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The Makings of a Scientist in the Age of Enlightenment

While still at Hamburg and thinking of his next move, Humboldt wrote directly to Abraham Gottlob Werner who was head of the School of Mining in Freiberg (in Saxony), asking if he could enrol as a student and spend six months there, a length of time that he acknowledged was considerably less than the norm required to reach the standard of a qualified mining engineer. His bold plea paid off and so, after having successfully completed his studies in Hamburg, he returned to Berlin in April 1791 to prepare for his mining studies in Freiberg. Apart from his deep interest in geology, nothing from what Wilhelm has said so far in his letters or what Kunth has indicated in his remarks has prepared us for this apparent volte-face in Alexander's choice of study that in fact became his first career. Not even Alex himself has explained anywhere why he turned to Werner and his school of mining. But the fact remains he did and it was a crucially important decision that affected everything thereafter. In fact, from what ensued it is clear that mining was without question the best choice he could have made. In a letter to a friend he describes his extremely busy daily routine:

What others achieve in three years study at the mining school I've condensed into some seven to eight months. . . . I get up every day at five am and go immediately to the mines that are all between half to three quarters of an hour away from Freiberg. I work underground for five hours; at one moment I'm looking at how the tunnels operate, the next at the type of quarrying carried out. . . . By eleven or twelve I leave the mines and spend the afternoons with colleagues. . . .¹

Other aspects of mining (surveying, the drawing of fissures and of machines, carrying out tests on silver deposits) were also studied and so every hour of his time was taken but he did not complain; in fact

he thrived on the challenges that mining posed because he was able to absorb the information being taught and he enjoyed being kept busy in activities that, perhaps only instinctively, he knew would serve his overall plans and purposes. His time, clearly, was not his own but he used every moment to learn everything that was taught about an industry on the verge of changing European societies forever. Despite being pushed in his quest to cover three years study in less than one, he modestly says of such hectic activity that 'one day passes into the next'. His only companion was Karl Freiesleben, the son of the mining surveyor in Freiberg and it is with him that he allegedly spends 'every waking hour'.

From his letter it is clear that anyone who could make such incredibly rapid progress in his coursework was destined so to do. He was in his element, seen in his limitless enthusiasm and love of learning. The letter was addressed to Freiesleben and from what Alex said of him above it is clear that he now filled the spot once held by Wegener. Indeed, of the 246 letters that he wrote during this period of his life in Franconia, some 56 are written to Freiesleben. Their friendship began in June 1791, when Abraham Werner chose Freiesleben, some five years younger than Alex, as his teacher and mentor. And so it is no surprise to learn that, when Alexander undertook a trip in August 1791 to study mineralogy and geology in the Bohemian Mountains, it was Freiesleben who accompanied him. Their friendship has given rise to speculation about a homosexual liaison although most commentators reject the notion and prefer to focus on the importance of the cult of friendship that was integral to the *Sturm und Drang* (*Storm and Stress*) literary and artistic movement. Best seen as an early aspect of Romanticism, the movement was characterised by passionate outpourings of emotional unrest and strong feeling. Literary historians will add that the movement was also a protest against the feudal order and the struggle for civil freedom.

In their letters they speak about memories of times shared in the recent past, their plans for the future, mining matters and the natural sciences. As with Wegener, it is in his correspondence where Humboldt reveals his true concerns and feelings; he 'opens up' to his younger mentor and companion in a way that reminds us strongly of Wegener and that will be repeated to an extent later with Reinhardt von Haefthen. And when Humboldt finally leaves Freiberg to return to Berlin there is an outpouring of emotion – almost the grief of bereavement – ending with the admission that never before had he loved someone so deeply. Needless to say his departure from Freiesleben left him emotionally vulnerable.²

The route normally taken by Humboldt to overcome such emotional stress was to submerge himself in work. And that is why his correspondence is so significant because in it he shows to what extent his professional concerns touch him personally. Nevertheless speculation about Alexander and homosexuality resurfaces later on in his so-called friendships with men but such speculation says more about our current obsessions with the sexual orientation of celebrities than of anything else. What seems to be lacking is the ability – or the willingness – to appreciate what the nature of friendship between males could mean at the period.

