

# **The (im)materiality of Goethe's geology**

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This thesis is submitted for the degree of Doctor of Philosophy.

## **Prefatory declarations**

This thesis is the result of my own work and includes nothing which is the outcome of work done in collaboration except as declared in the Preface and specified in the text. I further state that no substantial part of my thesis has already been submitted, or, is being concurrently submitted for any such degree, diploma or other qualification at the University of Cambridge or any other University or similar institution except as declared in the Preface and specified in the text. It does not exceed the prescribed word limit for the relevant Degree Committee.

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# **The (im)materiality of Goethe's geology**

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## **Abstract**

My PhD project explores Goethe's writings on geology from the perspective of the interplay between materiality and immateriality. Specifically, I posit that Goethe's descriptions of mountains, mines and rocks focus in equal part on the material and immaterial characteristics of the object in question, without privileging one or the other. Drawing on Goethe's presentation of the role of the imagination in geological enquiry, his belief in the existence of generative forces within geological masses and his colour theory, inter alia, I demonstrate that Goethe's geological writings are shaped by the monist duality of (im)materiality. I explore this hypothesis with reference to Goethe's engagement with the project to reopen the mine at Ilmenau, which was a deeply formative experience for the development of his geological theories.

My thesis makes a contribution to two separate fields of enquiry. Firstly, within the sphere of Goethe studies, it sheds light on Goethe's geological work in general, which has been greatly under-researched compared to his endeavours in other scientific fields. In so doing, it also seeks to bring together the arguments pursued by many critics to date, who have primarily focused on either the material or the immaterial in Goethe's work, without attempting to create a synthesis of both. Secondly, it also represents a new avenue of enquiry for the burgeoning field of immateriality studies, which has primarily focused on disciplines such as anthropology and archaeology to date.

In light of Goethe's explicit emphasis on holism in his studies of the natural sciences, I contend that research on his geological writings (and, indeed, on the rest of his scientific output) should approach questions of materiality and immateriality with an eye to the same holism. In so doing, this paints a detailed picture both of Goethe's engagement with the issue of (im)materiality and of his understanding of the geological world.

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## List of abbreviations

- FA Goethe, Johann Wolfgang von, *Sämtliche Werke, Briefe, Tagebücher und Gespräche (Frankfurter Ausgabe)*, ed. by Friedmar Apel, Hendrik Birus, Anne Bohnenkamp et al. (Frankfurt am Main: Deutscher Klassiker Verlag, 1992)
- HA Goethe, Johann Wolfgang von, *Goethes Werke: Hamburger Ausgabe in 14 Bänden*, ed. by Erich Trunz (Munich: CH Beck, 2005)
- LA Goethe, Johann Wolfgang von, *Die Schriften zur Naturwissenschaft. Vollständige und mit Erläuterungen versehene Ausgabe im Auftrag der deutschen Akademie der Naturforscher Leopoldina (Leopoldina Ausgabe)*, ed. by Dorothea Kuhn and Wolf von Engelhardt (Weimar: Hermann Böhlau Nachfolger, 1947)
- MA Goethe, Johann Wolfgang von, *Sämtliche Werke nach Epochen seines Schaffens (Münchner Ausgabe)*, ed. by Karl Richter et al. (Munich: Carl Hanser Verlag, 1989)
- WA Goethe, Johann Wolfgang von, *Werke, Tagebücher und Briefe, hg. im Auftrag der Großherzogin Sophie von Sachsen (Weimarer Ausgabe)*, ed. by Paul Raabe (Weimar: H. Böhlau 1887-1919, 1990 reprint)

## Introduction

Auf einem hohen nackten Gipfel sitzend und eine weite Gegend überschauend kann ich mir sagen: Hier ruhest du unmittelbar auf einem Grunde, der bis zu den tiefsten Orten der Erde hinreicht, keine neuere Schicht, keine aufgehäuften zusammengeschwemmte Trümmer haben sich zwischen dich und den festen Boden der Urwelt gelegt, du gehst nicht wie in jenen fruchtbaren schönen Thälern über ein anhaltendes Grab, diese Gipfel haben nichts Lebendiges erzeugt und nichts Lebendiges verschlungen, sie sind vor allem Leben und über alles Leben. In diesem Augenblicke, da die innern anziehenden und bewegenden Kräfte der Erde gleichsam unmittelbar auf mich wirken, da die Einflüsse des Himmels mich näher umschweben, werde ich zu höheren Betrachtungen der Natur hinauf gestimmt, und wie der Menschengeist alles belebt, so wird auch ein Gleichniß in mir rege, dessen Erhabenheit ich nicht widerstehen kann. (WA II: 9, pp. 174-5)<sup>1</sup>

Sitting atop a mountain peak, the protagonist in Goethe's essay 'Über den Granit' undergoes an experience of dramatic proportions, overcome by the forces and influences of the mountain environment. As he immerses himself in his surroundings, he launches into a long monologue, expounding on the connection that is being forged between himself and the primeval origins of the natural world. This connection gives rise to an overwhelmingly strong sensation, with the protagonist almost suspended between the forces deep within the earth pulling him downwards and the ethereal, heavenly powers floating above him. Held in this thrall, the protagonist is granted access to a higher plane of knowledge and, ultimately, is presented with an allegory of the 'Menschengeist' that exudes an irresistible sublimity. This essay was written in 1784, the very same year that Goethe saw the culmination of his project to reopen the silver and copper mines in the Thuringian town of Ilmenau. As a result, geological questions were at the very forefront of his mind during this period. Goethe himself was well aware of the impact that this town had on him and his geological studies, telling Eckermann on 26 September 1827 'Was habe ich nicht drüben in den Bergen von Ilmenau in meiner Jugend alles durchgemacht!' (WA Anhang: 6, p. 222). Goethe's mining endeavours in Ilmenau revolved around rocks, and ores more specifically, as economic commodities, but this did not mean that Goethe simply saw geological material as mere matter, however – as this extract from 'Über den Granit' makes clear. These twin arguments lie at the heart of this thesis, namely, that, firstly, Goethe's

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<sup>1</sup> This quotation, and all others from Goethe unless otherwise explicitly stated, is taken from Johann Wolfgang Goethe, *Werke, Tagebücher und Briefe. Hg. im Auftrage der Großherzogin Sophie von Sachsen (Weimarer Ausgabe)*, IV sections, 143 vols, ed. by Paul Raabe (Weimar: H. Böhlau, 1887-1919, 1990 reprint), with in-line citations detailing the volume and page number in question. Accessed online via <<https://search.proquest.com/goethe>>.

geological endeavours in Ilmenau both explicitly and implicitly informed his subsequent understanding of this field, and, secondly, that this understanding is shaped by Goethe's unerring commitment to the inextricable duality of materiality and immateriality. As a result, this thesis explores the geological texts written by Goethe during, and inspired by, his Ilmenau period with a particular eye to their representation of (im)materiality, with the aim of illustrating the importance of both Ilmenau and (im)materiality in Goethe's geological thought.

Indeed, the experience that the protagonist in 'Granit II' undergoes is triggered by, and rooted in, the material world, foregrounded by the mention of the 'hohe nackte Gipfel' prominently positioned at the start of the phrase. This materiality is further reinforced by the reference to 'Grunde', a basis so very solid that it reaches right down to the depths of the earth ('bis zu den tiefsten Orten der Erde hinreicht'). This material grounding stands in stark contrast to the immateriality of the 'Einflüsse des Himmels' and the 'innern anziehenden und bewegenden Kräfte der Erde' that lead the protagonist to his 'höhere Betrachtungen der Natur' – and yet they are an intrinsic part of the material mountain environment. Indeed, Goethe presents mountains as being far more than static, unchanging chunks of rock, both in this specific passage and across his oeuvre. As well as the mountain environment serving as the home of the 'innern anziehenden und bewegenden Kräfte der Erde' that trigger the protagonist's 'höheren Betrachtungen der Natur', it is, in and of itself, a living entity, as the protagonist makes clear in the previous sentence. In fact, the mountain is 'vor allem Leben und über alles Leben', pervaded with a kind of life that is even able to extend outward to exert its effects on humans in the vicinity. From the earth's forces within its depths to the mysterious life with which it is imbued, the mountain Goethe describes in 'Über den Granit' houses an excitingly vivid immateriality which is inextricably part of its explicit materiality, too.

Indeed, Goethe – as a scientist, author and civil servant – generated a sizeable quantity of work on the natural environment (and on many other subjects besides) throughout the long eighteenth century. In his monograph *The Life of Goethe*, which offers an overview of Goethe's life and work, John Williams epitomises Goethe as a man whose renown rests on 'his achievement in the republic of letters: on his achievement principally as a poet, secondarily as a man of immense intellectual versatility and prodigious intellectual energy, of an eclecticism and productivity that is quite exceptional even for his own time'.<sup>2</sup> While Goethe's prolific oeuvre has received plenty of critical attention, the topic of Goethe's science in a broad sense has also been granted a good deal of exposure over the past two decades: firstly, through the 2007 edition of the *Goethe-Jahrbuch* which collected writings from the Goethe-Gesellschaft's conference on 'Goethe und die Natur'; and secondly, through

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<sup>2</sup> John R. Williams, *The Life of Goethe: A Critical Biography* (Oxford: Blackwell, 2001), p. 4.



volume 22 of the *Goethe Yearbook* (2015), which featured the sub-heading ‘Goethe and Environmentalism’. Investigations of Goethe’s scientific work in general, and his geological writing specifically, can be found across many different disciplines, and not just in the obvious fields of German studies and literature studies. Indeed, Goethe’s scientific writings have informed scholarship on the history of science<sup>3</sup> and modern-day ecocriticism,<sup>4</sup> to name just two disciplines. Authors within each of these various fields have explored Goethe’s works for their own ends, but there are no studies bringing together all of these perspectives to create a fully comprehensive overview of his geological writing that takes into account all these angles. There are certainly not any studies exploring this grouping through the lens of materiality, immateriality, or, as I term it, (im)materiality: an approach that sees materiality and immateriality as being inseparable from one another, even in the way in which we express these concepts orthographically. This gap in the literature is even more surprising when consideration is given to the sheer breadth of ways in which Goethe’s scientific writings have otherwise been deployed.

Within the field of literature studies, and German literature studies specifically, critics often use Goethe’s scientific writings as a means by which to illuminate his literary output, with the aim of shedding new light on the work(s) in question. This often fits within a comparative framework, as in Angus Nicholl’s paper on representations of science in Goethe’s *Divan*.<sup>5</sup> This approach primarily involves a literary work being paired with a scientific work to stimulate discussion of the literary work at hand. Indeed, an array of critics focusing on Goethe’s literary writings have drawn on his scientific output to situate their reading alongside it either in terms of chronology or content. There is no shortage of critics who follow this approach. For example, Cornelia Zumbusch combines *Die Metamorphose der Pflanzen* with *Die Wahlverwandschaften* in her botany-based reading of Goethe’s novel, viewing the character Ottilie herself as a plant figure in human guise.<sup>6</sup> Similarly, Jane Brown also rests her interpretation of Goethe’s short story ‘Märchen’ on *Die Metamorphose der Pflanzen*, using the concepts of morphology discussed in this scientific work to illuminate the form, rather than

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<sup>3</sup> There is a good deal of critical literature on the history of science in the Romantic period that makes reference to Goethe. See, for example, Dennis L. Sepper, *Goethe Contra Newton: Polemics and the Project for a New Science of Color* (Cambridge: Cambridge University Press, 1988), Robert J. Richards, *The Romantic Conception of Life: Science and Philosophy in the Age of Goethe* (Chicago: University of Chicago Press, 2002), or Bernhard Helmut Kuhn, *Autobiography and Natural Science in the Age of Romanticism: Rousseau, Goethe, Thoreau* (Farnham, England; Burlington, VT: Ashgate, 2009).

<sup>4</sup> Heather Sullivan is at the forefront of this field of scholarship, with works including ‘Dirty Nature: Ecocriticism and Tales of Extraction - Mining and Solar Power - in Goethe, Hoffmann, Verne, and Eschbach’, *Colloquium Germanica*, 44.2 (2011), 111-131 and ‘Ecocriticism, Goethe’s Optics and “Unterhaltungen Deutscher Ausgewanderten”: Emergent Forms versus Newtonian “Constructions”’, *Monatshefte*, 101.2 (2009), 151-169 probing the intersection between Goethe’s scientific writing and contemporary ecocritical thinking.

<sup>5</sup> See Angus Nicholls, ‘Between Natural and Human Science: Scientific Method in Goethe’s “Noten und Abhandlungen zum West-Östlichen Divan”’, *Publications of the English Goethe Society*, 80.1 (2011), 1-18.

<sup>6</sup> See Cornelia Zumbusch, ‘The Metamorphoses of Ottilie: Goethe’s *Wahlverwandschaften* and the Botany of the Eighteenth Century’, *European Romantic Review*, 28.1 (2017), 7-20.

the content, of the fairy tale.<sup>7</sup> However, Goethe's geological work is rarely used in this way. One of the few critics to do so is Peter Schnyder, who draws parallels not only between Goethe's geological writings and literary writings, but also between his geological writings and Adalbert Stifter's novel *Nachsommer*. He asserts that both Goethe's geological writings and *Nachsommer* focus on the benefits of slowness and gradual, as opposed to hurried, development, but does not invert this comparison to explore its ramifications for understanding Goethe's science.<sup>8</sup> All these critics, whether drawing on Goethe's science generally or his geological work specifically, see pairing his non-fiction writings with his literary writings as a productive endeavour that can bring forth innovative new interpretations of much-studied classics. These interpretations are often grounded in Goethe's rich use of symbolism, allegory, and metaphor, or, in other words, immaterial characteristics. However, and as I seek to address, this comparative approach often leads to the scientific work in question, and the problems of (im)materiality around which it revolves, being given second billing: it is merely used illustratively rather than taking centre stage. Regardless of the quality of the scholarship on the scientific work being deployed in this way, the emphasis of the discussion lies on the literary work, rather than the scientific one.

While Goethe's geological writings have received little attention from scholars seeking to compare them with his literary output, critics working on Goethe's science specifically have paid more heed to them – although they have received far less focus than Goethe's work on, say, colour theory or morphology, despite being a no less important part of his oeuvre. One of the earliest of the major modern critics to investigate Goethe's geological writings (within the overall framework of his scientific endeavours) was Ronald Gray, writing in 1952. He found them rather lacking compared to Goethe's other scientific investigations, missing 'the certainty and conviction which inspires his botanical and optical works'.<sup>9</sup> Gray focuses only on one element of Goethe's geological writings: his essay on granite. For Gray, granite is representative of Goethe's philosophy of unity as a whole, with the rock being an 'apparent union of opposites, the highest and lowest, heaven and earth.'<sup>10</sup> I agree with Gray's contention that granite (and, indeed, other types of rock, too) were representative of unity, for Goethe – and push this reading of unity further, seeing Goethe's depiction of (im)materiality as the ultimate expression of this unity. Indeed, Gray is not alone in his slight scepticism regarding the scientific value of geological writings. W. Scott Baldrige, writing in the 1980s, states his case

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<sup>7</sup> See Jane Brown, 'Building Bridges: Goethe's Fairytale Aesthetics', *Goethe Yearbook*, 23 (2016), 1–18.

<sup>8</sup> See Peter Schnyder, 'Die Dynamisierung des Statischen. Geologisches Wissen bei Goethe und Stifter', *Zeitschrift Für Germanistik*, 19.3 (2009), 540–55.

<sup>9</sup> Ronald Gray, *Goethe the Alchemist* (Cambridge: Cambridge University Press, 1952), p. 134.

<sup>10</sup> Gray, p. 139.

plainly: ‘Goethe made no lasting contributions to geology or mineralogy’.<sup>11</sup> Baldrige’s argument hinges on the conviction that Goethe’s views on mineralogy and geology were merely reflections of the beliefs of the time, rather than being shaped distinctively by Goethe himself. Baldrige’s focus lies more on situating Goethe within the framework of his contemporaries, rather than exploring the details of his geological writings specifically, and as such, somewhat overlooks some of their more nuanced aspects. This attempt to read Goethe’s geology within broader geological trends is again echoed by Hans Wolff in his article from 1986, in which he argues that Goethe’s interest in, and exploration of, the mountains he came across in his journeys (particularly during his ‘italienische Reise’) were merely reflective of a late-eighteenth-century spike in interest in geology.<sup>12</sup>

More recently, Wolf von Engelhardt is one of the few scholars to focus their attentions on Goethe’s geological writings on their own merits, rather than assessing them on the basis of their scientific validity. His 1992 chapter ‘Morphologie im Reich der Steine?’ forged a bridge between previously separate research on Goethe’s studies in the fields of geology and botany. Rather than seeing morphology as solely applicable to organic entities, Engelhardt argues that Goethe believed that stones were also subject to morphological processes, supported by evidence from the start of Goethe’s dabblings in the subject through to his very late work. A decade or so later, Engelhardt’s 2003 book *Goethe im Gespräch mit der Erde* offers a near-exhaustive list of the instances in which geological and natural phenomena are presented across Goethe’s entire oeuvre.<sup>13</sup> Engelhardt covers a wide range of material, from Goethe’s poetry (singling out ‘Harzreise im Winter’ as being particularly applicable to the topic of geology) and the *Faust* saga, to Goethe’s letters to his relatives, friends and scientific contemporaries. A similarly exhaustive study was written almost a century earlier by Max Semper, which offers an in-depth chronological survey of almost Goethe’s entire written output on the subject of geology, positioning the development of his geological theories against the backdrop of previous and contemporaneous currents in the discipline. Situating Goethe’s geological writings within their broader context and with reference to his contemporaries is certainly of crucial importance, but I go beyond simply positioning Goethe within the currents of the time. By exploring the content of these texts themselves, with reference to contemporary scientists and thinkers, I offer justification for reading Goethe’s scientific writing with an eye to questions of (im)materiality. In turn, this highlights productive themes of wholeness, perception and subjectivity that can be applied across Goethe’s oeuvre as a whole to show connections across previously disparate text-types and genres.

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<sup>11</sup> W. Scott Baldrige, ‘The Geological Writings of Goethe: Despite His Keen Powers of Observation, Goethe’s Ideas on Geology Reflected the Biases of His Time’, *American Scientist*, 72.2 (1984), 163–67 (p. 167).

<sup>12</sup> See Hans Wolff, ‘Goethes Kenntnisse der Alpen im Lichte der modernen Geologie’, *Sudhoffs Archiv*, 70.2 (1986), 143–52.

<sup>13</sup> See Wolf von Engelhardt, *Goethe im Gespräch mit der Erde: Landschaft, Gesteine, Mineralien und Erdgeschichte in seinem Leben und Werk* (Weimar: Böhlau Nachfolger, 2003).

More recently, in 2009, Hamster and Sigrid Damm's monograph told the story of Goethe's involvement with the Ilmenau mine with reference to Goethe's written output during this period. Exploring Goethe's time there from his first invitation to the town to the unhappy conclusion of the mining project, the Damms draw not only on Goethe's treatises on geological theory but also on the plethora of documents he created relating to the business of running the mine itself. While most critics focus on either the history of Goethe's time in Ilmenau or the written work he produced there, the Damms' publication is one of the few to combine these two aspects. This approach demonstrates that Goethe's engagement with Ilmenau was extremely fertile ground for his geological work, reflecting both the insight that he gained into geology as a discipline and the impact that this field of research had on Goethe as a person more broadly. The Damms do not, however, offer more than a cursory overview of the direct effect that Ilmenau had on Goethe's geological research after the closure of the mine, despite the fact that Goethe himself admitted the significant influence that his time in the town had exerted, even on his subsequent work, although they do explore the role that geological entities play in some of Goethe's later literary works, such as *Faust* and 'Das Märchen'. Their work offers a rich, stimulating insight into Goethe's engagement with Ilmenau, and clearly demonstrates the substantial impact that this town had on Goethe – but they do not explore the individual pieces of writing they refer to other than to exemplify the connection between Goethe and the mountain environment. Demonstrating the strength of this link alongside proffering an in-depth reading of Goethe's output that this connection sparked offers insight into Goethe's geological theories themselves, as well as the experiences that underpinned them.

In the late twentieth and early twenty-first century, a new strand of critical activity, ecocriticism, has emerged, which explores the interaction between humans and the natural world against the backdrop of the Anthropocene, a term coined by the Dutch chemist Paul Crutzen in the early 2000s to refer to the current geological era during which humans are the dominant force.<sup>14</sup> Despite its origins in the earth sciences, this term has subsequently been leveraged by researchers in the humanities, including the field of Goethe studies. One key scholar within this field is Heather Sullivan, whose 2016 chapter 'Agency in the Anthropocene: Goethe, Radical Reality, and the New Materialisms' draws on Goethe's optics to explore the complex parallels, and differences, between the agency of the natural world, and that of humans. Taking a New Materialist perspective, she probes the complexity of the Anthropocene as a period in which human agency is 'distributed' across a 'vast collective' that can have a major impact on our planet, and all the while the individual's ability to exert an influence in

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<sup>14</sup> Paul J. Crutzen, 'The "Anthropocene"', in *Earth System Science in the Anthropocene*, ed. by Eckart Ehlers and Thomas Krafft (Berlin: Springer, 2006), pp.13-18.

this regard is greatly diminished.<sup>15</sup> This highlights the complex, contradictory nature of this epoch as one which sees humans both gain great power over the natural world, while also being more powerless than ever before. Sullivan's chapter draws on the interplay between light and the eye in Goethe's *Farbenlehre* to posit the controversial view that, far from being two separate, opposing entities, humans and the natural world are, in fact, 'inextricably bound up' with each other, as she puts it.<sup>16</sup> As a result, she concludes that Goethe viewed agency as a 'joint event of both the human and non-human', with humans inevitably immersed within the natural world.<sup>17</sup> The Anthropocene, as a term, then, is not quite as simplistic a term as its original geological usage may imply. Instead, with specific reference to questions of materiality, it serves to problematise the interaction between humans and our planet as an interplay that is multi-layered, rather than merely hierarchical.

