# Goethe, Granite, and his Search for Earth's Beginnings

"Here on the oldest and everlasting altar, raised directly on the ground of creation, I bring the being of all beings a sacrifice."

## Introduction

Goethe developed his ideas on the origins of the Earth over a period of ten years, from his arrival in Weimar in November 1775, until the summer of 1785 when he wrote his best-known geological essay "*On Granite*". Although he kept up his geognostic studies throughout his long life, by 1785 he had established his own unique approach to understanding the origin and structure of Earth's surface, from which he never departed. At the center of his convictions stood his deep and lifelong interest in granite. Looking back in 1820, the 71-year-old recalled:

"At the time when the body of the Earth began to interest me scientifically, and I tried to get to know its formations (Gebirgsmassen)<sup>1</sup> as a whole as well as in their parts, both internally and externally; in those days we were shown a fixed point of reference where we could stand - a better one we could not have wished for. We were shown granite as both the highest and the deepest rock. We respected it in this sense and made an effort to get to know it better."<sup>2</sup>

At the end of the eighteenth century it was generally accepted by geologists that granite was the oldest type of rock on Earth. This idea had a special attraction for Goethe. For him, this ancient and original rock provided him with a secure guarantee which promised to give him - unsettled by revolutions in political thought

and upheavals in scientific thinking - solid ground under his feet. Granite became for Goethe a metaphysical stability. His literary colleague Karl Böttiger<sup>3</sup> once commented on the far-reaching ideas Goethe associated with granite that he had 'found in the organization of granite the divine trinity, which can only be explained by a mystery'. In the "*perfect trinity of its parts*", (quartz, feldspar, and mica), it became the symbol of an overarching order valid beyond life and death.

While granite provided Goethe with the metaphysical stability his world conception required, during his first ten years in Weimar he was also very much in need of emotional stability. This was provided by Charlotte von Stein, in whom he confided not only his deepest personal feelings, but also his excitement and joy, as he gradually uncovered the secrets of Nature. There is scarcely a letter to her describing his thoughts and feelings



Charlotte von Stein. After a selfportrait from 1790, engraved by G. Wolf.

<sup>1</sup> Gebirge is a traditional mining term referring to the body of rocks from which metals and their ores were extracted, but by the middle of the 18<sup>th</sup> Century had a broad range of meanings not necessarily related to mining, from a local assembly of rocks to an entire mountain range. In geology a 'formation' is a rock unit distinctive enough in appearance enabling it to be distinguished from adjacent rock layers. I have usually, but not always, used 'formation' to translate *Gebirge*.

<sup>2</sup> About Geology, in particular the Bohemian, Zur Naturwissenschaft überhaupt (1820) Vol 1, Book 3.

<sup>3</sup> Karl August Böttiger was headmaster of the Weimar Gymnasium from 1791 to 1804.

about his geognostic and botanical discoveries, in which he does not also, in one way or another, profess his love for her.

#### Arrival and First Years in Weimar

Goethe arrived in Weimar with little or no understanding of Nature. He had grown up in the free imperial city of Frankfurt, studied in Leipzig and Strasbourg, had briefly practised law in Wetzlar, and was very much the young and privileged city gentleman.

"Born and reared in a large city, I acquired my first schooling in the study of ancient and modern languages, to which rhetorical and poetical exercises were soon added. My further education I likewise owe to rather large cities; hence it followed that my

intellectual activity was directed towards the manners of polite society, and to the pleasant activity which at that time was called 'polite literature'. On the other hand I had no understanding of external Nature in the strict sense of the term, nor the slightest knowledge of her so called three kingdoms. . ."<sup>4</sup>

A prolonged illness interrupted his studies and forced him to return to Frankfurt from Leipzig. During his convalescence he became interested in alchemy, studied the works of Paracelsus and von Helmondt, and carried out experiments with *liquor silicium* (sodium or potassium silicate) which he believed at the time to represent a kind of "virgin Earth". It was the beginning of his lifelong search for primal (Ur) beginnings, whether mineral, plant or animal.

He subsequently went to Strasbourg to complete his law degree, joined a small legal practice in Wetzlar, wrote several best-selling novels, was briefly engaged, fled to Switzerland with two friends, on his return broke off his engagement, and in November 1775 found himself in the impoverished Duchy of Saxe-Weimar-Eisenach, as friend and advisor to the 18**Charlotte von Stein** (1742-1827) was an educated and cultured woman, and an incompatible match for her more roughhewn husband, the court's chief equerry, Freiherr Gottlob Ernst Josias Friedrich von Stein (1735-1793), whom she married at the age of twenty-two. The marriage was a political one, and unhappy from the start. She gave birth to seven children, of whom all four daughters and one son died. Only her oldest and youngest sons survived into adulthood. She entrusted the youngest, Fritz (1772-1844) to Goethe as his personal tutor. Fritz moved into Goethe's house in 1783, living there until the latter's departure for Italy three years later.

Her meeting with Goethe towards the end of 1775 was the beginning of a deep friendship, unlike anything either of them had previously experienced. In Charlotte von Stein he found a kindred spirit, the likes of which he would not meet again. She immediately recognised his exceptional qualities, and he in turn her intelligence and distinguished demeanour. She had been thoroughly schooled in the conventions of courtly life, and over time was able to calm his youthful excesses. She became his muse, his source of inspiration, and was able to compensate for the loss he experienced when his sister Cornelia married in 1773, and moved out of his life.

There is no doubt that his love for Charlotte, expressed in many of the 1650 letters he wrote to her, especially during the early stage of their relationship, helped him overcome his crude and unsophisticated impulses, calm his emotional turmoil, and strengthen his character.

year old Duke Karl August.<sup>5</sup> In the rolling hills and lush forests of Thuringia, as well as in the tasks with which Karl August entrusted him – which included

<sup>4</sup> *The Author relates the History of his Botanical Studies*, in *Goethe's Botanical Writings* (1952) translated by Bertha Mueller, University of Hawaii Press, p.150.

<sup>5</sup> Duke Karl August of Saxe-Weimar Eisenach (1757-28) was brought up under the regency and supervision of his mother, the dowager duchess Anna Amalia (1739-1807). In 1771 Christoph Martin Wieland was appointed as his tutor, and in 1774 Karl Ludwig von Knebel (1744-1834) was invited to Weimar to tutor his younger brother Frederick Constantin (1758-1793). In the same year the princely brothers, accompanied by their tutors, went on an educational trip to Paris. It is no exaggeration to state that on that journey von Knebel arranged the most important meeting in Goethe's life; he

organising the reopening of a derelict copper and silver mine – Goethe found an outlet for his super-abundant youthful energy.

As a seventy-five-year-old, he took stock of the rich experiences Nature had afforded him: "I came to Weimar highly ignorant in the study of Nature, and only my wish to be able to give practical advice to the Duke in his various ventures, buildings and investments, drove me to study Nature. (The mine at) Ilmenau cost me a great deal of time, effort and money, but I also learned something from it, and acquired a conception of Nature, which I would not want to exchange at any price."<sup>6</sup>

The decision to reopen the mine at Ilmenau was made in July 1776. Goethe took his first geology lessons from Johann Gottfried Schreiber (1746-1827), a graduate from the Freiberg Mining Academy in 1773, who had been appointed mine surveyor and supervisor. He learned that granite is a mixture of quartz, mica and feldspar,

and that it underlies all other rocks in Thuringia. As part of the preparatory discussions for the opening of the mine in Ilmenau, Schreiber had written a report stating that granite forms not only the highest crags in the region, but is also found in mines as the deepest bedrock.

"It is known from historic reports that in most of the regions in Germany the highest crags consist of granite. In mining areas where shafts have been sunk into the depths, different rock layers have been noted, but none have been found lying deeper than this one. It is as far as we can tell, the deepest lying of all rock types. All other rocks and formations rest on it as their foundation."<sup>7</sup>

In December 1777 he was surrounded by large granite boulders on the snow covered summit of the Brocken<sup>8</sup>, but he barely noticed them, and made no mention of them either in his diary or in his letters to Charlotte von Stein. But he did ponder, perhaps presaging **The Freiberg Mining Academy** (*Bergakademie Freiberg*) was founded in 1765, part of the Saxon program of economic recovery after the devastation of the Seven Years' War. It introduced for the first time a combination of theory and practice in the training of geologists and mining engineers, and led by such able and charismatic teachers as Abraham Gottlob Werner (1749-1817), the *Bergakademie* soon became a leading centre in the field of mining science and technology. Werner, for 40 years the Academy's most important teacher, brought order to the study of minerals and rock strata, and is considered the founder of geognosy (as geology was called before it became geology early in the 19<sup>th</sup> Century).

Werner believed that continental rocks had been laid down in a definite order, precipitated and deposited on the floor of a primeval ocean (the so-called Neptunist stratigraphic system). He based his theory on the work of Füchsel (see below), and on his own observations in his native Saxony. The sequence of formations is as follows:

- 1. The primary formations; e.g. granite, gneiss.
- 2. The transition formations; basalts, greywackes, and limestones.
- 3. The secondary (stratified) formations; sandstones and all obviously sedimentary rocks.
- 4. The tertiary (alluvial) formations; gravels, sands, and clays.
- 5. The volcanic formations; lava, ash, slag, and cinders.

introduced Goethe (then 25) to the seventeen-year-old Duke, who formed an immediate friendship with the famous poet, and spontaneously invited him to Weimar. Their friendship was to last to the end of his life.

6 In a conversation with Chancellor Friedrich von Müller on 16 March 1824. Quoted in: Manfred Wenzel (1987) Der Ilmenauer Bergbau uns sein Einfluβ auf Goethe als Dichter und Naturforscher, Medizinhistorisches Journal <u>22</u>,1 pp 3-27. Also at http://www.zeno.org/Literatur/M/Goethe,+Johann+Wolfgang/Gespr%C3%A4che/%5BZu+den+Gespr%C3%A4chen%5D/1824.

7 Quoted in Margrit Wyder in Margrit Wyder (2013) *Gotthard, Gletscher und Gelehrte: Schweizer Anregungen zu Goethes Naturwissenschaftlichen Studien,* p42. Zurich Open Repository and Archive. https://www.zora.uzh.ch/id/eprint/91863/1/Wyder\_Goethe.pdf.

8 The highest mountain in the Harz region in the North-East of Germany.

his future geognostic interests, the mountain's "*unexplored entrails*"<sup>9</sup>, at the end of the poem "*Harz Journey in Winter*", which he wrote during this time.

"You stand with unexplored entrails, An open secret over the astonished world, And gaze from clouds, Upon her kingdoms and her glory."<sup>10</sup>

An "open secret", an expression Goethe here used for the first time, is one of several possible translations of "Geheimni $\beta$ voll offenbar". He used the phrase to express his belief that although certain natural phenomena present themselves as mysterious or secretive (geheimnisvoll), they only do so to reveal (offenbaren) hidden relationships. It was a concept he considered essential to his later scientific work. There would be many more occasions when Goethe became aware of the "glory" of the kingdoms of Nature. Indeed, it was on a journey through the Swiss Alps two years later that Goethe's interest in Earth's rocky surface was first awakened.

# Geognostic Research in Switzerland

In the autumn of 1779 he accompanied the Duke - only 22 at the time - and his entourage to Switzerland. This was Goethe's second journey into the Swiss Alps, and the Duke's first. It was planned as an educational 'grand tour', allowing the Duke to familiarise himself with the art, natural history, constitution, political organisation, and finance of the mountain republic. These last objectives rang alarm bells in the Weimar establishment. There was concern that the young Duke might be infected by republican ideas. But the concern was unfounded. Although Karl August developed into one of the more enlightened princes of the time, Weimar remained in effect no more than a benign dictatorship. Even the French revolution and subsequent upheavals in Europe had little effect on the Duchy's administration.

The royal party visited the natural history collection in Basel as well as those of Sprüngli<sup>11</sup> and Wyttenbach<sup>12</sup> in Bern. Goethe was impressed by the practical knowledge of these pious men, and wrote to his friend Merck on 17 October: "*I've spent all of three hours with Wyttenbach, he is very instructive. He has collected rocks from all the mountains and the ends of Switzerland. He is a very agreeable man.*"<sup>13</sup>

Two weeks earlier, on 3 October he had written about his impressions in the Birs Gorge, his first detailed description of exposed rocks in a landscape. Here, at the very beginning of his geognostic observations, he makes clear his firm belief that the rocks making up Earth's surface were laid down without great commotion or upheavals:

<sup>9</sup> Unerforschten Geweide in the original version, later changed to unerforschtem Busen.

<sup>10</sup> Matthew 4:8: 'Again, the devil takes him up into an exceeding high mountain, and shows him all the kingdoms of the world, and the glory of them.'

<sup>11</sup> Daniel Sprüngli (1741-1801) was a pastor in Bern who took early retirement to devote himself to the study of Nature, and became well known for his "Cabinet", his collection of stuffed birds.

<sup>12</sup> Jakob Samuel Wyttenbach (1748 – 1830) was a Swiss protestant theologian and natural philosopher; also active as a doctor and herbalist.

<sup>13</sup> Letter to Johann Heinrich Merck, 17 October 1779. Merck (1741-1791) was a German writer and critic, and co-founder in 1772 of the periodical "*Frankfurter Gelehrte Anzeigen*", in which some of Goethe's earliest pieces were published. They became lifelong friends, and corresponded often about a variety of subjects. Merck was especially interested in fossils. Several failed business ventures and misguided speculation, as well as the death of all five of his daughters, led him to take his life in June 1791.

One darkly intuits the origin and the life of these singular forms. However and whenever it might have happened: these masses must, according to their weight and the similarity of their parts, have assembled themselves grandly yet by simple means. Whatever revolutions may subsequently have upheaved, split, and separated them, these were only single convulsions; and even the idea of such mighty commotions gives one a deep feeling of eternal stability. Time too, bound by the everlasting law, has had here greater, there less effect upon them.<sup>14</sup>

The "revolutions" refer to epochs of Earth's development described in a book by the Comte de Buffon, a book which Goethe had read while a student in Leipzig. After his return from Switzerland he wrote an enthusiastic letter to Merck: The second Buffon is excellent. I am in full agreement, and don't mind if some call it a hypothesis or a novel (German Roman). It's much easier to say this than to prove it. Such people should withhold their comments, unless they're able to produce a better and more coherent whole. For me the book is less of a hypothesis than the book of Genesis."<sup>15</sup>

In Switzerland he came across exposed granite (which he had failed to notice on the Brocken) high up in the Lauterbrunnen Valley ". . . *all the rocks and stones are granite*" in a region otherwise dominated by limestones. Perhaps he recognised here Buffon's 'roc *vif*" (primal rock) which formed the solidified core of the Earth, and the foundation of high mountains. Buffon assumed that the molten Earth first solidified, 'fused', into a kind of primal glass, which he named '*matières vitrescibles*' (vitreous matter).



The Birs Gorge

Georges-Louis Leclerc, Comte de Buffon (1707-1788) was a French natural scientist and mathematician. In Les époques de la nature (1778) Buffon discussed the origins of the solar system, speculating that the planets had been created by the collision of a comet with the sun. He estimated the age of the Earth to be 75,000 years, which he divided into seven evolutionary epochs (which he called 'revolutions'). The book won wide acclaim, but his speculations, many based on actual observations in the field, were so revolutionary that it was referred to as a novel (Roman), i.e. a work of fiction, by Johann George Adam Forster (1754-1794) natural scientist and travel writer, who commented in a letter to a colleague 'You will without doubt have read that wonderful novel, Buffon's 'Epochs of Nature'. It is indeed contagious, when one reads a well written book, even if it only contains sweet dreams. . .' Quoted in Wolf von Engelhardt (2003) Goethe im Gespräch mit der Erde, p.66.