Given that Alexander's teacher in Freiberg was Werner who was looked upon as the principal figure of the Neptunists – geologists who advocated that rocks such as granite were the product of crystallisation from the waters of a primeval ocean – it is not difficult to understand why, initially, he followed his teacher's viewpoint. Werner believed that a vast primordial ocean had once covered the entire globe and, as its waters receded, all the earth's landforms remained exposed to erosion. One such landform was the volcano and given that the Neptunists believed the earth had no molten core, volcanoes were thought to be caused by fires smouldering in subterranean beds of coal. When the Scottish geologist James Hutton claimed in his book *Theory of the Earth* (1785) that landforms were created by molten rock, his findings tallied with Humboldt's own researches undertaken later. As a result Alex changed sides and joined the Vulcanists (also known as the Plutonists). As in all matters related to the natural sciences his interest in volcanoes was to become a lifelong study.

Although when in Freiberg everything to do with the study of a mining engineer was paramount, he never lost sight of his interest in plant physiology and in chemistry. He examined the effect of sunlight on the plant world; this led to several experiments and, eventually, to his second publication in 1793 entitled *Florae Fribergensis Specimen* which includes the description of 258 types of lichens and mushrooms that he had encountered down in the mines. It was principally a study of cryptogams that are curious in that they are plants that have no true flower or seed; hence ferns, mosses, algae and fungi. No doubt countless others had seen such lichens and mushrooms when in the mines but not until Humboldt made a detailed study did their importance manifest itself. It is altogether a remarkable work and like its predecessor, *Mineralogical Observations of various Basalts of the Rhein*, is most often glossed over by commentators and biographers alike, eager to discuss his journeys in faraway places or his work on other later publications. *Florae*

Fribergensis Specimen points to his single-mindedness, tenacity and love of his subject and, arguably, deserves much more than a passing reference. Moreover, he found through experimentation that plant growth could be accelerated. This was a major discovery and of immense value a little later to agriculture in its attempts to boost food production needed to meet the demands of rapid industrialisation and increases in population. Humboldt's findings were of particular use to the rising star of German chemistry named Justus von Liebig and to his work on the uses of chemistry for agricultural purposes; von Liebig's researches led to increased yields in such products as watercress, peas, beans, etc.

Linked to Humboldt's publication on cryptogams was another work of his, a treatise entitled *Principles of the Chemical Physiology of Plants*. His interest in cryptogams inevitably led him to a study of the function of living organisms – in this instance plants – and to an analysis of their chemical compounds. His study of rocks had likewise led him to examine their formation and physical make-up in much the same way that his work underground had led him to analyse subterranean gases and the quality and circulation of air. Even at this very early stage in his life Humboldt had caught sight of the interconnectedness of all physical phenomena and, more swiftly than most, had also recognised the increasing importance of geology (mining and vulcanology), chemistry and botany, disciplines that in time would become independent fields of study. As a consequence, he instinctively cultivated friendships with leading figures in all three domains of learning; his interest in the work and career of Justus von Liebig exemplifies this. Moreover, his passion for the disciplines mentioned (and there were to be others) remained with him throughout a life dedicated to the natural sciences.

Humboldt finished his mining studies in February 1792 and as early as March 6 took up his new post as an Assessor (assistant Inspector) in the Prussian Mining Service. Not yet twenty-three years old a dazzling career, and one entirely in tune with his mother's wishes, but more so with his own desire and intention to serve his homeland, seemed to open up before him. He began his new job with an inspection of peat processing plants in Linum, a brickworks factory in Zehdenick, a stoneware factory in Rheinsberg and the manufacture of porcelain in Berlin. These were indeed modest beginnings but in keeping with his area of responsibility. His duties also included the inspection of mines as well as the extraction and uses of mineral resources. Fortunately we have a report of his of some 31 pages that describes his tours of duty in connection with the activities of the Rheinsberger Works that he had inspected on 6 June 1792, that is, only three months into his new job. Intact and housed

in the Märkischen Museum in Berlin, his report recommends that for the factory to improve the quality of its products it should undertake a chemical analysis of English glazed earthenware. His report is also significant in that it shows a fundamental characteristic of all his work thereafter in that he never limits himself to describing what he finds but always makes suggestions for improvements.³

Towards the end of August 1792, Friedrich Anton von Heinitz, the government minister in charge of mining in Prussia, visited Bayreuth where Humboldt furnished him with a report of his activities in the region. It is a remarkable document in that it further illustrates Humboldt's attitude to his position and the thoroughness with which he approached his profession. Not only had he made an inspection of the saltworks and sites where dyes, sulphuric acid and alum were produced as well as a porcelain factory in Bruckberg but he had also examined the structure and formation of the mountains looking specifically at where beds of ore lay. He then went on to collect statistical data and information in general concerning the former working of both the mines and smelting works. He also included a detailed account of the geology of the mountains in Franconia and the physical condition of the three mining stations at Wunsiedel, Goldkronach and Naila, pinpointing their development and decay. It was a first-class piece of work, the value of which was obvious to his superiors, so much so that von Heinitz immediately promoted him to the post of Superintendent of Mines in the two Franconian Duchies.