Work on ecocriticism more broadly has often drawn on Goethe's scientific work (including his geological writings) in their work, and within the past decade, in particular, there has been a move towards ecocritical readings of Goethe. Other recent publications by Sullivan have involved pairing a work of literature by Goethe with a piece of his scientific output and reading this nexus through the lens of ecocriticism. Her work on Goethe's geological writing includes her chapter 'Faust's Mountains: An Ecocritical Reading of Goethe's Tragedy and Science', which looks at the role that geological masses, in particular, play in the interplay between humans and nature.<sup>18</sup> Sullivan's explicit objective is to demonstrate that, in *Faust*, mountains (and the mountain environment more broadly) are not connected to the spiritual realm, as previous critics have understood them to be: rather, they are wholly within the material sphere. She 'insists on the materiality of both mountains and human beings', placing their materiality far ahead of their spiritual, or immaterial, characteristics.<sup>19</sup> Unlike the approach taken by Sullivan, focusing wholly on the materiality of natural bodies, I demonstrate that reading geological entities as playing host to both material and immaterial traits, rather than one or the other, aligns much more closely with Goethe's own intent in the presentation of them.

From a scholarly perspective, the question of the importance of matter and materiality came to prominence in the field of social anthropology in the 1980s and 1990s. Since this point, scholarship

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<sup>15</sup> Heather Sullivan, 'Agency in the Anthropocene: Goethe, radical reality, and the new materialisms', in *The history of embodied cognition 1740-1920: The Lebenskraft-debate and radical reality in German science, music, and literature*, ed. by John McCarthy, Stephanie Hilger, Heather Sullivan & Nicholas Saul (Leiden: Brill, 2016), pp. 285-304 (p. 285)

<sup>16</sup> Sullivan, 'Agency in the Anthropocene: Goethe, radical reality, and the new materialisms', p. 304.

<sup>17</sup> Ibid.

<sup>18</sup> Heather I. Sullivan, 'Faust's Mountains: An Ecocritical Reading of Goethe's Tragedy and Science', in *Heights of Reflection: Mountains in the German Imagination from the Middle Ages to the Twenty-First Century*, ed. by Sean Ireton and Caroline Schaumann (Rochester, New York: Camden House, 2012), pp. 116-33

<sup>19</sup> Sullivan, 'Faust's Mountains: An Ecocritical Reading of Goethe's Tragedy and Science', p. 118.

on these subjects has explored many potential definitions of materiality and immateriality, some of which differ greatly from others: the terms ‘materiality’ and ‘immateriality’ are somewhat subjective and do not have fixed meanings. At the time that questions of materiality first began to arise in this context, the primary debate revolved around the extent to which object-based research, as opposed to less tangible culture-based research, should form the heart of the study of previous human civilisations. The core of this dispute focused on questions of the nature of matter, and the interaction between humanity and matter. Nicole Boivin, an archaeologist who calls for a return to object-focused study, summarises recent shifts in archaeology as having ‘concentrated overwhelmingly on ideas and symbols at the expense of materiality’.<sup>20</sup> She believes that this change in dynamics is ‘puzzling’, and contends that an exclusive focus on symbols, as non-material entities, cannot be compatible with a view that sees archaeological knowledge as rooted in physical objects. Her explicit aim is to ‘collaps[e] the mind-matter dichotomy in material culture studies’,<sup>21</sup> or, in other words, strike a more reasonable balance in terms of ‘the interaction between mind and matter [leading] us to ask not just about the meanings things held, but also about the possibilities they enabled and the constraints they imposed by virtue of their very materiality’.<sup>22</sup> This balanced approach to questions of materiality and immateriality, rather than a focus on one at the expense of the other, is a framework that I also pursue here. Indeed, Boivin’s argument can also be read as a representation of the interplay between the two concepts: namely, that, as the counterpart of the material, the immaterial is inextricably linked to the material in its role as its natural opposite. By focusing on the immaterial, the material fades into the background. The two concepts are like two sides of the same coin, with a sole focus on one side necessitating the other’s moving out of view.

This connection between materiality and immateriality is a productive approach to draw on with regard to Goethe’s usage of these concepts. Materiality and immateriality are not contradictory opposites: unlike, say, the antithetical pairing of ‘scented’ and ‘unscented’, an object can exhibit both ‘immaterial’ and ‘material’ characteristics. Take a red pencil, for example. The pencil itself is material: it exists in space and time, is clearly solid and composed of visible parts. However, it is also a collection of immaterial properties: from the colour to its temperature, through to the memories of school, say, that it evokes. The immaterial and material do not stand in contradiction to one another. Instead, they combine with each other. Indeed, even objects that seem to be firmly one or the other are

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<sup>20</sup> As cited in *Rethinking Materiality: The Engagement of Mind with the Material World*, ed. by Elizabeth DeMarrais and others, McDonald Institute Monographs (Cambridge : Oakville, CT: McDonald Institute for Archaeological Research ; Distributed by Oxbow Books, David Brown Book Co, 2004), p. 69.

<sup>21</sup> As cited in *Rethinking Materiality: The Engagement of Mind with the Material World*, ed. by Elizabeth DeMarrais and others, p. 63.

<sup>22</sup> As cited in *Rethinking Materiality: The Engagement of Mind with the Material World*, ed. by Elizabeth DeMarrais and others, p. 69.

not: something that is as immaterial as it can be (for example, a memory) is also imbued with materiality – it could not exist if it were not for the remembering subject. Furthermore, something that seems wholly material, a chunk of rock, for example, is rich with immaterial characteristics that also shape how we see it and interact with it, and how it interacts with its non-human environment. This interplay is expressed by Goethe himself, in his discussion of the role of the material (or, as he terms it, ‘die Materie’) and the immaterial ‘Geist’ in the context of questions of ‘Steigerung’. He states that ‘[...] die Materie nie ohne Geist, der Geist nie ohne Materie existirt und wirksam sein kann’ (WA 2: 11, p. 11). This statement is explored further in Chapter Five of this thesis, but even on a superficial reading, it emphasises the intrinsic interplay between these two components. For Goethe, ‘Geist’ was often synonymous with a broader sense of immateriality, as Helmut Koopman clarifies in the *Goethe-Handbuch*: ‘Goethe zufolge ist der Geist das Immaterielle – auch in uns – das der Zeitlichkeit nicht unterworfen ist’.<sup>23</sup> Various critics have emphasised this understanding of ‘Geist’, including David John, on whom this introduction will focus in greater detail subsequently. As Goethe explains in this discussion of ‘Materie’ and ‘Geist’, the material and the immaterial are inextricably linked, with each only able to exist if the other is present. As a result, an exploration of Goethe’s depiction of material objects must necessarily include an explanation of the immaterial properties with which these objects are imbued.

It is tempting to conflate the term ‘material’ with the term ‘tangible’, particularly given the archaeological context within which materiality studies began, where ‘material’ objects are by their very nature ‘tangible’. This does not, however, mean that the term ‘immaterial’ is naturally interchangeable with the term ‘intangible’. Tangible objects are often material – but they are also often imbued with immaterial properties. These two notions of materiality and immateriality need not be seen as mutually exclusive or in some way competing with each other. In some cases, in fact, the notion of the material extends further than we would initially assume: individual atoms may well not be tangible, but they are certainly material – even if, under this approach to reading (im)materiality, the flow of electricity, for example, that they create is considered to be immaterial. In the modern age, the association between immateriality and flows can even be applied to the digital sphere, as Yasmin Ibrahim has alleged, describing the digital world as representing a network of ‘virtual, immaterial processes, including the flow of electronic images, commodity culture and financial capitalism’.<sup>24</sup> This question of the shifting bounds between materiality and immateriality is probed by Ned Markosian, who explores issues relating to the classification of objects. He rejects theories that

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<sup>23</sup> Helmut Koopmann, ‘Geist’, in *Goethe-Handbuch: Band 4/1: Personen, Sachen, Begriffe A–K*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 346-348 (p. 347).

<sup>24</sup> Yasmin Ibrahim, ‘Transacting Memory in the Digital Age: Modernity, Fluidity and Immateriality’, *Fudan Journal of the Humanities and Social Sciences*, 11.4 (2018), 453–64 (p. 456).

suggest that physical objects are those objects studied by physics or that they are those objects capable of being sensed by human subjects. Instead, he settles on an approach that he dubs the ‘Spatial Location Account of Physical Objects’. This alleges that physical objects must exist both in time and in space, whereas non-physical objects (such as souls, the example used by Markosian) merely exist in time.<sup>25</sup> This offers one way in which to differentiate between the terms ‘tangible’ and ‘physical’: for an object to be physical, it must exist in both space and time. However, for an object to be tangible, it must exist in space and time to the extent that the human sense of touch can perceive it. Drawing this distinction enables air (or quarks, as Markosian illustrates this example), for example, to be viewed as physical but not tangible: while the atoms of which it is composed are technically material, the overarching grouping that these atoms form can ultimately be viewed as being immaterial. This perspective on questions of (im)materiality aligns, I contend, with Goethe’s own view of both materiality and the world at large, a view which, as will be explored, is shaped by an inherent sense of duality.

Distinguishing between the terms ‘material’ and ‘tangible’ also calls into question the importance held by the sensing subject. If an object is ‘tangible’, this implies the presence of a subject touching (or able to touch) the object in question, but the adjective ‘material’, or its counterpart ‘immaterial’, seems to require no such subject, as Markosian makes clear. Immaterial characteristics may well be invisible, or intangible, grounded in a subject’s sensory experience despite being part of the object at hand. That said, the use of such sensory adjectives alone offers too shallow an approach to immateriality, and one which misplaces the emphasis, in my view. Not every critic agrees with this. For example, architectural theorists Thomas Barrie and Julio Bermudez explain that ‘architectural immateriality describes the subjective experience of place; the embodiment of culture, symbolism and ritual, and the uncountable ways that architecture articulates existential meaning’.<sup>26</sup> In their interpretation, immateriality always exists in parallel with a sensing, experiencing subject: it cannot stand alone. They go on to state that ‘essentially, immateriality is revealed in embodied consciousness’<sup>27</sup>: in their view, immaterial attributes cannot come into existence without the presence of a (presumably human) mind, although, somewhat paradoxically, they subsequently emphasise the loss of meaning intrinsic to divisions of sense-based relationships into subject and object. The link they draw between immateriality and a sensing subject goes on to shape their article on architectural immateriality, which they term ‘the subjective experience of place’.<sup>28</sup> This is not what I mean by this

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<sup>25</sup> Ned Markosian, ‘What Are Physical Objects?’, *Philosophy and Phenomenological Research*, 61.2 (2000), 375–95 (p. 375).

<sup>26</sup> Thomas Barrie and Julio Bermudez, ‘Introduction’, *Journal of Architectural Education*, 62.2 (2008), 4–5 (p. 4).

<sup>27</sup> Barrie and Bermudez, p. 4.

<sup>28</sup> Barrie and Bermudez, p. 4.



term. After all, as critics have alleged, ‘natural things really do have temporal and spatial relations without the intervention of the human mind’<sup>29</sup>: a self-evident statement that does bear repeating. In this thesis, I explore the duality of immateriality and materiality that, for Goethe, co-exists within geological entities, regardless of any other dualities relating to the subject/object dichotomy. While the specific instances of immateriality explored in this thesis are those that have been filtered through the senses of an embodied subject (in this case, Goethe), it is worth being alert to the fact that these instances continue to exist whether or not Goethe is present to perceive them. Indeed, Goethe himself discusses this issue of the overlap between the sensing subject and external objects in his essay ‘Der Versuch als Vermittler von Objekt und Subjekt’, which opens with the statement:

‘Sobald der Mensch die Gegenstände um sich her gewahr wird, betrachtet er sie in Bezug auf sich selbst, und mit Recht. [...] Diese ganz natürliche Art die Sachen anzusehen und zu beurtheilen scheint so leicht zu sein als sie nothwendig ist, und doch ist der Mensch dabei tausend Irrthümern ausgesetzt’ (WA II: 11, p. 21).

This essay depicts the bedrock of Goethe’s *Naturphilosophie*, a holistic approach that encompassed an understanding of the intertwining of humans with the natural world that surrounded them. However, it also sees Goethe highlight the importance of being alert to the risk posed by this inevitable subjectivity – just as we, as readers of (im)materiality, must be alert to the fact that an object’s sensory attributes continue to exist even if we are not there to sense them.

I contend that Goethe saw the natural world, and the geological space specifically, as being intrinsically imbued with both material and immaterial properties. However, this question of the inevitable interplay between these two concepts in Goethe’s work has received little attention, whether from scholars working within the field of materiality studies, or within the field of Goethe studies. I have drawn on the range of approaches to the immaterial summarised in the above discussion to develop my own understanding of this concept. Throughout this thesis, I will apply this understanding, both explicitly and implicitly, to my explorations of Goethe’s geological writings. Firstly, and as Goethe himself makes clear in his statement on ‘Materie’ and ‘Geist’, the immaterial and the material are inextricably linked. The interconnectedness of these two terms also aligns neatly with his broader worldview that privileged questions of wholeness, unity and harmony. For this reason, I will use the portmanteau ‘(im)materiality’ when referring to these concepts to highlight this intrinsic connection. Secondly, immaterial entities can be composed of a multitude of material objects, without this material basis negating their immateriality. Air and light are two such entities, both composed of material atoms or photons that ultimately create a grouping that is in itself

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<sup>29</sup> Kenneth L. Schmitz and Paul O’Herron, *The Texture of Being: Essays in First Philosophy* (Washington D.C., United States: Catholic University of America Press, 2007), p. 181.

immaterial. In the *Goethezeit*, of course, knowledge of such microscopic components was limited, at best, and, as a result, such entities were imbued with an even greater sense of mystery than they are today. Thirdly, and finally, immaterial and material entities alike have a complex, often problematic, relationship with questions of the senses and subjectivity. For example, immaterial characteristics are often synonymous with invisible characteristics, but immateriality cannot necessarily be conflated with invisibility. In the specific context of the natural environment, the forces acting within a rock are both invisible and immaterial, while the colour of that very same rock is also immaterial, but not invisible. This brief summary of my understanding of (im)materiality serves as a touchstone with which to identify instances of materiality and immateriality across Goethe's writings on geology and nature more broadly, before probing them in more depth.

Heather Sullivan's exploration of *Faust*, mountains and materiality mentioned previously in this Introduction is one of a very small number of works to look at questions of materiality or immateriality in Goethe's geological writings, as I seek to do here. Another scholar exploring the fringes of this issue in the present day is Elizabeth Powers. Her article in the *Goethe Yearbook* examines Goethe's early writings to investigate how they might have influenced his later scientific pieces, and argues that Goethe's scientific writings (particularly those on rocks and minerals) can be associated with the sublime just as his poetic writings can. For Powers, it does not matter that the geological works are written in a more objective, scientific tone: 'despite the seemingly dispassionate tone, the discourse on the sublime is present from the start'.<sup>30</sup> She picks out references to Egyptology and granite sculpture as being particularly evocative of the sublime moment, but identifies the most resonant instance of the sublime as being the experience of the unnamed protagonist who undergoes a quasi-religious experience when atop the mountain. For Powers, this highlights Goethe's belief in the unity of nature as a whole: 'Humans could intuit this unity because they, too, were a part of it'.<sup>31</sup> This juxtaposition of the mountain and the forces it exerts or triggers verges on a discussion of the interplay between material and immaterial attributes as represented in 'Über Den Granit', but Powers chooses to focus on questions of sublimity (which can, in my understanding of the immaterial, be assigned to the sphere of immateriality more broadly), rather than materiality. She views the essay as 'the transmutation of the sublime into the medium of scientific writing',<sup>32</sup> or, in my reading of these concepts, turning something that is immaterial into something that is material. As a result, she reaches a conclusion that is the exact opposite of that drawn by Sullivan, who places the emphasis on

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<sup>30</sup> Elizabeth Powers, 'The Sublime, "Über den Granit," and the Prehistory of Goethe's Science', *Goethe Yearbook*, 15 (2008), 35–56 (p. 46).

<sup>31</sup> Powers, p. 50.

<sup>32</sup> Powers, p. 37.

materiality. In turn, this contradiction between these two scholars suggests that a hybrid approach bringing together both materiality and immateriality, such as that followed in my thesis, is more apt.

Goethe has also been discussed in broader studies investigating the question of materiality as a concept. One such study is a two-volume monograph by Friedrich Lange published in 1866, who includes Goethe in his survey of the history of materialism, which he understands as the philosophical study of 'Dinge', matter and materiality. For Lange, the question of immateriality is intrinsically connected to issues of religion, theology and spirituality, and this is the lens through which he views Goethe's involvement in the debate surrounding materiality. While materialism gained a strong foothold in Germany around the turn of the 19<sup>th</sup> century, it was not able to become the dominant approach to understanding the natural world. As Lange summarises, 'Die ganze aufstrebende Geistesströmung des achtzehnten Jahrhunderts war dem Materialismus nicht günstig.'<sup>33</sup> Modern critics, such as Falk Wunderlich writing in 2016, take a slightly softer view of the situation, acknowledging that these eighteenth-century materialists were more numerous, and rather more connected, than previously thought, although it still took a secondary position compared to British and French materialism.<sup>34</sup> In Lange's critical view, Goethe is a key proponent of the flood of literary production that stifled interest in materialism as a philosophical movement, and consequently, as a central opponent of a material-focused approach. For Goethe (in Lange's view), a good deal of the enjoyment of an artistic work lies in its non-material elements. As Lange puts it, describing Goethe's belief: 'Wo bleibt die Schönheit der Ilias, wenn sie buchstabiert wird?',<sup>35</sup> or, in other words, texts are rather more than the mere letters of which they are composed. He draws on Goethe's *Dichtung und Wahrheit* to substantiate this interpretation of Goethe's thoughts on (im)materiality with reference to literary, rather than scientific, texts. Despite (aptly) summarising Goethe's interest in exploring non-material attributes and unwillingness to ignore them completely, Lange does not discuss whether this represents a complete rejection of materialism in itself, or simply a more critical approach to it that reflects a complex interplay between materialism, or in other words, an approach prioritising questions of matter, and anti-materialism, or an approach focused on non-material entities, as I seek to highlight here.

There has been little scholarship examining the specifics of Goethe's particular approach to materiality, rather than providing a general overview of materiality as an abstract philosophical

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<sup>33</sup> Friedrich Albert Lange, *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart* (Frankfurt am Main: Holzinger, 1974), p. 418.

<sup>34</sup> See Falk Wunderlich, 'Materialism in late Enlightenment Germany: a neglected tradition reconsidered', *British Journal for the History of Philosophy*, 24:5 (2016), 940 – 962.

<sup>35</sup> Lange, p. 423

notion. In one of the few papers to study the former issue, David G. John explains that the concept of materiality is ‘rarely associated’ with Goethe, stating that the few studies to discuss the topic at all give it only ‘scant consideration’.<sup>36</sup> In his article, John attempts to redress this balance by examining how Goethe’s works (and their early reception) reveal his deep-seated interest in philosophical questions of materiality. Just as I seek to undertake in this thesis, John roots Goethe’s exploration of (im)materiality within the scientific realm. John believes that Goethe’s optical works, such as his *Farbenlehre*, show his ‘uniquely dualistic approach to materialism, combining it with immaterialism’.<sup>37</sup> This thesis supports this finding, which suggests that Goethe did indeed view materiality and immateriality as inextricably linked concepts, or, as John puts it, the belief that ‘materialism must include immaterialism at the same time’.<sup>38</sup> While John’s theoretical framework aligns with my own, he focuses his application of this framework on Goethe’s optical research, rather than his geological works, as I will do. In his view, Goethe’s interest in colour and light, instead of physical artefacts, marks a ‘scientist’s step from the material into the immaterial world’.<sup>39</sup> However, John’s paper does not go on to investigate precisely where in the *Farbenlehre* Goethe makes explicit (or implicit) reference to questions of (im)materiality, referencing the work in broad terms rather than analysing it in detail. I go further than this, offering firm support not just to the idea that Goethe’s approach to materiality and immateriality was shaped by a sense of duality, but also to the belief that an awareness of this approach can further interpretations of Goethe’s scientific work.

Preceding John by four years, but not cited by him, Hazel Brook’s 2009 article ‘Dualism, Monism and the Wonder of Materiality as Revealed through Goethean Observation’ makes many of the same arguments. Unlike John, who draws directly on Goethe’s writings, as I do, Brook focuses on the process of Goethean observation itself as an active method that she learned and practiced. Part of this method involved developing an awareness for the intrinsic connections between things, or as she terms it: ‘[a thing’s] interconnectedness to everything else, so whilst my object of study might be the colour of the sky at sunset, once embarked on the experiment my experience of colour anywhere is heightened and I see everything differently’.<sup>40</sup> This interconnectedness, she argues, can be extended to cover questions of materiality more broadly. She summarises her approach by saying that: ‘If we reject the clunky version of matter that dualism has bequeathed to us, because on examination matter just doesn’t seem like that, we shouldn’t reanimate it by bringing back a dualistic conception of mind

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<sup>36</sup> David G. John, ‘The Duality of Goethe’s Materialism’, *Lumen: Selected Proceedings from the Canadian Society for Eighteenth-Century Studies*, 32 (2013), 57 – 71 (p. 57).

<sup>37</sup> John, p. 58.

<sup>38</sup> John, p. 68.

<sup>39</sup> John, p. 68.

<sup>40</sup> Isis Hazel Brook, ‘Dualism, Monism and the Wonder of Materiality as Revealed through Goethean Observation’, *PAN: Philosophy Activism Nature*, 6 (2009), 31-39 (p. 32).

or spirit and inserting it into the clunky stuff, since to do so is still to play the dualists' game.'<sup>41</sup> Rather than separating matter from mind, spirit or, as I term it, the immaterial, it is instead necessary to conjoin them, creating a situation where 'the material is thought to be already infused with (Cartesian) mentality',<sup>42</sup> or as David John puts it, an 'approach to materialism [that combines] it with immaterialism'.<sup>43</sup>

This investigation into the representation of (im)materiality in Goethe's geological writings is divided into five chapters, each of which investigates a different facet of this topic with reference to a particular piece of writing by Goethe. Chapter One of the thesis explores the time that Goethe spent in Ilmenau, the town that had an inestimable impact on his development as a geologist and mining expert. In the light of the influence that Ilmenau had on him, Goethe's Ilmenau period will serve as the guiding thread through the major works referred to in this thesis, offering a connection between seemingly disparate pieces of writing. After sketching out the history of Germany at the time, the background to the mine there and the circumstances that led Goethe to undertake his endeavours in Ilmenau, the chapter then moves to a consideration of the poem Goethe wrote about the town, 'Ilmenau'. This poem sees Goethe reflect on the events, people and places Goethe engaged with when he was in the town, but it also serves to provide insight into Goethe's interactions with, and understanding of, the natural world, specifically its geological features such as mountains, rocks and cliffs. In so doing, it also highlights many of the issues of (im)materiality that will be explored in more detail in subsequent chapters, such as the notion of rocks as living entities and the mysterious nature of the natural world. Ultimately, the chapter also uses 'Ilmenau' as a means through which to explore Goethe's other poetic output during this Ilmenau period and demonstrate the impact that the town had on his work, both while he was resident there and thereafter.