In Geneva he met Horace Bénédict de Saussure<sup>16</sup> who had recently completed his book '*Voyages dans les Alpes*' (it was published in January 1780), in which he

<sup>14</sup> Letter to Charlotte von Stein, 3 October 1779.

<sup>15</sup> Letter to Merck 7 April 1780. Buffon's first edition was *Histoire et Théorie de la Terre*, which Goethe had read in Leipzig.

<sup>16</sup> Horace Bénédict de Saussure (1740-1799) was a Genevan geologist, meteorologist, physicist, mountaineer and Alpine explorer. He believed the Alps to be the key to a true understanding of Earth's formation, and his mountaineering skills gave him the opportunity to study geology in a manner not previously attempted.

outlined his geologic discoveries, and was the ideal person to approach for guidance to the rocks and minerals of the Alps. Goethe's careful geognostic studies of a rock's components, the inclination of their strata, their fossils and minerals, were inspired by de Saussure.

De Saussure explained to them the underlying structure of the Alps, and the nature and occurrence of granite. The highest Alpine peaks consist of granite with subsequent strata resting steeply against this first and original mountain range, becoming more and more horizontal the further away they are from the central mountain chain - a simple but basically correct description of a folded mountain range after long ages of weathering and erosion, one which had a ring of truth for Goethe, and which he would use in his later writings.

# Goethe continues his Studies

Goethe brought back several crates of rock specimens from his journey, and continued to add to his collection at every opportunity. Towards the end of his life he had amassed a rock and mineral collection of over 80,000 specimens, not counting the many smaller collections he gave away to friends and fellow geologists. He wrote to anyone whom he thought might be able to assist him in his search for interesting rocks which he believed might help him develop his ideas of Earth's origins.

In his first official letter to mining commissioner and Freiberg Mining Academy professor Johann von Charpentier regarding the status of 400 copies of a map of the Ilmenau mining district<sup>17</sup> which had been ordered six months earlier, he added a personal request: "I would like to add another request: in your 'Mineralogical Geography of Electoral Saxony' you offered enthusiasts small collections of all types of rock samples from the region, made under your supervision; I would like to have such a collection, in order to make reading your estimated work doubly interesting.

In anticipation of a favorable answer, I have the honor to sign with deepest respect. Your most obedient servant, Goethe."<sup>18</sup>

He also wrote to his friends, to whom he took a different approach: *"It has just occurred to me that you might be able to feed one of my* 

Johann Friedrich Wilhelm von Charpentier (1738-1805) studied law and mathematics in Leipzig. In 1766 he was appointed to teach mathematics and drawing in the newly established Mining Academy in Freiberg, at the same time enrolling as a mining engineering student. In 1773 he was appointed mining commissioner in Saxony. Charpentier's most important contribution was a 'Mineralogical Geography of Electoral Saxony', published in 1778, which contained the first ever geological map of a large region. Drawing on what he had learned in Freiberg, as well as his excellent powers of observation, Charpentier divided Electoral Saxony into 4 main geological areas: basement rocks (granite), sedimentary rocks (slates and schists), coal formations, and alluvial deposits (gravels, sands, and clays). His daughter Julie von Charpentier became engaged to the poet Novalis in December 1798, a year after the death of his beloved Sophie von Kuhn.

favourite inclinations if you would be so kind. Since my involvement with the mine in Saxony I have dedicated myself body and soul to mineralogy. If you could by means of some happy-to-serve spirit, of which there are legion at your merest nod, bring something together from your part of the country, or elsewhere, you would

<sup>17</sup> These maps were intended for the shareholders prospectus Goethe was preparing to raise the finances needed to reopen the Ilmenau mine.

<sup>18</sup> Letter to Johann von Charpentier, Weimar, 4 July 1780.

# prepare a feast for me. Since I do not demand bread, but only minerals and rocks, it should be possible. Addio!"<sup>19</sup>

He employed Johann Voigt, a recent graduate of the Freiberg Mining Academy, to assist him in his explorations of the Thuringian landscape.<sup>20</sup> Goethe was impressed not only by Voigt's detailed knowledge of the local geology, but also by his approach to the subject. He wrote about his work with Voigt in a letter to his friend Duke Ernst II, who shared his geologic interests. This letter contains an important clue to Goethe's own geognostic approach. He compared concepts arrived at by observation with concepts arrived at by scientific theories. He would distinguish throughout his life between 'geognosy', based on observation, and 'geology', based on scientific theories. He regarded himself a geognost, and considered theories attempting to explain the origin of rocks unprovable. Only careful and repeated observations would provide the key to the mystery of Earth's origin.

"Neither fables nor ancient tales, neither doctrines nor opinions, keep him from seeing. (Schauen). He carefully separates what he has seen from what he expects or concludes. Every correctly recorded observation is invaluable for those who follow, in

that it gives them concepts derived from observation (anschauende Begriffe), increases the sum of his own experiences, and finally makes as it were the opinions of several people into a whole.

In this matter, as with a thousand similar ones, a concept derived from observation (anschauende Begriff) is infinitely preferable to the scientific one. When I stand on, in front of, or in a mountain, and observe its contours, its nature, the thickness of its strata and widths of its crevices, and vividly call to mind its components and arrangements in their natural formation and location, I feel with the vivid observation <u>thus it is</u>, also a dim suggestion in the soul, <u>thus it has</u> <u>come about</u>!"<sup>21</sup>



Bergrat Johann Voigt.

In April 1782, at Karl August's request, Goethe was elevated into the hereditary nobility by Kaiser Joseph II. This made his life at court easier but also brought with it more responsibilities, because as a privy councillor who was a member of the nobility, he could now be entrusted with diplomatic missions to other courts. Although he now had even less time to pursue his own interests, he used his 'travel time' on these diplomatic journeys to good effect.

"It is now a sublime, wonderful spectacle when I ride over mountains and fields, because the origin and formation of the surface of our Earth, and the food that people draw from her, becomes clear and vivid to me at the same time; allow me when I return to lead you to the summit of a high rock in my own way, and show you the kingdoms of the world and their glory."<sup>22</sup>

<sup>19</sup> Letter to his friend Sophie von Laroche,1 Sep 1780.

<sup>20</sup> Mining Engineer (*Bergrat*) Johann Karl Wilhelm Voigt's (1752-1821) studies at the Freiberg Academy had been sponsored by the Duke. He taught Goethe not only the basic facts of geology as understood at the time, but also mineralogy. At the instigation of Goethe he was appointed secretary of the Ilmenau mining company.

<sup>21</sup> Letter to Duke Ernst II of Gotha, 27 December 1780. Duke Ernst II (1745-1804) ruled over the neighbouring Duchy of Saxe-Gotha-Altenburg from 1772 until his death.

<sup>22</sup> Letter to Charlotte von Stein, Meiningen, 12 April 1782.

On this particular journey he was reminded of his Brocken adventure five years earlier, when he had first experienced the glory and kingdoms of the world. As his responsibilities included the well-being of all the Duchy's inhabitants, he took an active interest in increasing the productivity of the farmers' fields.

On another such journey between 8 and 18 May he noted: "good soil, well mixed by the last retreating waters of the old ocean".<sup>23</sup> At a sandstone quarry situated well above slate strata: "Should one have the opportunity and inclination to follow through the revolutions of the old world, this would be a noteworthy location. One would be convinced, as I am, that here one would be able to locate the highest level of the ancient waters."<sup>24</sup>

In July he was made responsible for the natural history collection in Jena. Karl August had purchased the foundation of this collection from the estate of the Jena professor Johann Walch in 1778. Goethe took on the task on with enthusiasm. The collection was under the overall supervision of professor of medicine Justus Christian Loder, with whom Goethe had been studying anatomy since 1781.

Although Goethe had been impressed by Buffon's *Epochs of Nature* (1778) he realised that this ground-breaking work needed to be developed further.

"I see more and more that we will have to proceed on Buffon's path, but will have to deviate from the epochs he has determined. It appears to me that the matter is becoming more and more complicated.

Concerning granite, although I am convinced that it is the foundation of the strata known to us, we will probably have to give in and accept a **granit secondaire**. This will give rise to a great deal of discussion. But it seems to me that even this will not be difficult to resolve in the end; we see how dissolved granite becomes a solid rock again as gneiss. Why should it not, once dissolved, appear again as solid granite a second time? We find some rocks which effervesce with acid; couldn't this be granite a second time?

And what do you think of the idea that from a granite in which feldspar and mica has largely weathered away, if a solution of iron penetrates it, and it then comes back into a state of petrification, that a kind of red porphyry must arise from it."<sup>25</sup> Jean-Louis Giraud-Soulavie (1752-1813) was a French geologist, priest, diplomat and historian. He is notable for being the author of one of the only descriptions of the effects on the climate in France caused by the eruption in Iceland in June 1783 of the Laki volcano which sent such a quantity of dust and sulphur dioxide into the sky over Europe that the general temperature dropped by several degrees, causing reduced harvests and a serious famine. His Natural History of Southern France was published between 1780 and 1784. In this work he estimated the age of the Earth at several hundred million years, far exceeding Buffon's estimates. He was the first to propose that species were not fixed when they were created, but that plants and animals living today were altered from older forms by gradual changes brought about by changes in the environment. In 1784, the Church ruled that his ideas contradicted a literal reading of the Bible. Soulavie was forced to renounce geology, and the publication of the last two volumes was prohibited.

Goethe first came across the idea of secondary granite in the work of Jean-Louis Giraud-Soulavie. He purchased a copy of Soulavie's book in 1784, but it is not known whether this was the original or a censored second edition.

#### Working with Herder

<sup>23</sup> Wolf von Engelhardt (2003) Goethe im Gespräch mit der Erde, p.80.

<sup>24</sup> Ibid. The "revolutions" are again Buffon's 'epochs'.

<sup>25</sup> Letter to Merck, early November 1782. Limestones "effervesce with acid".

During 1782 Goethe was mainly occupied with affairs of state and had little time for writing or geognostic studies. He took his administrative and diplomatic responsibilities seriously, and his friend Herder noted the change in the person he had first met as his student in Strasbourg, noting in a letter to Hamann, not without envy, that 'he really is privy councillor, president of the war commission, supervisor of building and road construction, in addition, *Directeur des Plaisirs*, court poet, creator of festivities, operas, ballets, masked balls, etc., director of the drawing academy<sup>26</sup>, where he holds lectures on osteology, always the main actor and dancer, in short the factorum of all that is Weimar, and, God willing, soon to be

the major-domo of the entire house of Ernestine, where he wanders about looking for worship.<sup>27</sup> From his own point of view, although Goethe had used his influence at the court to secure for Herder the position of General Superintendent of the Duchy's Lutheran evangelical church in 1776, over the years he had distanced himself from the doctrines his erstwhile friend and teacher now officially represented. Fortunately, towards the end of 1783 they were firm friends again.



Johann Gottfried Herder

"It is again a great joy in my life that the vexatious clouds which have separated the Herders from me for so long, have finally, and, I am convinced, forever, been dispelled."<sup>28</sup>

He now began to work closely with Herder in writing the geological chapters of Herder's *Outlines of a Philosophy of the History of Man*, first published between 1784 and 1791. Both were in complete agreement that granite formed the core, the nucleus of the Earth.

'As soon as the core of our Earth, granite, was manifest, light was there, in the dense vapours of our Earthly chaos perhaps still active as fire; it was a coarser, mightier air than we enjoy today, it was a promiscuous, gestating water acting on it. Penetrating acid dissolved it, and transformed it into rocks of other kinds.<sup>29</sup>

In Volume 2 the creation story in Genesis is discussed, again placing granite as the original solid core of the Earth, and rejecting the idea of Buffon that the Earth was scooped from the sun by a passing comet. See text box.

Goethe later reminisced about their work together.

"My laborious, agonising investigations were made easier, even sweetened, by Herder undertaking to put his ideas on the history of humanity in writing. Our daily conversation dealt with the primal beginnings of the Water-Earth, and the development of organic creatures from time immemorial. The primal beginning, and its unceasing development, was always under discussion, and our scientific

<sup>26</sup> This was not true. The director was Georg Melchior Kraus, Goethe's former drawing teacher in Frankfurt.

<sup>27</sup> Herder's letter to Hamann, 11 July 1782. Quoted in Engelhardt, p57. Johann Gottfried Herder (1744-1803) philosopher, theologian, and literary critic, first met Goethe in Strasbourg in 1770.

<sup>28</sup> Letter to his friend Friedrich Heinrich Jacobi, Weimar, 12 November 1783.

<sup>29</sup> Gottfried von Herder (1869 edition), *Ideen zur Philosophie der Geschichte der Menschheit*, (*Outlines of a Philosophy of the History of Man*) Vol 1, Book 2, Chapter 1, p36. Forgotten Books reprint.

understanding was daily purified and enriched by mutual discussion and mental combat."  $^{\rm 30}$ 

In spite of a very busy life Goethe did find time to apply himself to *The* Theatrical Mission of Wilhelm *Meister*, his first major literary work since Werther.<sup>31</sup> The first three books were completed in 1782, the fourth. fifth, and sixth three years later. *Wilhelm Meister* is the rambling story of a young man wandering through life as he finds his way to adulthood. There are parts which more than hint at Goethe's own vounger vears. Although Wilhelm's journey unfolds in difficult circumstances, very different from Goethe's own bourgeoisie youth and the cultured life of the court in Weimar, at the beginning of book 3 the description of Wilhelm on his way through a mountainous landscape follows closely how Goethe himself must have felt as he first explored the hills and forest of Thuringia.

"With light steps he strode along his path, through dales and over hills, with a feeling of the greatest satisfaction. Overhanging cliffs, rushing brooks, moss-grown rocky

# The most ancient written Tradition concerning the Origin of the History of Humankind

When the creation of our Earth and of our Heaven began, says this narration, the Earth was a void, shapeless mass, on which a dark sea flowed, and a living brooding power moved on this water. Now if the most ancient state of the Earth were to be deduced from all recent observations, as they offer themselves to the inquiring mind, without having recourse to unprovable hypotheses, we should have precisely this old description. A vast granite rock, covered for the most part with water, and over it natural powers pregnant with life. That is as much as we know; more we know not.

That this rock was ejected glowing from the Sun is a tremendous idea, but founded neither on an analogy of Nature, nor on the progressive development of our Earth; for how came water on this glowing mass? whence acquired it a rounded form? whence its revolution and its poles? since the power of a magnet is destroyed by fire. It is much more probable that this wonderful primal rock formed itself by its own intrinsic powers; in other words, that it was set down by condensation from the pregnant Chaos from which our Earth was to be produced.

The Mosaic tradition cuts out this chaos, and begins by depicting the rock; thereby also dispatching the chaotic monsters and miraculous creatures of the ancient traditions into the abyss.

All that this philosophic fragment (The book of Genesis) has in common with myths is perhaps confined to the Elohim who may possibly be compared with the Lahs (?), the Zophesamin (?) etc., but here exalted to the idea of an active Unity. They are not creatures but creators. From Herder's *Outlines*, Volume 2, Book 10, Chapter 5.

walls, deep precipices, he saw them here for the first time; yet his earliest dreams of youth had hovered among such regions. In these scenes he felt himself renewed; all the sorrows he had undergone were obliterated from his soul."