Things were certainly looking very bright for Humboldt; his mother would have been rightly proud of her son's excellent progress and he, too, must have marvelled at his own deserved success. After a tour of inspection through Bavaria, Austria, Poland and Silesia he began working at the end of May 1793 in Franconia. His superior in Bavaria was the later Chancellor of Prussia, Count Hardenberg who allegedly reigned in Franconia 'like a viceroy'.⁴

In Franconia there were three mining offices but Alexander chose the one in Steben as his headquarters because it allowed him easier access to the other two. That said, Steben was little more than a rather remote and desolate village in the Fichtel mountains yet it was to have a profound effect on his thinking inasmuch that while there he 'forged great plans' and found himself in a 'continual state of tension', so much so that of an evening he could not look at the farmhouses enveloped in mist at the mountaintop without tears coming to his eyes.⁵

He does not elaborate on what the 'great plans' were that he had forged in Steben but they most probably relate to his achievements in the region, one of which was the free mining school that he established

and paid for out of his own funds because he wanted to provide the best education and training for miners, most of whom were poor and also, as he soon discovered, deeply ignorant: they could not tell one rock from another and had no idea at all of the commercial value of minerals. The need for a mining school was clearly urgent.

In fact during his term of office two schools were established and Humboldt insisted that, alongside practical skills, theoretical knowledge was also to be taught. Both institutions were highly successful and prove to us how he was motivated from the outset by the desire to help others. Indeed, in his view, all scientific endeavour, whether in research or in development, could have no higher purpose. He was determined that the underprivileged should benefit from what he poetically called 'the fruits of his labours'. It was this belief, summed up in the phrase 'working for others' that armed him with his heroic perseverance and exuberance. If through his work he could also bring others to enjoy the delights and mysteries of Nature, his life would be both worthwhile and meaningful.

Further evidence of his belief that science should serve the needs of humanity is seen in his invention of a 'safety lamp' and of a 'gas mask-respirator' for use down the mines; the latter, especially, was significant for it enabled miners to operate in oxygen-poor areas. Both contraptions were of particular use in the rescue of miners who had suffered from accidents which, sadly, were not uncommon.

In a letter to Freiesleben dated 7 September 1792, he explains how he spent autumn evenings reading mining reports some of which were written in the sixteenth century. He had come across these in the archives housed in the fortress at Plassenberg and, because of his position in the mining service, took it upon himself to make a detailed study of each and every one. It led him to discover a side tunnel mentioned in a mining report of 1544.

To us such a discovery may seem unimportant, even irrelevant, but is in fact significant because it points to both his passion for thoroughness and to his belief that, in order to understand present phenomena, we need to study the past. If everything in Nature is connected then it follows that things are now what they are because of what they once were. Such thinking became a cornerstone of his work and explains his abiding interest in rocks, minerals, physical landscapes and in the evolution and distribution of flora and fauna; other areas of interest such as astronomy and oceanography were to follow.

Not only did he spend his evenings reading ancient mining papers but he also found time to write a textbook for mining students to be

used in the schools he founded. His prime aim was to write a text (none existed at the time) that would be of general use but yet would cover every possible aspect of mining without being superficial. He persevered despite considerable discouragement for he was told that the miners had no desire to learn and that in the local schools there were no teachers available whom the children could understand. In his view such objections stemmed from deeply ingrained prejudices that, far from discouraging him, only made him more determined.

What further emerged from his time as an inspector of mines was that the pits and collieries under his administration became profitable. This was welcome news to his superiors who were accustomed to poor returns, even losses. In eight years of mining at Goldkronach some 150 tons of gold ore costing some fourteen thousand florins were mined whereas, in one year only, Humboldt extracted 125 tons of ore costing seven hundred florins.⁶

Despite untiring efforts in his work as an inspector he did not neglect his interest in scientific experiments and research. Similarly to his contemporaries he also searched for evidence of a 'life-force'; hence his deep interest in galvanism that led to several experiments on himself, often with painful consequences. He was well aware of Luigi Galvani's experiments and of his discovery of the twitching of frogs' legs in an electric field. When Galvani published his *Commentary on the Effect of Electricity on Muscular Motion* in 1791, he concluded that animal tissue contained an innate, vital force that he called 'animal electricity'. He also believed that this new force was in addition to what he termed the 'natural' forms of electricity produced by lightning, electric eels and torpedo rays as well as to the 'artificial' form produced by friction (static electricity). Humboldt was also familiar with the researches of Alessandro Volta – it was he who first coined the term galvanism – and his invention of the first electrochemical battery. The work of both scientists influenced him to examine the chemical processes of life and so he began to study animals and plants in order to assess their similarities and differences. That analogies existed between them seemed very obvious but only direct and thorough scientific research could explain how and why.