Chapter Two explores the role of the imagination, or 'Einbildungskraft', in Goethe's scientific enquiry generally, and in geological enquiry more specifically. This chapter uses Goethe's piece 'Der Kammerberg bei Eger I' as a starting point from which to investigate Goethe's understanding of the imagination. It draws on discussions of the imagination by Goethe's contemporaries across a range of disciplines, including Kant and Coleridge, and compares and contrasts these with the various ways that Goethe depicts the use of the imagination in his work. It also investigates how the imagination fits within an (im)material framework, and explores the complicated nexus created by immaterial imagined thoughts, housed within a material body, triggered by the (im)material external world. The

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<sup>41</sup> Brook, p. 9.

<sup>42</sup> Brook, p.10

<sup>43</sup> John, p. 58

chapter concludes that, for Goethe, any instance of scientific perception was inextricably linked to the faculty of the imagination, and as such, any subsequent exploration of Goethe's scientific writing must always be underpinned by an understanding of Goethe's views on the functioning of the imagination. Furthermore, the specific investigation of the (im)materiality represented in Goethe's work on geology must always rest on the existence of the duality of materiality and immateriality inherent to the imagination: the very act of Goethe's observing geological entities, writing about them and discussing them involves the use of the imagination, which means that both of these concepts are always present.

Chapter Three builds on the connection made in Chapter Two between the human as a sensing agent and the geological environment, or rather, Goethe's representation of it. Focusing on questions of wholeness and fragmentation, this chapter opens by illustrating the connection between colours and rocks in the practice of map-making. It situates Goethe's writings on geology within the wider context of his most well-known scientific work, the *Farbenlehre*, to illuminate unexpected connections between them that, in turn, shine a light on the question of (im)materiality. Taking a broader approach to the definition of geological writing, it explores the role that both colours and gemstones play in his fairy tale 'Märchen', which concludes his *Unterhaltungen deutscher Ausgewanderten*. This tale has long been interpreted by critics as revolving around light, but this chapter argues that this focus on light has rather led to neglect of the role played by the (gem)stones which interact with this light, representing a core component of its plot. It reads the interplay between geological entities and light as mirroring the interplay between immateriality and materiality to suggest new similarities between Goethe's geological writing and his literary output as a whole. In turn, this reveals (im)materiality to be just as stratified as the rocks in question, with material rocks, and all their immaterial properties, represented by material colour pigments on material paper – with these colours only visible courtesy of immaterial light.

The discussion of Goethe's 'Märchen' in Chapter Three paves the way for Chapter Four, which begins to explore the question of (im)materiality by exploring the notions of agency, mind and spirit. This chapter revolves around the theory of gemstone creation posited by Goethe in 'Über Bildung von Edelsteinen', a short text that sees Goethe ascribe to rocks surprising forces that seem to hint at their having hidden agency. In 'Über Bildung von Edelsteinen', this agency is styled as a 'Neigung', a highly resonant term used across Goethe's scientific writing. This chapter explores Goethe's discussions of geological agency with reference to Jane Bennett's concept of 'thing-power', which 'gestures toward the strange ability of ordinary, man-made items to exceed their status as objects and

to manifest traces of independence or aliveness'.<sup>44</sup> In so doing, it draws on the definition of immateriality put forth at the start of this Introduction to read these flows, desires and pulls as immaterial forces in their own right, which Goethe viewed as being inherently housed within every kind of geological matter. This assertion was not as strange in the *Goethezeit* as it may seem today, and this chapter places Goethe in the context of contemporaneous scientific enquiry, looking at works by Novalis and others, to explore how Goethe aligned with (and differed from) his contemporaries in terms of interpreting the intrinsic agency of rocks.

While these forces discussed in Chapter Four are often represented as productive powers that lead to the creation of the rock in question, or even its transformation into a gemstone, they are not the only immaterial forces associated with the geological environment, or even the natural world more broadly. Chapter Five uses Goethe's essay 'Über den Granit' or 'Granit II', cited at the start of this Introduction, to explore this notion. Given that Goethe's clearest statement on 'Materie' and 'Geist', referred to earlier in the Introduction, was intended primarily to explain the concepts of 'Steigerung' and 'Polarität', this chapter begins by exploring how these two notions apply in the geological space. Moving from these well-known concepts to the less clear-cut terms of 'Materie' and 'Geist', it investigates how Goethe uses these two terms within his geological writing specifically. Goethe is not alone in his fascination with these two concepts: eminent thinkers, such as Plato and Descartes, have also written extensively on the dichotomy between the mind and the body. Their discussions of these notions, along with work by modern-day theorists, illuminates Goethe's own unique understanding of what these two concepts are, and how they align with each other. In light of all the previous chapters looking at (im)materiality more broadly, this chapter serves to return the focus to Goethe's own statements on the subject.

As the five chapters described above demonstrate, the interaction between geology and (im)materiality in Goethe's writing can be explored from innumerable angles and with reference to a broad range of texts. This spectrum ranges from Goethe's essays and treatises on geology itself, through to diary entries, not to mention snippets from letters discussing issues of geological interest, offering as broad as possible an insight into the potential hidden within Goethe's oft-overlooked geological works. The focal texts which this thesis explores in the greatest detail all have an explicit or implicit connection to the town of Ilmenau, the place which lends its name to the poem around which Chapter One revolves. Chapter Two's focal texts, the pair of essays on the 'Kammerberg bei Eger', were written either side of Goethe's 1813 trip to Ilmenau and draw heavily on the knowledge

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<sup>44</sup> Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010), p. xvi.

he gained there. Chapters Three and Five both focus on writings that were composed during Goethe's most prolific period in Ilmenau, specifically part of the *Farbenlehre* and his essay 'Granit II' respectively, while Chapter Four's focal text, 'Über Bildung von Edelsteinen', goes so far as to mention Ilmenau by name. These focal works cannot be taken in isolation, however. At the same time as Goethe was investigating the geological questions depicted within them, he was also composing poems, novels and short stories that explored many of the same issues as addressed in his scientific writing on geology. Some of them address geology-related matters explicitly, whether through the overt inclusion of references to gemstones, say, whereas others handle geology in more implicit terms, in the form of general allusions to the mountain environment, for example. In each case, though, they serve to deepen and expand readings of Goethe's outwardly scientific work on geology. Thus, rather than using Goethe's scientific work to contextualise and illuminate his literary output, as many critics have done previously, I instead make reference to his poems and prose writings to add richness to readings of his writings on science, specifically geology.

Indeed, the holism of (im)materiality extends to the holism of Goethe's output in general, with firm divisions between text-types being counterproductive. In fact, pairing Goethe's geological work (whether this be in the form of fragments, essays, or letters) with carefully selected literary texts, whether poetry or prose, calls to the fore elements that would otherwise have gone undetected in his scientific writings. The same is, I contend, true of pursuing a deliberate focus on the interplay between materiality and immateriality in Goethe's presentation of geological entities. Without a conscious effort to include both of these aspects when analysing Goethe's geological writings, there is a very real risk that most, if not all, of the attention will be devoted to the often more tangible, more visible material elements presented, with the immaterial features receiving second billing, if at all. By instead pursuing an approach dedicated to a holistic analysis of Goethe's understanding of geological entities, processes and characteristics, this ensures that his thought on the subject is considered in its entirety. In turn, this facilitates a deeper, more resonant understanding of his *Weltanschauung*, which, after all, impacted all of his output – not just in the realm of science.



## Chapter One: Ilmenau – the bedrock of Goethe’s interest in geology

Anmuthig Thal! du immergrüner Hain!  
Mein Herz begrüßt euch wieder auf das beste  
[...] (WA I: 2, p. 141)

These lines are the cry uttered by the poet-protagonist in the opening lines of Goethe’s 1783 poem ‘Ilmenau’. This lengthy piece offers a paean to Ilmenau, one of the most formative locations in Germany, if not *the* most formative location, for Goethe’s endeavours as a geologist. This town was located within the Herzogtum Sachsen-Weimar und Eisenach, in modern-day Thuringia. As Jochen Klauß summarises in his place-by-place overview of Goethe’s life, *Goethes Deutschland*, ‘Auf keine Stadt – Jena ausgenommen – hat er zeitlebens soviel Kraft gewendet [...], wie in dieser Bergstadt. [...] Ohne Ilmenau wäre Goethes Leben anders verlaufen’.<sup>45</sup> Klauß lists an array of areas in which Ilmenau bore witness to Goethe’s personal development: it was the town where he expanded his social and professional networks more than ever before, the town where his relationship with Charlotte von Stein truly flourished, and, most importantly for our purposes, the town where he gained the most direct experience of mining, and by extension, geology. Barring Jena, Klauß asserts that there is no other town or city in Germany to which Goethe devoted so much energy – not, say, his adopted hometown of Weimar, nor Frankfurt, the city of his birth. For his geological pursuits specifically, Ilmenau served as both the crucible within which Goethe’s interest in the subject was forged, and the cradle within which it grew, as Sigrid and Hamster Damm have summarised: ‘Das Bergwerk in Ilmenau ist es, das Goethes Gespräch mit der Erde eröffnet, das ihn auf die Spur des Naturwissenschaftlers bringt.’<sup>46</sup> Without Ilmenau, Goethe’s research activity as a geologist would not have flourished, or even existed, to the extent which it would go on to do. Indeed, as I contend in this chapter, it is possible to identify in Goethe’s Ilmenau writings from every stage of his involvement in the town the initial traces of the specific themes that would shape his later work on the subject, which, in turn, highlights areas for subsequent exploration.

In short, the role Ilmenau played in Goethe’s life and overall development, to say nothing of his growth as a geologist, was far greater than might initially be presumed from the town’s rather moderate size and provincial character. Goethe’s engagement in the town began with his first visit in May 1776, after which he was commissioned to reopen a nearby mine where ore was to be excavated. His work at the mine (and by extension, his direct involvement with the town) continued until October

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<sup>45</sup>Jochen Klauß, *Goethes Deutschland: Orte und Stätten von Aachen bis Zwickau aus der Sicht des Dichters* (Stuttgart: Deutsche Verlags-Anstalt, 1998), p. 149.

<sup>46</sup>Sigrid Damm and Hamster Damm, ‘*Geheimnißvoll Offenbar*’: *Goethe im Berg* (Frankfurt am Main: Insel, 2009), p. 18.

1796, when a disastrous accident meant the extraction of ore from the mine had to cease. Goethe would not return for another 17 years, when he made a brief visit in 1813, and subsequent to that, the last major journey he ever undertook would take him to Ilmenau, where he celebrated his birthday from 26 to 31 August 1831, just months before his death.<sup>47</sup>

Goethe's time in Ilmenau was also a period in which his social circle was both widened and deepened to encompass new relationships and strengthen existing ones. These connections ranged from Goethe's ever-closer friendship with Carl August, to the new relationships he forged with specialists as a result of his involvement with the mine, such as the various members of the Voigt family who were also involved in the industry. However, as mentioned above, Goethe's social ties were not the only aspect of his life to develop significantly during the two decades or so that he interacted with Ilmenau. Indeed, Goethe's interpersonal relationships were intrinsically linked to another field in which Goethe saw great development over this period: his work also flourished, in every respect. From poems and literary works through to travel essays and studies of the natural sciences, not least geology, the Ilmenau period was exceptionally fruitful for Goethe. Goethe wrote scores of essays, notes and speeches on geological matters during his time in the town, some (such as his 1781 'Nachricht von dem Ilmenaischen Bergwesen') with a direct connection to the mining undertaken in the region, but others (such as his 1784 'Granit II') dealing with the question of geology and the natural world in a broader sense. Taken as a whole, these texts are testament to both his endeavours in Ilmenau itself and the development of his geological beliefs during this early period: as a result, this chapter will focus on this temporally and geographically self-contained corpus of work to demonstrate the sizeable impact that Ilmenau, specifically, had on Goethe and the path his geological work would come to take.

Indeed, his time in Ilmenau determined the direction of his geological interests for the years thereafter. This has been remarked upon by numerous critics, such as John Greene and John Burke, both historians of science, who state that 'Goethe's interest in geology developed as a result of his appointment as supervisor of the re-opening of the copper mines in the Ilmenau region'.<sup>48</sup> As a consequence, even the geological writings produced by Goethe after the conclusion of his extended stay in the town can be viewed as having been influenced by the region, especially given that his engagement with Ilmenau, its geology and its people, continued in one form or another until his death. The impact wrought by Ilmenau, as the place where Goethe had one of his first direct engagements,

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<sup>47</sup> For an in-depth overview of Goethe's activities in Ilmenau, see Klauß, 1998.

<sup>48</sup> John C. Greene and John G. Burke, 'The Science of Minerals in the Age of Jefferson', *Transactions of the American Philosophical Society*, 68.4 (1978), 1-113 (p. 86 ff.).

and certainly the most extended, with geology cannot be overstated: to fully understand the process by which Goethe's subsequent geological work and beliefs came about, it is necessary to first explore his formative time in Ilmenau.

## Historical background

In the period that Goethe was in the town, 1776 – 1812, Ilmenau was 'ein sehr kleiner und abgelegener Ort; die historischen Umwälzungen jener Jahre machten sich dort kaum bemerkbar', as one critic has summarised.<sup>49</sup> The 'pleasant', 'ever-green' valleys and groves of Ilmenau that Goethe describes in the poem 'Ilmenau' served as a paradigm of hope against the backdrop of upheaval suffered by the Duchy of Sachsen-Weimar-Eisenach during the *Goethezeit*. This duchy was presided over by Carl August, who took office in September 1775 and who would ultimately become Grand Duke of Sachsen-Weimar-Eisenach when his 'Herzogtum' was upgraded to become a 'Großherzogtum'. It was to mark the occasion of his 26<sup>th</sup> birthday that the poem 'Ilmenau' was composed. The beginnings of Goethe's and Carl August's friendship (and its subsequent progression) are discussed in detail in Friedrich Sengle's 1993 monograph *Das Genie und sein Fürst*. This book traces every stage of the association between Goethe and Carl August, from the heady closeness of the start of their acquaintance to the distance that marked their friendship in the last few years of the eighteenth century, through to their reconciliation ahead of Carl August's death. As Sengle makes clear, their friendship operated on multiple levels, both encompassing the literary scene in Weimar and Carl August's political activities, in which he also involved Goethe. One of the first of these activities, and the one which would come to shape both of their lives the most, was the re-opening of the mine at Ilmenau. It would be hard to overstate the significance of this event, one which took on near-romantic overtones for Goethe and the Duke alike.<sup>50</sup> In turn, the town of Ilmenau, and the mining activities undertaken there, was inextricably connected to Carl August, for Goethe.

Effi Biedrzyński in the *Goethe-Handbuch* underlines Carl August's lofty position within the region, stating that he was 'durch ein halbes Jahrhundert Weimars zentrale Figur, unbestritten auch zentrale Figur des literarischen Weimar'.<sup>51</sup> Carl August's younger years followed the path taken by many

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<sup>49</sup> Otfried Wagenbreth, *Goethe und der Ilmenauer Bergbau* (Weimar: NFG, 1983), p. 39.

<sup>50</sup> Friedrich Sengle, *Das Genie und sein Fürst: Die Geschichte der Lebensgemeinschaft Goethes mit dem Herzog Carl August von Sachsen-Weimar-Eisenach: Ein Beitrag zum Spätfeudalismus und zu einem Vernachlässigten Thema der Goetheforschung* (Stuttgart: Metzler, 1993), p. 20.

<sup>51</sup> Effi Biedrzyński, 'Carl August, Herzog von Sachsen-Weimar-Eisenach', in *Goethe-Handbuch: Band 4/1: Personen, Sachen, Begriffe A–K*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 150-155 (pp. 150-151).

aristocratic figures of his time, including six months spent in Paris, before returning to his duchy to grapple with a series of problems:

[The] Abbau des Militärs, Vereinfachung der Prozessordnung, Reform der Steuern; unter Herders Führung sollte das Schulwesen verbessert, in Ilmenau das stillgelegte Bergwerk in Gang gesetzt werden, der sollte Strassenbau vorangetrieben, Land- und Forstwirtschaft sollten modernisiert, das veraltete Triftrecht, der bäuerliche Frondienst abgeschafft werden, und das schwierigste Problem: die Staatsfinanzen mussten geordnet, der Ausgleich von Soll und Haben musste gefunden werden.<sup>52</sup>

These issues were not as separate and discrete as this extract makes them appear, with the latter ‘schwierigste Problem’ of financial issues intrinsically linked to the desire to reopen the mine at Ilmenau mentioned shortly before it in the list. Carl August inherited a duchy that was already in a financial deficit when he took up the mantle of being its ruler. This deficit had, most notably, been deepened by a 1774 fire which wrought ruin on the city of Weimar, destroying both the ducal palace of Wilhelmsburg and the court theatre.<sup>53</sup> Instead of attempting to balance the duchy’s accounts by raising taxes or taking out loans, the Duke decided that the best approach would be to generate wealth organically within the duchy itself by revitalising its economy – and the mine at Ilmenau was the linchpin of this plan.<sup>54</sup>

The area had first been used for mining in the 13<sup>th</sup> century, and from around 1200 onwards, it generated a rich amount of silver and copper ore. Various advanced technical projects were carried out in the early 18<sup>th</sup> century, installing a water wheel in the mine to provide energy to the pumping machinery and constructing various channels to lead water away from the depths of the mine, for example. One enormous undertaking saw the construction of the Martinrodaer Stollen, a tunnel stretching almost 7 kilometres in length and located a good 100 metres under the ground. Work began on the Martinrodaer Stollen in 1592, but it was not completed until 1717: as the duration of these works demonstrate, the scale of the mine at Ilmenau, and the effort associated with it, cannot be underestimated. Thanks to this new construction, the mine was able to enjoy a good few years of prosperity, producing decent quantities of copper and silver ore. However, disaster struck in 1739 when a dam broke, flooding all the usable portions of the mine and rendering it unserviceable.

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<sup>52</sup> Biedrzynski, p. 152

<sup>53</sup> Michael H. Kater, *Weimar: From Enlightenment to the Present* (New Haven: Yale University Press, 2014), p. 18.

<sup>54</sup> See Manfred Wenzel, ‘Der Ilmenauer Bergbau und sein Einfluß auf Goethe als Dichter und Naturforscher’, *Medizinhistorisches Journal*, 22.1 (1987), 3-27 (p. 5, in particular).

Repeated efforts were made over the next few decades to resolve this issue and return the mine to its formerly productive state, but they were in vain, and the mine would remain idle for decades.<sup>55</sup>

Goethe was brought into the mining project in the mid 1770s and dedicated years of hard work to this undertaking. This work involved Goethe acquiring a good deal of economic, technical and geological knowledge in a short space of time – but it is the geological expertise that is most vividly reflected in his writings. After eight years of great efforts to procure the necessary funds and update the technological equipment in the mine, Goethe presided over its reopening on 24 February 1784. As part of this event, he gave a celebratory speech that left listeners in no doubt as to the significance of the geological realm, in his eyes:

Dieser Schacht, den wir heute eröffnen, soll die Thüre werden, durch die man zu den verborgenen Schätzen der Erde hinabsteigt, durch die jene tiefliegende Gaben der Natur an das Tageslicht gefördert werden sollen. (WA I: 36, p. 370)

While Goethe's initial involvement with the mining project was sparked by the tempting prospect of replenishing the duchy's empty coffers, this speech is testament to the fact that, for Goethe, economic concerns were not his sole (or even his main) motivation for his engagement with the mine at Ilmenau. Instead, the mine served as a way for him to engage even more directly with the alluringly mysterious subterranean world, or, to use Goethe's words, a doorway through which he could descend into the hidden treasures of the earth. The near-magical lure of the mine was a common Romantic trope: as Theodor Ziolkowski explains in his monograph on institutions of the Romantic period, it was 'not simply a cold dark hole in the ground; it [was] a vital, pulsing place into which man descends as into his own soul'.<sup>56</sup> As Ziolkowski goes on to explain, though, it was rare, barring a handful of exceptions, for practical mining-related experience to directly impact an author's references to mining, as was the case with Goethe. As far as his mine went, Goethe was brimming with optimism, proclaiming 'ich will und kann das Beste hoffen' (WA I: 36, p. 370) and looking forward to many years of rich yields. However, his attempts to revive the mine were not crowned with success. As Manfred Wenzel summarises: 'Unter bergbaugeschichtlichem Aspekt war die von Goethe begleitete Periode des Ilmenauer Bergbaus ein völliger Fehlschlag: Es wurde keinerlei Erz gewonnen, dafür aber waren ungeheure Mittel (zwischen 1784 und 1800 ca. 120.000 Taler) in das Projekt investiert worden'.<sup>57</sup> The mine did not deliver the ores it was supposed to, and, as a result, did not deliver the financial returns the Duke had hoped for, either. This was not necessarily Goethe's fault.

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<sup>55</sup> For a detailed description of the history of the mining project, see Benedikt Jeßing, 'Bergbau und Fürstenlob: Goethes Gedicht "Ilmenau am 3. September 1783"', *Der Anschnitt*, 69 (2017), 249-261.

<sup>56</sup> Theodore Ziolkowski, *German Romanticism and Its Institutions* (Princeton: Princeton University Press, 1990), pp. 31-32.

<sup>57</sup> Wenzel, p. 8.