#### Georg Christian Füchsel

Goethe's enthusiasm for his natural scientific investigations, and the attention he paid to the details, is well known. But there was one geognostic stone he left unturned – although he took note of the work of Georg Christian Füchsel,<sup>32</sup> he never made the attempt to develop it further. Füchsel was born in Ilmenau, and spent his working life in the neighbouring Duchy of Schwarzburg-Rudolstadt. He published his major work *The history of the earth and of the sea, brought to light by* 

<sup>30</sup> From *Zur Morphologie*, Volume 1, Part 1 (1817) *Bildung und Umbildung Organischer Naturen* (Formation and transformation of organic nature).

<sup>31</sup> The Sorrows of young Werther, which was published in 1774.

<sup>32</sup> Georg Christian Füchsel (1722-1773) was a pioneering geologist, the first to study stratigraphy in detail. He was born in Ilmenau in the Thuringian Forest, studied medicine at the University of Jena, and theology and natural science at the University of Leipzig. He practised as a doctor in Rudolstadt in Thuringia, where he developed his geognostic interests. See also https://www.lindahall.org/about/news/scientist-of-the-day/george-christian-fuchsel.

the natural history of Thuringia, based on a description of its landscape, in 1761. It contains a detailed description of the rocks and hills of the Thuringian Forest, and an historical account of the region's geology. Füchsel considered the geology of Thuringia as a 'model' for the rest of the world, and so he believed (like Werner after him) that Earth's past history could be deduced from the sequence of rock strata as they appeared in Thuringia.

He recognised that the various strata had been deposited at different times in the geologic past, periods which he referred to as 'courses of time' (Zeitlaüfe). He used the principle of superposition (lower formations are laid down before higher ones), and index fossils (used to correlate the strata in which they are found) to identify thirteen such courses, and was able to place separated occurrences of the same formations in their correct position in the sequence. He prepared the first geologic map to be published anywhere. Like Hutton<sup>33</sup> after him (but unlike Buffon) he assumed that the workings of Nature proceeded in much the same way as today. without major upheavals and revolutions, and did not need to invoke catastrophic events to support his theory.

Despite his important findings, Füchsel only gained limited recognition, even in his native Thuringia, and his book remained largely unread. Füchsel's manuscript, originally in German, was translated for publication into poor Latin with many orthographic errors. Goethe (who was able to read Latin) possessed a copy of the book, but he was always ready to admit that he found it difficult "learn anything from books",<sup>34</sup> and was reluctant to study it closely<sup>35</sup>, a task he left to Voigt, who had done so while a student at the Freiberg Mining Academy. Füchsel himself was aware of the shortcomings of his book, but his early death prevented an improved second edition. Had Goethe taken the trouble to study his work more closely, he

If, perhaps, friendly reader, after reading through this Historia, doubts about it have remained in your mind, you should defer judgment until you have tracked down at least two different mountains according to this description, have wandered through the various records of the strata, and are able to draw conclusions of this kind yourself. For observations are the foundation of knowledge. and conclusions drawn from the observations are deeds of the spirit. In reading you must direct your attention to both in the same way as the author did when writing it, so that you, my impartial reader, do not call the Historia a pure hypothesis, or you, my educated reader, do not call it a poem by Lucretius or Empedocles. Translated from Füchsel's introduction to part two of the Historia.

https://www.zobodat.at/biografien/Fuechsel\_G eorg\_Christian\_Veroeff-Natmus-Erfurt\_28\_0011-0030.pdf

would have recognised in Füchsel a kindred spirit.

#### First field trip into the Harz mountains

<sup>33</sup> The Scottish geologist James Hutton published his 'Theory of the Earth' in 1788. He coined the phrase 'The present is the key to the past'.

<sup>34</sup> For example in a letter to Johann Heinrich Merck, 11 Oct. 1780.

<sup>35 &#</sup>x27;But I think it worthwhile to draw the attention of your serene highness to a document that has not been without benefit to me; it can be found in the first section of the older Acts of the Erfurt Academy, and bears the title: Historia terrae et maris ex historia Thuringiae per montium descriptionem eruta a Georgio Christiano Fuechsel. This writing, as I was told by one of his surviving friends, was originally written in German, then had the misfortune, because in these Acts the German language should not appear, to be translated into Latin by someone else. It has become so mutilated and difficult to understand, that as familiar as I am with these matters, and as much as they interest me, I must confess that I have not yet read it to the end.' Letter to Duke Ernst II of Saxe-Gotha, 27 December 1780.

In September 1783 Goethe undertook his first proper geognostic field trip. Freed from court visits and administrative responsibilities, and unencumbered by a courtly entourage, he was able to explore the geology of the Harz mountains at leisure, visiting many of the places he had passed through in the depth of winter six years earlier. His friend von Trebra<sup>36</sup> had visited him in Weimar in July, and it seems likely that they had planned a journey aimed solely at geognostic studies for the autumn. They were accompanied by Fritz von Stein, the eleven-year old son of Charlotte, who had moved in with him on the Frauenplan<sup>37</sup> in May, as well as his servant Sutor.<sup>38</sup> Goethe reported that they passed the Roßtrappe on 11 September, where they had lunch on a granite boulder which had crashed into the river from the heights.

"Regardless of my tiredness, I must write to you tonight, for surely today all your good wishes were with me. The first beautiful day on this whole trip! As long as I was with the beautiful woman vou always brought about storm and bad weather, and for this you blessed my pilgrimage to the Roßtrappe. It was a perfect day. After I had looked around at the top, we descended into the valley, where I wished your presence a hundred times as Fritz and I ate our lunch sitting on a large granite boulder which had plunged into the river.<sup>39</sup>



*The Roβtrappe* A 400 m high granite crag towering over the Bode Gorge in the Harz mountains.

On the 13<sup>th</sup> they visited the Baumann's cave which Goethe had spent a day exploring during his first Harz journey in 1777. The limestone cave complex was already a tourist attraction in Goethe's day.

"Here I am really in my element, and I am happy that I find myself on the right path with my speculations about the old crust of the new world. I teach myself as fast as possible, observe a lot, conclusions will present themselves."<sup>40</sup>

<sup>36</sup> Friedrich Wilhelm Heinrich von Trebra (1740-1819) was the first student to graduate (in 1767) from the newly founded Freiberg Mining Academy in Saxony. He met Goethe in 1776 when he was commissioned by Duke Karl August to prepare a feasibility study in preparation for reopening the copper and silver mine at Ilmenau. In 1783 he was chief mining inspector in the Harz region.

<sup>37</sup> Goethe moved from the *Gartenhaus* (*Garden House*), his first home in Weimar, located outside the town limits, to a larger residence on the *Frauenplan* in the centre of town in 1782. Today it houses the Goethe National Museum.

<sup>38</sup> Christoph Erhard Sutor (1754-1838) was one Goethe's personal servants from 1776 to 1795.

<sup>39</sup> Letter to Charlotte von Stein, Blanckenburg, 11 September 1783. The *beautiful woman* was Marchioness Maria Antonia Branconi (1746-1793). Branconi had been married off at the age of 12, and left a widow with two children eight years later. She subsequently (until 1777) was the mistress of William, Duke of Brunswick, after which she retired to her estate *Langenstein* near Halberstadt in the Harz region. Goethe first met her in 1779 in Switzerland, where his friend Lavater had unsuccessfully tried his hand at matchmaking.

<sup>40</sup> Letter to Charlotte von Stein, Claustal, 20 September 1783.

In Claustal they met up with von Trebra who joined them for a four-day hike across the Brocken to Andreasberg. Goethe had with him a 28-page summary of de Saussure's 'Voyages', which they discussed on their journey, and to which von Trebra added notes explaining his own views.

Goethe was by now familiar with the sedimentary formations of Thuringia, which he had explored with Voigt during the preceding years. Now for the first time he explored and studied granite formations in Germany. These make up a major part of the landscape in the valleys and on the summits of the Harz mountains, landscapes which would have been familiar to him from his journey through the Alps four years earlier.

My journey is going well and I am enjoying the most beautiful weather. Tomorrow morning we venture onto the Brocken. Fritz is endearing and well behaved, and his company gives me great pleasure. In him I enjoy silent moments of happiness in the knowledge that I am completely yours. ....

At the top of the summit on the ancient crags I want to look out for your residence and send you thoughts of the most lively love. I did the same thing some years ago, and how different it is today. Farewell my dearest. I'll be writing again soon."<sup>41</sup>

On 20 September they passed the *Torfhaus* where Goethe met again the forester who had guided him to the summit six years earlier. They reached the summit that afternoon, and spent the night in a hut on the Heinrichshöhe, originally built as a shelter for peat diggers. On leaving the following day, the party of four signed the guest book. They set out for Andreasberg along the *Rehbergergraben* (Rehberg canal).

#### Contact at the Rehbergergraben

The *Rehbergergraben* is an eight kilometre canal originally dug to supply the local mines with water for the waterwheels which generated the power needed for

hoisting spoil, ore, and groundwater up the shafts. The canal was completed early in the eighteenth century, leaving rock formations exposed by the works for early geognosts to explore. The canal is still in use today, powering several small water turbines.

On 22 September Goethe and von Trebra visited the site of an old quarry where rocks used in lining the canal had been excavated. Here Goethe believed that he had found conclusive evidence for Neptunism.<sup>42</sup> Von Trebra had



The Unconformity at the Rehbergergraben. Granite below, Hornfels above

<sup>41</sup> Letter to Charlotte von Stein, Claustal, 20 September 1783. Although the Brocken at 1142 meters is the highest peak in North-East Germany, it is unlikely that he would have been able to see Charlotte's home in Weimar, more than 60 miles away.

<sup>42</sup> Neptunism was the theory taught at the Freiberg Mining Academy that all rocks either crystalised from the water of a primal ocean, or were deposited as sedimentary rocks on its floor. Although it fitted

earlier discovered an unconformity<sup>43</sup> in the exposed rock face, and knew that Goethe would be keen to see it at close hand. In fact, Goethe was so enthusiastic when he saw it, that he insisted on climbing on von Trebra's shoulders in order to reach up high enough to knock off a specimen with his hammer. Von Trebra reported that Goethe called out: *"We still have to achieve great honours before we break our neck!*"<sup>44</sup>

What the two men observed on the exposed rock face was a very hard and tough hornfels<sup>45</sup> overlying granite. The contact between the granite (which Goethe believed had crystallized first) and the hornfels (which Goethe believed had been deposited later) is clearly visible. It was, and still is, a basic geologic principle (the principle of superposition) that lower formations preceded higher ones, so Goethe can be forgiven for drawing the wrong conclusions. He believed that he was looking at direct evidence of Neptunism; granite as the primal rock crystallized from the primal ocean, overlain by hornfels, a secondary rock which crystallized later.

What Goethe didn't know was that molten granite had intruded into much older greywacke<sup>46</sup> formations deep under the surface of the Earth. Hot viscous magma (a pluton) had pushed up into ancient sedimentary rock (greywacke) to within 4 km of the surface 300 million years ago, slowly cooling and solidifying over many thousands of years at temperatures between 700°C and 800°C. The hornfels is in fact metamorphosed greywacke. The heat of the intruded granite had baked and hardened the parent greywacke, changing it without melting into hornfels (a process known as contact metamorphosis). Because the granite and hornfels are

intimately connected, Goethe believed that "both masses had a reciprocal attraction on each other."

Erosion over many millions of years brought the unconformity to the surface, where it was exposed by quarrying for the canal. The granite is from the same intrusion which so impressed Goethe on the Brocken. Today the old quarry is a Geopark site, and the nearby *Goetheplatz* is a popular tourist attraction.

Friedrich von Trebra later arranged for two slabs showing the granite-hornfels contact to be excavated, and presented them to Goethe, who had them made into coffee tables.<sup>47</sup> Soon



Goethe's Coffee Table in the Garden House Granite on the left, hornfels on the right. The elliptical slab measures 50×32 cm Stiftung Weimar Klassik

comfortably with his geognostic views (he intensely disliked violent events) Goethe was always ambivalent about whether he fully accepted Neptunism, which by the end of his life had been completely superseded.

- 44 Johann Wolfgang Goethe, *Die Metamorphose des Granits* (1985) collected and commented by Dankmar Bosse. Verlag Freies Geistesleben, p. 13.
- 45 From the German word *Hornfels*, meaning "hornstone", because of its exceptional toughness and texture, both reminiscent of animal horns.
- 46 Greywacke (from German *Grauwacke*, signifying a grey, earthy rock) is a variety of sandstone generally characterized by its hardness, dark colour, and poorly sorted angular grains of quartz, feldspar, and small rock fragments, set in a compact, fine clay matrix.
- 47 One is in the mineral collection of the University in Jena, the other in Goethe's Garden House in

<sup>43</sup> An unconformity is a break in the continuity of a rock face; a meeting or contact of two different rock types.

after their arrival Goethe wrote to thank his friend in a moving reply, indicative of the awe and respect he felt in the presence of Nature, and, of like-minded friends.

"Indeed! You have surprised me, my worthy dear friend, with your gift, and amazed me with the magnificent slabs. I remembered our bold ventures to discover the answer to a geological problem that is still as important today as it was then, and, like the few instances similar to it, still remains a mystery. I studied again the specimens of these mountains in my collection, specimens which I owe to your kindness. On my travels something similar, but never quite the same, was occasionally pointed out to me. On the other hand, I couldn't recall the beautiful slabs; I really don't know if I've ever seen them before. The one intended for me shall remain as a glorious monument to our love and friendship; to our mutual inclination, which is as constant and permanent as the inclination towards Nature, as the quiet passion to observe her riddles, and the desire to gain something from her mysteries through our own enigmatic spirit."<sup>48</sup>

Unusually, Goethe did not mention the excitement he felt at his discovery in his next letter to Charlotte, but perhaps he had had enough of rocks that summer.

"Our Brocken journey is happily completed. I have silently turned my eyes to the region where you live and make me happy. Fritz was very cheerful and well-behaved. He rode on a pony as if he had been completely familiar with it; he is very content and only has short bouts of moodiness and mischief. Now my longing draws me back to you. On Friday I leave here for Göttingen, where I hope to find letters from you and will write to you.

I have quite fed myself with stones, they should help me, I think, like grit for the grouse, to digest my other more difficult winter food."<sup>49</sup>

#### Granite I

Goethe's work with Herder had encouraged him to put in writing his own ideas about Earth history, placing them in the context of his discoveries in the Harz mountains, and began to tell his friends about his plan. Among them was Georg Forster who in December 1783 wrote to their mutual friend Friedrich Heinrich Jacobi that Goethe was intending to write something about granite.<sup>50</sup>

In January 1784 he began by dictating some short paragraphs based on his recent experiences in the Harz. It was his first attempt at ordering his geognostic ideas in a coherent form. He refers to the text as a treatise (*Abhandlung*), but it remained an untitled fragment, today known as *Granite I*.<sup>51</sup>

Weimar.

<sup>48</sup> Draft of a letter to Friedrich Wilhelm Heinrich von Trebra, 27 October 1812.

<sup>49</sup> Letter to Charlotte von Stein, Zellerfeld, 24 September 1783.

<sup>50</sup> *Goethe Handbuch, Supplemente 2*, p.152. Johann Georg Adam Forster (1754-1794) was a natural scientist and explorer.