Public interest in this and related subjects was both intense and widespread and explains the numerous essays that were published at the time in German magazines; very rapidly geology, mineralogy and chemistry came into their own. For his work in such fields of study Humboldt was made a member of the Leopoldina (Academy of Naturalists) in 1793 and won the award of the Saxon gold medal for arts and sciences. A major contribution to the award was his study,

mentioned earlier, entitled *Florae Fribergensis Specimen*; his success led to further 'mining' travels in 1794 to Poland and Bohemia undertaken to examine potassium nitrate and saltwater spas and to report on usable mineral deposits. As a result of his efforts Alex was offered a post to head the administration in Westphalia and, according to a letter he sent to Freiesleben, 'he would earn some four times his current salary'.⁷ It was probably due to his achievements in mining that in September 1794 he planned to write during the winter months an important work on minerals. In July 1795 he envisaged a work that examined ore deposits of mountains located in Central Europe. Both projects probably belonged to the 'great plans' mentioned earlier but nothing came of either. We have to admire his enthusiasm but all too often external events were to thwart his plans. Always ambitious, he tended to bite off more than he could chew.

Following a suggestion from the revered German dramatist, poet and historian, Friedrich Schiller, Wilhelm von Humboldt and his wife went to live in Jena in February 1794 and so when Alexander went to visit them in March of that same year he was destined to meet both Schiller and his more illustrious contemporary, Johann Wolfgang von Goethe, a figure who stands as high in the German national consciousness as Shakespeare does in England. It should be said, however, that Goethe's interests and activities were more far-ranging than those of the Bard of Avon, for not only was he a poet, novelist and dramatist but also a natural philosopher and held a number of government posts. Throughout his long life Goethe retained a passion for scientific and philosophical studies gaining widespread recognition for his now celebrated theory of colours. His writings on both botany and biology were of particular interest to Humboldt. Goethe remained astonishingly creative; in his last years he wrote *Wilhelm Meisters Wanderjahre* (Wilhelm Meister's Travels, 1821-29) and *Faust* (1) 1808 and *Faust* (II) in 1832, the year he died.

In December of that same year Alexander revisited Jena and stayed with his brother Wilhelm and met Goethe once more; Goethe then stayed with the Humboldts for three days. Alexander took an immediate shine to Goethe who in turn greatly enjoyed the young mining official's company. During their conversations Goethe employed all his eloquence to persuade Alexander to accompany him to Weimar – at the time Goethe was also director of Weimar Theatre – to meet the duke. In fact it had been the duke who had urged Goethe to return with Alexander. It was not to be but in April of the following year Alexander once again visited his brother in Jena and met Goethe and all three men undertook shared

experiments in galvanism. It was not until May 1795 that Alexander sent Goethe his publications and at the same time made known his desire to dedicate to him his next, as yet unpublished text entitled *Vegetation within the earth's core, a fragment of the general description of Nature*.

For reasons not yet known the work never appeared although remnants of it can be found today in the Museum for Art and History in Quito in Ecuador and have been published, including the draft of the dedication. Goethe, however, was able to read Alexander's other writings and urged him to publish his experiments on galvanism, a process by which electricity is produced by chemical action. Despite differences in their views it is clear that what drew both men together was a shared interest in the natural world as well as their acknowledgement that personal experience was the real – perhaps only – basis of knowledge.

With hindsight it is now obvious that 1794 proved a very busy year for Alex for he also undertook the duties of a diplomat accompanying Count Hardenberg, the administrator of Ansbach-Bayreuth and his superior in Franconia, to Mainz; this was followed by other missions to the Rhine, Westphalia and to the Netherlands. It so happened that during the reign of Friedrich Wilhelm II (1786-1797) Prussia had bought the margravates of Ansbach and Bayreuth, a purchase that explained the Prussian army's presence in the region. It is claimed that Hardenberg took Humboldt on a secret diplomatic mission to the king's HQ in Frankfurt am Main where the allied German States and the French Revolutionary Army were conducting preliminary negotiations that were to lead to the Peace of Basle.