As Wagenbreth has summarised in a deeply comprehensive overview of the techniques used in the mine at Ilmenau, this area contained ‘kein oder nur minimal Metall’, and there was little anyone, even Goethe, could do about it.<sup>58</sup> Disaster struck once again in 1796, when the Martinrodaer Stollen collapsed, flooding the mine with water and leaving it too unsafe for the miners to continue their endeavours underground. After this disaster, Goethe gradually withdrew from the Ilmenau project and the mining enterprise itself was formally dissolved in 1814. Despite the failure of the project per se, Goethe’s time and effort were far from wasted, as it allowed him to engage in depth with geological questions and gain direct experience of the process of geological research. In turn, this in-depth engagement, I argue, laid the foundations for much, if not all, of Goethe’s subsequent work on geology, with traces of this being evident in both his literary and scientific work from the period.

### **Goethe’s writings during the Ilmenau period**

Goethe’s engagement in Ilmenau marked an exceptionally productive period in terms of his scientific writing, and especially his work on geology, laying the foundations for his subsequent writings in this field. He created a good deal of work about the mine specifically, starting with the 1780 ‘Instruktion für den Bergbeflissenen J.C.W. Voigt’. This short piece involved Goethe sketching out instructions for Voigt to view the various rock and mineral deposits in the local area. It also serves as testament to Goethe’s belief in the interconnectedness of the various components of the natural world, with Goethe instructing Voigt ‘den Lauf der Ilm, weil er die Gebürge am tiefsten entblößt, sorgfältig durchzugehen’ (WA II: 13, p. 321). As these instructions demonstrate, Goethe’s focus was not narrowly fixated on mountains and geological entities alone: he was well aware that other natural phenomena, such as rivers, were an integral part of the geological system. This piece was followed by his May 1781 ‘Nachricht von dem ilmenaischen Bergwesen’, which saw Goethe provide a lengthy and detailed report of the mine’s history and his future plans for it, with a strong focus on the financial aspects. Even today, this essay remains one of the fullest pieces of writing on the Ilmenau mine and its past. The 1783 ‘Nachricht von dem ehemaligen Bergbau bei Ilmenau in der Grafschaft Henneberg und Vorschläge ihn durch eine neue Gewerkschaft wieder in Aufnahme zu bringen’ deals with many of the same topics, focusing primarily on the history of the mine and its financial and administrative running in the present, rather than on geological theory per se. In the very first line of this essay, Goethe makes plain the importance of the mine for Ilmenau as a town, saying ‘Ilmenau [...] hat ohne Zweifel seinen Ursprung den in dieser Gegend entdeckten Bergwerken zu verdanken’ (LA I: 1, p. 32). Ilmenau’s very existence, Goethe believes, is the result of the mines in its vicinity. These mines were,

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<sup>58</sup> Wagenbreth, Otfried, ‘Bergbau’, in *Goethe-Handbuch: Band 4/1: Personen, Sachen, Begriffe A–K*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 104–7 (p. 105).

therefore, not merely of formative importance for Goethe's development as a geologist: they were also of formative importance for the development of the town where he spent many years of his life.

The Ilmenau mine was officially opened on 24 February 1784, and after this date, Goethe continued to write a plethora of texts about Ilmenau's geology specifically. They include the 'Nachricht von dem am 24sten Februar 1784 geschehenen feierlichen Wiederangriff des Bergwerks zu Ilmenau', which includes Goethe's speech to mark this occasion as cited above. According to this piece, this speech was received by the crowd of assembled dignitaries 'nicht ohne sichtbaren Eindruck', and was followed by a 'Trompeten- und Paukenschall' to mark this truly festive occasion (LA I: 1, p. 63). As with the previous 'Nachrichten' from Ilmenau, this essay focuses more on the administrative workings of the mine as an enterprise than its geological features. This was followed by the 'Erste Nachricht von dem Fortgang des neuen Bergbaues zu Ilmenau', dated 24 February 1785, the October 1785 'Bergwerksangelegenheiten', the 'Zweite Nachricht von dem Fortgang des neuen Bergbaues zu Ilmenau', dated 1 February 1787, the 'Dritte Nachricht von dem Fortgang des neuen Bergbaues zu Ilmenau' dated 18 March 1788, and so on, until the 'Zum Bruch des Martinröder Stollens' dated 8 November 1796 reports on the disaster that would close the mine down for good.

However, Goethe also produced pieces of writing about geology more broadly: the specific work he was undertaking on the Ilmenau mine was also serving to inform his approach to geological issues outside of Ilmenau. This is the case with his 1782 essay 'Mineralogie von Thüringen und angrenzender Länder', which provides an in-depth description of the various rock types that Goethe believes make up the mountains and hills in the region. His 1784 piece 'Über den Granit', also referred to as 'Granit II', mentioned briefly at the start of the Introduction, does not revolve around a particular region. Instead, it focuses on granite as a stone and geological formation in general, representing a broader-based approach to geological theory. Its metaphor-rich, highly evocative style is completely different from that of the 1782 essay on Thuringian mineralogy, and as a result, demonstrates that Goethe's work on geology is of literary, as well as scientific, interest. Alongside offering a rich discussion of geological issues, such as the formation of mountains, the history of granite's uses in various civilisations and modern-day terminology for this stone, this piece also views granite as a trigger for aesthetic considerations and reflections on the interaction between humans and nature in the broadest sense. The focus on geology in general in 'Granit II', rather than the geology of the Ilmenau region, is also reflected in Goethe's 1785 'Zur Theorie der Gesteinslagerung', where Goethe discusses the formation of rock by the process of the crystallisation of liquid rock. Granite plays a key role in this formative process, and is a central concern of his 'Zerklüftung des Granits' essay from around the same time, too.

Not all Goethe's output during the Ilmenau period was composed within Ilmenau itself. The time also saw him undertake a great deal of travel, whether his second journey to Switzerland in 1779, his 1785 trip to the Fichtel mountains, his journey to Italy or any one of his numerous travels to the Harz, from all of which there are innumerable diary entries and letters recording his thoughts relating to geology. Regardless of the location from which he was writing, however, Ilmenau and its mine were frequently in his mind, as numerous letters from Goethe attest. During his voyage to Rome, for example, he writes to Christian Gottlob Voigt on 23 October 1787:

Gewiß habe ich oft diesen Sommer über nach Briefen von Ihnen verlangt und Nachricht gewünscht wie es in Ilmenau stehen möchte, denn die Entfernung und die Scheidewand so mancher großer Gegenstände kann doch mein Gemüth nicht hindern oft an den gewohnten, geliebten Plätzen zu seyn. (WA IV: 8, p. 273)

Even while Goethe is kept extremely busy with all kinds of activities in Italy, even apologising later in the letter for the resulting delay in responding to Voigt's missive, this sentence leaves the reader in no doubt as to Goethe's deep-seated interest in the Ilmenau project. Despite being a good distance away, Goethe says, he remains keen to hear the latest news of Ilmenau, a place to which his mind wanders frequently. Consequently, no matter how far away from the town Goethe's travels took him, and no matter how busily occupied he was during them, it is safe to assume that the Ilmenau project remained on his mind throughout, as evidenced both by his explicit statements to that end and the sheer volume of writing that he produced over the course of this endeavour.

While the 'Ilmenau' poem cited at the opening of this chapter has the clearest connections to Ilmenau of any poetic work written by Goethe during his time there, it is far from the only poem that Goethe wrote over the course of his involvement with the town. The most famous of his creations during this period is 'Wandlers Nachtlied' ('Über allen Gipfeln ist Ruh'), composed by Goethe in September 1780 as he sheltered within a small wooden hut on Ilmenau's 'Hausberg', known as the 'Kickelhahn'. Goethe inscribed the poem on the wooden wall of the hut itself, thereby making the poem part of the mountain environment that inspired it while also reflecting Goethe's experience of this very same environment.<sup>59</sup> Alongside this well-known piece, Goethe composed an array of other poetic works during the time he was involved in Ilmenau, including the 1776 'Rastlose Liebe', which depicts a poet-protagonist frantically pressing forth 'dem Schnee, dem Regen | Dem Wind entgegen' to seek the 'Glück ohne Ruh' provided by love (WA I: 1, p. 84). The poet-protagonist even proceeds 'durch

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<sup>59</sup> For an in-depth exploration of the genesis of this poem, see Wulf Segebrecht, *Johann Wolfgang Goethes Gedicht 'Über allen Gipfeln ist Ruh' und seine Folgen: Zum Gebrauchswert klassischer Lyrik: Text, Materialien, Kommentar* (Munich and Vienna: Carl Hanser Verlag, 1978).



Nebeldüfte’ and ‘im Dampf der Klüfte’, asking whether he should ‘wälderwärts ziehen’ (WA I: 1, p. 84). Similar motifs of nature, albeit in a much calmer atmosphere, are to be found in his poem ‘Gefunden’. Goethe composed this poem for his wife Christiane during his visit to Ilmenau in 1813 after many years away. It opens with the line ‘Ich ging im Walde | So für mich hin’ (WA I: 1, p 25), immediately conjuring up a setting that bears striking similarities to that of both ‘Wandrer’s Nachtlid’ and ‘Rastlose Liebe’. There is no doubt, therefore, that the mountain environment around Ilmenau directly influenced Goethe’s poetic production during his period of engagement with the town.

As with Goethe’s geological research, Ilmenau’s influence on Goethe’s poetry also extended beyond the period during which he was physically present in the city. This is most clearly demonstrated by his poem addressed to, and titled, ‘Herrn Staatsminister von Voigt’, with whom Goethe collaborated on the Ilmenau project. This poem, written to mark Voigt’s 50-year service anniversary on 27 September 1816, deals with the issues to which Goethe had been exposed in Ilmenau, while also offering an insight into the ways in which his engagement in this town shaped his life. This is most clearly evidenced by the friendship that Goethe forged with Voigt, the lasting importance of whose patronage Goethe explores throughout the poem. The first stanza, in particular, shows that the inspiration provided by the mine, the people he met and his endeavours in the town was still having a considerable impact on Goethe, despite the fact that it had been about three years since he had spent any time in the town at all, and two decades or so since he had spent an extended period there:

Von Berges Luft, dem Äther gleich zu achten,  
Umweht, auf Gipfelfels hochwaldiger Schlünde,  
Im engsten Stollen wie in tiefsten Schachten  
Ein Licht zu suchen, das den Geist entzündet,  
War ein gemeinsam köstliches Betrachten,  
Ob nicht Natur zuletzt sich doch ergründet?  
Und manches Jahr des stillsten Erdelebens  
Ward so zum Zeugen edelsten Bestrebens.  
(WA I: 4, p. 15)

This stanza outlines the background behind Goethe and Voigt’s friendship, as two men who explored the depths of the earth together during their mining endeavours. In so doing, Goethe poetically entwines the actions that the poem describes, namely, the search for promising mineral deposits, with its form. Just as Goethe and Voigt were surrounded by the gases and vapours of the mine, so too does the divided phrase ‘von Berges Luft...umweht’ wrap around the clause ‘dem Äther gleich zu achten’, with the object of their search tantalisingly positioned at the head of the line. Once again, human

interaction with the mountain environment is highlighted in this poem. Here, this comes in the form of the mirroring of the superlative and grammatical construction of ‘stillsten Erdelebens’ and ‘edelsten Bestrebens’. The poem offers an idealised view of the gritty, dangerous reality of mining: the ‘engsten Stollen’ and ‘tiefsten Schäften’ add an air of mystery, rather than a threatening aura, to the setting. Just like the verses from ‘Ilmenau’ that opened this chapter, talking of the town’s ‘anmutig Tal‘ and ‘immergrüner Hain‘, the poem ‘Herrn Staatsminister von Voigt’ tells of the pleasant interaction between man and the mountain environment: the natural world was not merely to be studied and observed, but directly experienced and encountered, too.

### ‘Ilmenau’

‘Herrn Staatsminister von Voigt’ is not the only of Goethe’s poems to merge references to real people (and real events) from Ilmenau with broader notions relating to the natural world around it. Indeed, historians’ accounts are far from the only source of information to draw on for exploring Goethe’s connection to Ilmenau further. ‘Ilmenau’, his 1783 poem cited at the start of this chapter, takes its name from the town and is deeply grounded in the events of the time and Goethe’s experiences in Ilmenau. While this poem was written at the midpoint of Goethe’s involvement in Ilmenau and cannot be considered a retrospective summary of his time there, it nevertheless serves as a guide to the importance that Ilmenau would assume in Goethe’s life. Henry and Mary Garland characterise the poem as offering a combination of

a sense of the healing power of nature, a friendly caricature of court figures [...], a retrospect of Goethe’s life, a tribute to the Duke, and a solemn word on a ruler’s responsibilities. The unifying factor in this conglomerate poem is the stable and steady gaze of the poet, which **makes each point of comment a part of his own experience** [my emphasis].<sup>60</sup>

The inspiration that Goethe drew from his own experience in Ilmenau to compose the poem is also referenced in the commentary to the *Hamburger Ausgabe*, which talks in detail about the importance of the poet-protagonist’s experience of Ilmenau itself: ‘das Wiedersehen der Landschaft erinnert den Dichter [...] an frühere dortige Erlebnisse, und [...] regt Ilmenau ihn nun wieder an, [...] Erlebtes in Verse zu fassen’ (HA I: 513). Central to both these experiences and the poem itself was Goethe’s interaction with the key public figures in Ilmenau at the time, chiefly Carl August and Voigt. This viewpoint is further shared by Manfred Wenzel, who believes that, despite the fact that a mere three lines focus on mining in Ilmenau itself, the poem is ‘von eminenter Bedeutung’ when it comes to

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<sup>60</sup> Henry Garland and Mary Garland, *The Oxford Companion to German Literature* (Oxford: Oxford University Press, 1997) ebook.

understanding the relationship between Goethe and Carl August.<sup>61</sup> Given the close association in Goethe's mind between Carl August and the town of Ilmenau, the poem can also be viewed as being 'von eminenter Bedeutung' when it comes to understanding the relationship between Goethe and the natural world around Ilmenau (specifically, its geological components) during this time, and after it, too.

On the basis of the Garlands' commentary, it would be easy to assume that the poem's focus lies squarely on historical events and Goethe's interpretation of them. Indeed, one critic has even gone so far as to suggest it is 'a kind of private therapy, conceived as compensation for the frustrations of social and political life'.<sup>62</sup> While the poem does indeed offer a temptingly idealised image of the natural world, narrated by a poet-protagonist longing for its comforting embrace, it is, however, much more complex than this, shifting between different temporalities, settings and moods. 'Ilmenau' opens with the poet-protagonist seemingly alone in the natural world of the Ilmenau region, crying out to its 'anmuthig Thal', 'immergrüner Hain' and 'erhabner Berg' (WA I: 2, p. 141). In the opening two stanzas, the poet-protagonist reveals himself to be a regular visitor to the area, a place that offers him both peace and rejuvenation. From these private reflections, the poet-protagonist moves to consider the lives of those who live there and are trapped in 'Erdefesseln' (WA I: 2, p. 141). He touches on the lives of farmers, hunters and miners, before his thoughts turn back to the magic of the mountain environment. Held in the spell woven by the mountain, he begins to reminisce, and his focus turns to a 'nächtliches Gelag' (WA I: 2, p. 142). Based on a real event later recounted by Eckermann (WA Anhang: 10, p. 64), the next few stanzas see the poet-protagonist describe the various members of this hunting party. The assembled attendees include various aristocratic friends of Goethe's, and even the young duke himself, described as a 'Jüngling' asleep in one of the huts (WA I: 2, p. 144). Sitting on the threshold of this hut is Goethe, 'der hier in später Nacht | Gedankenvoll an dieser Schwelle wacht!' (WA I: 2, p. 144). This poetic version of Goethe then interacts with the narrative voice in the poem, ultimately providing a remarkably detailed, unfiltered portrait of the Carl August, who will doubtless, the poetic voice says, be given 'die rechte Richtung seiner Kraft' in time (WA I: 2, p. 146). After this lengthy monologue, the poetic voice returns once again to share an idealised depiction of Ilmenau and its 'ruhig Volk' (WA I: 2, p. 147). It closes with a direct call to Carl August, telling him to 'streue klug wie reich [...] | Den Segen aus auf ein geackert Land', promising a bountiful harvest in return (WA I: 2, p. 147).

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<sup>61</sup> Wenzel, p. 19.

<sup>62</sup> Matt Erlin, 'Goethe's "Ilmenau" and the Origins of the Aesthetic State', *Goethe Yearbook*, 13 (2005), 53-74 (p. 56).

Wenzel, cited above, is correct when he asserts that the poem of nearly 200 lines only contains three that make a direct reference to mining. I believe, however, that these three lines are far from the only ones that can be deployed to deepen our understanding of Goethe's preoccupation with the natural world, and the geological space specifically, in Ilmenau. Indeed, even the portions of the poem that do not make direct reference to mining serve to illustrate Goethe's understanding of the natural world. One of the key tenets of Goethe's *Weltanschauung*, namely, the concept that the entire natural world, man and nature alike, was shaped by holism, is illustrated in the very first stanzas of the poem:

Anmuthig Thal! du immergrüner Hain!  
Mein Herz begrüßt euch wieder auf das beste;  
Entfaltet mir die schwerbehangnen Äste,  
Nehmt freundlich mich in eure Schatten ein,  
Erquickt von euren Höh'n, am Tag der Lieb' und Lust,  
Mit frischer Luft und Balsam meine Brust!

Wie kehrt' ich oft mit wechselndem Geschicke,  
Erhabner Berg! an deinen Fuß zurücke.

[...] (WA I: 2, p. 141)

In these opening lines of the poem, the poet-protagonist addresses the mountain environment directly, almost as if talking to a friend. He firstly calls to its 'anmuthig Thal', then its 'immergrüner Hain', and finally, as he is in the middle of a phrase, he is overcome and appeals to its 'erhabner Berg', too. The protagonist's direct, ebullient appeals to the various features of the environment around Ilmenau highlights a key theme in these opening stanzas, and, indeed, the entire poem: the interaction between man and mountain. This interaction is shaped not by their differences, but rather by their similarities: the mountain is almost as alive as man, who, in turn, draws his vitality from it. This transfer of vitality is made clear in lines nineteen and twenty of the poem, where the poet-protagonist cries 'Verjüngt euch mir, wie ihr es oft getan, | Als fing' ich heut ein neues Leben an' (WA I: 2, p.141). This sharing of vitality is marked by an overriding image of the poet-protagonist merging with the mountain environment itself. While in the second line of the poem, it is the poet-protagonist's heart that reaches outward to greet the mountain environment, the rest of these stanzas are shaped by imagery of envelopment and enclosure, as the treetops 'entfalten' towards him, he requests to be '[eingenommen] in eure Schatten'. This is far from a threatening, aggressive enclosure, however: rather, it is imbued with calmness and gentleness. It is not merely the treetops that gently envelop the poet-protagonist. The mountain does too, implicitly, with the poetic voice seeking solace from its lowest point ('an deinen Fuß') and its highest ('von euren Höh'n'). Indeed, the peak of the mountain offers nourishment and refreshment ('erquickt von euren Höh'n'), like a mother suckling her baby. Throughout these

lines, the mountain environment takes on decidedly human attributes, assuming a level of activity that suggests it is home to more agency than might initially be presumed. Moreover, this presentation offers the suggestion that the sense of a dichotomy between the poet-protagonist, representing humanity as a whole, and the natural world is capable of being eroded.

This granting of anthropomorphic attributes to the mountain environment can be seen throughout Goethe's poetic oeuvre, such as in his 1774 poem 'Ganymed', which like 'Ilmenau' sees the poet-protagonist receive refreshing nourishment from the natural environment ('Du kühlst den brennenden | Durst meines Busens' [WA I: 2, p. 79]) before being utterly enveloped by it ('umfangend umfängen' [WA I: 2, p. 80]). This elision of the divide between man and mountain is not only to be seen in Goethe's poetic work, however. It is most strikingly reflected in the speech Goethe gave on 24 February 1784 to mark the celebratory opening of the mine at Ilmenau, mentioned earlier in this chapter. Towards the end of this speech, when he is talking about the 'Unternehmen' of re-opening the mine, Goethe states:

Auch ich habe mich dieses Unternehmens, das nunmehr zu einer männlichen Stärke gereift ist, als es noch ein Kind war, liebeich angenommen, ich habe es nähren, schützen, erziehen helfen, und es wird nun zu meiner Freude auf die Nachkommenschaft dauern. Ja, möge uns diese Nachkommenschaft für das, was wir von heute an thun weden, segnen und die Unsrigen diesen Segen genießen! (WA I: 36, p. 372)

In this passage, Goethe refers to the mine itself, and the process of its re-opening, as a child that he fed and protected, in much the same way as the mountain in 'Ilmenau' nourished and sheltered the poet-protagonist there. He guided it from its childlike state ('als es noch ein Kind war') to mature adulthood ('zu einer männlichen Stärke'), and is now looking forward expectantly to the future ('es wird nun zu meiner Freude auf die Nachkommenschaft dauern'). Just as the mountain enveloped the poet-protagonist in 'Ilmenau', so too does Goethe tinge the mine and the mountain with his very own humanity in his speech.

Indeed, the mountain is even imbued with the most human of all attributes in the 'Ilmenau' poem: it is presented as being alive, filled with an immaterial life-force:

O laß mich heut an deinen sachten Höh'n  
Ein jugendlich, ein neues Eden sehn!  
Ich hab' es wohl auch mit um euch verdient:

Ich Sorge still, indes ihr ruhig grünet.

(WA I: 2, p. 141)

Against the backdrop of the poet-protagonist's changing fate and his repeated visits to Ilmenau, the 'Thal', 'Hain' and 'Berg' presented in these opening stanzas at first appear to be static, reliable masses that can refresh ('erquicken') the poet-protagonist in the midst of his trials, thanks to their ever-green groves. However, closer examination reveals that they are, in fact, a hive of activity. The 'schwerbehängnen Äste', presumably laden with lush greenery, are a marker of things to come. The colour green was a highly resonant colour and of great importance in Goethe's literary and scientific work, as will be explored further in Chapter Three of this thesis. Here, this colour represents fertile, verdant, and active plant growth, and holds a dominant position throughout these two stanzas, whether in the 'immergrünen Hain', the mountain that 'ruhig grünet', or most evocatively, the 'neues Eden', a lush Garden of Eden created in Ilmenau itself. This eternal growth may appear reliable, but, in fact, this greenness is symbolic of constant change and growth, the ongoing creation of new life and the endless rejuvenation of ancient structures. At the end of the third stanza, the poet-protagonist's appeal to the mountain makes this question of reanimation clearer than ever before, as mentioned above. The poet-protagonist calls out: 'Verjüngt euch mir, wie ihr es oft getan, | Als fing' ich heut ein neues Leben an', asking the mountain, valley and meadow to rejuvenate him, significantly, emphasising that this is a frequent occurrence, not a process happening for the first time, so that he can feel like he has started a new life.