<sup>51</sup> Previously known as *Der Granit als Unterlage aller geologischen Bildung* (Granite as a Foundation for all geological Formations). This brief text was never published in Goethe's lifetime. It was first published in the Weimar 'Sophien' edition (1891-1896), together with other geognostic texts Goethe wrote during this time, brought to light and edited by Rudolf Steiner.

"Early this morning early I dictated my treatise on granite, and in between I always thought of my beloved, and remembered how I longed for the home of my dearest from the heights of the rocks that I climbed."<sup>52</sup>

Goethe's text follows closely the notes made by von Trebra in Saussure's 'Voyages dans les Alpes' the previous summer.<sup>53</sup> It explains, in agreement with de Saussure, that granite is the deepest lying rock making up Earth's crust. It has three constituents, quartz, feldspar and mica, which do not appear to have been assembled separately, but as a whole, and are not visibly held together by anything else. No one constituent appears as the groundmass<sup>54</sup> holding the others in place.

He then moves on to the question of how granite might have arisen, strongly disagreeing with the ancient poets, who described a tumultuous creation, and with Buffon, who had imagined a comet striking the sun, thereby breaking off molten fragments which cooled to form the planets of the solar system. The poets he was thinking of were possibly Ovid (43 BCE-17 CE) who commences his *Metamorphosis* with a description of Chaos<sup>55</sup> reigning over the still uncreated world, and Moses, who used the expression *tohu wabohu*, often translated as 'formless and void', to describe Earth's pre-creation state .

'Before the ocean and the Earth appeared, before the canopy of heaven spread overhead, the face of Nature in a vast expanse named Chaos, a rude and formless waste; nothing but a ponderous weight; all discordant elements confused, indiscriminately heaped together in tumultuous turmoil.'

Goethe rejected such tumultuous beginnings and based his explanation of granite's origins on his understanding of natural processes as he had imagined them in the Birs gorge and described them in his letter to Frau von Stein - Nature made use of *"grand and simple means"*. He therefore proposed to ask granite itself how it might have been formed.

#### Granite as a Foundation for all geological Formations (Granite I) 1784

Since we want to talk about rock formations in the order in which we find them on and next to each other, it is natural that we start with granite.

For all the observations, so many of which have recently been made, agree that it is the deepest lying rock of our Earth, that all other rocks are found on and next to it, but that it does not rest on any other, so that, although it does not make up the entire core of the Earth, it is at least the deepest crust known to us.

This noteworthy type of rock differs from all the others in that it is not homogenous, but consists of visible parts; however, a first glance shows that these parts are not bonded by any third means, but only exist adjoining each other, and mutually holding each other in place. We name these parts, which are easily distinguishable from each other, quartz, feldspar, and mica, to which is sometimes added tourmaline.

If we look closely at these components, it seems to us as if they did not exist, as one must usually think of components, before the whole. They do not seem to have been put together separately, but emerged together with the whole. Although only mica often appears in a six-sided, sheet-like crystallization, and quartz and feldspar have insufficient space to take on their own forms, one can clearly see that granite was created by a lively crystallization process, inwardly very crowded together when it originated. – Allow us to draw some conclusions about its origin, and about the substance from which it arose.

Since man only sees such effects that arise from great commotion and violent forces, he is always inclined to believe that nature needs brutal means to produce great things, even though he could daily teach himself to the contrary by means of the same (observations). Thus the poets have fashioned a quarrelsome, disjointed, raging Chaos for us.

Enormous masses have supposedly been siphoned off from the body of the Sun, and hurled into the void, thereby creating our solar system.

My spirit has no wings to swing into such primordial beginnings (*Uranfänge*). I stand firmly on granite, and ask it if it wants to give us occasion to think about how the body (*Masse*) from which it came into being was constituted.

# **Exploring the Thuringian Forest**

In June and early July Goethe was in Eisenach in the South of Thuringia. Although he had several ministerial duties to fulfil, he was again accompanied by Fritz von Stein. His plan was to undertake several field trips whenever there was an opportunity to break away from the tedium of court business:

"The mountains and chasms promise a lot of diversions; they no longer appear picturesque and poetic to me, but it's another kind of painting and poetry with which I'm exploring them. Voigt is here doing the preliminaries, so that I only go to see interesting places..."<sup>56</sup>

He enjoyed Fritz' company, and on their walks together he explained his botanical and geognostic discoveries to his young protégé.

"Today we took a mineralogical walk and heartily enjoyed ourselves like good mining folk. The simple thread which I have spun for myself is a splendid guide through all these underground labyrinths, and gives me an overview even in the confusion."<sup>57</sup>

It is evident from his letters during this time that he is making good progress with his geognostic "*speculations*", and is on the point of making an important discovery, establishing a "*simple principle*", which will bring order into the wide range and "*confusion*" of his observations. The structure of the "*underground labyrinths*" could be ascertained by their rocky outcrops which no longer appeared to him as a confusion of large cracks and shapeless forms. Goethe believed he had found order in the confusion. As he explained in a brief essay the following year, the large blocks had not cracked because of cooling, but were themselves crystal structures.<sup>58</sup> He believed that their vertical surfaces were not placed randomly, but followed an inherent order, the discovery of which needed further observations.

But he is still very much in love, and rarely writes to Charlotte about his geognostic work without expressing in some way or other his love for her, yet never sharing the details of his discoveries with her in writing.

"My rock speculations are making good progress. I see much more than others who sometimes accompany me and are also attentive to these things, because I have discovered a few basic principles of rock formations, which I keep as a secret, and which enable me to evaluate the evidence more easily."<sup>59</sup>

"I have been diligently climbing about on the rocks, and have discovered a lot that is useful for me. I believe I have discovered a very simple principle, or rather applied it in such a way that it completely explains the formation of the larger stone masses."<sup>60</sup>

"The bad weather is keeping me away from my rocky speculations. Before I leave here I want to spend a few more days hiking in the hills. If only I could think of a memento for you somewhere. I was planning to have carved into a rock somewhere:

What I confess in denial and conceal to reveal, Is my only well-being, remains a plentiful treasure.

<sup>56</sup> Letter to Charlotte von Stein, Eisenach, 7 June 1784.

<sup>57</sup> Letter to Charlotte von Stein, Eisenach, 12 June 1784.

<sup>58</sup> See Text Box Epochs of Rock Formation below.

<sup>59</sup> Letter to Charlotte von Stein, 17 June 1784.

<sup>60</sup> Letter to Johann Gottfried and Caroline Herder, Eisenach, 20 June 1784.

I entrust it the rock, that the lonely may guess, What in solitude brings blessing, what in the world brings me joy."<sup>61</sup>

Next day he was still pondering the poem he planned to carve in a rock, and made another suggestion to Charlotte, which he thought might be suitable for the Hermannstein cave, where he and Charlotte had spent a whole day together in 1777, and Goethe had carved a big S (*Stein*) into the rock wall:

"Rocks should not remain rocks, neither deserts remain deserts, And so Cupid descended and the world lived. He also enlivens for me the cave with heavenly light Although only in hope, yet hope was fulfilled."

Before I go to bed one word for a thousand. It has become such an insurmountable need for me to see you that I fear for my sanity. I don't know what will become of me. Good night.<sup>62</sup>

"The mountains and cliffs give me a lovely view, although I do not believe that I will conquer them completely in this summer campaign, but I will explore deep into their bowels."<sup>63</sup>

In August and early September he was able to tour the Harz region for the third time. In the course of this journey he collected the evidence he needed to continue the treatise on granite he had started in January. But there were other matters on his mind as well.

#### Dedication, Introduction to Goethe's Rosicrucian poem

After a promising start in January with his first short introductory text on granite, 1784 turned out to be Goethe's *annuus mirabilis*. In February work could finally begin on excavating the new shaft at the Ilmenau mine, work which legal and financial difficulties - which Goethe had played a leading role in resolving - had delayed for eight years. On the 24<sup>th</sup> Goethe gave a rousing speech at the official opening of the mine.<sup>64</sup> In March he discovered the intermaxillary bone, proving to his own satisfaction that there was no anatomical difference between humans and other mammals.<sup>65</sup> He expressed his great joy at his discovery in a letter to Herder.

"Taking a cue from the gospels, I must inform you most immediately of the good fortune that has come my way. I have found – neither gold nor silver, but what gives me an ineffable joy – the os intermaxillare in humans!

Together with Loder I compared human and animal skulls, came on the trail, and lo and behold, there it is. Only I beg you, do not tell anyone, for it must be kept secret. It

<sup>61</sup> Letter to Charlotte von Stein, 23 June 1784.

<sup>62</sup> Letter to Charlotte von Stein, 24 June 1784. We shall never know how Charlotte reacted to these letters. She felt betrayed by Goethe's abrupt departure to Italy in 1786, and by his liaison with Christiane Vulpius immediately after his return, asked for her letters back, and burned them.

<sup>63</sup> Letter to Charlotte von Stein, Eisenach, 9 July 1784.

<sup>64 24</sup> February 1784 was Shrove Tuesday, traditionally a holiday (*Fasching*) in the mining communities.

<sup>65</sup> The premaxilla, a pair of cranial bones that are located at the front of the upper jaw. The Dutch anatomist Peter Camper (among others) believed that the premaxilla were missing in humans, calling attention to an essential anatomical difference between humans and mammals. His friend Merck was in contact with Camper, and Goethe hoped to use him as an intermediary to invite comments. Unfortunately Merck delayed passing on the manuscript which Goethe had prepared in October, and also did not pass on Camper's eventual replies. Goethe finally published his hypothesis in 1820, but it was rejected by most leading anatomists.

should also make you very happy, because it is like the keystone to humans; not missing, but right there! And how! I also thought of it in connection with your ideas, how beautiful it will be. Farewell! I'll be with you on Sunday evening."<sup>66</sup>

On the same day he wrote to Charlotte von Stein. He was so excited that he forgot to tell her what he had discovered: "A delightful pleasure has come my way; I have made an anatomical discovery that is important and beautiful. You shall also have a part in it. But don't say a word to anyone. I will also tell Herder in a letter under the seal of secrecy. I have such joy that all my intestines move within me."

Less than a month after his return to Weimar from Eisenach he was required to join the Duke on an important diplomatic conference in Brunswick. The conference was passed off as a family visit to Karl August's uncle, Duke Karl Wilhelm Ferdinand. But its real purpose was to win over Karl Wilhelm, a competent and highly respected general, for the League of Princes, an alliance of the smaller principalities intended as a bulwark against the expansionist policies of the Austrian Habsburg Empire. He much disliked such gatherings of aristocrats, particularly the social duties he would be expected to fulfil, but was compensated by having an opportunity to spend four days before and ten days after the conference to pursue his geognostic studies in the Harz mountains. He again intended to study the formation of the granite outcrops, in particular the orientation of their cracks and fissures. These fourteen days made up his third and final Harz journey, and were a highlight of the year.

Goethe was accompanied this time by the principal of the Weimar drawing school, Georg Melchior Kraus,<sup>67</sup> whose task it was to make accurate drawings of the various outcrops, particularly the orientation of their fissures. Kraus was instructed to draw what he actually saw, not what he considered a pleasing picturesque scene. On the day before their departure he wrote to his friend Merck:

"I only have time to write a few words, because I had hardly worked my way out of the duties I had fallen into as a result of the Eisenach visit, when another journey is imminent, this time to Brunswick.

I will be back again on the Harz, and will continue my mineralogical and oryctological observations, which I have tirelessly continued until now. I am beginning to come up with results, which I keep to myself for now, so that they are not snatched away from me."<sup>68</sup>.

The ducal party set out from Weimar on 7 August, but on the following day, as they approached Dingelstedt, an axle on one of their coaches broke. Goethe used the delay to begin work on *The Secrets (Die Geheimnisse*), an epic poem he had promised Herder and Charlotte. It was originally introduced by a prologue, today referred to as the *Dedication (Zueignung)*<sup>69</sup>, and it seems likely that this was what Goethe began to compose as he waited for the carriage to be repaired. That evening he wrote to the Herders.

<sup>66</sup> Letter to Herder, Jena, 27 March 1784.

<sup>67</sup> Goethe had first met Kraus (1737-1806) as his art teacher in Frankfurt. Encouraged by Karl August's tutor Christoph Martin Wieland (1733-1813), Kraus moved to Weimar in 1774, where he established the 'Princely Free Drawing School'. He was appointed its first Director and held that position until his death.

<sup>68</sup> Letter to Johann Heinrich Merck, 6 August 1784.

<sup>69</sup> Not to be confused with the Dedication to Faust I, written in 1797.

"Today the axle of the heavily packed carriage broke between Mühlhausen and here. As we had to stay here I immediately made a start with the poem I promised you. What I send herewith is intended to be the introduction, instead of the traditional invocation and what belongs to it. Not everything is as it should be yet, I barely had time to write down the stanzas. Farewell, think of me as I think of you, and send the verses with this letter to Frau v. Stein as soon as possible. Farewell. At 1 o'clock we continue to Duderstadt."<sup>70</sup>

Goethe also wanted to share what he had written that day with his beloved Charlotte, and he wrote to her telling her to expect the beginning of his poem.

"Instead of repeating to you so often that I love you I am sending you via the Herders something I wrote for you today. Between Mühlhausen and here an axle broke, and we were forced to make a halt. To keep my mind occupied and to divert my restless thoughts from you, I wrote the beginning of the promised poem. I am sending it to the Herders from whom you will get it. Farewell, I will probably only be able to sleep a few hours. Everyone else is already asleep. Adieu. Evening 10 p.m. G."<sup>71</sup>

Like Herder, she had also been expecting Goethe to start work on "the promised poem". He had already written to her earlier that summer while in Eisenach: "Encouraged by the Italian improviser I tried to cast my own verses into the German language while out on a walk. It is much more difficult, but it should be more or less possible if one gives it one's full concentration."<sup>72</sup>

The *Dedication* is modelled on an allegorical neo-platonic poem by Girolamo Benivieni in which a beautiful woman appears on a flower bedecked meadow. In Goethe's poem a "*divine woman*" appears before his eyes, who reveals herself as the spirit of Truth offering him "*the veil of poetry from the hand of truth*".<sup>73</sup> On that fateful day he had in mind not only his beloved Charlotte von Stein but also the Herders, with whom he had discussed his overall plan.

*"The Secrets"* was intended as an allegorical and esoteric epic, describing the spiritual evolution of humankind in the sign of the Rose Cross, taking in along the way twelve historic religions.<sup>74</sup> His work with Herder on his philosophy of human history had inspired him to attempt something similar from an esoteric point of view. With this decision he took on an enormous task which ultimately became too much for him. Less than a year later he wrote to von Knebel.

"I have also been hard at work on my grand poem, and have reached the 40th stanza. But that is still very much in the forecourt. The enterprise is too enormous for my situation, but I want to continue and see how far I get."<sup>75</sup>

<sup>70</sup> Letter to Johann Gottfried and Caroline Herder, Dingelstedt, Sunday, 8 August 1784.

<sup>71</sup> Letter to Charlotte von Stein, Dingelstedt, Sunday 8 August 1784.

<sup>72</sup> Letter to Charlotte von Stein, Eisenach, 9 June 1784. The Italian improvisor was most probably Girolamo Benivieni (1453-1542). See <u>https://gombricharchive.files.wordpress.com/2011/04/showdoc90.pdf</u>

<sup>73</sup> Der Dichting Schleier aus der Hand der Wahrheit.

