terribly and belching floods of water over me. They struck their jaws together so close to my ears, as almost to stun me, and I expected every moment to be dragged out of the boat and instantly devoured. But I applied my weapons so effectually about me, though at random, that I was so successful as to beat them off a little; when, finding that they designed to renew the battle, I made for the shore

Bartram describes dramatic happenings, and nature reveals itself occasionally as cruel and inimical, but nevertheless the overall impression, to a modern reader, is

rather that of a continuous idyll. His story breathes a spirit of pantheism, nature is divine and everywhere in nature we find God.

Without doubt Bartram's book contains much that is a valuable contribution to our knowledge of the state of nature and landscape, and the habits of the Indians of Florida and the Carolinas in Bartram's time.

But already in Bartram's own time there was a lot of criticism of his story. One critic disapproved of William's positive attitude towards the Indians; another complained that there occurred too many untamed wildernesses and swamps full of vermin, unhealthy and unattractive to the human species. More seriously, there were doubts concerning the facts from natural history in Bartram's book; in particular the veracity of his alligator stories has often been doubted.

Thus Bartram confronts us with that other aspect of the natural history travel story I wanted to discuss, the truth content. It has been maintained that travel stories are a kind of fiction. Does this hold even for scientific travel stories, and in particular Bartram's story? How do we know whether the related incidents really happened, and that what is being reported has really been seen by the narrator?

The truth criteria for a text depend on the subject matter. The correctness of a mathematical text may be judged, in principle, on the basis of the text itself; the results of a physical experiment must be reproducible by other investigators in order to be accepted as true. In the case of natural history travel narratives, one may compare the accounts of different travelers, and decide to accept facts only when they are corroborated by others. But this method has its limitations; for example, it does not apply where the personal adventures of the traveler are concerned. To pronounce a judgment on the veracity of an author, we may need the methods of historical studies; it may be necessary to study the historical context and the personality of the author. Bartram's story may serve as an illustration.

In Bartram's case we luckily possess supplementary evidence, for there exists a draft of some chapters of Bartram's book. Moreover, we possess, for the first half of Bartram's voyage another travel report, namely the hand-written report which William sent to his sponsor. This report has been published by Francis Harper in 1940, with a detailed commentary. Harper has reconstructed in detail Bartram's route during the first two years of his travels. In his commentary on the report he notes that Bartram was occasionally hopelessly muddled for what concerns route, measures, distances, and chronology, which give rise to despairing remarks on the part of Harper, such as: *Bartram's chronology is assuredly one of his weakest points, and a vastly confusing matter. Perhaps his severe bouts with fever interfered with his grasp of dates.*

What is being said here concerning the report to Fothergill, also applies to Bartram's book. But there are other problems still. Thus, for example, the description of the dramatic encounter with the alligators in the report on the whole agrees with account in the book, but in the Report Bartram has a companion; in the book his companion has deserted him before the encounter. It looks as if in the book Bartram has upgraded his role.

But what interests a biologist above all, is whether we can trust Bartram's biological facts. On this point Harper convincingly defends Bartram. It has been doubted whether alligators can really roar; but Harper declares that he has heard it himself. But what about those fantastic dimensions, Bartram mentions animals with a length of 6 meters. The longest known animals from Florida nowadays remain below 4 meters in length, and an encyclopedia mentions a maximal length of 4,5 meters. From some preserved draft chapters, apparently unknown to Harper, it appears that Bartram inserted many dimensions in the text only afterwards, as if he

made an estimate trusting to his memory. He felt, no doubt, that this kind of precise data was necessary in order to be taken seriously as a naturalist, but inserted them afterwards makes the dimensions mentioned by him doubtful. Our conclusion has to be, that Bartram is a reliable observer, but that we have to reckon with the fact that he rather viewed things as a poet and painter than as a scientist, and that therefore we have to take his dimensions with a grain of salt.

Why scientific travel narratives?

Maybe you have wondered: why do we want a chronological report of the adventures of the traveler? Would it not be more to the point, more businesslike, more scientific to present the information obtained, sorted according to subject matter? Facts regarding the same subject are thus presented together.

And indeed, the choice of the travel narrative as mode of presentation of scientific information is sometimes dictated by opportunistic reasons. Pehr Kalm (1716–1779), a student of Linnaeus who travelled from 1747 till 1751 in the American colonies, states that he followed the method of chronological narrative since it meant less work for him.