This is far from the only time that the trope of mountains imbued with a surprisingly vivid life-force makes an appearance in Goethe's poetic output. Two short poems written just a few years before 'Ilmenau', on 21 and 22 July 1776 respectively, explore the interplay between the mountain environment and living beings, within the specific context of the Ilmenau region. The latter poem was even written on the reverse of a sketching of the Hermannstein cave near Ilmenau, which Goethe visited on the same day that the poem is dated. This serves as a clear demonstration that 'Zwischen Felsen' itself was generated and brought to life by Goethe's direct engagement with the mountain environment, just as the content of the poems reflect the life that it can nourish. The first of the two works see flowers acting as the representative of the life-giving properties of this setting:

Zwischen Felsen wuchsen hier

Diese Blumen die wir treu dir reichen,

Verwelkliche Zeichen

Der ewigen Liebe zu dir.

(WA I: 4, p. 208)

Flowers grow between the cliffs, nourished by the fertile surroundings of the mountain environment. This life, however, is transient: the flowers will wilt (as ‘verwelkliche Zeichen’), but, despite this, they will remain an eternal marker of love – and one that saw its oddly transient yet permanent life be granted by the geological space. This association between life and the mountain environment is repeated in the second of these poems, written just one day later:

Ach, so drückt mein Schicksal mich,  
Daß ich nach dem Unmöglichen strebe.  
Lieber Engel, für den ich nicht lebe,  
Zwischen den Gebürgen leb ich für dich.  
(WA I: 5, p. 65)

This time it is not flowers that grow nestled between the mountains of the Ilmenau region: it is the poet-protagonist himself. The surroundings of the mountains are, above all else, a life-giving environment that radiates its vibrancy to plants and humans alike. This connection between mountains and vitality has strong overtones of Goethe’s 1784 essay ‘Granit II’ quoted in the Introduction to this thesis. In this essay, the protagonist describes the process by which the mountains were created by the powerful waves of the ocean, and explains ‘es senkt sich das Wasser, die höhern Berge werden grün, es fängt alles an, von Leben zu wimmeln’ (WA II: 9, p. 175). The mountains become covered in greenery, just like the mountains in the ‘Ilmenau’ poem, and the entire environment surrounding them begins almost to vibrate with a strikingly powerful life-force. The protagonist in ‘Granit II’ also discusses this occurrence in rather more abstract terms, stating ‘diese Gipfel haben nichts Lebendiges erzeugt und nichts Lebendiges verschlungen, sie sind vor allem Leben und über alles Leben’ (WA II: 9, p. 174). As this utterance makes clear, the mountain environment neither gives nor takes life: rather, it is life itself, and all other forms of life are subordinate to it.

These mentions of the mountain’s surprising vitality are not the only moments in the poem where the mountain environment appears to exert an unexpectedly powerful force on the protagonist. Verses four and five reveal the existence of forces that are similarly strong, yet act in a different way:

Ihr seid mir hold, ihr gönnt mir diese Träume,  
Sie schmeicheln mir und locken alte Reime.  
Mir wieder selbst, von allen Menschen fern,  
Wie bad’ ich mich in euren Düften gern!  
Melodisch rauscht die hohe Tanne wieder,  
Melodisch eilt der Wasserfall hernieder;  
Die Wolke sinkt, der Nebel drückt in’s Thal,  
Und es ist Nacht und Dämmerung auf einmal.

Im finstern Wald, bei'm Liebesblick der Sterne,  
Wo ist mein Pfad, den sorglos ich verlor?  
Welch seltne Stimmen hör' ich in der Ferne?  
Sie schallen wechselnd an dem Fels empor.  
Ich eile sacht, zu sehn, was es bedeutet,  
Wie von des Hirsches Ruf der Jäger still geleitet.

Wo bin ich? ist's ein Zaubermärchen-Land?  
Welch nächtliches Gelag am Fuß der Felsenwand?

[...]

(WA I: 2, p. 142)

Returning his focus to the 'Berg' itself, the poet-protagonist enters into a reverie that impacts almost every sense: the 'Düften' stimulate the sense of smell, and by association, the sense of taste, while adding a tactile dimension by literally wrapping themselves around the poet-protagonist as he bathes in them. This notion of touch is further emphasised by the fog that 'drückt' itself into the valley. Throughout this, the poet-protagonist is surrounded by the visual backdrop of the mountain environment, before the sense of vision is called into the foreground in the line 'ich eile sacht, zu sehn, was es bedeutet'. By far the most prominent sense, however, is the sense of hearing, emphasised by the repetition of 'melodisch', strikingly positioned at the head of the line. Indeed, the reason behind the only active movement undertaken by the poet-protagonist in these stanzas ('ich eile sacht') occurs as a result of his hearing 'seltne Stimmen'. The use of the Romantics' favourite verb, 'rauschen', fulfils a dual purpose: it emphasises the importance of sound and hearing in these stanzas, while also contributing to the magical, mysterious atmosphere conjured up by these lines.

Indeed, as this stanza makes clear, the mountain environment surrounding Ilmenau was not merely a source of geological material to be used for financial or academic gain: it was also a source of great mystique and a conduit into the greater mysteriousness of the natural world as an overarching entity that offers rather more than meets the eye. The geological space of the mountain environment offers the possibility of reconciliation between seemingly contradictory concepts – including, I contend, the pairing of 'Materie' and 'Geist' that was central to Goethe's understanding of nature. The next few lines of 'Ilmenau' serve to reiterate the dual focus on sound and mysticism that was established earlier in the poem, asking, for example 'Welch seltne Stimmen hör ich in der Ferne?' and 'Wo bin ich? ist's ein Zaubermärchen-Land?'. This magical environment is prefigured before the poet-protagonist wonders whether he has reached a 'Zaubermärchen-Land', however. The opening couplet of the



stanza sets the scene for a seductively enticing atmosphere, courtesy of the verbs ‘locken’ and ‘schmeicheln’, while the reference to ‘Träume’ and ‘alte Reime’ hints at elements that are somewhat out of place with reality. This is made explicitly clear at the end of the first stanza quoted here, with the statement that it is ‘Nacht und Dämmerung auf einmal’: while this mysterious atmosphere is rooted in the natural world, there is also something wholly unnatural, or rather, supernatural, about it. These pairings of apparent opposites can be found throughout the poem, such as when poetic Goethe exclaims that he is ‘zugleich erhoben und gedrückt, | Unschuldig und gestraft, und schuldig und beglückt’ (WA I: 2, p. 145), or that he is ‘halb erwacht und halb im schweren Traum’ (WA I: 2, p. 146). The mysterious power of the mountain, though, is able to synthesise these seemingly contradictory states, with the poet-protagonist able to be both wide awake and shrouded in sleep at the same time.

This is not to say, however, that this mysterious mirage conjured up by the mountain world is unsettling or threatening. Quite the opposite, in fact: early on, the poet-protagonist admits that he likes being enveloped in the scents of the mountain environment, with it being something he does ‘gern’. The woods through which he is walking may well be ‘finster’, but they are illuminated by the ‘Liebesblick’ of the stars above, and while he lost his way ‘sorglos’, it is not long before he finds where he needs to be, reaching the camp set up by a hunting party where he is reunited with his compatriots. This camp, significantly, is located at the foot of a cliff (‘am Fuß der Felsenwand’), which brings to the fore the role, easily overlooked, that geological masses play in these stanzas, and, by extension, in crafting the magical world created within them. The ‘Fels’ makes an appearance earlier in the poem, too, acting as a soundboard that reverberates the voices of the hunting party back to the poet-protagonist. More than this, though, the entire situation is shaped by the topography of the natural world, which, in itself, relies on the shape of the mountain, with the mountain’s gradient providing the opportunity for the waterfall to come crashing down and creating one-half of the v-shape that forms the ‘Thal’ filled with fog.

Indeed, Goethe’s literary oeuvre is replete with works that demonstrate the central role played by the mountain environment in creating a setting that cloaked in mystery. One particularly resonant passage can be found at the end of Goethe’s ‘Harzreise im Winter’. This poem was first drafted in December 1777, just a year or so after Goethe joined the Ilmenau project, and was inspired by Goethe’s ascent of the Brocken. Its final stanza paints the mountain as a tantalising enigma:

Du stehst mit unerforschtem Busen  
Geheimnißvoll offenbar  
Über der erstaunten Welt,

Und schaut aus Wolken  
Auf ihre Reiche und Herrlichkeit,  
Die du aus den Adern deiner Brüder  
Neben dir wässerst.  
(WA I: 2, p. 64)

The poet-protagonist describes the mountain looking down from the clouds at the richness and splendour of the world: a richness and splendour that has only come into being courtesy of the seams of ore in its neighbouring mountains that have laid the foundations for great wealth and prosperity. However, this mountain does much more than simply facilitate the creation of earthly riches. Indeed, it is a remarkable entity in and of itself, unexplored and hiding the promise of a rich vein of mystique within its striking visibility. The mountains' depths, their 'unerforschtem Busen', contrast with their unmistakable presence, creating beings that are 'geheimnißvoll offenbar', or as Sigrid and Hamster Damm explain it, 'Naturwesen, die sich dem Betrachter in einem gewissen Maße erschließen und zugleich auf Dauer verweigern'.<sup>63</sup> They are enticingly, inevitably visible in the present, and yet home to enduring mystery and silence, too.

In Goethe's scientific work, as well, the mountain environment is shown to be a place of mystery, and even one of magic. Alongside housing the 'verborgenen Schätze' that Goethe mentions in his speech to mark the opening of the mine, discussed above, he also presents the geological landscape as being able to conjure up an atmosphere shaped by fantasy that extended far beyond the bounds of the mountains themselves. In an example recounted in his *Farbenlehre* which will be explored in more detail in Chapter Three of this thesis, Goethe reports an enchanting incident that occurs as he 'steig [...] gegen Abend vom Brocken herunter' (WA II: 1, p.35). The combination of the twilight sun and the snow covering the ground give rise to a purplish hue that covers the entire world around him, creating the impression of being in a 'Feenwelt' (WA II: 1, p. 35), just like the 'Zaubermärchen-Land' alluded to in 'Ilmenau'. This magical aura is visual in nature, but a similar situation is created in 'Granit II', which was briefly discussed at the start of the Introduction to this thesis and previously in this chapter. In this text, the protagonist undergoes a moment in which 'die innern anziehenden und bewegenden Kräfte der Erde gleichsam unmittelbar auf [ihn] wirken [und] die Einflüsse des Himmels [ihn] näher umschweben' (WA II: 9, p. 174). These mysterious, enigmatic forces lead the protagonist to an inexplicable, overwhelming sensation of sublimity – one which is triggered by the mountain environment.

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<sup>63</sup> Damm and Damm, p. 88.

The extract from the *Farbenlehre* demonstrates the impact that the mountain environment can have on an individual's sense of vision, while the extract from 'Granit II' exemplifies the influence that it can have on their sense of self. In both instances, these effects are strikingly powerful, and make their impact felt outside the mountain itself. However, of the entire 'Ilmenau' poem, the antepenultimate stanza contains the most detailed references to human interaction with the natural world, and the mountain environment in particular:

Ich sehe hier, wie man nach langer Reise  
Im Vaterland sich wieder kennt,  
Ein ruhig Volk in stillem Fleiße  
Benutzen, was Natur an Gaben ihm gegönnt.  
Der Faden eilet von dem Rocken  
Des Webers raschem Stuhle zu,  
Und Seil und Kübel wird in längerer Ruh  
Nicht am verbochnen Schachte stocken;  
Es wird der Trug entdeckt, die Ordnung kehrt zurück,  
Es folgt Gedeihn und festes ird'sches Glück.  
(WA I: 2, p. 147)

In this idealised 'Vaterland', its 'Volk' are engaged in wholesome pursuits that make the most of the 'Gaben', or gifts, that nature has bestowed upon them, whether in the form of weavers in cottage industries spinning thread, or in the shape of miners winching buckets down into the depths of the earth. The hopeful vision that these contraptions will 'nicht am verbochnen Schachte stocken' is particularly poignant: as mentioned earlier in this chapter, this is a rather prescient statement. Thirteen years or so after this poem was written, in October 1796, the undertaking of the mine at Ilmenau met its end when one of its tunnels collapsed, rapidly flooding the mine with water and rendering it unusable.<sup>64</sup> This stanza, however, contains not a hint of the disaster that was to come, with its rosy setting even seeing the corruption rife in the Ilmenau tax office (the 'Trug' mentioned in the penultimate line above) being rooted out. The 'Volk' are left with success and happiness, and indeed, this success and happiness is 'irdisch', originating from the geological foundation beneath their feet. Ilmenau's residents are also poetically entwined with the geological space surrounding them in this stanza. In these lines, the 'Volk' are described as 'ruhig': the same word is used to describe how the mountain 'ruhig grünet' at the start of the poem. This term does not appear anywhere else in this poem, and in turn, its usage here forges a connection between the local people and the mountain. This mountain is at the heart of their happiness, their lives and their prosperity. While Goethe's time in

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<sup>64</sup> For a detailed description of this disastrous event, see Klauß, p. 151.

Ilmenau was ostensibly for the purpose of operating the mine for financial gain, as his numerous reports from the mine attest, this did not mean that he saw the geological environment around Ilmenau as merely being a means to an end. Quite the opposite, in fact. As the ‘Ilmenau’ poem illustrates, the scientific writings on geology that Goethe composed during, and in the wake of, the Ilmenau period are replete with references that would not be out of place in a poetic work. Central to all these writings is Goethe’s firmly held belief that mountains, rocks, and the geological space more broadly, had much more to offer than their matter itself: rather, this matter is inherently imbued with all kinds of resonances, whether in the form of a vivid life-force or an aura of mystery.

## **Summary**

Goethe composed a great deal of work on geology both during his involvement in Ilmenau and in the wake of his engagement there. He made repeated visits to the town, which had a visible, lasting impact on his geological work that followed: nowhere in Germany had a greater, or more consistent, impact on Goethe’s geological development than Ilmenau. As a result, any attempt to understand Goethe’s geological work must also encompass an understanding of the background to Goethe’s interest in geology, rocks and mining – and this understanding must also include an awareness of the impact of Ilmenau, the town that stimulated his thought on this subject for so many years and where the kernels of Goethe’s subsequent writings on geology first took root. Many of the themes that would be reflected in his geological work, such as the power and agency of mountains, and their capacity to exude powerfully immaterial forces, are prefigured in his ‘Ilmenau’ poem. Indeed, similar themes recur across Goethe’s written output from the period, reflecting his sustained engagement with these topics. These references, both explicit and implicit, demonstrate that these issues of applied (im)materiality were occupying Goethe’s mind as early as 1783, if not before. Goethe’s engagement with these issues would continue to unfold and expand as the years went on, stimulated by the experiences that he had in the town, whether running the mine, climbing its ‘Kickelhahn’ mountain or reflecting on discussions he had with his professional colleagues in Ilmenau. The mirroring of these themes across Goethe’s scientific work offers a clear link between his scientific, and specifically geological, output and his literary production during this period. By extension, this connection means that it is possible to read his geological writings with an eye to their literary nature, as I do in this thesis, looking for resonances in terms of lexical choices, structure and imagery, say, rather than merely focusing on their objective scientific value. In turn, homing in on Goethe’s earliest writings and areas of focus in his geological development highlights specific issues to explore in more detail with his later, more fleshed-out writings on the subject.

## Chapter Two: The imagination

In his study of the interplay between literature and embodied cognition, Terence Cave offers an overview of how the imagination has been perceived throughout history:

Famously, the suspicion of the imagination which was endemic in medieval and early modern thought, up to and including the Enlightenment, was countered in the earlier nineteenth century by the notion that the imagination has a creative power, and more specifically a cognitive power, that gave it ascendancy over ‘scientific’ reason, **materialized** as the latter was in the technological innovations of the industrial revolution.<sup>65</sup> (my emphasis)

Cave is writing about authors of literature in general here, but I contend that his assertion of the ‘ascendancy’ of the imagination and the importance of the position that it held also applies to Goethe, specifically, as well: the faculty of the imagination was a central component of his thought and shaped his approach to science and natural philosophy. As Cave summarises, previous critics have ‘famously’ drawn a clear division between the ‘creative’ cognitive faculty of the imagination and the ‘scientific’ one of reason. As a result, these critics have implied that the two are somehow competing with one another, rather than working in concert with each other. Similarly, this overview suggests that previous scholars have considered the ‘imagination’ per se to be something fixed and able to be categorised. Furthermore, these prior critics clearly align the imagination with creativity and reason with science, marking out firmly delineated (and separate) areas of influence for them both. However, Cave calls (and I agree) for a more nuanced attitude towards the imagination, seeing it as an integral part of thought itself, rather than as its lesser, fanciful cousin.

Cave has summarised his argument elsewhere by explaining that ‘thought as we experience it in everyday life [...] is shot through with feeling, imagination and deeply-rooted physiological resonances’.<sup>66</sup> This sentence offers a rich, densely packed summary of Cave’s view of the imagination. Firstly, Cave makes explicit that this faculty is embedded within the physical, material world, by reference to the ‘physiological resonances’ that are an inextricable part of the imagination’s workings. While the process of imagination itself is intangible and immaterial, it is inevitably housed within an embodied subject. Secondly, Cave’s use of the term ‘shot through’ in this phrase highlights that the imagination (along with other faculties) is deeply embedded within thought – but in the specific context of reading Goethe, I would go further. Rather than simply being embedded in thought

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<sup>65</sup> Terence Cave, *Thinking with Literature: Towards a Cognitive Criticism* (Oxford: Oxford University Press, 2016), p. 65.

<sup>66</sup> Terence Cave, ‘Introduction’, *Paragraph*, 37.1 (2014), 1-4 (p. 3).

as part of the general process of thinking, the imagination is, for Goethe, also a deeply productive, generative faculty that actively leads to the creation of thoughts themselves. Cave ends his assessment of the imagination by stating that scientific reason took material form in technology. If reason can be ‘materialised’, to use his term, this suggests that the imagination can also express itself in material form. By extension, this also begs the question as to where this occurs. I contend that Goethe’s writings, and particularly his works on geology, represent a material expression of the imaginative process that was so central to his understanding of scientific enquiry. In turn, this means that any engagement with Goethe’s geological texts is intrinsically linked to an engagement with the multi-layered (im)material process that led to their creation.

‘The Enlightenment created the idea of imagination’, states James Engell in the opening line of his book *The Creative Imagination*.<sup>67</sup> The Enlightenment was when this concept was ‘brought [...] to ripeness’,<sup>68</sup> but this does not, however, imply that the imagination peaked during the Enlightenment and faded away thereafter. Quite the opposite: it held a prominent role in the Romantic period, too. In Engell’s view, the importance of the imagination in this period cannot be understated:

Far more than any other one thing, this idea shaped and sustained Romanticism, which itself might be described as the mingled achievements of a number of individuals who in their own characteristic ways, shared a faith in imaginative power. Romanticism grew around the imagination in the manner that a storm masses around a vortex, a central area that differs in pressure from the surrounding space. If that area vanishes — if the idea is taken away — there will be only light and aimless winds. The attracting and unifying force of the imagination made Romanticism in the first place.<sup>69</sup>

The imagination, then, was a central component, or indeed, *the* central component of Romantic thought – and Goethe’s use of the imagination in the context of science fitted neatly within this trend. Donald G. Marshall, another scholar who has written on the history of the imagination, largely shares Engell’s view that the Enlightenment, or pre-Enlightenment, imagination enjoyed a resurgence during the eighteenth and early nineteenth centuries. He sees its origins as lying in the Renaissance, a time when ‘a mental faculty concerned with the perception of sensuous realities [was] combined with a spiritual ambition to bring man into touch with higher things’.<sup>70</sup> In this statement, Marshall summarises the imagination (‘a mental faculty’) as receiving external sensory input (‘the perception

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<sup>67</sup> James Engell, *The Creative Imagination: Enlightenment to Romanticism* (Cambridge MA: Harvard University Press, 2013), p. 3

<sup>68</sup> Engell, p. 4.

<sup>69</sup> Engell, p. 4.

<sup>70</sup> Donald G. Marshall, ‘Ideas and History: The Case of “Imagination”’, *Boundary 2*, 10.3 (1982), 343-59 (p. 347).

of sensuous realities'), which, in turn produces something which is much more than the sum of its parts ('bring man into touch with higher things'). Marshall's summary, I contend is very similar to Goethe's interpretation of the imagination, too, as a transformational force that can turn the perception of external reality into internal sensations.

### **The (im)materiality of the imagination**

Questions of materiality are intrinsically connected to the functioning of 'Einbildungskraft'. The materiality of 'Einbildungskraft', or the lack thereof, operates on two distinct levels. Firstly, there is the shifting, stratified (im)materiality of 'Einbildungskraft' itself as a faculty that is, in and of itself, immaterial, but nevertheless is, and must be, housed within a material, embodied subject, as Cave explains. Secondly, there is the process by which this faculty functions. Seen through a lens of (im)materiality, the imagination has a unique power: triggered by material objects (and, indeed, their immaterial characteristics, too) perceived by the individual in question, it then conjures up immaterial thoughts and imaginings on the basis of these objects. This process of transformation is made clear by the composition of the word 'Einbildungskraft' itself. The word houses within itself the root of the verb 'bilden', or 'to form': 'Einbildungskraft' is a formative power that shapes and creates. Etymologically, Duden states that the term 'einbilden' originates from the Middle High German term 'inbilden', which it glosses as '(in die Seele) hineinprägen'.<sup>71</sup> In itself, this notion of one's soul almost being embossed or imprinted with an idea is a challenging concept, from the perspective of (im)materiality: the act of embossing, something that changes the physical shape of an object, must be carried out on a material entity, and not a wholly immaterial entity, like the soul. This issue of materiality is brought into sharp relief by the fact that the term 'imagination' does not share the same root as 'Einbildungskraft'. According to Merriam-Webster, the word 'imagine' comes from the Middle English 'ymagynen', which, in turn, originates from the Latin 'imaginari', the verbal derivative of 'imago', meaning 'representation, semblance, image'.<sup>72</sup> The verb 'imagine' and its related words, then, have their roots in notions of representation and appearance. Despite having the same meaning in day-to-day usage, 'imagination' and 'Einbildungskraft' have very different etymological overtones: the former merely focuses on reflecting a particular image, whereas the latter revolves around a process of formation within the subject's mind. Moreover, this process of formation is also a transformational one that can turn the material into the immaterial.