<sup>74</sup> An English translation of *The Mysteries* can be found in the translation of a lecture given by Rudolf Steiner in Cologne on 25 December 1907; *The Mysteries: A Christmas and Easter Poem by Goethe*. <u>https://wn.rsarchive.org/Lectures/Dates/19071225p01.html</u>

<sup>&</sup>lt;sup>75</sup> Letter to Karl Ludwig von Knebel, 28 March 1785. Goethe broke off the "*enormous*" task after the 42<sup>nd</sup> stanza which describes brother Mark seeing three youths hastening away from the courtyard.

He soon broke off the task altogether. Because "*The Secrets*" remained unfinished, Goethe later used the "*Dedication*" as a prologue to the first edition (in 1787), and all subsequent editions, of his collected poetry, an indication of the importance he attached to it. Many scholars interpret the angelic figure of Truth whom Goethe describes as meeting on a misty mountainside early one summer morning as the muse who inspired his poetry – possibly Charlotte on Stein.<sup>76</sup> Much like his poem "*Ilmenau*" which he had written for Karl August the previous September<sup>77</sup>, the "*Dedication*" is undoubtedly a poem in which Goethe expressed his most personal feelings and misgivings about the direction his life was taking.

As always, Goethe played his cards close to his chest, and all that is known about Goethe's progress with the epic itself is contained in the seven letters he wrote to Charlotte von Stein during August and September 1784. There are no hints in his notebooks and letters of the exhilaration he must surely have felt as the work progressed. Most of the letters merely state that he is working on the poem, but in one of them he writes a stanza which he felt would be suitable for the *Dedication*.

"I end with a German verse that will be placed in the poem that I cherish so much, because I will be able to speak of you, of my love for you in a thousand forms, without anyone hearing it than you alone:

Surely I would already be so far far away Have gone as far as the world lies open to my wish Were it not for overwhelming powers of the stars Which tie my skills and destiny to yours That only now I get to know myself in you My poetry, my striving, my hopes and my desires Reach out only to you and to your being. My life depends only on your life."<sup>78</sup>

He did not include the stanza in the published version of the *Dedication*, but there are stanzas remarkably similar in their sentiments. Indeed, Goethe's portrayal of Charlotte as his muse found expression in many of his poems. Already in 1781 he had written:

#### "The only Lotte you can love,

You demand completely for yourself, and rightly so. Also, he is yours alone. For since I am away from you The fastest of life's noisy movements seems to me Only a light veil through which I sense your presence Always as if seen in clouds.

It shines kindly and faithfully to me as if Through the shimmering of the Northern Lights I see the gleaming of eternal stars."<sup>79</sup>

One week later he wrote to her:

Gewiss ich waere schon so ferne ferne Soweit die Welt nur offen liegt gegangen Bezwaengen mich nicht uebermaecht'ge Sterne Die mein Geschik an deines angehangen Dass ich in dir nun erst mich kennen lerne Mein Dichten, Trachten, Hoffen und Verlangen Allein nach dir und deinem Wesen draengt Mein Leben nur an deinem Leben haengt.

> Den einzigen Lotte welchen du lieben kanst Foderst du ganz für dich und mit Recht. Auch ist er einzig dein. Denn seit ich von dir binn Scheint mir des schnellsten Lebens lärmende Bewegung Nur ein leichter Flor durch den ich deine Gestalt Immerfort wie in Wolcken erblicke, Sie leuchtet mir freundlich und treu Wie durch des Nordlichts bewegliche Strahlen Ewige Sterne Schimmern. Gotha 9 October 1781

<sup>76</sup> A translation of the *Dedication* can be found at <u>The Works of J. W. von Goethe/Volume 9/Dedication -</u> <u>Wikisource, the free online library</u>

<sup>77</sup> On the occasion of the Duke's 26<sup>th</sup> birthday on 3 September 1783.

<sup>78</sup> Letter to Charlotte von Stein, Brunswick, 23 August 1784.

<sup>79</sup> In a letter dated 9 October 1781.

"After tomorrow morning we will probably leave and this letter will find you at home. You must feel how much I am yours, how much I want to see you again. No, my love for you is no longer a passion, it is a disease, a disease that is more dear to me than the most perfect health, and from which I do not want to heal.

I have again written some verses of the poem which is a great source of strength for me when I am far from you. It will greatly please me if you are happy, because it is for you that I compose it. The few words you told me in your last letter have given me an infinite joy.

By the way, everything is fine here; the serious goal of our conference was perfectly successful. It's a secret that I confide to you because everyone surely believes that we only came to have fun."

And on the following day: "If my duties allow it I will try to continue with my poem; I would like to be able to do everything to please you and I can never stop being your debtor. Goodbye once again my sweet my adorable friend."<sup>80</sup>

And for the last time on 16 September 1785: "That my poem is so dear to you will spur me on to continue it as I can."

## Into the Harz mountains

The coach had been repaired and the company continued into the Harz mountains. There is no exposed granite between Dingelstedt and Brunswick, but Goethe noted Zechstein limestones and gypsum, as well as greywacke and schists. Together with von Trebra he also visited several mines. The shaft at Ilmenau would soon be deep enough to begin hoisting up the ore,<sup>81</sup> and Goethe used the opportunity to see for himself the practical aspects of smelting and extracting copper (and hopefully some silver) from the ore.

He wrote to Charlotte often to report on their journey, without ever giving her any details of his geognostic discoveries, or even of what he hoped to discover. But in his next letter there is a strong hint that she will recognise herself in the poem if she reads it in the spirit in which it was written.

"If I were further away from you, but on a more reliable postal route, I would have hoped that this letter would come to you faster than will actually be the case. We have arrived here in good spirits, and are enjoying the most beautiful weather, climbing the mountains and exploring the big wide world. With the exception of the rocks you have no competing paramour, and I would wish to have you here during these beautiful days.

I hope you now have the beginning of the poem which I sent you via the Herders. You will take from it what is for you; it pleased me very much to tell you in this way how dear you are to me.<sup>82</sup>

He is also still working on the poem.

<sup>80</sup> Letters to Charlotte von Stein, Brunswick, 30 and 31 August 1784.

<sup>81</sup> In the event, the first ore was only brought to the surface in September in 1792. The intervening eight years had been a constant battle against flooding of the underground works by groundwater.

<sup>82</sup> Letter to Charlotte von Stein, Zellerfeld, 11 August 1784. What he didn't tell her was that the royal party had spent two days, as they had the previous year, as the guest of Marchioness Branconi. She was reputed to be the most beautiful woman in Europe; no wonder Goethe kept repeating to himself and Charlotte how much he loved and needed her. See footnote 37.

"Yesterday we were up and about at five in the morning, and ended the day in the evening with a supper at Mining Captain von Reden's. I am writing this while the barber is here, because there will be exercise enough again today. We will go into the pits, an arduous journey, which will be very instructive for me. From the heights and the depths I send you my thoughts, and look forward to seeing the mountains again, which I climbed years ago with longing for you in my heart.

My thoughts are always focused on telling you what I have seen, or to write something for you that might please you. I am thinking hard about the plan of the poem, and already have it much more orderly; should we encounter rainy weather or some other accident, I will certainly continue. I can assure you that apart from the Herders and Knebel I don't have an audience.

Kraus is making excellent sketches, and I am very happy that I can bring you the beautiful subject matter so lovingly drawn. My speculations are progressing, and I will certainly arrive at a correct (understanding) soon. The weather is gorgeous, and I miss nothing except letters from you."<sup>83</sup>

"14<sup>th</sup> Early. I again have to write to you while the barber is here, and it will probably be the last time. Today we are going to a high mountain where there are beautiful crags to be seen, then tomorrow down to Goslar.

It is so interesting here that I would like to stay here for a while to learn more (about the region), but then my Lottchen would also have to live in Zellerfeld so that I would find her in the evening when I come home tired after a long day.

I am also happy with my observations, I'm finding what I'm looking for everywhere, and I hope soon to have in hand Ariadne's thread, with which one can wind oneself out of these apparent confusions."

"Evening.

Just one more good night! Dearest Lotte. Tomorrow morning we are leaving early for Goslar. Kraus has again drawn very beautifully today, and when I see the subjects of our observations taking shape on his paper I am so happy that I will be able to show them to you, and thereby share with you some of our memorable moments. The only worry I have is losing you, but when I'm thinking you will stay with me, everything in the world seems bearable, and I have the courage to face anything. I have pondered a great deal about the poem, but not written anything further. Adieu dearest Lotte, I'm starting to miss your letters now; perhaps I'll find something in Brunswick."<sup>84</sup>

#### Letters from Brunswick

He arrived in Brunswick on 16 August. In order to stay in the *milieu* of the proceedings at the Brunswick court, he wrote his next letters to Charlotte in French. He wrote little about his geognostic work, except to tell her that it was possible to read the grand book of Nature, although he felt pessimistic about whether others would be able to follow his ideas. But at least he had Charlotte to whom he would, with the help of Kraus's drawings, explain his discoveries. The poem was a work in progress, but he was still thinking about it. He more than once expresses his dislike of the aristocratic company, the billiards, the women, and the food which invariably disagreed with him. But he was also thinking a great deal about how much he loved and missed her.

<sup>83</sup> Letter to Charlotte von Stein, 13 August 1784.

<sup>84</sup> Letter to Charlotte von Stein, Zellerfeld, 14 August 1784.

"I don't know whether I've already told you that I am very happy with my discoveries in the Harz. If I had more time, I would certainly be able to contribute something to natural history. Kraus has made some charming drawings; he will have done others while we are here, because he stayed in the mountains. I am very curious to see what he has done.

The runes of Nature are grand and beautiful, and I claim that it is possible to read them all. Humankind, however, is more likely to have small ideas, since they themselves are small, and do not appreciate comparing their limited existence with unfathomable beings."<sup>85</sup>

"Kraus has arrived from the Harz. He brought me a drawing of a granite cliff that is really beautiful. I am already rejoicing in advance to be able to show you all these beautiful things, to tell you about all the observations I have made about the origin of the mountains. How glad I am that all this interests you, and that I find in you a dear companion in all that I undertake. The ideas I had conceived about the formation of our globe have been positively confirmed, and amended, and I can say that I have seen rocks, which by confirming my system, surprise me by their novelty and grandeur. I do not presume to believe that I have found the principle by which these phenomena exist, but I will bring to light a harmony of effects that suggest a common cause, and it will be left to heads better than mine to take the matter further...

Kraus is of great help to me because he records the objects that would otherwise soon have escaped from my memory, because here my mind is occupied by other matters. . Goodbye my dear Lotte, we must finish. I attach some pages from the Journal de Paris, you will find a report of the air travel of Mr. Blanchard.<sup>86</sup>

Keep me in your love. Farewell, farewell. G....

Tomorrow will be my birthday. I had hoped to celebrate it on the Brocken, but it will not be so. I am sure that you will think of me in your solitude, that you will take care of your friend, who only wants to exist for you. All the moments of my life I have spent without knowing you, without possessing your love, are lost to me. I can live and breathe only for you.

Farewell once again."87

#### On the Brocken again; Discovering the Order of Nature

"Released from the shackles of the court into the freedom of the mountains, with the most beautiful weather, a word to you.

The Duke had an insurmountable urge to go to Dessau, went, and let me retreat with Kraus from Goslar alone to the Harz. Left to ourselves we both enjoyed the most glorious days, were on the Brocken, hammered on all the rocks in the area, always accompanied by the brightest sky.

I cannot say how close your love is to me. Seven years ago, I also wrote to you from here. Again and again I come back to where I first thought about you, and talked to you.

I hope to be in Weimar on the 15<sup>th</sup>, would it be possible to see you there? Farewell Lotte. Tomorrow we go to the Roβtrappe. Kraus has drawn quite delightful things. A thousand times farewell."<sup>88</sup>

<sup>85</sup> Letter to Charlotte von Stein, Brunswick, 24 August 1784.

<sup>86</sup> The French inventor Jean-Pierre ,Blanchard (1753-1809) made a successful balloon flight in Paris on 2 March 1784, in a hydrogen gas balloon.

<sup>87</sup> Letter to Charlotte von Stein, Brunswick, 27 August 1784.

Goethe and Kraus began their excursion at the slate quarry near Goslar on 1 September. By measuring the strike (compass bearing) of the crevices Goethe noted that the slate blocks formed rhomboids with an acute angle of 80°. They visited the mines at Rammelsberg, the oldest continuously worked mines in Europe.<sup>89</sup> They walked through the Oker valley where Goethe sketched the granite cliffs, carefully detailing the blocks created by weathering of the original outcrop.

On the second day they climbed the Brocken. On the summit Kraus drew the *Witches Altar* and the *Devil's Pulpit*, while Goethe measured the strike of the vertical gaps and fissures between the granite blocks in order to determine their orientation.

As in the previous year, they spent the night in the mountain hut on the Heinrichshöhe near the Brocken summit. On departing next morning Goethe quoted a short verse from the first century Roman poet Manilius in the visitor's book:

> "Quis coelum posset nisi coeli munere nosse, Et reperire Deum nisi qui pars ipse Deorum est."



Granite rocks in the Oker valley Pencil drawing by Goethe, 2 September 1784. *Goethezeitportal.de* 

'Who would be able to understand the heavens unless through the benevolence of the heavens, or to find God unless he was himself part of God?'

Goethe had read Manilius<sup>90</sup> in his youth, and although he had not been impressed at the time, he did have an excellent memory, and now, walking the Harz mountains with a trained eye, he was deeply impressed by the grandeur of Nature he had witnessed. He believed he had received confirmation of his insights into the ordering of the Earth's rocky surface, confirmation which he experienced as a gift of the gods. He remembered the Latin words, which would later become, in different formats, one of his guiding scientific principles.<sup>91</sup>

Several more days of drawing and measurement followed, until the party reached the valley of the Bode river, where they passed the Roßtrappe on 8 September. Here Goethe noted near vertical blocks split horizontally into rhomboid columns and blocks.

Goethe accurately measured the strike of the cliffs and outcrops they passed, and of their faults and crevices, which he believed held the clue to their origin. He made

<sup>88</sup> Letter to Charlotte von Stein, Elbingerode, 6 September 1784.

<sup>89</sup> The last pit closed in 1988 after more than 1000 years of continuous ore extraction. Today the mines are a World Heritage Site.

<sup>90</sup> Manilius believed that the ordered universe had been created by a rational God, and that human beings were capable of understanding the order of the universe because insofar as God had given them reason, they were themselves part of God.

<sup>91</sup> See for example his introduction to the Theory of Colour. "Unless the eye be sun-like,/How could we see the light?/Unless there lived in us God's own power,/How could the divine delight us?"

notes of all his observations while Kraus prepared accurate drawings (as opposed to picturesque ones). The aim of this intensive work was to come closer to an understanding of the universal law governing the genesis of large masses of rock. He believed this universal law, this *"simple principle"*, would reveal itself amidst the *"apparent confusions"* he observed in Nature. The cracks and crevices visible in the rocks were clues to their formation, an idea to which he had been alerted in the rocks of the Bode valley the previous year.

He believed that he had found confirmation that these huge granite blocks were themselves enormous crystals, the first to appear as the Earth gradually solidified. He hoped to be able to show that these 'crystal' blocks were not aligned haphazardly but followed an ordered rhomboidal system aligned with the cardinal points of the compass.

On the way down through the Bode valley they passed the village of *Elend* (misery) and the *Snarcherklippen* (snoring cliffs), drawing and measuring as they went. They were aware that the granite contains iron (in the form of magnetite) which deflected their compass needle, but probably concluded that this was a very local phenomena.