Wisely or not, Napoleon had declared war on Britain and Holland in February 1793 and then on Spain in March of that same year. This prompted Prussia to join Great Britain, Austria, Spain and Holland in what is now commonly termed the First Coalition. Despite being a member of the coalition these years, especially between 1793-95, proved very difficult for Prussia and its citizens and for Humboldt in particular; indeed, due to the ever-changing status of alliances and coalitions together with declarations of war among the nations mentioned above, most of Humboldt's plans were to be thwarted, shelved, or dramatically changed. From such setbacks and disappointments, however, he would acquire the virtue of patience that was to serve him in good stead when undertaking journeys over terrains and in climates few would want to experience.

It is obvious that Hardenberg had seen more in Alex than the required competence in mining matters. He was impressed by his versatility, diligence and breadth of knowledge, so much so that he readily consulted

him on questions of trade and industry and went so far as to commission him to draw up suggestions for a reform of currency. The request came about because Prussia's finances were in ruins. It was not to be the only time that men in power would turn to Humboldt when seeking advice on currency reform, however. Despite his request, Hardenberg insisted that the relatively higher living standards that obtained in Franconia should remain! A blatant contradiction and so nothing ever came of the request.

Humboldt accompanied Hardenberg to assist him in his diplomatic negotiations for loans with the English and the Dutch; on one such visit, in August 1794, Alex went to Frankfurt am Main and met Reinhard von Haefthen, an officer in the Grevenitz regiment – at that time stationed in Bayreuth – and by the end of 1794 they were sharing the same accommodation.

It was during the next twelve months that the friendship between von Haefthen and Alex blossomed. What the friendship with Reinhard meant to Alex is seen best in a long letter that he sent to Freiesleben in November 1794. Alex claims that he has torn himself away from all other society and that he and Reinhard have become 'inseparable'. Indeed Humboldt claims that Reinhard is his 'hourly company' and that their relationship parallels that which he shared with Freiesleben. Clearly, his friendship with van Haefthen helps to explain why Humboldt did not write any of the two works he had planned to begin in 1794 and in 1795

He goes on to mention the trip to Upper Italy and Switzerland during which he visited, *inter alia*, Venice, Milan, Zurich and Geneva, meeting scholars and drawing inspiration from their work. It was a happy time for Humboldt but when Reinhard met and had an affair with Christine von Waldenfels, the wife of another Prussian officer, Humboldt was inevitably drawn into the imbroglio, made worse when Christine found herself pregnant and eventually, in January 1794, bore Reinhard a son, news of which was kept hidden from the public. Despite being a new father he accompanied Humboldt on further journeys from mid-July to September and then from September to November 1795, Freiesleben joined them. In short, Alex found himself in the company of two of his closest friends; there were only five such friends during his years in Franconia.⁸

Christine's husband, Karl von Waldenfels sued for divorce which, in the event, passed smoothly to the relief of all involved. Only now could Reinhard marry Christiane. Humboldt was a guest at their wedding in 1795 in Bayreuth. Wisely or not, he became the child's godfather, a role that at times caused him deep worry, even annoyance. After all, he

was building up a successful career and was meeting very influential leaders in society and in government; the last thing he wanted was any slur on his hard-won reputation.

Public knowledge of the affair, however, only came to light in the 1990s when correspondence between Humboldt and Friedrich von Schöler (a Prussian officer and friend of Reinhard's) was discovered in archives housed in Cracow University library that the State Library of Berlin had sent there for safekeeping during World War Two.

But there was another side to his friendship with von Haeften that could have changed everything. During the nights of 1-4 January 1796 Humboldt wrote a letter in which he revealed his plans

for a shared future with Reinard and his wife (there is no mention of the baby): all three would go to Italy and live in Rome, Florence or Naples and, in the cooler seasons, he and Reinhard would travel throughout the whole of Italy and Sicily.⁹ The proposed trip to Italy would include his brother Wilhelm's family as well but each would travel as separate families and he, Alex, would tag along with the von Haeftens. And if, after two or three years in Italy, they wanted to return to Germany, no doubt a way could be found for all three to go on living together there, too. What is unexpected is the fact that he was prepared to postpone his longing to travel in order to live and accompany a newly married couple. And for this to occur, Reinhard would have to resign his post from the army and Humboldt would have to abandon his career in mining although such a decision, so it seems, had always been his intention. His career in the service of the state was nothing more than a stepping stone to serve the cause of science. It is not stated how long Wilhelm



A drawing of Humboldt completed in 1795 when he was 26. By the French painter François Gérard.

and his family would have travelled with them, but clearly not long, given Wilhelm's diplomatic career and philological interests. There is no doubt that Alex viewed his proposal as serious and who can say what would have unfolded had such plans ever come to fruition?