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<sup>71</sup> 'Einbildungskraft' on *Duden online*. <<https://www.duden.de/node/135940/revision/135976>> (Accessed on 9 October 2020).

<sup>72</sup> 'Imagine' on *Merriam-Webster online*. <<https://www.merriam-webster.com/dictionary/imagine>> (Accessed on 9 October 2020).

The imagination as a faculty was a source of fascination to authors in the eighteenth century, which saw a lively, impassioned debate as to its benefits and its pitfalls. Accordingly, much work on the imagination undertaken during the *Goethezeit* and the decades preceding it served primarily to either defend or attack this faculty, rather than to identify the actual nature of it. These attacks revolved around the opposing positions of the Cartesians, who believed in the fundamental separation of mind and body (or ‘Geist’ and ‘Materie’, to use Goethean terminology), and the empiricists, who believed that the mind could not function autonomously. For the Cartesians, the imagination was able to operate independently without any external input from the sensory organs, whereas the empiricists took the view that the imagination needed sensory input to function.<sup>73</sup> This latter approach, one which highlighted the inevitable pairing of the immaterial imagination with the material body, aligns most closely with my reading of Goethe’s understanding of this faculty as a concept, shaped by the same monist duality as the compound concept of (im)materiality itself. Indeed, James Engell, mentioned in the introduction to this chapter, has offered a summary of the imagination that similarly reads it as offering a bridge between these seemingly opposed concepts of the physical objects perceived by the senses and the rather less physical thoughts of the mind:

The principles could be learned only as the senses received them piecemeal from the external world or as the mind intuited them from an internal sensibility and store of innate ideas. The imagination held out hope and promised a reconciliation of this dualism. It could overcome the alienation between man and nature by establishing a power of knowledge and creation common to nature and the mind, a power Coleridge might call ‘connatural’.<sup>74</sup>

It is not a coincidence that Engell makes reference to Goethe’s contemporary Samuel Taylor Coleridge here. Coleridge was a highly prominent thinker on the imagination during the *Goethezeit*, and one of few to express his thoughts on the subject in a coherent treatise. The two men had many shared interests: Coleridge, like Goethe, was interested in geological pursuits (climbing the Brocken twice in 1799, for example).<sup>75</sup> In Coleridge’s 1817 work on the nature of poetry, *Biographica Literaria*, he devotes the entirety of chapter XIII to the imagination, using the concluding three paragraphs of the text to detail his understanding of ‘imagination’ and ‘fancy’. Coleridge divides this imagination into the ‘primary imagination’ and ‘secondary imagination’. This former, primary version of the imagination is for Coleridge as ‘Einbildungskraft’ is for Goethe, ‘the living Power and prime

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<sup>73</sup> For a thorough overview of these debates and the various factions within them, see Jonathan Lamb, ‘Imagination, Conjecture, and Disorder’, *Eighteenth-Century Studies*, 45.1 (2011), 53-69.

<sup>74</sup> Engell, p. 7.

<sup>75</sup> C. J. Wright, ‘The “Spectre” of Science. The Study of Optical Phenomena and the Romantic Imagination’, *Journal of the Warburg and Courtauld Institutes*, 43 (1980), 186–200 (194).



Agent of all human Perception'.<sup>76</sup> Imagination, for Coleridge 'is essentially vital, even as all objects (as objects) are essentially fixed and dead'.<sup>77</sup> In this statement, contrasting the vividness of the imagination with the stasis of the objects it takes as its sustenance, Coleridge is exploring many of the same issues of the mind/body dichotomy that shaped debate on the imagination previously, albeit in different terms.

The grounding of this process in materiality is made explicitly clear by a thinker from whom Goethe admitted drawing substantially in his understanding of mental processes: Immanuel Kant. One of Goethe's most explicit admissions of the role that Kant's writings played in the development of his own thought comes in his 1817 essay 'Anschauende Urteilskraft'. He admits that he tried 'die Kantische Lehre wo nicht zu durchdringen doch möglichst zu nutzen' (WA II: 11, p. 54). In his attempts to do so, Goethe explains that he found it somewhat ironic that Kant oscillated between a tightly defined concept of 'Erkenntnisvermögen' and one which 'bald über die Grenzen, die er selbst gezogen hatte, mit einem Seitenwink hinausdeutete' (WA II: 11, p. 54). One of these tightly formulated definitions of 'Erkenntnisvermögen' can be found in § 49 of *Kritik der Urteilskraft*, where Kant offers a definition of 'Einbildungskraft':

Die Einbildungskraft (als produktives Erkenntnisvermögen) ist nämlich sehr mächtig in Schaffung gleichsam einer andern Natur, aus dem Stoffe, den ihr die wirkliche gibt.<sup>78</sup>

In an utterance that would not seem out of place in Goethe's geological writings, Kant describes 'Einbildungskraft' as a faculty that is at once productive and powerful. This power, just as in Goethe's descriptions of 'Einbildungskraft', lies in the imagination's transformational ability to turn material reality into immaterial thoughts. To use Kant's terminology, the imagination works with 'Stoff', or matter', drawn from 'die wirkliche [Natur]' to create something which is 'einer andern Natur', or, in other words, of a nature that is un-'wirklich'. The use of the term 'Stoff' here implies that the imagination (or at least, the productive imagination), is able to convert material 'Stoff' into immaterial thoughts, acting as a portal between the realm of materiality and that of immateriality. This comparison with Kant's use of 'Einbildungskraft' reveals that the connection between (im)materiality and the imagination is even more complex than might initially be assumed: not only can the imagination theoretically act as a bridge between the material, external world of things and the immaterial, internal world of thoughts, the very (im)materiality of this internal imaginative world is complex and stratified. Housed within a material body and a material brain, and yet with thoughts,

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<sup>76</sup> Samuel Taylor Coleridge, *The Collected Works of Samuel Taylor Coleridge*, ed. by James Engell and W. Jackson Bate (Princeton NJ: Princeton University Press, 1983), p. 304

<sup>77</sup> Coleridge, p. 304.

<sup>78</sup> Immanuel Kant, *Kritik der Urteilskraft (Berliner Ausgabe)*, ed. by Michael Holzinger (Frankfurt am Main: Suhrkamp, 2014), p. 125.

imaginings or mental images being anything but material, the faculty of the imagination itself is imbued with the same multi-layered (im)materiality as the objects that act as fodder for its workings.

Indeed, many critics believe that the imagination requires a material stimulus to function. This is the view taken, for example, by the creativity researcher Cathy Treadaway. She argues that ‘materiality and remembered physical experiences stimulate the imagination and are crucial to the development of creative thought’,<sup>79</sup> suggesting that there is a productive, indispensable connection between an individual’s process of creative thought and the material world around them, with imagination providing the link between the two. For Treadaway, and for Goethe too, as his geological writings show, an individual’s imagination works via sensory interaction with (im)material artefacts: despite the fundamentally immaterial nature of conscious (or unconscious) thought within the embodied subject, these thoughts are rooted in the (im)material environment surrounding them. However, the imagination’s productive workings extend further than the subject’s mind. As Simon Marsden explores in his discussion of the tripartite connection between writing, the imagination and materiality in the context of Emily Bronte’s work, the act of writing imagined thoughts adds a layer of materiality to this process. As he explains, ‘the imaginative experience is unmediated: its translation into text thus necessarily demands that the visionary step out of the vision.’<sup>80</sup> The process does not stop with imagination, which is necessarily internal to one person only. Rather, the imagined thoughts must be transmitted to others in written, material form, as in the case of Goethe’s geological writings in this instance.

### **‘Einbildungskraft’ in geological enquiry: Goethe’s ‘Der Kammerberg bei Eger’**

The centrality of the imagination to Goethe’s thought processes and his understanding of the natural world is brought to the fore in the 1808 version of his geological text ‘Der Kammerberg bei Eger’, in which he makes repeated reference to the role of the imagination in understanding the natural world. At the time that Goethe wrote this essay, he was staying in Karlsbad and was deeply intrigued by the question of the origins of the Kammerberg mountain, located in modern-day Czechia. For example, he met on 29 July of that year with ‘Bergrat’ Werner to discuss the ‘Egerschen zweifelhaften vulcanischen Producte’ (WA III: 3, p. 365). This man, Abraham Gottlob Werner, was a prominent geologist in the *Goethezeit* who engaged in a lively exchange of opinions and expertise with Goethe

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<sup>79</sup> Cathy Treadaway, ‘Materiality, Memory and Imagination: Using Empathy to Research Creativity’, *Leonardo*, 42.3 (2009), 231-37 (p. 236).

<sup>80</sup> Simon Marsden, ‘Imagination, Materiality and the Act of Writing in Emily Bronte’s Diary Papers’, *Nineteenth-Century Contexts* 28.1 (2006, 35-47 (p. 39).

over many years.<sup>81</sup> Goethe turned his attention to the subject of the Kammerberg and the Eger region twice, first in 1808 and subsequently in 1820: the two essays book-end his return to Ilmenau in 1813 after many years of absence, with the geological expertise he gained in the town doubtless informing his understanding of the Eger region as well. The former, ‘Der Kammerberg bei Eger’, offers a lengthier, more detailed discussion of the Kammerberg, containing extended descriptions of the Kammerberg’s geographical positioning and its geological composition. These descriptions lead into a discussion of its potential origins, with Goethe expressing a belief that the mountain had been created by volcanic lava. A decade or so later, as Goethe reports in his much briefer 1820 ‘Kammerberg bei Eger’, a shaft had been dug sufficiently deep into the mountain to enable geologists to identify the rocks from which it was formed, and Goethe’s initial volcanic theory was proved correct. To accompany the 1808 essay, Goethe also put together a collection of rock samples to illustrate the geological features of the region. While the physical collection itself has been long dispersed,<sup>82</sup> a list detailing its contents survives. This list serves to demonstrate that Goethe’s geological writings were not mere pieces of theory: they were deeply connected to, and inspired by, the material geological environment with which he interacted directly.

This repeated engagement with the ‘Kammerberg’ is testament to Goethe’s deep-seated interest in the mountain and its formation. One of the very few critics to comment on the ‘Kammerberg bei Eger’ essays, Christoph Michel, goes so far as to suggest that ‘dieser äußerlich ganz unscheinbare Hügel [übte] auf Goethe eine ungewöhnliche Faszination’.<sup>83</sup> This is evidenced by the sheer amount of time that Goethe dedicated to the mountain: he made eight visits to it in 1808 alone.<sup>84</sup> While the content of the two essays superficially revolves around the geological conundrum surrounding the Kammerberg’s origins, the earlier essay has been described by Michel as ‘ein glänzendes Muster wissenschaftlicher Prosa, das die gesamte Landschaft des Egerlandes in ein geophysikalisch-ästhetisches Panorama faßt’.<sup>85</sup> Alongside providing a comprehensive overview of the geology of the Eger region, it also offers an insight into Goethe’s process of scientific perception, a process shaped by the interaction between consideration and imagination. Indeed, this insight is offered in the literal sense of the term, as the text is replete with references to both the sense and the activity of vision. The start of the second line of the essay focuses on identifying the Kammerberg through its visual features (‘er zeigt sich [...] etwa eine halbe Stunde rechts vom Wege’ [WA II: 9, p. 76]), and is followed by a

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<sup>81</sup> The pair’s interactions with each other are discussed in more detail in Chapter Four.

<sup>82</sup> See Max Semper, *Die geologischen Studien Goethes* (Leipzig: Verlag von Veit & Comp., 1914), p. 119.

<sup>83</sup> Christoph Michel, “‘ein Kontinent mitten im Kontinente’ - Goethe in Böhmen”, *Goethe-Jahrbuch*, 120 (2003), 111–22 (p. 115).

<sup>84</sup> Michel, p. 115.

<sup>85</sup> Michel, p. 115.

paragraph that steps away from focusing on the mountain itself to briefly discuss the importance of vision in such endeavours. Goethe writes:

Wir geben zu unserer Darstellung ein Kupfer und legen dabei eine Sammlung zum Grunde.  
Denn wenn man gleich mit Worten vieles leisten kann, so ist es doch wohlgetan, bei natürlichen Dingen die Sache selbst oder ein Bild vor sich zu nehmen, indem dadurch jedermann schneller mit dem bekannt wird, wovon die Rede ist. (WA II: 9, p. 76)

Here, Goethe explains that he has included a copper etching and a collection of rocks (a list of which is appended to the end of ‘Der Kammerberg bei Eger’, as mentioned above) to enable the reader to understand the matter at hand more quickly. While words are often adequate (they can ‘vieles leisten’), in Goethe’s eyes, they are not necessarily the most effective (or speediest) means by which to trigger the reader’s or viewer’s process of imagination. Instead, it is ‘wohlgetan’ either to look at the literal matter in question or a visual depiction of it – especially as far as the natural world is concerned. This suggests that heightening a researcher’s visual engagement with the matter at hand is the preferred approach, positioning vision as the supreme sense when it comes to scientific research.

Throughout ‘Der Kammerberg bei Eger’, vision is shown to play a key role in stimulating productive thought. This is reinforced early on in the text, where Goethe calls on the reader to conjure up a mental image of the valley, comparing the larger valley of Bohemia to the smaller valley of the Eger region:

Läßt sich Böhmen als ein großes Thal ansehen, dessen Wasser bei Außig abfließen, so kann man den Egerdistrict als ein kleineres denken, welches durch den Fluß dieses Namens sich seiner Wasser entledigt. (WA II: 9, p. 77)

In this sentence, the act of ‘ansehen’ leads directly to the act of ‘denken’, with the visual overtones of the former offering fodder for the cognitive processes of the latter. The subsequent phrase makes this connection stronger still. As Goethe begins to describe the valley in question, he states:

Betrachten wir endlich die Gegend, von der zunächst hier die Rede ist, so erblickt unsre Einbildungskraft gar leicht an der Stelle des großen Franzenbrunner Moors einen vormaligen Gebirgssee. (WA II: 9, p. 77)

After the sense of vision has been brought into play (‘betrachten’), the imagination begins to ‘see’ (‘erblickt’) – except it sees what is *not* there, whether in the form of what was there, will be there, or should be there, rather than what *is* there, as the eyes do. In turn, this reveals the nature of the imagination itself to be a faculty that is both triggered by vision and complements it, something that is both stimulated by material artefacts and supplements them. After this brief moment of imagining the

past, the imagination's work is not yet done, as Goethe moves to the present and describes the Kammerberg's appearance as it was in the early nineteenth century. He takes the reader on a virtual tour of the Kammerberg's geological composition, first proceeding in a north-easterly direction from the pavilion on its peak before exploring the mountain in a south-westerly route. Once again, this implied process of imagination is achieved with a plethora of verbs of sight: 'Wie man sich nach der Rechten wendet, **erblickt** man [...] in der Ferne den sächsischen Fichtelberg' (WA II: 9, p. 79); 'herwärts **sieht** man sodann das Schloß Hohberg' (WA II: 9, p. 79); 'hier **zeigen sich** Lagen vulkanischer Produkte' (WA II: 9, p. 80); 'bei einigen dieser Art **scheint** der Stein selbst angegriffen' (WA II: 9, p. 81) and so on, thereby emphasising the centrality of vision to this process.

These two imaginary walks lead the reader to the next mention of 'Einbildungskraft' in the text. The protagonist moves to describe the rock's colour ('durchaus lichtgrau' [WA II: 9, p. 86]) and its texture, featuring 'uneben und splittterig' fractures in the rock (WA II: 9, p. 85) and the 'größere und kleinere Höhlungen' on its surface (WA II: 9, p. 86). He even suggests that this tactile dimension of the rock can be replicated by the reader using more conveniently sized pieces of the stone ('wie man sich selbst an kleinern Stücken überzeugen kann' [WA II: 9, p. 86]). After these brief descriptions, the narrative voice once again steps away from the focus on the Kammerberg to make a more general assertion relating to the imagination, stating:

Nachdem wir dasjenige, was uns der äußere Sinn in dem gegenwärtigen Falle gewahr werden läßt, umständlich und deutlich vorgetragen, so ist es natürlich, daß wir auch unser Inneres zu Rathe ziehen und versuchen, was Urtheil und Einbildungskraft diesen Gegenständen wohl abgewinnen könnten. (WA II: 9, p. 86)

This statement makes even more explicit the connection between the external world of the senses, and the internal world of the imagination. As Goethe explains, our outer senses become aware of our surroundings, and this, in turn, gives rise to the innate, natural ('natürlich') desire to bring our internal faculties (our 'Inneres') into play to derive further conclusions from these external inputs. This is striking for two interconnected reasons. Firstly, it demonstrates that 'Einbildungskraft' is not merely a tool for flights of fancy and does instead provide utility ('zu Rathe ziehen', 'abgewinnen'). Secondly, 'Einbildungskraft' is presented as almost a cousin of 'Urtheil', rather than its opposite, working in concert with it and coming together with it to form a person's 'Inneres': something which resides within an individual's material body (or mind) but that is, in and of itself, wholly immaterial in nature.

The interconnectedness of 'Einbildungskraft' with other immaterial mental faculties is further emphasised in the third, and final, use of the term in 'Der Kammerberg'. While the earlier portions of

the essay provide a description of the Kammerberg's geological composition, at this point the essay sketches out the debate between two opposing groups of theorists, who believe that the mountain was formed either by the movement and minerals of the ocean or by volcanic eruptions, respectively. Once again, the protagonist then steps outside the framework focused on the Kammerberg to discuss the overarching issues relating to scientific perception. Here, the protagonist states that:

Alle solche Versuche, die Probleme der Natur zu lösen, eigentlich nur Konflikte der Denkkraft mit dem Anschauen sind. Das Anschauen gibt uns auf einmal den vollkommenen Begriff von etwas Geleistetem; die Denkkraft, die sich doch auch etwas auf sich einbildet, möchte nicht zurückbleiben, sondern auf ihre Weise zeigen und auslegen, wie es geleistet werden konnte und mußte. Da sie sich selbst nicht ganz zulänglich fühlt, so ruft sie die Einbildungskraft zu Hülfe, und so entstehen nach und nach solche Gedankenwesen (entia rationis), denen das große Verdienst bleibt, uns auf das Anschauen zurückzuführen, und uns zu größerer Aufmerksamkeit, zu vollkommenerer Einsicht hinzudrängen. (WA II: 9, p. 91)

In this extract, imagination is seen as an aid to thought which can step in when thought attempts to extrapolate information from an object in front of the viewer. The power of thought ('Denkkraft') can only do so much before it actively calls ('ruft') for assistance from the imagination, which gradually ('nach und nach') allows these more attentive, deeper thoughts to emerge. This 'Denkkraft' does, indeed, have some imaginative work to perform itself ('die sich doch auch etwas auf sich einbildet'). The imagination does not replace the power of thought, nor does it stifle it. Rather, it complements it, appearing only when actively summoned and drawing on the work already done by the process of vision ('Anschauen') rather than creating convoluted fantasies with no connection to reality.

Of Goethe's writings on geology, 'Der Kammerberg bei Eger' offers the fullest exposition of the role that 'Einbildungskraft' played within the process of scientific enquiry. However, this concept is frequently mentioned in Goethe's other geological studies, and it often appears in conjunction with Goethe's time in Ilmenau and the experiences he had there. This is the case, for example, in his 1823 essay 'Herrn von Hoff's Geologisches Werk'. Alongside offering an overview of Goethe's opinion of von Hoff's study, this piece also sees Goethe provide a retrospective of his forty-year career as a geologist. As part of this, he looks back on his interactions with 'Bergrat Voigt zu Ilmenau', with whom Goethe spent decades at the helm of the mine at Ilmenau. As he reminisces on his and Voigt's explorations of the environment around Ilmenau, Goethe also explains how the process of geological enquiry functioned for the two men. Confused by the blocks of stone that could be found scattered all across Thuringia, the pair proceeded as follows:

Wir bildeten mehr oder weniger dieses Phänomen in der Einbildungskraft aus, ließen uns die Hypothese eine Zeitlang gefallen, dann scherzten wir darüber, Voigt aber konnte von seinem

Ernst nicht lassen, und ich glaube, er hat irgendwo den Gedanken abdrucken lassen. (WA II: 9, p. 286)

In a process that is near-identical to that pursued in *Der Kammerberg bei Eger*, Voigt and Goethe are presented with a geological phenomenon that cannot easily be explained – and ‘Einbildungskraft’ is the first faculty to which they turn. They conjure up an imagined version of the phenomena, and use these imaginings to create a hypothesis upon which they base their further studies. A similar process is described in Goethe’s 1797 ‘Schema zu einer Vorarbeit die fossilen brennbaren Materialien im hiesigen Fürstenthum betreffend’, a brief exploration of the various kinds of coal to be found distributed across the duchy presided over by Duke Carl August. In this, Goethe states:

Ilm und Saale, so lange sie durch unser Territorium fließen, sind zwischen Bergen und Hügeln eingeschlossen, und wenn man mit der Einbildungskraft in jene Zeiten zurück geht, in welchen solche Depots entstanden sein mögen, so können jene Gegenden noch lange unter Wasser gestanden haben, da unsere Hügel und ihre Schluchten schon trocken waren. (WA I: 53, p. 321)

Goethe alleges that tracking the course of the Ilm, the river that flows through Ilmenau and scythed through its landscape to create the mountains and, as Goethe states here, leave valuable coal deposits in its wake, could be one way by which to identify understand where these deposits are, and why they are there. To do so, it is necessary to use one’s ‘Einbildungskraft’ to mentally travel back in time to the point at which these coal deposits were created, imagining the process by which they were created. The imagination, then, was an indispensable aid for attempting to make sense of geological phenomena that, at first glance, were not so easily understood.