Eastern Tower of the Snarcherklippen

He wrote to Herder to explain that he was looking for rocks which were the most difficult to categorize, which were causing cataloguers much hardship. With his overall grand plan in mind there would be no need to categorize.

"Before leaving the mountains I must send you a greeting. Post will be collected from here this evening, and be brought to you. My time at court was miserable and at the expense of my stomach. But here I am again in The *Snarcherklippen* are two 25 metre high granite blocks standing about 60 metres apart in the Bode valley in the Harz mountains. Both are excellent examples of spheroidal weathering. Due to large temperature fluctuations and the expanding power of ice, granite weathers into large, rounded blocks (socalled woolsack weathering). When the wind blows from the southeast the rocks make a strange sound which was the inspiration for its name (*schnarchen* = "snoring").

Years later Goethe referred to these impressive granite towers in the Walpurgis night scene (which takes place on the Brocken) in Faust part 1, and in the Classical Walpurgis night scene (which takes place on the banks of the upper Peneus river in Greece) in Faust part 2.

In Part 1 Faust, Mephistopheles and the will-o'-thewisp speak:

Tree on tree in vision reeling, Cliffs that curtsey in their wheeling; Snouted rocks in gorges roaring, Hear them blowing, hear them snoring.

In Part 2 Mephistopheles, unfamiliar with the Greek landscape where the classical Walpurgis night scene takes place, mutters:

Though northern witches I command with ease, I'm not so sure of foreign sprites like these. Around the Blocksberg (1) I prefer to roam, A place where I can feel myself at home. Dame Ilse (2) guards for us her lofty stone, And Heinrich's Height (3) has revels of its own. The Snorers' snorts at Elend (4) greet the ears, And this has lasted for a thousand years.

- 1. Another name for the Brocken.
- 2. The Ilsenstein is granite outcrop near the village of Ilsenburg in the Harz mountains.
- 3. King Henry IV (1050-1106).
- 4. Elend is a nearby village.

Translations by Phillip Wayne (1959) Penguin Classics

the freedom of the forest, where I have been since the first. The Duke is not with me but has gone to Dessau. So I am alone with Kraus, and we are out in the open all day, hammering and drawing. You will enjoy what I bring back; we have certainly collected the largest and most important specimens. The days are glorious. We are hauling a large load. I have carefully selected those with the smallest variations and nuances, which bring one type of rock closer to another. These are the bane of the systematic collectors, because they do not know where to order them. Luck has been on our side, and you will certainly enjoy seeing them, and there will be little need to add much more about them."<sup>92</sup>

The slight variations and nuances he sought are a sure indication that he was searching for, and believed he had found, order and continuity in the transition from one rock type to another closely related one. In May the following year, with the assistance of Voigt, he drew up a catalogue of the rocks and minerals gathered during the two Harz expeditions - almost 160 rock specimens which he had collected himself, and about 60 samples of ores and minerals, collected or purchased from the mines he had visited.<sup>93</sup> He arranged the former to bring out their subtle differences in a list entitled simply "Sequence of rock types from the Harz". The collection was arranged as evidence in support of Goethe's hypothesis explaining the genesis of rocks. This closely follows Werner's Neptunist scheme, which is in fact a good approximation to the order of the Thuringian strata as they were laid down in geologic time.



Western Tower of the Snarcherklippen Drawing by Kraus Goethe noted the point at its base "where this rock changes the magnetic needle."

Soon after his return to Weimar he was needed in Ilmenau where the administration of the mining project which he had inaugurated with great fanfare in February, had run into difficulties. He was there between 5 and 15 October, and again had young Fritz with him. The officials on site had been lax, Goethe explained to Charlotte von Stein, because "the time between February and October had been too long for the impulse given to the work at its inception to have any lasting effect for such a lengthy period of time". By "paying close attention to the smallest detail (he) hoped to give a good direction to the tasks of the officials."

Fritz however, was very well behaved. Goethe took the trouble to explain to him "the two first two epochs of the world according to my new system. He understood everything clearly, and I was happy with my attempt by which the matter gained

<sup>92</sup> Letter to Herder, Elbingerode, 6 September 1784. An example of a sequence "bringing rocks closer to one another" is on display at the Goethe Museum in Weimar. The order is feldspar, quartz, mica (the three components of granite), coarse grained granite, medium grained granite, fine grained granite, augen gneiss with quartz eyes, augen gneiss with red feldspar, gneiss. He did not imagine one member of the sequence metamorphosing into the next, but saw in the changes from one rock to the next evidence of "traces of God's grand forming hand" (Letter to charlotte von Stein, 7 Sep. 1780)

<sup>93</sup> Wolf von Engelhardt (2003) Goethe im Gespräch mit der Erde, p.102.

more clarity and precision. Children are a real touchstone for truth and falsehood. Unlike adults, they are much less likely to be swayed by self-deception."<sup>94</sup>

At the end of the year he wrote to his friend Merck:

"As for minerals, I have this time again gathered together a large collection on the Harz and in the Thuringian Forest. From the Harz I will soon have the most important assemblage. Of rocks that is; for I do not allow myself to be tempted by opulent and precious stones. For my purposes I am anyway not interested in valuable specimens. Could you not send me a set from your area which you've been promising me for so long? It's been such a long time since I've written you that I do not even know whether I've thanked you for the detailed review of the Dutch collection. This time I had Kraus with me on the Harz. He drew the different rock types not in a picturesque manner, but in a way that drew attention to what interests the mineralogist. If we continue this collection, it could be completed and very beautiful. – Write to me soon how things are with you, and whether you have recently come across anything of note."<sup>95</sup>

# Granite II

The second, and longer, of the two fragmentary texts on granite was composed during the summer of 1785. It was intended as the introduction to what appears to have been planned as a substantial scientific work on geognosy. *Granite I* was his first attempt at committing his thoughts to paper, but he had been thinking about a larger project for several years, and had mentioned the idea of writing a "romance of the universe" in a letter to Charlotte von Stein some years earlier. "Along the way I thought through my new romance about the universe, and wished that I could dictate it to you. There would be a discussion, and the work would come to paper. Goodbye Lotte. I shall not part from you."<sup>96</sup> Goethe was alluding to Buffon's 'Epochs of Nature'. The ideas it contained were considered by critics to be so radical, that they described it as a work of fiction, i.e. a novel (German Roman), but Goethe's opinion of the book was very positive. See footnote 14.

But by 1785 his plans had changed. He was now confident enough to present his recent discoveries in the form of a textbook or primer outlining Earth's genesis. "I have dictated some more chapters of Wilhelm (Meister), and wrote something about my theory on rock formations. A new English mineralogy has cheered me up again."<sup>97</sup>

But finding the appropriate form and language for his geognostic book presented him with a major challenge. When he was faced with a similar challenge many years later, he expressed it as follows.

"When we speak of primal beginnings, we should speak primally, that is, poetically. For everything that is subject to our daily language, experience, reason, judgment, all

<sup>94</sup> Letter to Charlotte von Stein, Ilmenau, 5 October 1784.

<sup>95</sup> Letter to Johann Heinrich Merck, Weimar, 2 December 1784.

<sup>96</sup> Letter to Charlotte von Stein, Erfurt, 7 December 1781.

<sup>97</sup> Letter to Charlotte von Stein, Ilmenau, 7 June 1785. The minerology book which encouraged Goethe was written by Richard Kirwan (1733-1812) an Irish chemist and geologist, who lived in London between 1768 and 1787. He published his *Elements of Minerology* in 1784.

# is inadequate. When I immersed myself into these desolate chasms, it was the first time that I envied the poets."98

If he, Germany's greatest poet, envied the ancient poets their powers of diction (although he disagreed with their interpretations of Earth's creation) where could he find the words to describe his own vision of the genesis of Earth's rocky surface? Goethe's geognostic conceptions were deeply personal, and what he was attempting to describe in 1785 were his encounters with the very ground of existence.

*Granite II* (See appendix) opens with a discussion of the use of granite by the ancient Egyptians, and a reminder to his readers that there was complete agreement among geologists that granite "makes up the very foundation of our *Earth*". De Saussure had first written about the belief that the Egyptians manufactured granite artificially because handling such large masses appeared to defy human strength. The travellers referred to were all geologists; de Saussure, von Charpentier, and others.<sup>99</sup>

Following a physical description of granite as broad as it is brief, Goethe puts aside his role as a geognost and apologises for introducing a personal note, in which he explains why the author of a wildly popular novel<sup>100</sup> is now writing about his geognostic beliefs and discoveries; why his interests have changed from the human heart, the "*most vulnerable part of creation*" to granite, the "*most unshakable son of Nature*".

He himself had suffered much "from the inconstancy of human sympathies, from their sudden changes in myself and others", and asks that his readers do not begrudge him "that sublime serenity afforded us by the solitude and silence of vast soft-spoken Nature".

The vision he described was not speculation, but a far reaching Imagination. The images he used to describe his Imagination – bordering on a super-sensible experience – he took from the literature he had studied; Buffon, de Saussure, Charpentier, and others.

He imagined himself sitting high up on a mountain, between the *forces of Earth and the influences of heaven*, overlooking a wide vista, much as he would have experienced it on his first ascent of the Brocken in 1777, when he had been surrounded by low cloud in the valleys with only the highest summits visible above an endless sea of white, illuminated by the sun. Recalling the scene eight years later, he saw as in a vision a primal world before the primal ocean had begun to recede. His description took on a highly personal and religious note, sitting as he was as close as possible to the canopy of heaven. The granite cliffs were "before all *life, and are above all life*", and he felt the need to "bring the being of all beings a sacrifice".<sup>101</sup>

<sup>98</sup> Wolf von Engelhardt (2003) Goethe im Gespräch mit der Erde, p.324. These were the words Goethe used to introduce his dictation of a short piece directed against the ideas of Cuvier in November 1826. The challenge was to avoid postulating the cataclysmic events imagined by Cuvier, and to think about primal elemental forces and events not as catastrophic, but as more energetic, gravity as stronger, chemical attraction as more vigorous. Georges Cuvier (1769-1832) was a French naturalist and palaeontologist.

<sup>99</sup> Wolf von Engelhardt (2003) Goethe im Gespräch mit der Erde, p.106.

<sup>100</sup> The Sorrows of young Werther, first published in 1774, revised in 1787.

<sup>101</sup> This is what he wrote to Charlotte von Stein after his first ascent of the Brocken, when he "offered on the devil's altar dearest thanks to my god." Letter to Charlotte von Stein, 10 December 1777.

From this high observation point at the beginning of time he (following the epochs of Buffon) journeyed through geological time until he arrives in the present age. The *"all encircling"* ocean is taken from Buffon's third epoch, and the *"scenes of destruction"* from his fourth.

Descending from sublime visionary heights down to Earth again the text ends with a warning to geologist that they learn to clearly distinguish granite from other rock types. The vision he describes in *Granite II*, which he had hinted at in his poem *"Harz Journey in Winter"* and on other occasions, had become a part of his life. Just how important this vision continued to be is shown by a letter Goethe wrote many years later.

In 1820 the author, translator and critic Carl Friedrich Kannegießer offered Goethe an interpretation of "*Harz Journey in Winter*".<sup>102</sup> Goethe agreed with Kannegießer's interpretation as one of several possibilities, and explained how he had come to write the poem all those years ago in 1777.

"I really did stand on the seventh of December<sup>103</sup> at noon, overlooking boundless snow, on the summit of the Brocken between those foreboding granite crags; above me a most perfectly clear sky, from which the sun burned down fiercely, so that the wool of my greatcoat exuded the familiar singed smell. Below me I saw a motionless sea of undulating clouds covering the region in all directions, and only hinting at the hills and valleys below by the higher and lower altitudes of the cloud layers."<sup>104</sup>

Replace the "*undulating clouds*" with "*the ancient waters*", and the scene he described to Kannegießer is the same as that described in his vision of *Granite II*. Even the "*burning sun*" in the vision was remembered in the letter.

Goethe likewise never deviated from his conviction that granite is the "most ancient and worthy monument of time". In 1815 he sent two pieces of granite to his friend, the art historian Sulpiz Boisserée: "Two talismans, one for you, the other for giving away. They are the first formations of the emerging world known to us. Trebra calls them crystallized granite; I agree. No one will understand them. Whoever looks at them attentively is protected from common thoughts, the true hallmark of a talisman!"<sup>105</sup>

# More Thoughts and Contemplations

During the summer of 1785 Goethe also wrote four shorter texts on granite, in which he developed details intended for his treatise. He made additional notes in the form of extracts and summaries of several books by leading geologists which supported the ideas expressed in *Granite II*. He had not discussed the actual origins of granite in *Granite I* and *Granite II*, and in these additional texts he attempted to bring clarity to this all important question. They deal mainly with the crystallization of granite from a "universal" or "general" solution, a kind of primal substance, a prima materia<sup>106</sup> from which all physical matter was derived. He had searched for this "virgin Earth" as he then called it, in the experiments he

<sup>102</sup> Carl Friedrich Ludwig Kannegieβer (1781-1861) was an author, translator and critic well known for providing explanations of Goethe's poetry.

<sup>103</sup> According to his diary on the 10th.

<sup>104</sup> In Kunst und Altertum III, 2 (1821).

<sup>105</sup> Letter to Sulpiz Boisserée (1783-1854), 21 December 1815.

<sup>106</sup> A formless primeval substance regarded by alchemists as the original material of the universe.

had carried out during his convalescence in Frankfurt in 1769. In the texts he composed in 1785 he referred to this primeval state as the Greeks did, as *Chaos*. It contained as a potential everything we find on earth today, but Goethe was unsure how to describe its consistency: "Wet and dry solutions. The same solution of the first Chaos. Not only of the first Earth, but of all salts and metals."<sup>107</sup>

During the previous winter he had experimented with the crystallization of silver and other metals<sup>108</sup> held in solution: "In my parlour 'Arbor Dianae'<sup>109</sup> and other metallic vegetation is germinating. . . I wouldn't want to, and can't tell you the directions I'm going in all the kingdoms of Nature. It doesn't bear thinking about, the silent Chaos separating itself more and more beautifully, and purifying itself in the process of becoming."<sup>110</sup>

He also had in mind his work with Herder: '*The multitude of active powers and elements from which the Earth was formed contained, probably, as a Chaos all that was to be, and could be, on it. In cyclic periods of time, Air, Fire, Water, and Earth arose from spiritual and material condensation points (stamina).*'<sup>111</sup> "*As soon as granite, the nucleus of our Earth, existed there was also light, which in the thick vapours of our Chaos acted perhaps as fire.*"<sup>112</sup>

Goethe's most detailed attempt to describe the genesis of granite is given in "*Epochs* of *Rock Formation*", a set of notes bearing testimony to his struggle to describe in words the state of granite before it became physically manifest. An intimate association of *Fire* and *Water* with no sign of "*enmity*" between them, somehow gave birth to Earth-granite and Air-atmosphere.

It contained the components of granite in a state of solution. They began to crystallize in the first epoch of rock formation. Goethe did not assume crystal formation as a result of cooling, nor did he agree with Buffon that the cracks and crevices we see in the rocks today were caused by cooling. They are themselves a sign of crystallization.