Kalm is a practical man: first and foremost he wants to collect useful knowledge. In this respect he would fit well in our present times. But I ought to add that he did not want this in order to better himself. It is therefore not surprising that his travel story resembles a chronologically ordered storehouse of information, rather than a narrative. Here I cannot resist the temptation to include one anecdote. Because Kalm went about his work with a deadly seriousness, John Bartram, the father of William mentioned above, pulled a fast one on him, by telling him that a bear kills a cow, by biting a hole in the cow's skin and then inflating the cow through this hole till she dies. However, Kalm includes this tale in his travel report, but, very conscientious, he gives John Bartram as his authority.

Publishing a travel narrative was undoubtedly a sensible move from the viewpoint of public relations. A travel narrative meant that more people would hear of you than if you had published a purely specialist report on the facts discovered. Curiously enough, Humboldt long resisted the pressure for writing a travel narrative, although in other respects he excelled in public relations; but this may be due to the, already mentioned, tensions he felt to exist between the various aims of the narrative. Somewhat peevishly he notes in his foreword:

I think I have observed, that there exists such an outspoken predilection for this type of literature, that it seems that scientists who have published their investigations concerning the productions, the customs and the economy of the countries through which they have travelled, are still far removed from having fulfilled their obligations towards the general public as long as they have not narrated their voyage.

Nevertheless it is widely felt that a chronological narrative represents a certain surplus value above sorted information, a surplus value which, however, is not so easy to describe. A chronological report provides, in a manner of speaking, a context for the discoveries made. Provided the traveler has recorded his adventures with sufficient accuracy, it is possible to extract afterwards implicit information from his record; information which might never have been written down if the facts would have been presented in sorted form, without chronological context, for the simple reason that the traveler did not think of writing it down. In the preface of his travel book, Burchell expresses himself as follows.

In the narrative, the strict form of a journal has been adhered to, as being that which best enables the reader and the author to travel, as it were, the journey over again,

and view, in their proper light, the facts in connection, and the impression made by each event in succession. The object of this journal being to give a natural and faithful picture of passing scenes and transactions, many circumstances of less importance have been allowed their place in it; just as, in a landscape or historical painting, even of the sublimest conception, the weeds of the foreground, or the stones of the pavement, however trifling in themselves, must be represented, in order to complete the whole, and convey the just resemblance of nature.

The surplus value of a presentation as something personally seen and experienced has been well expressed by the zoologist Hans Krieg, who wrote a beautiful book "Zwischen Anden und Atlantik" ("Between Andes and Atlantic") on his travels in South-America in the nineteen-thirties, copiously illustrated with his own drawings and watercolors. In the preface of his book he writes, concerning the collecting on natural history voyages:

But I also have this feeling, that what once was a vivid experience, now has become "material". Over these skins, skeletons, preparations in spirit the air of the steppe no longer quivers, the sultriness of the tropical jungle no longer brews. They have a separate existence, factual, in paper and printer's ink.

Life has become lost. Not the experience as adventure, the diary-like noting down of happenings, but the experience as image, impression, atmosphere.

It is wholly wrong, and arbitrary, to think that research is exhausted in the analysis by specialists. To study and present a country as living space, intensive labour of many years is required, and even if such labour, just like every synthesis, unavoidably remains patchwork, still it is scientific in the true sense, if it does not restrict itself to the enumeration of some objective events, but also tries to amalgamate these isolated facts into an image of the whole. For, although such an image has a subjective component, it presupposes knowledge and insight.

Conclusion

I wish to conclude my talk with a remark of a more general nature. The natural history travel narrative does not any longer play a role in the scientific literature in the strict sense — it has been "banned", if I may use such a pregnant expression, to the popular domain. The banning is at the same time liberating — authors are not any longer under the obligation to take all scientific information into account, the literary aspect can get due weight.

But separating strictly scientific writing and popular literature is undesirable and not feasible; all possible gradations occur. Two important functions of popular literature are indicated by the keywords synthesis and identification.

Synthesis: literature for a wide audience lends itself to a synthesis, the presentation of a general picture, something which often remains out of sight in the specialist literature.

Identification: in the popular literature there is room for the human, subjective elements of research, for the emotions, for science as a specifically human activity, with natural history travel narratives as an obvious example. This permits the public to identify itself with the investigator and his results, and identification creates involvement.

Because of this, among other reasons, popular writing on science is of vital importance for the embedding of science into our culture. Our society can experience science as a meaningful activity only, regardless of economic utility, provided a sufficiently large segment of society feels involvement, and is interested; just as the recognized position of serious music in our culture is not the business of

composers only, but above all depends on the existence of a sufficiently large interested segment of the population.

Herewith I have reached the end of my story, but I do not want to finish without expressing my thanks. [This part has been left out here]