### **The ambivalence of the imagination**

Goethe’s ‘Kammerberg bei Eger’, along with the various texts directly connected to his time in Ilmenau, leave no doubt as to the central importance that ‘Einbildungskraft’ played in the process of geological enquiry for Goethe. However, this does not mean that Goethe presents the imagination as a purely helpful and utterly unproblematic faculty. Indeed, James Engell, the scholar of the imagination mentioned earlier in this chapter, sees Goethe’s complex understanding of the imagination as being the defining hallmark of his approach to this faculty. Engell states, for example, that ‘it is Goethe’s expression of the complexity of imagination, and of its elusive nature, that we value most highly’.<sup>86</sup> This complexity is expressed through ambivalence, as Engell subsequently makes clear:

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<sup>86</sup> Engell, p. 279.

Goethe sees the imagination as a potentially split faculty. Nothing can match its creative power or its grasp of the flow of experience, but when it is unregulated and estranged from reality, it becomes the greatest source of terror and even despair.<sup>87</sup>

In Engell's reading, the Goethean imagination could not function properly in isolation. Instead, it needed to operate in conjunction with other senses and other mental faculties to ensure that it was not overstepping the bounds of reality – which is when it could become rather more of hindrance than a help.

As Engell suggests, Goethe certainly did not see the imagination as a panacea. Indeed, across Goethe's geological writings, the risks inherent to the imagination are presented alongside the benefits it can offer. This riskier side of the imagination is reported in his 'Brief aus der Schweiz' dated 12 November 1779, when Goethe was deeply involved in his endeavours to reopen the mine at Ilmenau after being brought onto the project just three years earlier. Written during his travels through Switzerland, the letter opens with a lengthy description of the route taken through the mountains and the locals that the travellers met on the way, until Goethe pauses for a minute to narrate the experience of coming out of the valley bottom. He explains that:

Die Tiefen, aus denen man herkommt, liegen grau und endlos in Nebel hinter einem. [...] Ich bin überzeugt, dass einer, über den auf diesem Weg seine Einbildungskraft nur einigermaßen Herr würde, hier ohne anscheinende Gefahr vor Angst und Furcht vergehen müßte. Eigentlich ist auch hier keine Gefahr des Sturzes, sondern nur die Lauwinen, wenn der Schnee stärker wird als er jetzt ist, und durch seine Last zu rollen anfängt, sind gefährlich. (WA I: 19, p. 291)

Here, the imagination's work in the geological space is triggered by Goethe's experience of the mountain environment, but this mysterious sense can lead astray, as well as offer guidance or spark new thoughts. Only if the walker's imagination is fully mastered, says Goethe, can he walk along this path, in the rational understanding that there is no danger of falling off. If the walker's imagination is left to run riot, he will instead be too afraid of the risks innate to the hike to pursue it fully. In some cases, imagination can provide an excess of information once triggered by an external stimulus, rather than just enough: the imagination is a helpful tool, but it is inherently imbued with danger, too.

While 'Der Kammerberg bei Eger' and Goethe's letter from Switzerland are both texts relating to the applied science of geology, his writings on scientific theory examine the imagination from a more abstract, distanced standpoint, and present 'Einbildungskraft' in a slightly different light as a result.

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<sup>87</sup> Engell, p. 279.



One such piece is the 1792 essay ‘Der Versuch als Vermittler von Objekt und Subjekt’, written just four years before the mining disaster that would spell the end of Goethe’s direct involvement with the Ilmenau project. Unlike ‘Der Kammerberg bei Eger’ and the ‘Briefe aus der Schweiz’, where ‘Einbildungskraft’ is merely mentioned as a tool that plays a role in the protagonist’s geological explorations, ‘Der Versuch als Vermittler’ offers rather more in the way of information about Goethean ‘Einbildungskraft’, in both a positive and a negative dimension. Although the examples from Goethe’s ‘Der Kammerberg bei Eger’ mentioned above seem to show ‘Einbildungskraft’ as a helpful aid in investigating the mountain landscape, with the protagonist’s imagination allowing him to visualise features that are not really there, Goethe is rather more critical of ‘Einbildungskraft’ in ‘Der Versuch als Vermittler’. The specific risk posed by the imagination is explored comes when it is used to synthesise individual facts to form an argument or a hypothesis:

Argumente können ganz isolierte Verhältnisse enthalten und dennoch durch Witz und Einbildungskraft auf einen Punkt zusammengeführt und der Schein eines Rechts oder Unrechts, eines Wahren oder Falschen überraschend genug hervorgebracht werden. Ebenso kann man, zugunsten einer Hypothese oder Theorie, die einzelnen Versuche gleich Argumenten zusammen stellen und einen Beweis führen, der mehr oder weniger blendet. (WA II: 11, p. 34).

Here, a person’s ‘Einbildungskraft’ can actively lead an investigator astray, working in tandem with ‘Witz’ to give mere ‘Argumente’ nothing other than ‘der Schein eines Rechts oder Unrechts’. Furthermore, it works to jeopardise the very sense that Goethe set so much store by in his experimentation, namely, vision. Instead of offering the enhancement to ‘Anschauung’ it seems to provide in ‘Der Kammerberg bei Eger’, in ‘Der Versuch als Vermittler’ (and, indeed, as implied in the letter from Switzerland), imagination’s role in synthesising the individual components of an argument is aligned with the effect of blindness (‘blendet’) which results when a hypothesis or a theory makes use of disparate, unconnected experimental findings. This extract explores the outcome of combining ‘Einbildungskraft’ with all the other negative characteristics mentioned in the previous quotation, offering a more concrete example of the risks that the imagination can pose to a serious scientist. However, this danger does not seem to be a concern in ‘Der Kammerberg bei Eger’, where the imagination enables the individual in question to bring together the material present-day appearance of the mountain environment with their immaterial conjecture as to how it came to be.

However, ‘Witz’ and ‘Einbildungskraft’ are not solely a destructive, unhelpful pairing. Indeed, in line with Goethe’s ambivalent representation of ‘Einbildungskraft’, the depiction of the imagination in ‘Der Versuch als Vermittler’ is not solely negative, either. After the extract above, Goethe goes on to discuss his theories about ‘Erfahrungen der höheren Art’ (WA II: 11, p. 35), which he sees as

occurring when an experiment is replicated multiple times, leading to a more holistic form of knowledge. When these findings are brought together by the imagination, the outcome is illuminating, rather than dangerous. Goethe states:

Hat man aber eine Reihe Erfahrungen der höheren Art zusammengebracht, so übe sich alsdann der Verstand, die Einbildungskraft, der Witz an denselben wie sie nur mögen, es wird nicht schädlich, ja es wird nützlich sein. (WA II: 11, p. 35).

In this extract, a striking tripartite grouping of reason, imagination and wit come together to provide utility to the researcher. ‘Witz’ and ‘Einbildungskraft’ were both explicitly mentioned in Goethe’s statement above on the risks of ‘Einbildungskraft’ as being the faculties that are most likely to form erroneous connections between isolated events, but here, when paired with reason, or ‘Verstand’, they are actively helpful. Indeed, the quotation above from Goethe’s essay ‘Herrn von Hoff’s geologisches Werk’ provides an example of this in action:

Wir bildeten mehr oder weniger dieses Phänomen in der Einbildungskraft aus, ließen uns die Hypothese eine Zeitlang gefallen, dann scherzten wir darüber, Voigt aber konnte von seinem Ernst nicht lassen, und ich glaube, er hat irgendwo den Gedanken abdrucken lassen. (WA II: 9, p. 286)

Goethe and Voigt first deploy their ‘Einbildungskraft’, then they use ‘Witz’ (‘dann scherzten wir darüber’), and, crucially, Voigt manages to keep this in check with his reason and seriousness (‘Voigt aber konnte von seinem Ernst nicht lassen’). In turn, this ultimately enables him to produce a geological theory that ended up in print.

The evident utility of reason, imagination and wit in ‘Herrn von Hoff’s geologisches Werk’ begs the question as to whether the experiences synthesised by imagination in ‘Der Kammerberg bei Eger’ are of similar utility. This question revolves around Goethe’s statement that the tripartite grouping of imagination, reason and wit can only function with ‘Erfahrungen der höheren Art’. Goethe describes this kind of experience earlier in ‘Der Versuch als Vermittler’, stating that it represents those that can ‘von jeden untersucht und geprüft werden’, leaving it ‘nicht schwer zu beurteilen, ob die vielen einzelnen Teile durch einen allgemeinen Satz ausgesprochen werden können’ (WA II: 11, p. 35). It is unclear whether the protagonist’s musings in ‘Der Kammerberg bei Eger’ comply with the requirements for this higher type (in which case, the use of imagination would be perfectly acceptable, and indeed, beneficial), or whether they are merely singular, isolated experiences (in which case, the use of imagination would be actively detrimental). Arguably, neither quite applies: the walk portrayed in ‘Der Kammerberg bei Eger’ is not a ‘Versuch’ in the experimental sense, and thus the relevance (or helpfulness) of the term ‘Einbildungskraft’ remains undefined. The same is true of the ‘Brief aus der

Schweiz’, where the combination of knowledge about the likelihood of falling and the danger of the same could well be seen as representing ‘Erfahrungen der höherer Art’, and yet the use of imagination in this context is criticised by Goethe in the letter. Imagination, then, is not necessarily a fixed entity that functions in the same way in every situation: rather, it is a fluid, flexible faculty that leads to a different outcome depending on the overarching conditions that surround its use – but as an integral part of thought itself, ‘Einbildungskraft’ is, always, present.

This not the only instance in ‘Der Versuch als Vermittler’ where Goethe highlights the potential dangers of the imagination. In a lengthy sentence, he states that:

Man kann sich daher nicht genug in acht nehmen, dass man aus Versuchen nicht zu geschwind folgere [...]; denn hier an diesem Pässe, beim Übergang von der Erfahrung zum Urteil, von der Erkenntnis zur Anwendung ist es, wo dem Menschen alle seine innere Feinde auflauern, Einbildungskraft, die ihn schon da mit ihren Fittichen in die Höhe hebt, wenn er noch immer den Erdboden zu berühren glaubt, Ungeduld, Vorschnelligkeit, Selbstzufriedenheit, Steifheit, Gedankenform, vorgefasste Meinung, Bequemlichkeit, Leichtsinns [...], alle liegen hier im Hinterhalte und überwältigen unversehens den handelnden, so auch den stillen von allen Leidenschaften gesichert scheinenden Beobachter. (HA 13, 14-15).

Here, imagination is once again presented as something which can lead astray, just as in the letter from Switzerland. In this instance, however, it is not the walker who is going to be misled by thoughts of falling. Instead, it is the serious investigator who is at risk. Imagination, Goethe alleges, encourages ever-loftier thoughts that are increasingly removed from the serious, down-to-earth nature considerations that Goethe views to be appropriate for a natural scientist. These thoughts are misleading, too, with the individual in question believing their feet to be firmly planted on the ground, while their mind is carried skyward on the imagination’s wings. In contrast to the gradual, gentle guidance provided by the imagination as discussed in ‘Der Kammerberg’, here the process of imagination proceeds at a rapid gallop that must be kept in check by the individual concerned (‘nicht zu geschwind folgere’). This, too, aligns with the notion of an individual needing to become ‘Herr’ of his imagination as discussed in Goethe’s letter from Switzerland. There, however, imagination is depicted as even more powerful than in this extract. While in this excerpt from ‘Der Versuch’ there is a certain amount of tempering (‘nicht zu geschwind’, as opposed to simply ‘nicht geschwind’), this is not the case in the letter. If a person becomes only ‘einigermaßen Herr’ of his imagination, they will nonetheless be led astray: total, complete supremacy and control over the imagination is required.

Goethe illustrates the process by which ‘Einbildungskraft’ can steer a scientist onto the wrong path by setting the action of being raised ‘mit ihren Fittichen in die Höhe’ in opposition to the belief that one is still in contact with the ‘Erdboden’. Just like the English metaphors of having one’s head in the clouds, compared to keeping one’s feet on the ground, height is associated with (quite literal) flights of fancy, whereas remaining grounded is seen as the sensible, desirable option. Goethe rewrote this sentence fully before publishing ‘Der Versuch als Vermittler’ and completely removed any reference to this metaphorical construction: it can be found in the early draft of the essay (which the *Hamburger Ausgabe* draws on), but there is no trace of it in the published version (which the *Weimarer Ausgabe* is based on). It is one of a large number of sweeping changes made to the text prior to publication, and reading anything into Goethe’s decision to erase this metaphor would be unfounded, at best, and disingenuous, at worst. However, this is not the only time that the imagination is linked to the dangers of heights in Goethe’s writing. In Terence Cave’s cognitive work on literature, he makes reference to a letter that Goethe wrote to his friend Karl Ludwig von Knebel on 17 November 1784. In this letter, Goethe uses the image of hot-air balloons to emphasise the importance of coming back down to earth, at least to a certain extent:

Wie es vor alten Zeiten, da die Menschen an der Erde lagen, eine Wohlthat war, ihnen auf den Himmel zu deuten, und sie auf’s geistige aufmercksam zu machen, so ist’s ietzt eine grössere sie nach der Erde zurückzuführen und die Elastizität ihrer angefesselten Ballons ein wenig zu vermindern. (WA IV: 6, p. 391)

Previously, Goethe explains, the task lay in pointing out the heavens above and the mysteries to be found there. This contrasts sharply with the present day, a time in which humans really were able to float heavenward in their balloons – and a time in which, Goethe believed, their attention would be better spent getting their feet back on the ground. Cave summarises the ambivalent presentation of the imagination in general with reference to ‘the tricky duality of imagination as at once creative alternative thinking and deceptive illusion, ‘mere’ fantasy’.<sup>88</sup> These two halves of the imagination, one productive and helpful, the other misleading and dangerous, also apply to Goethe’s geological writings, whether in the imagination leading the walker astray in his letter from Switzerland or offering insight into geology in the *Kammerberg bei Eger*, and can also be identified in his writings on scientific research in general, as in ‘Der Versuch als Vermittler’.

However, ‘imagination’ is not the only term used by Cave in this statement. He also mentions ‘fantasy’, using this term to denote the frivolous, confusing side of the imagination. For Goethe, however, ‘fantasy’, or ‘Phantasie’ was a completely separate concept from the imagination, or

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<sup>88</sup> Cave, *Thinking with Literature*, p. 67.

‘Einbildungskraft’. This is made clear in his 1780 poem ‘Meine Göttin’, written not only during Goethe’s time of engagement with Ilmenau but also in the town of Kaltennordheim, just 40 or so miles outside Ilmenau itself:

Welcher Unsterblichen  
Soll der höchste Preis sein?  
Mit niemand streit’ ich,  
Aber ich geb’ ihn  
Der ewig beweglichen,  
Immer neuen,  
Seltsamen Tochter Jovis,  
Seinem Schooskinde,  
Der Phantasie.  
[...]

Sie mag rosenbekränzt  
Mit dem Lilienstengel  
Blumenthüler betreten,  
Sommervögeln gebieten,  
Und leichtnährenden Thau  
Mit Bienenlippen  
Von Blüten saugen:

Oder sie mag  
Mit fliegenderm Haar  
Und düsterm Blicke  
Im Winde sausen  
Um Felsenwände,  
Und tausendfarbig,  
Wie Morgen und Abend,  
Immer wechselnd,  
Wie Mondesblicke,  
Den Sterblichen scheinen.  
(WA I: 2, p. 58-59)

In this poem, Goethe offers a poetic, metaphorical exploration of the role that fantasy plays. With two of these stanzas composed of a single long sentence running from one line to the next, this poem captures the effusive, capricious nature of fantasy, or ‘Phantasie’. A nebulous faculty that was able to float away ‘in Winde’, changing colours like a chameleon to appear ‘tausendfärbig’, and shaped by constant movement (‘ewig beweglich’), ‘Phantasie’ is a volatile, whimsical concept that offers much in the way of enjoyable companionship (‘gesellen mögen’) and is surprisingly evergreen (‘unverwelklich’) – but it offers rather less in the way of insight or true benefit to an individual’s intuition. ‘Phantasie’ does not exist in isolation, however. The last few verses of the poem illustrate its relationship to hope (which Goethe views as being fantasy’s ‘ältere, gesetztere’ sister), and to wisdom, or its ‘alte Schwiegermutter’, of which Goethe asks that it ‘Das zarte Seelchen [of ‘Phantasie’] | Ja nicht beleid’ge!’ (WA I: 2, p. 60). Here, the anticipated hierarchy is inverted: it is not wisdom that is put under threat by fantasy, but rather delicate fantasy that is at risk of being crushed by wisdom.

As this poem shows, Goethean ‘Phantasie’ functions in a completely different way from Goethean ‘Einbildungskraft’. While ‘Einbildungskraft’ draws directly from an individual’s surroundings and is actively called upon to untangle confusion, offer insight and provide clarity as part of a holistic mental process, as in ‘Der Kammerberg bei Eger’, ‘Phantasie’ floats around in an array of guises. It has a pleasant, diverting quality – but, unlike ‘Einbildungskraft’ it does not happily coexist with more rational faculties, such as wisdom. Drawing a clear line between ‘Phantasie’ and ‘Einbildungskraft’ enables ‘Einbildungskraft’ as a productive, scientific force to be deliberately separated from the fragile gratification of ‘Phantasie’. In light of Goethe’s ambivalent presentation of ‘Einbildungskraft’, this division cannot be simply reduced to viewing ‘Einbildungskraft’ as positive and ‘Phantasie’ as negative. Indeed, instead of attempting to fracture the imagination itself into ever more complicated and ever more restrictive categories, Goethe presents this faculty as being inherently, and unavoidably, contradictory. Throughout ‘Meine Göttin’, the reader is left with an overriding sense of fantasy’s delicate, ethereal nature. Floating around in the wind and explicitly aligned with the ephemeral ‘Mondesblicke’, the immateriality of fantasy is emphasised in almost every stanza – and yet it cannot exist independently of a material, embodied subject.

### **Materialising ‘Einbildungskraft’**

In the preface to his *Farbenlehre*, Goethe discusses how nature ‘spricht [...] hinabwärts zu andern Sinnen, zu bekannten, verkannten, unbekanntem Sinnen, so spricht sie mit sich selbst und zu uns durch tausend Erscheinungen’ (WA II: 1, p. X). He does not go on to specify what these ‘verkannten’ and

‘unbekannt’ senses are, and indeed, if they were truly ‘unbekannt’, nor would he be able to. As this quotation from the *Farbenlehre* indicates, the act of understanding nature, for Goethe, revolved around sensing, perceiving and then attempting to understand natural phenomena – and, by extension, so did the act of practicing science. Indeed, as Goethe’s own writings on geology show, the imagination, or ‘Einbildungskraft’, was a central component of this often mysterious process of scientific perception. By necessity, these instances of perception involve translating the outwardly material natural world into immaterial thoughts. The final stage of this process of perception, and one which has been referred to obliquely throughout this chapter in the form of references to Goethe’s geological writings, lies in turning these immaterial thoughts back into a material artefact, whether written, painted, drawn or otherwise created. In turn, this creates a situation that revolves around the unavoidable interplay between materiality and immateriality, whether in the environment under observation or in the observing subject.

The practice of science (especially geology) is necessarily material to one extent or another, whether in terms of the physical rocks themselves, or the ‘proliferation of the materiality of the experimental system: traces, sketches, and drafts’ that represent a core part of scientific enquiry.<sup>89</sup> However, this scientific system also rests on a shifting, stratified cycle of immateriality and materiality pertaining to the imagination and internal processes of the scientific investigator in question, which has been comparatively little explored. Goethe’s own writings on the imagination are scattered and fragmentary, at best: nowhere does he lay down a formal schema explaining the precise functioning of the imagination. As a result, his approach to the imagination can only be understood by piecing together the disparate references to this faculty across his literary and scientific works. In so doing, this reveals Goethean ‘Einbildungskraft’ to be replete with risks: it can distract, mislead or confuse, but it can just as easily trigger productive thoughts that facilitate access to concepts that reason alone might not be able to reach. For geological investigation, which requires both deep-seated engagement with intensely material bodies and creative thinking regarding events that may have happened many thousands of years previously, the imagination is of even more central importance than in scientific research generally. Given the impossibility, in Goethe’s eyes, of thinking without using the imagination in some form, and by extension, the impossibility of writing without either thinking or using the imagination, any study of the presentation of (im)materiality in Goethe’s written work must also go hand-in-hand with an exploration, and an awareness, of the (im)materiality of the imagination, too.

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<sup>89</sup> Bryan K. Klausmeyer, ‘Signs of Life: Form, Life, and the Materiality of Writing around 1800 (Georg Christoph Lichtenberg - Jean Paul - Goethe)’ (unpublished doctoral thesis, Johns Hopkins University, 2016), p. 213.

### Chapter Three: Colours, light & vision

So begreift sich die Geschichte der Farbenlehre auch nur in Gefolg der Geschichte aller Naturwissenschaften. Denn zur Einsicht in den geringsten Theil ist die Übersicht des Ganzen nötig. Auf eine solche Behandlung können wir freilich nur hindeuten; indessen wenn wir unter unsern Materialien manches mit einführen, was nicht unmittelbar zum Zwecke zu gehören scheint; so ist ihm doch eigentlich nur deßwegen der Platz gegönnt, um an allgemeine Bezüge zu erinnern, welches in der Geschichte der Farbenlehre um so nothwendiger ist, als sie ihre eigenen Schicksale gehabt hat und auf dem Meere des Wissens bald nur für kurze Zeit auftaucht, bald wieder auf längere niedersinkt und verschwindet. (WA II:3, p. 109)

As Goethe explains in this extract from his *Farbenlehre*, the history of work on colour theory can only truly be understood if it is viewed within the context of science in general. In other words, as he puts it, gaining insight into the smallest part necessitates acquiring an overview of the whole, as well. This entire process is not static but fluid, with the various sub-components taking turns to float to the top of the ‘Meere des Wissens’ before sinking back down again and becoming invisible once more. It is solely by triggering thoughts of ‘allgemeine Bezüge’ that a scientist can gain this overview, which, in turn, can only be created by the inclusion of content ‘was nicht unmittelbar zum Zwecke zu gehören scheint’. A similar interpretation of the *Farbenlehre* was proposed by Dennis Sepper in his 1988 monograph *Goethe contra Newton*. In this work, Sepper states that ‘it is precisely the manifold richness of Goethe’s *Farbenlehre* that has made it so difficult to evaluate, because no single discipline, whether natural scientific or humanistic, is in a position to see it as a whole.’<sup>90</sup> This need not solely apply to colour theory: Goethe’s statement that ‘zur Einsicht in den geringsten Theil ist die Übersicht des Ganzen nötig’ is couched in generalised terms, with it possible for any field, or sub-field, of science to serve as the ‘geringsten Theil’. The same ‘manifold richness’, I contend, can be found in Goethe’s writings on geology, and, just as with his *Farbenlehre*, poses a challenge to analysing them. However, reading Goethe’s geological work alongside his writings on colour, I believe, goes some way to creating the holistic perspective that Goethe himself calls for.