Epochs of Rock Formation (1785) Epochen d	ler Gesteinsbildung
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When our Earth formed into a solid body its mass was in a more or less liquid state. This mass was not simple, but its constituent parts were intimately (innigst) dissolved. The solution was brought about by an internal fire, or rather the mass was kept in an equilibrium solution by an internal fire that cannot be compared to a melting fire. The core of the Earth crystallises itself, and is probably the heaviest mass. The outermost crust of the core is granite. It is likewise crystallised, in its innermost ... [gap] The different parts of the mass have drawn together and stayed together. Quartz, feldspar, mica. In its external aspects, because it shows itself in regular forms. What has been observed. Cracks and crevices due to crystallisation, not due to cooling. The internal fire appears not to have had such an enmity with the water as that which stemmed from it (das Entbundne). The water helped keep the first groundmass (*Grundmasse*) in solution; it covered all the mountains of the world. From this general solution granite was the first to precipitate, it crystallised itself first. But the enormous ocean was still a long way from becoming clear and pure. All the parts that make up granite, with many volatiles, still clouded the water; the most fleeting hovered in the atmosphere above the waters, alternating from time to time (with the dissolved volatiles) The first epoch of granite is simple and widespread all over the world. After granite the next formation to precipitate was a tremendous mass of clay and mica, (appearing as gneiss and slate) which everywhere covers the granite to a certain height. This was also very widespread but not as simple. This precipitation took place in water. It happened right after the granite had crystallised itself, because we find this type of rock grown into the granite, even alternating with it. Gneiss is the granite which precipitated from the water after the first base foundation, hence its banded appearance. Translated from https://www.xn-gedichteundzitatefralle-tpc.de/2020/01/jwvgoethe-aphorismen-geologie.html

There is no mention of *Chaos* in this set of notes. Here Goethe appears to have been thinking of a "*more or less liquid state*", whose constituent parts were "*intimately dissolved*" and held in equilibrium by an "*internal fire*". This hot, viscous, primordial fluid must not be confused with a hot magma. Fire and Water co-existed, as there was no enmity between them. After granite had appeared "*the enormous ocean was still a long way from becoming clear and pure*". The fiery liquid gradually cleared as gneiss, schists, and slate (*Tonschiefer*) were formed, and the ocean gradually became *clear and pure*.

Mountain ranges like the Alps or the Harz were for Goethe formations of enormous crystals which precipitated from the waters of a primal ocean – this being no ordinary ocean, but one imbued 'with natural powers, pregnant with life' (from Herder). The peaks of these mountains (Mont Blanc, the Brocken) protruded from the waters as they began to recede.<sup>113</sup>

"Cracks and crevices due to crystallization, not due to cooling" rejects Buffon's hypothesis that granite crystals were formed from an initially hot, but gradually cooling magma, (which is how granite formation is understood today - slow cooling deep under the Earth allowing large crystals to grow). Goethe had in mind a different crystallisation process, one having its origin in *Chaos*, in which neither cooling nor gravity played a role.

"Granite was formed by crystallization. There is no evidence of gravity in it. So also the rocks immediately next to it. The further away rocks are from granite, the more gravity takes over, until finally stratified rocks show only a trace of crystallization."<sup>114</sup> There is a gradual change from the granular composition of granite, on which gravity

had no effect during its formation, to the stratified composition of sedimentary rocks, whose horizontal beds reveal the effects of gravity.

In Goethe's vision the genesis of granite crystals took place before gravity could have an effect on them; i.e. before they became physical. The "universal solution" from which granite formed was a potent one. It contained not only potential substances, but also the potential "simple Earthly qualities" of these substances. See the text fragment Theory of Rock Formations.

The note, also from 1785, entitled 'Quartzose Mudstones' (Quarziges Tongestein) describes what happened immediately after granite and gneiss had crystallized, at which stage "the enormous ocean was still a long way from

#### **Theory of Rock Formations**

*Zur Theorie der Gesteinslagerung* (1785) When one sees how intimately Nature unites, one can deduce the intimate solution in which it must have held the substances before they became firm and solid. How difficult it is for analysis to separate what Nature has united, and how much is lost in each separation. Would one therefore stray far from the goal if one imagined all known and unknown Earthly substances or simple Earthly qualities, in a universal solution within the first Chaos? What we roughly refer to as elements, ores and other solids, were once intimately conjoined (*innig verbunden*).

This was all the more possible and necessary, since one element combined with another dissolves more of a third, and so forth, that a general solution seems as possible as essential.

<sup>113</sup> Goethe initially imagined that granite mountain ranges had existed even before the primal ocean had been created, but later accepted the first stage of Werner's Neptunist theory – granite crystallizing from the primal ocean.

<sup>114</sup> Quoted in Margrit Wyder (2013) *Gotthard, Gletscher und Gelehrte: Schweizer Anregungen zu Goethes Naturwissenschaftlichen Studien,* p56. Zurich Open Repository and Archive. https://www.zora.uzh.ch/id/eprint/91863/1/Wyder\_Goethe.pdf. See also https://elischer-goethe.mtak.hu/de/notiz-und-zeichnung-uber-den-granit/

*becoming clear and pure*". Schists and greywacke were deposited as sedimentary rocks in stepwise gradations (*Abstufungen*) of mudstones.<sup>115</sup> Their different mineral compositions were a result of the changing chemical composition of the primal ocean. As each layer of rock settled on the ocean floor, the concentrations of the various dissolved and suspended minerals also changed, so that the next layer to be deposited had a different mineral composition.

# Later Writings

In 1820 Goethe began to bring order into his natural scientific papers in a series of short articles he published in two volumes as *Zur Naturwissenschaft überhaupt* ("On the natural sciences in general"). In one of these articles he summarised his observations of granite's crystalline structure by noting that its three components "exercise equal rights" in their formation.

"It soon became clear that under the same name (i.e. granite) one had to understand a range of rocks all different in appearance. Syenite was identified, but even then there remained an unmistakable variation. The main characteristic however was shared by all; it consisted of three intimately connected components, related in content, different in appearance; of quartz, feldspar, and mica, which exercised equal rights of togetherness. Of none could it be said that it is the containing (element), of none that it is contained. But it should be noted that in view of the great variety, one component could gain a preponderance over the other.

During my frequent stays in Karlsbad it was particularly noticeable that large feldspar crystals, which themselves still contained all the components of granite, accumulated in the local rocks, making up their largest proportion. We need only mention the district of Ellbogen, where it can be said that Nature has exceeded herself with crystalline feldspar formation, and has completely spent herself. But it is at once apparent that the other two components are breaking away from the collective. Mica in particular concentrates in flakes, and one can see that the Trinity is endangered. now the mica begins to play a leading role, forming itself into sheets, and forcing the remaining components to accommodate themselves to this situation as well. But the separation continues. On the way to Schlackenwalde we find large stone masses in which mica and quartz are completely separated, until we finally reach rock masses that consist entirely of quartz, but contain flecks of mica shot through with quartz, so that it is hardly recognisable as mica."<sup>116</sup>

But the "*equal rights*" could be disturbed if one component got the "*upper hand*" over the others, so that a relative increase in the proportion of feldspar resulted in large feldspar crystals between much smaller quartz and mica crystals, and a relative increase in mica would give rise to the banded structure of gneiss.

Analysis of his careful measurements of strike and dip, of his sketches, and of the drawings so carefully prepared by Kraus had to wait until 1824 before he used them as evidence for his ideas on the solidification of granite - in two texts describing the formation of granite from the point of view of solidification processes.

<sup>115</sup> Mudstones are fine-grained sedimentary rocks made up of quartz and clay minerals. They include claystone, mudstone, siltstone, slate and shale.

<sup>116</sup> About Geology, in particular the Bohemian, Zur Naturwissenschaft überhaupt (1820) Vol I, Book 3.

"Large inorganic masses are formed by solidification according to a rule. We used a latticework as a model, and included in the catalogue a collection of drawings prepared for this purpose many years ago, und until now carefully preserved."<sup>117</sup>

"Not only rocks of original mountains, but even red sandstones and later deposits, have the need to separate in several regular directions, so that parallelepipeds arise, which in turn are inclined to separate diagonally. I discovered this general law forty years ago on the Harz, and have in my possession the most beautiful drawings prepared by an excellent artist. Even back then I was not averse to believing that these great inner divisions of mountains were related to telluric and cosmic effects; the North-South line long familiar to us, but the West-East line only recently revealed."<sup>118</sup>

He had already attempted, starting in 1804, to construct a three-dimensional model of the fissuring process in granite using coloured wax. It was intended to be part of a relief model along the lines of the one he had seen in Switzerland.<sup>119</sup> But in 1807 he handed the project to the botanist/geologist Karl Constantin Haberle, who soon abandoned the project altogether, although he did publish a preliminary sketch of

Goethe's proposed model in his book *The Mineral Kingdom* (1807), which is all that is known about it.

Nevertheless, the importance Goethe attached to the orientation of granite blocks and mountain ranges never left him. He had probably read in Plato's *Timaeus* that the cardinal points of the compass provided the framework on which Earth's ordered structure is established. This had a decisive ring of truth for him, a conviction which was confirmed as he stood on top of the Gotthard pass for the second time in November 1779. He later wrote about this particular mountaintop experience:



Haberle's sketch of Goethe's proposed model of fissuring in weathered granite. from Max Semper (1913) Die Geologischen Studien Goethes, p60.

"The mountains of Schwyz and Unterwalden, chained to those of Uri arise from midnight (the North). From morning (the East) the mountains of Graubünden, from noon (the South) the Italian Vogteien arise, and from evening (the West) the double range enclosing Wallis presses towards it through the Furka.

Not far from here are two small lakes, one of which feeds the Tessin river running through gorges and valleys to Italy, the other in a similar manner feeds the Reuss running down to the Vierwaldstättersee. Not far from here is the source of the Rhine, which flows towards the morning (East), and if one adds the Rhône, which arises at the foot of the Furka and flows towards the evening (West) through Wallis - we are

<sup>117</sup> *Gestaltung groβer anorganischer Massen* (Formation of Large Inorganic Masses) in *Zur Naturwissenschaft überhaupt*, Vol II Book 2 (1824).

<sup>118</sup> *Gebirgsgestaltung im Ganzen und Einzelnen*, (The Formation of Mountains in General and in Particular) in *Zur Naturwissenschaft überhaupt*, Vol II Book 2 (1824).

<sup>119</sup> This model, the first of its kind, was created by Franz Ludwig Pfyffer von Wyher (1716-1802). Goethe had seen the model in Luzern in 1779, and subsequently wrote to von Knebel, "*There you visit General Pfyffer, who made the remarkable model of the surrounding area*".

here at a crossing point, from which mountains and rivers flow towards all four cardinal points of the compass."  $^{120}$ 

Sometime after 1820 he tried again to bring clarity to his convictions.

"Granite mountains are not made up of whole unseparated masses; but are divided in a variety of ways. The first main fissuring divides them lengthways from top to bottom. This results in rock walls of considerable width. The middle wall usually stands vertically, the following ones partly so. In some cases they are inclined inwards towards the middle so that the side of one wall lies underneath another, and in line with the direction of the mountain range – transversal fissures (Transversalklüfte). These walls are again crossed by other cracks. at first we notice that some run horizontally, or more or less deviate from the horizontal. Making use of a common mining expression, I have called these seam fissures (Flöz-klüfte) (i.e. horizontal fissures). There are others which cross the first more or less perpendicularly, and may be called vertical fissures. (Gang-klüfte). In this way sections are created which are made up of large parallelepipedal or rhombic masses, but even these are not unbroken, for they are again separated by lesser fissures. Therefore allow me to call the first fissures main seam and main duct fissures (Haupt Flöz-klüfte and Haupt Gang-klüfte).

This paragraph is best understood if the "*vertical fissures*" are imagined as running from North to South, and the "*transversal fissures*" (which also lie in a vertical plane) from West to East. But he felt himself defeated by his lengthy description which told the reader very little except that the structures he described appeared more random than ordered. He therefore provided a chart, illustrating the three main directions he believed determined the order he was looking for.

The subdivisions are not as simple, nor are they as regular. – The fissures of these intermediate masses might run parallel with the main fissures, or they might deviate

from them. They might split into horizontal benches, or perpendicularly into vertical blocks. They might separate into several layers while the block below remains in one piece, which then pushes itself forward like a moving barricade. A crevice might run over into the next block, or it might lose itself. It would be impossible to give a clear picture of all this with mere words. that is why for those interested parties unable to climb the higher mountains, what has been said so far will be made clear by means of a chart."121



A three-dimensional lattice cuts the rock into imaginary cubes. The actual fissures are drawn in thicker lines. From Bosse (1985) p 177.

<sup>120</sup> From *Briefe aus der Schweiz* (Letters from Switzerland), 13 November, 1779. <u>http://www.gutenberg.org/cache/epub/2402/pg2402-images.html</u>.

<sup>121 &</sup>quot;Zur Naturwissenschaft überhaupt", Quoted in max Semper (1913) Die Geologischen Studien

The chart is a two-dimensional sketch of what should be imagined in three dimensions. He explained his intentions as follows:

"In order to facilitate the concept of the formation of such stone masses one may imagine that a latticework passes through them, six sided, whereby many individual solids are cut off, cubes, parallelepipeds, rhombohedrons, columns, or slabs, whatever the case might be.

Here however it must be remembered: this separation is to be regarded as ideal, as potential, according to what is possible, and is therefore bound as much to an eternal rest, as to opportunities of earlier or later appearances, since not all intended separations achieve reality every time, and can perhaps be shown to actually exist only occasionally. In large masses the shapes indicated above soon emerge individually formed, but they may also be swallowed up in such large masses, and must be imagined as hidden within them.

By means of this idea the draughtsman too develops an ability to represent rock walls and mountain peaks correctly and truthfully, by elucidating the invisible through the visible, and being able to depict the general character on small scales as well as on large. The original structure (Urgestaltung) becomes clear to him, he understands how the same rock can appear as a slab or a column, and yet also as a wall, and how all these phenomena are based on related forms.

We have attempted such a hypothetical depiction of large rocks on a chart overlaid with grid lines; a simple landscape in which one hardly notices the overlying lattice drawn onto the picture."<sup>122</sup>

It is doubtful whether Goethe ever came across a mountain range or granite outcrop approximating his ideal, but together with several other strongly held beliefs, it provided him with an inner certainty from which he never deviated.

# Urgestein

Goethe never used the term "*primal rock*" (*Urgestein*) as a concept or model from which all continental rocks might have been derived. He used the term *Urgestein* only five times,<sup>123</sup> specifically to refer to what is today called 'parent rock', an original rock from which a younger rock (or soil) has been derived. In this sense all igneous rocks are the parent rocks of metamorphic and sedimentary rocks. Only once did he refer to a (weathered) granite as *Urgestein*. In 1785 on a visit to the Luisenburg (see below), he noted that the sand and clay making up the soil were obviously derived from the local granite parent rock (*Urgestein*), and many years later he described a "*differentiated granite*" from Karlsbad, explaining the differentiation as brought about by contact of the parent rock (*Urgestein*) with the hot underground water giving rise to the hot springs.<sup>124</sup>

The other three occasions were in relation to the changes undergone by volcanic tuffs and obsidian as a result of heat and volcanic vapours. If Goethe did ever imagine an *Urgestein* in the sense of the *Urpflanze* he once imagined (but later discounted), there is no record of it in his geological writings.

Goethes, p59.

<sup>122</sup> Gebirgsgestaltung im Ganzen und Einzelnen, in Zur Naturwissenschaft überhaupt, Vol II Book 2

<sup>123</sup> Johann Wolfgang Goethe, *Die Metamorphose des Granits* (1985) collected and commented by Dankmar Bosse. Verlag Freies Geistesleben, p. 346.