At the heart of such envisaged sweeping changes to his life style was the nature of his friendship with Reinhard, expressed in the same letter mentioned above.

Two years have passed since we met, since your fate became mine. . . . I felt better in your company, and from that moment I was tied to you as by iron chains. . . . Never would I cease to remain attached to you, and I can thank heaven that I was granted before my death the grand experience of knowing how much two human beings can mean to each other. With each day my love and attachment for you increase. For two years I have known no other bliss on earth but your gaiety, your company, and the slightest expression of your contentment. My love for you is not friendship, or mere brotherly love, it is respect, child-like gratitude, surrender to your will as my most exalted law.¹⁰

Is this homosexual love? In terms of its context, that is, correspondence in eighteenth century Germany – and it must be read in such a context – the sentiments expressed are not that uncommon or unusual.

We already know that the *Zeitstil*, the literary style of the period, was characterised by the cult of friendship, an exuberance of emotions and a marked emphasis on the value of individual experience. Literary historians have defined the age as one of *Empfindsamkeit* (Sensibility) that became the prevailing mood in literature and lay at the heart of the epistolary novel. As such it filtered through to letter writing between close friends and it is in this tradition that Humboldt's letters to Reinhard are best read and understood. That said, there are some commentators who believe that a homoerotic element exists in their correspondence.¹¹

Not to be overlooked is the fact that all such early friends got married when quite young: Freiesleben, von Haeften, Schöler, Schiller and Goethe. In fact if we read the letters of Humboldt's friends and contemporaries (Goethe, Herder, Schiller, Koerner, the Grimm brothers, Gauss and Justus von Liebig) we will find very similar sentiments.

Humboldt's plans of a shared life with the von Haeftens and their trip to Italy began in July, 1797. Reinard had taken leave from the army, Humboldt had resigned his post and both parties had left Dresden for Vienna. But when civil unrest occurred in Italy Humboldt decided to

spend the winter in Salzburg with the von Haefkens while Wilhelm and his family opted to go to Paris; the plan for all those travelling to Italy was to meet in Paris the following summer. It is clear, however, that when in Salzburg Alex abandoned all hope of his idyllic plan of touring Italy with Reinhard and his family. In a letter to Freiesleben dated 22 April 1798, he tells him that Christiane is expecting her third child and so the family would most likely return to their estate in Goch bei Kleve in the autumn. And he was right.

What emerges from an analysis of this period in Humboldt's life is that political events, especially those instigated by Napoleon, were to thwart his plans and movements throughout all of these years until 1799, and indeed later, too. From today's perspective it can be argued that a 'chain of events' (a favourite phrase of Humboldt's) conspired to prevent him from carrying out various trips and expeditions. With regard to von Haefken there exist nine other letters written to his wife Christiane who, after Rheinhardt's sudden and tragic death in 1803, remarried in 1804. In the meantime Alex was to spend some five years in the so-called torrid zone of South America. And yet, if we jump ahead just for a moment to 1813 we know that Reinhard's eldest son (Humboldt's godson) spent three months with Humboldt in Paris; as for Freiesleben there is no letter from Humboldt at all. In fact they went their separate ways and did not meet until December 1826 in Freiberg; during that time – over two decades – Freiesleben became a leading official in Freiberg's Mining department and was later appointed head of the entire iron and steel industry in Saxony. Humboldt, typically, kept abreast of his career and in 1844 praised him saying that alongside Willdenow, Gay-Lussac and Arago (we shall meet these later) he had remained an abiding influence on his way of thinking. Humboldt valued their friendship because each was 'friendly, good-natured and erudite'; such character traits appealed to Humboldt because they were precisely the ones he cultivated.

Humboldt's friendship with Freiesleben served a double purpose: education in both its formal sense as well as in the art of forming human relationships. Perhaps the appropriate term in today's jargon and taken from pop psychology would be 'bonding'. There is no doubt that Humboldt made friends easily and quickly. Furthermore, we are indebted to Freiesleben for an insight into Humboldt in his younger days: he describes him as 'infinitely good-natured, benevolent, charitable and unselfish,' but also as someone who was 'straightforward and frank, funny and, at times rather mischievous'.¹²