<sup>124</sup> See *Problematical*. In Volume 1, Part 3 of "*Zur Naturwissenschaft überhaupt*", Goethe's first collection of natural scientific writings, published in 1820.

## Detour in the Fichtelgebirge

In July 1785 Goethe was on his way to the popular Karlsbad spa in Northern Bohemia,<sup>125</sup> the first of many summer visits to take the waters for his health and to socialize. He was travelling with his friend Karl Ludwig von Knebel, and Friedrich Gottlieb Dietrich, a young botanist who was assisting him with his plant studies at the time. There were no courtly protocols at the Bohemian spas, and it was possible for the nobility to mingle with the untitled civilian middle classes relatively informally. Goethe the politician and administrator benefited as much from this informal approach as did the author, the artist, the music lover, the botanist, and the geologist. Duchess Louise<sup>126</sup> and her entourage were there, and important friends such as Charlotte von Stein and the Herders had also arrived from Weimar.

He had long wanted to examine the granites of the *Fichtelgebirge*, and had planned his journey to Karlsbad carefully, staying in the area for four days. He hiked up the granite summit of the *Ochsenkopf* (Ox's head), measured the strike of the crevices in the granite blocks with his geologist's compass, and made numerous drawings. His



Summit of the Ochsenkopf.

sketch shows clearly the vertical and horizontal cracks which interested him.

He was particularly interested in the 'rock labyrinth' – huge granite boulders strewn about chaotically in a valley between two hills – near Luchsburg, which he visited on 3 July. Goethe noted that the sheer size of the granite was remarkable, and that "few were in their original position, although they were more pushed together than collapsed. They make the most magnificent stacks."

Goethe's sketch of 1 July 1785. From Bosse (1985) p 230.



Rock labyrinth in the Fichtelgebirge Fichtelgebirge.net

<sup>125</sup> Karlovy Vary, today a spa town in the Czech Republic.

<sup>126</sup> Louise Auguste of Hesse-Darmstadt (1757-1830) was married to Karl August one month after his 18<sup>th</sup> birthday. She was a sophisticated woman, but shy and withdrawn, and no match fer her worldly husband. She had a keen interest in German poetry, an interest which she was able to share with Goethe, who recognized her shyness, and took her under his wing.

July 3 had been a blustery day, and von Knebel wrote in his diary: '*This morning we* drove to the Luchsburg under heavy thunderstorms. We climbed the magnificent granite rocks, which are still towering up, and lying about in scattered piles of rubble. Storm and rain forced us to go down again, and I went back alone with my valet, while Goethe stayed to draw.'

In spite of the inclement weather Goethe was keen to test the theories he had thought about all summer long. Earlier geognosts had attributed the formation of the rocky labyrinth to strong earthquakes and 'precipitous mountain peaks plunging into deep chasms and smashing into a thousand pieces'. Goethe disliked violence of this kind, and looked for other clues which might explain the origin of the rocky disorder. He noted the quartzite sand on the ground, and that the feldspar and mica had weathered into clay.

He visited the site again in 1820, and concluded that the chaotic tumbling of the granite blocks was due to slow natural weathering processes taking place within the fissures he had thought about so long. He made sketches illustrating his conclusion. On the left he showed the granite blocks in their presumed original

state, shading in the subsequently weathered parts. The drawings on the right show the blocks in the condition in which he found them. In his "*Tages- und Jahresheften 1820*", he wrote a clear (and correct) explanation for how the chaotic assemblage had come about.

"My abhorrence of violent explanations, which were underpinned here with assertions of abundant Earthquakes. volcanoes, floods, and other titanic events, was increased on the spot, because with a calm look it was easy to recognize that by a partial dissolution and partial persistence of the parent rock (Urgestein), resulting in them tumbling and dropping down, admittedly to an enormous extent, this astonishing phenomenon has come about naturally. The subject was also developed in words and images in my scientific notebooks; I doubt, however, that such a tranquil view of the matter will suffice for this turbulent age." 127

The weathering of the granite began as soon as it had become exposed to the elements many millions of years ago. The subtropical climate prevailing during this time intensified the chemical weathering processes which also penetrated into the



Engraving illustrating weathering processes at the rock labyrinth at based on Goethe's 1820 sketch. https://www.researchgate.net/figure/JW-Goethe-Die-Luisenburg-bei-Alexanders-Bad-Werke-Vollstaendige-Ausgabe-letzter\_fig3\_233664221

depths through the cracks and fissures which had been caused by gradual cooling of the granite pluton. The glacial periods that followed promoted the physical

<sup>127</sup> In Die Luisenburg bei Alexanderbad, in Zur Naturwissenschaft überhaupt (1820).

weathering processes: Large temperature fluctuations and the expanding power of ice caused the granite to weather into large rounded blocks (so-called woolsack weathering). The weathering products (clays and sand) were washed out of the gaps between the still intact blocks during warmer periods. The now isolated granite blocks were thus able to slowly change their position relative to each other, a process that continues today at barely detectable rates.

By 1820, the inhospitable, difficult to access "Luchsburg" had become a tourist attraction, renamed "Luisenburg" in 1805 on the occasion of a visit by the Prussian royal couple in honor of the young queen. Today, part of the Luisenburg is used as an open-air theatre.

After 1785 Goethe wrote no more about granite, or any other rocks, until 1805, when he started preparing notes for his natural science classes at the *Mittwochgesellschaft* (Wednesday society) made up of the ladies of the court with Karl August, von Knebel, and Wieland occasionally present. The intervening years were filled with his botanical studies, his Italian journey, and his collaboration with Schiller (who died in 1805).

# **Postscript – A Conversation with Daniel Falk**

Granite continued to play an important role in Goethe's life, and he from time to time spoke with great eloquence about it to his friends. One such friend was the author and philanthropists Johann Daniel Falk (1768-1826).

Falk was born in Danzig, studied theology in Halle, but soon turned to ancient and modern literature. His talents were recognised by Wieland who introduced him to Goethe and Schiller in 1792. He moved to Weimar in 1797, and collaborated with Goethe on his scientific work, especially the experimental work described in *Theory of Colours (Farbenlehre*). After the battle of Jena in October 1806, Falk, on the recommendation of Wieland, was appointed to positions under the French authorities, first as an interpreter, then as secretary to the French legate, with whom he negotiated the French requisition claims on behalf of the people of Weimar. His skills at mediation rendered his fellow citizens such good service that in 1807 Karl August appointed him a counsellor of legation. After another war between the French and the Germans in 1813, and the death of all four of his children, he devoted his life to the care of orphaned and neglected children. His work is remembered in the *Lutherhof* in Weimar, the home he provided for those in his care, where he lived from 1821 until his death in 1826.

Falk had the habit of writing down his conversations with Goethe. In October 1806 he recorded the following discourse, which once again brings into sharp focus not only Goethe's strong attachment to granite, but also his method of reading the *"runes of Nature"*, which are always *"grand and beautiful"*<sup>128</sup> Falk wrote:

'Faithfully devoted to Nature as Goethe was, he also loved to talk about her works and products with mysterious preambles and hints. So he once led me to his natural history collection and said, pressing a piece of granite showing highly unusual transitions into my hand: "Here, take this old rock as a memento from me! If I ever find an older law in Nature than that which is visible in this object, I will also honour you with an example, and take this one back. Until now I don't know of any, and I doubt very much that I will ever come across anything similar, let alone better,

<sup>128</sup> See footnote 85.

of this kind. Look carefully at these transitions, on which everything in Nature depends in the end. As you can see, some things are there that seek each other out, penetrate each other and, when they have become one, give rise again to a third.<sup>129</sup> Believe me, here is a piece of the oldest record of humankind. But you have to discover the connection yourself. Those who don't find it, aren't helped by being told. Our naturalists love too much the details. They spell out for us an inventory of the whole world, and are fortunate in having for each individual component a special name. This is clay! That is sand! This is that and that is this! But how am I made better if I also hold all these designations in my mind? Whenever I hear about this sort of thing, the old reading from Faust comes to mind:

Encheirisin naturae chemistry calls it, Mocks itself, knows not what befalls it.<sup>'130</sup>

What do the parts help me? and their names? I want to know what inspires (begeistert) each individual part in the universe so strongly that it seeks out the other, either serving it or dominating it, depending on how the law of reason common to them all, advances it, to a greater or lesser degree, to this or to that role. But it is precisely in this question that the deepest silence prevails everywhere.<sup>""131</sup>

#### Appendix

"He who living things would study Drives first the spirit from the body, And then the parts holds in his hand He only lacks the spiritual band. Encheirisin naturae chemistry calls it, Mocks itself, knows not what befalls it."

<sup>129</sup> See Text Box Theory of Rock Formation.

<sup>130</sup> From Faust I, Faust's study, Mephistopheles is talking to the student:

Encheirisin naturae = Manipulation of nature

<sup>131</sup> 

 $<sup>\</sup>label{eq:http://www.zeno.org/Literatur/M/Goethe,+Johann+Wolfgang/Gespr%C3%A4che/%5BZu+den+Gespr%C3%A4chen%5D/Zeitlich+ungewi%C3%9F$ 

#### On Granite (Granite II)

Even in antiquity granite was recognised as a mineral worthy of note, and it has become even more so in our own times. The ancients did not know it by this name; they called it syenite after Syene, a town on the border of Ethiopia. The enormous masses of this stone inspired the Egyptians with the idea of creating monumental works. Their kings erected obelisks of it to honour the Sun, and because of its variegated red colour it was soon named as Fiery-Coloured. The sphinxes, the statues of Memnon, and the enormous columns continue to amaze travellers, and in our own time the powerless Lord of Rome is raising up the remains of an ancient obelisk, which his omnipotent predecessors brought intact from foreign lands.

Because of its granular appearance, this type of rock was more recently given the name by which it is known today. In our own day it was subjected to a brief period of humiliation before it rose to the reputation in which informed natural scientists now hold it. The tremendous masses of the obelisks. and the extraordinary variations in their granularity misled an Italian scientist into believing that the Egyptians had moulded them artificially from a fluid mass.

But this view was soon abandoned, and the dignity of this rock was finally secured by the excellent observations of many travellers. Every journey into unknown mountains reaffirmed the longstanding experience, that the highest and deepest lying rock is granite; now better known, made easier to distinguish from others, it makes up the very foundation of our earth, upon which all other mountains were laid down. It lies unshaken in the deepest bowels of the earth, its high ridges ascending to summits which the surrounding waters have never reached. This much we know of granite, and little more. Composed of familiar materials, assembled in mysterious ways, its origins can be traced back neither to fire nor to water. Highly diverse in the greatest simplicity, its components intermingle in an infinite variety. The location and relationship of its components, its durability, and its colour, vary from mountain range to mountain range, and the rocky masses of each range often exhibit variations every few paces, although the whole always remains consistent. And so anyone who knows the fascination natural mysteries hold for man will not be surprised that I have departed from my usual field of observation, and turned with passionate fervour to this one. I do not fear the accusation that it must be a contrary spirit which has led me away from my contemplation and depiction of the human heart, the youngest, most diverse, most versatile, most fluctuating, and most vulnerable part of creation, to the observation of the oldest, firmest, deepest, and most unshakable son of Nature. It will happily be conceded that everything in Nature stands in precise relationships with each other, and that the questing spirit resists being denied what it can attain. Yes, grant me, who has suffered much, and suffers still, from the inconstancy of human sympathies, from their sudden changes in myself and others, that sublime serenity afforded us by the solitude and silence of vast soft-spoken Nature. Whoever has a sense of this, follow me.

Filled with these sentiments I approach you, most ancient and worthiest monuments of time. Sitting high up on a barren summit, and overlooking a wide area, I can say to myself: Here you rest directly on ground which reaches down into the deepest regions of the earth, no newer strata, no accumulation of alluvial debris has been deposited between you and the solid foundation of the primal world. You do not pass over a perpetual grave as in those beautiful fertile valleys, these peaks have never given birth to anything alive, and have never engulfed anything alive; they were before all life, and are above all life. At this moment, when the inner attracting and moving forces of the earth have as it were a direct effect on me, and the influences of heaven float closer about me, I am attuned to higher reflections of Nature, and as the human spirit brings life to everything, here too a parable is stirring within me, the majesty of which I cannot resist. This mood of solitude, I say to myself, as I gaze down from the barren heights, and barely discern in the distance below a faint patch of low growing moss, this mood

of solitude I say, will affect all who desire to open their souls only to the oldest, original, deepest feelings for the truth. Yes, he can say to himself, here on the oldest and everlasting altar, raised directly on the ground of creation, I bring the being of all beings a sacrifice. I feel the first and most enduring origins of our existence, I survey the world with its harsh and gentle valleys, and its distant fertile meadows. My soul is exalted beyond itself and over all the world, and yearns for heaven which is so near. But soon the burning sun will call back thirst and hunger, his human necessities. He will seek out the valleys over which his spirit has soared; he envies the inhabitants of these more fertile plains with their abundant springs, who have built their happy homes on the debris and rubble of error and opinion, scratching open the dust of their ancestors, and quietly meeting the meagre needs of their daily existence within their narrow bounds. Prepared by these thoughts, the soul penetrates into past centuries, recalling all the experiences of careful observers, all the assumptions of fiery spirits. This cliff I tell myself, rose more craggy, more jagged, and higher into the clouds, when its summit still stood as an island encircled by the ancient waters. Around it surged the spirit brooding over the billowing waves. In the vast depths the higher mountains were formed from the rubble of the primeval mountains, and from their debris and remains of its fossil denizens the later and more distant mountains. Already the moss begins to spread, now the shelly inhabitants of the sea start their decline, the water ebbs, the higher mountains become green, everything begins to teem with life.

But soon this life is countered by new scenes of destruction. In the distance, raging volcanoes rise into the air, they seem to threaten the world with extinction. but the bedrock on which I rest remains secure and unshaken, while the inhabitants of the distant shores and islands are buried under the faithless land. I turn away from these far-ranging contemplations. and look at the rocks themselves, whose presence lifts my soul and makes it safe. I see their masses, here standing upright, there inclined, intersected by complicated cracks; here arranged in an orderly manner, there thrown into intricate piles one on top of the other. At first sight I am almost driven to exclaim: Here nothing is in its first, original condition, here everything is rubble, disorder, and destruction. This is exactly the opinion we will meet when we turn from direct observation of these mountains into the library, and open the books of our predecessors. Here we find it asserted on the one hand that the primal mountains are an indivisible whole as if cast in a single piece, on the other that they are separated by fissures into layers and benches which are crisscrossed by innumerable veins in all directions. Sometimes it is said that this rock is not stratified, but occurs as individual masses irregularly separated in a completely random fashion, at other times observers claim to have found strong stratification alternating with muddled confusion. How do we unite all these contradictions and find a guideline for our further investigations?

This is a task which I presently intend to undertake. Should I not be as fortunate in this as I would wish and hope, my efforts will nevertheless give others the opportunity to go further; for in observations even errors are useful, by drawing attention to themselves, and giving the sharp sighted opportunities to hone their skills. Here however a caution may not be unwarranted, more for foreigners if this treatise should come to them, than for Germans: Learn to clearly distinguish this rock type from others. To this day the Italians confuse a fine grained granite with a type of lava, and the French confuse it with gneiss, which they call foliated or second order granite. Yes, even we Germans, conscientious as we usually are in such things, have until recently confused granite with a conglomerate of quartz and varieties of hornstone chiefly found among layers of schist, as well as with the greywacke of the Harz mountains, a younger mixture of quartz and schist.