Reading Goethe’s statement in broader terms does certainly imply that understanding one scientific discipline necessitates viewing it in the light of science as a whole. As a consequence, any

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<sup>90</sup> Dennis L. Sepper, *Goethe Contra Newton: Polemics and the Project for a New Science of Color* (Cambridge; New York: Cambridge University Press, 1988), p. 19.



consideration of Goethe's geological studies must also examine them in conjunction with his other scientific endeavours. Given the prominent role played by colour theory in Goethe's scientific work in general, bringing together his work on geology and his work on colours and optics is a natural step to take. Indeed, there is an evident intersection between colours and geological entities (and, indeed, every other object in the natural world) in that each rock, mountain or crystal has a colour of its own. Across Goethe's geological writings, colour is one of the attributes that is most frequently paired with the various rocks in question, from the 'rotgesprengte Farbe' of the granite in 'Granit II' (WA II: 9, p. 171) to the 'grau und unverändert' shade of the 'Glimmerschiefer' listed in his note on his 'Sammlung' (WA II: 9, p. 93). These colours are an intrinsic property of the rock in question – but they also cause the rock to be imbued with other, independent characteristics by virtue of the associations with which each colour is freighted, regardless of the rock at hand. This is made explicit in Goethe's essay 'Granit II', mentioned in the Introduction to this thesis. As Goethe explains in this piece, the red-tinged colour of the granite rock ultimately leads to this stone being given a name that associated it with fire ('von seiner rotgesprengen Farbe erhielt er in der Folge den Namen des Feurigbunten' [WA II: 9, 171]). However, little is said explicitly in Goethe's geological writings about the effect of these colours: while colour is a characteristic of the various rocks that is intrinsic to them, Goethe's focus is on the rocks themselves, not their colours. His *Farbenlehre* takes the opposite approach, revolving around the workings of light and colours itself, rather than the objects bearing the colours in question. As a result, combining Goethe's work across these two disciplines serves to bridge this divide.

There is no shortage of parallels between the *Farbenlehre* and Goethe's geological writings: even when viewed on the most superficial level, the *Farbenlehre* is replete with allusions to rocks and minerals of all kinds, while Goethe's geological writings make frequent reference to the colours of the stones at hand. Seeking out these parallels enables Goethe's work within these two disciplines to be read in tandem, thereby facilitating a richer interpretation of Goethe's geological theories as a result. However, colour does not only serve as a characteristic of rocks in Goethe's geological studies: it also has a representative function. This is demonstrated by his work as one of the pioneers of colour-based geological maps, which were innovative in their use of specific colours to depict the various rock strata, with each colour also serving to signify a particular type of rock. By extension, I contend that these maps were also innovative in their creation of a new association between colours and rocks, one which goes beyond the simple fact that each rock, as a physical object, has a colour of its own. In turn, these maps also served as the vehicle through which a new, unusual connection between the (im)materiality of rocks and colours was forged.

## Colour and (im)materiality

Coloured paint, coloured pigments and coloured ink are, of course, material in nature. However, this does not automatically mean that the actual colour in question is similarly material. In fact, the interplay between colour and (im)materiality is complex and multi-layered, and any attempt to understand this interaction must also encompass an understanding of the nature of the process by which colours are produced. The art historian and colour theorist John Gage, who has written extensively on the interaction between colour and culture, terms colour ‘the subjective outcome of an objective process of stimulation’.<sup>91</sup> Subsequently, Gage makes the connection between colour and subjectivity even clearer, stating:

Many scientific writers, for example, are concerned not with ‘colour’, but with radiant stimuli in light, or with the physiological processing of these stimuli by the eye, whereas ‘colour’ properly speaking does not come into the picture until rather later, in the mind which apprehends it.<sup>92</sup>

As Gage explains, colour is fundamentally a product of the mind, not of physics. Just like the workings of the faculty of the imagination in the previous chapter, the process by which colour is perceived is inherently rooted within the materiality of an embodied subject’s mind – even though this process itself is anything but material.

Gage’s statements make explicit the unavoidable connection between colour qua colour, and the perception of this colour by a sensing subject. Indeed, this connection is also implicitly present in Goethe’s understanding of colour creation. Goethe was a ‘scientific writer’, to use Gage’s term, and he was certainly concerned with ‘the physiological processing of [...] stimuli by the eye’ – but he was also well aware of the role that the mind played in the process of colour perception. Goethe, for example, made very clear that his writings on colour were no substitute for direct experience. Colour cannot be simply reduced to dry scientific texts, given that ‘ein freies physisches Phänomen, das nach allen Seiten wirkt, ist nicht in Linien zu fassen und im Durchschnitt anzudeuten’ (WA II: 1, p. XVIII). In Goethe’s view, colour was to be defined as the impact of light. As he puts it in the preface to his *Farbenlehre*, ‘die Farben sind Taten des Lichts, Taten und Leiden’ (WA II: 1, p. IX). This light, in turn, is perceived by the subject’s eye, an organ which, according to Goethe, ‘hat sein Dasein dem Licht zu danken’ (WA II: 1, p. XXXI). Colours, then, are merely the expression of light’s actions –

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<sup>91</sup> John Gage, *Color and Meaning: Art, Science, and Symbolism* (Berkeley: University of California Press, 1999), p. 11.

<sup>92</sup> Gage, p. 21.

and, by extension, are by their very nature as immaterial as light itself, regardless of the medium via which they are conveyed.

Heather Sullivan, a Goethe scholar who has dedicated a great deal of work to exploring the presentation of materiality in Goethe's writings, has also looked at Goethe's *Farbenlehre* from the perspective of materiality. In her 2017 chapter comparing Goethe's presentation of the colour blue to that of the artist Jeanette Schäring, Sullivan repeatedly defines colour with reference to questions of its materiality. Summarising Goethe's understanding of colour, she states that, for example, 'from light energy engaging with material objects and beings emerges *colour* [italics original]',<sup>93</sup> and that 'when light, matter and perception combine, then we can speak of colour'.<sup>94</sup> Sullivan even makes reference to geological matter to illustrate this, explaining that 'colour, in sum, is the changing flow of matter and energy that materialises and crystallises into form, whether momentarily with the blink of an eye or in a more durable state such as the geological time scale of minerals'.<sup>95</sup> In Sullivan's reading of Goethe's colour theory, colours are created when the energy of light interacts with matter, and this, in turn, is perceived by a sensing subject. Sullivan explicitly draws attention to the materiality of the objects in question – but she does not explore where the light energy fits within the schema of materiality. To complete Sullivan's theory, I contend that reading this energy as the counterpart to the matter at hand, or, in other words, as an immaterial entity, enables this light energy to take up its logical position within Goethe's understanding of (im)materiality.

The events that happen *after* colour has been perceived by the sensing subject, or, to use Gage's terminology, the 'subjective outcome' that inevitably follows the 'objective process' rooted in the eye, gives rise to a product that is no less immaterial. Indeed, colours are freighted with inevitable resonances that go beyond the mere hue in question. As Goethe explains in Section 758 of the 'Sinnlich-Sittliche Wirkung der Farbe' section of the *Farbenlehre*, colour can exert an impact, or a 'Wirkung', on the beholder through the associations that it evokes in the mind. This impact is analogous to Gage's 'subjective outcome'. In turn, these associations can be transferred to the coloured object in question. In Goethe's understanding, when we see a particular colour, the colour itself unfolds a wide array of further meanings, sparking associations that are, at most, indirectly associated with the object in question. This is the 'bedeutende Wirking' that they call forth from us,

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<sup>93</sup> Heather Sullivan, 'The Materiality and Ecology of Blue: Goethe and Jeanette Schäring', in *Matter in Motion and the Mysticism of Nature's Colour*, ed. by Jeanette Schäring (Billdal: Förlaget 284, 2017), pp. 242-254 (p. 243).

<sup>94</sup> Sullivan, 'The Materiality and Ecology of Blue: Goethe and Jeanette Schäring', p. 243.

<sup>95</sup> Sullivan, 'The Materiality and Ecology of Blue: Goethe and Jeanette Schäring', p. 250.

having an effect ('mitwirkend') that can be aesthetic, and that also sits within a socio-cultural context ('das Sittliche'):

Da die Farbe in der Reihe der uranfänglichen Naturerscheinungen einen so hohen Platz behauptet, indem sie den ihr angewiesenen einfachen Kreis mit entschiedener Mannigfaltigkeit ausfüllt, so werden wir uns nicht wundern, wenn wir erfahren, dass sie auf den Sinn des Auges, dem sie vorzüglich zugeeignet ist, und durch dessen Vermittlung, auf das Gemüth, in ihren allgemeinsten elementaren Erscheinungen, ohne Bezug auf Beschaffenheit oder Form eines Materials, an dessen Oberfläche wir sie gewahr werden, einzeln eine spezifische, in Zusammenstellung eine theils harmonische, theils charakteristische, oft auch unharmonische, immer aber eine entschiedene und bedeutende Wirkung hervorbringe, die sich unmittelbar an das Sittliche anschließt. (WA II: 1, p. 307)

In this extract, Goethe explains that colours can have a 'Wirkung' on the 'Gemüth', and reinforces this few paragraphs further into the *Farbenlehre*, in section 762. Here, as Goethe states, 'die Erfahrung lehrt uns, dass die einzelnen Farben besondere Gemüthsstimmungen geben' (WA II: 1, p. 309). As such, colours and objects act as emotional triggers, with the immaterial emotions in question triggered not solely by the material object itself, but also by the colour it takes. This connection between material colour pigments and immaterial emotional associations has been traced by many critics, including Boris Wiseman in his 2013 article exploring the symbolic resonances of indigo. His article revolves around what he terms the 'connotative power' of this hue, linking, for example, the physical movement of the dark blue shade across fabric to the metaphors and beliefs surrounding the spread of grief.<sup>96</sup> These 'connotative powers' of colours are subjectively perceived and interpreted, but are nevertheless omnipresent. As every material object has a colour, and every colour, as Goethe describes above, has an effect on the viewer, engagement with any object at all is in itself an engagement with both materiality and immateriality. In the geological space, this is emphasised even further by virtue of the explicit materiality of the objects in question.

### **Vision and representation**

In Goethe's geological writing, there is a direct link between colours and geology: the colours in question are intrinsic features of the stones at hand. However, the connection between geology and colour, and indeed, vision more broadly, also functions on the level of representation in Goethe's geological writings. The *Goethezeit* saw the production of the first geological maps – and Goethe was an innovator in this sphere, thanks to his collaboration with a fellow geologist called Christian

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<sup>96</sup> See Boris Wiseman, 'The Materiality of Color', *The Senses and Society*, 8.2 (2013), 223-31 (pp. 226-7).

Keferstein. Unlike regular maps that depict, say, the location of countries or topographical features, geological maps instead display the location and strata of various types of rock. They can provide information that can be useful for miners hoping to find a new seam of a particular mineral, theorists trying to ascertain the process by which certain mountains came to exist, structural engineers attempting to erect new constructions or even planners trying to find a new source of water. While the first of their kind used symbols to denote the various varieties of rock, subsequent geological maps used different colours to identify each kind of stone.<sup>97</sup> These colour-based maps marked a great step forward in terms of practicality, making previously complex depictions of multi-layered geological structures much clearer to read. However, when viewed within the broader context of geological developments in the late eighteenth and early nineteenth centuries, they also mark a great step forward in terms of creating a closer connection between geology, as a science, and colour and visual representation in the broadest sense. This link between the science of geology and the use of colour to represent other concepts enables geological maps to be viewed as far more than maps per se. Rather than merely being a useful aid for geologists, they are representative of the interplay between vision and science more broadly. In turn, I contend, they offer a rich opportunity to probe the interplay between materiality and immateriality in Goethe's geological research.

The concept of geological maps serving as an illustration of the close connection between vision and science is also the argument proposed by Martin Rudwick in his 1976 article 'The emergence of a visual language for geological science, 1760 – 1840'. In his article, Rudwick bemoans the 'lack of any strong intellectual tradition in which visual modes of communication are accepted as essential for the historical analysis and understanding of scientific knowledge'.<sup>98</sup> By neglecting the importance of the visual media that were so central to geology's early development, he argues, the study of the history of geology in general has been subjected to comparable neglect. I believe that studies of Goethe's involvement with geology have suffered a similar fate: there is a distinct lack of research on the interaction between Goethe's geological work on any subject, not just mapping, and his work on vision, colour and light, which is all the more surprising given Goethe's well-known interest in these latter subjects. This is not to say, however, that the visual aspects of geological enquiry should take precedence over elements laid down in writing: rather, the two complement and supplement each other. As Rudwick summarises:

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<sup>97</sup> For a detailed description of the history of the development of geological maps, see Jan Kozák, Alena Čejchanová, Zdeněk Kukul, and Karel Pošmourný, *Early Geological Maps of Europe: Central Europe 1750 to 1840* (Heidelberg: Springer, 2016).

<sup>98</sup> Martin J. S. Rudwick, 'The Emergence of a Visual Language for Geological Science 1760-1840', *History of Science*, 14.3 (1976), 149–211 (p. 149).

An essential part of this complex historical process [of the development of geology] was the construction of a *visual language* [italics original] that was appropriate to the subject-matter of the science, and which could complement verbal descriptions and theories by communicating ideas and observations that could not be expressed in words.<sup>99</sup>

For Goethe, specifically, it is logical that this ‘visual language’, to use Rudwick’s term, would be inextricably entwined with questions of colour, given his extensive work on the *Farbenlehre* and other texts on optics. Indeed, the tripartite connection between geology, colour and vision, with the associated layers of (im)materiality, is made evident on both a textual and a visual level, as selected passages from the *Farbenlehre* will show.

The first geological map was produced in France by Jean-Etienne Guettard (1715-1786), leading to the construction of the national Service de la Carte Géologique. A design based on the use of symbols, Guettard’s map was of ‘ground-breaking significance [...] for geological cartography’.<sup>100</sup> Despite its pioneering nature, it marked but the start of the development of such maps, with the first major milestone being the use of different colours, rather than symbols, to illustrate the various kinds of rock in a geological map. The first map to do so was a German invention, created in 1768 by Christian Hieronymus Lommer (1741-1787).<sup>101</sup> Despite the technical and financial constraints associated with colour printing until the 1840s, Lommer’s coloured map sparked great interest, leading to the production of more colour-coded geological maps. Indeed, Goethe’s direct contemporaries became caught up in the craze, too, with his colleague, assistant and friend from Ilmenau, Johann Carl Wilhelm Voigt, even producing a ‘Petrographische Landkarte des Hochstifts Fuld’ in 1782 when he and Goethe were in the full throes of their collaboration on the mining project. Goethe was aware of Voigt’s endeavours, reporting in a letter to Merck dated November 1782 that Voigt ‘giebt ietzt sein Werkchen über das Fuldische heraus’ (WA IV: 6, p. 81). Indeed, geological mapping was clearly at the forefront of Goethe’s mind in this period. At a later moment in his letter to Merck, Goethe even expresses a desire to become involved with this trend himself, saying ‘Ich habe große Lust bald eine mineralogische Charte von ganz Europa zu veranstalten’ (WA IV: 6, p. 82). At this point in time, however, Goethe’s desire to create this kind of map remained unfulfilled.

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<sup>99</sup> Rudwick, p. 177.

<sup>100</sup> Pierre Savaton, ‘The First Detailed Geological Maps of France: Contributions of Local Scientists and Mining Engineers’, *Earth Sciences History*, 26.1 (2007), 55-73 (p. 57).

<sup>101</sup> Karen Severud Cook, ‘From False Starts to Firm Beginnings: Early Colour Printing of Geological Maps’, *Imago Mundi*, 47 (1995), 155-72 (p. 156).

This trend also piqued the interest of Christian Keferstein, a fellow scientist who was interested in creating a geological map and who was familiar with Goethe's *Farbenlehre*. In early 1821, Keferstein made contact with Goethe, hoping that he might be able to provide him with some assistance with regard to the colouring he planned to use on his map, and Goethe was happy to oblige.<sup>102</sup> With the seed of this endeavour planted in Goethe's mind as far back as his time in Ilmenau, it occupied Goethe for quite some time after he began his collaboration with Keferstein: on 17 March 1821, for example, Goethe notes in his diary that he had 'Kefersteins geologische Karte und ihre Färbung durchgedacht' (WA III: 8, p. 29). Goethe was well aware of the significance of pairing theory and practice, specifically within the context of coloration: in his *Farbenlehre*, he states that 'wir schon bei jedem aufmerksamen Blick in die Welt theoretisiren' (WA II: 1, p. xii). Thus, for Goethe, looking at the material world in all its colourful glory automatically leads to the observer's mind translating this into immaterial theory – with Goethe reversing this process in his materialisation of his colour theory in the form of Keferstein's map. Given the amount of effort that Goethe expended on Keferstein's project and the careful consideration he devoted to the colour scheme of the map, it is hardly surprising that Goethe subsequently decided to explore the subject further, noting on 4 September 1821 that he had 'Den Aufsatz zu Keferstein schematisirt und zu dictiren angefangen.' (WA III: 8, p. 107). This 'Aufsatz' Goethe refers to is his essay 'Bildung des Erdkörpers', in which he lavishes Keferstein's map, published as the 'General-Karte von Deutschland', with unbridled praise. Goethe's engagement with Keferstein's map project is, on the surface, a process by which Goethe collaborated with a fellow geologist on an innovative project – but, on a deeper level, it was also a process by which Goethe put into practice the materialisation of his theories of colour.

Despite the clear connection forged between Goethe and Keferstein through their collaboration, hardly any critics have researched the explicit link between the two men's work. Of the few to do so, Dorothea Schäfer-Weiss and Jens Versemann offer the most detailed exploration of this pairing. In their article, 'The Influence of Goethe's *Farbenlehre* on Early Geological Map Colouring: Goethe's Contribution to Christian Keferstein's General Charte von Teutschland', Schäfer-Weiss and Versemann explore Goethe's positioning within the cartographic trends of the 1780s onwards, probing how Goethe's *Farbenlehre* influenced the colouring of Keferstein's map. They summarise the connection between the two as follows:

As shown in the key to Keferstein's map, the colour chart starts at the top with the complementary pair of red (granite) and green (slate), followed by the 'characteristic combination' of orange (Red Sandstone) and violet (Alpine Limestone) and, after a gap of

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<sup>102</sup> See Jaimey Fisher and Barbara Caroline Mennel, *Spatial Turns: Space, Place, and Mobility in German Literary and Visual Culture* (Amsterdam: Rodopi, 2010), p. 28.

two strata, by another ‘characteristic’ pair: blue (Muschelkalk, a marine limestone of the Middle Triassic period) and yellow (sandstone of the Cretaceous system). These colour choices and arrangements meant that when the relevant rock strata appear next to each other on the map, the visual effect reflected the principles of totality and harmony embodied in Goethe’s chromatic circle.<sup>103</sup>

In this extract, Schäfer-Weiss and Verseemann pinpoint the visual connections between the geological map and Goethe’s well-documented theory of colours, with both the map and Goethe’s *Farbenlehre* imbued with a sense of wholeness and harmony. However, their article does not solely draw on these visual links to prove the association between Goethe’s work with Keferstein and his independent scientific endeavours. Instead, the authors also undertake a textual analysis, comparing Goethe’s *Farbenlehre*, specifically the ‘Sinnlich-Sittliche Wirkung der Farben’ section, with his brief essay commenting on Keferstein’s map, mentioned above, to highlight areas of similarity between them. Their detailed exposition looks at the linguistic parallels between the two texts, identifying the

key attributes from the opening and two related paragraphs (§835 and §896) [of the ‘Sinnlich-Sittliche Wirkung der Farben’ section of the *Farbenlehre*]: such as *entschieden* (decided, definite), *bedeutend* (significant), *harmonisch* (harmonious), *charakteristisch* (characteristic), and *bunt* (motley)<sup>104</sup>

that later appear in Goethe’s essay reviewing Keferstein’s map. Schäfer-Weiss and Verseemann focus their argument on the thesis that Goethe’s theories from the *Farbenlehre* informed his approaches to colouring Keferstein’s geological map. This argument is certainly convincing, as the plethora of linguistic features shared by the two texts demonstrates. The similarities Schäfer-Weiss and Verseemann identify suggest that there was a direct, productive connection between Goethe’s work on colour theory and his work on the colour-based geological map, which, I believe, can be viewed as part of his geological endeavours in the broadest sense of the term. Strikingly, if Schäfer-Weiss and Verseemann’s conclusion is pushed further, this suggests that Goethe deliberately used colour as a way to imbue his geological map with the resonances associated with the colours in question (and the arrangement of them). In this reading, each colour acts as a vehicle for the emotional effects it triggers. In turn, I contend that this creates a multi-layered approach to (im)materiality, with the map offering the opportunity to materialise both Goethe’s colour theory and colours themselves. These colours firstly trigger immaterial associations related to the colour in question, while secondly representing material rock varieties and the immaterial associations related to the rock in question.

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<sup>103</sup> Dorothea Schäfer-Weiss and Jens Verseemann, ‘The Influence of Goethe’s *Farbenlehre* on Early Geological Map Colouring: Goethe’s Contribution to Christian Keferstein’s General *Charte von Teutschland* (1821)’, *Imago Mundi*, 57.2 (2005), 164-84 (p. 170).

<sup>104</sup> Schäfer-Weiss and Verseemann, p. 170.



Indeed, Goethe was not only well aware of the fact that colour could assert an immaterial impact on the viewer, as detailed earlier in this chapter: he was also alert to the way in which colour could function as a representative of particular concepts. He discusses this in detail in the ‘Allegorischer, symbolischer, mystischer Gebrauch der Farbe’ section of his *Farbenlehre*, where he states it ‘folgt sogleich, daß die Farbe sich zu gewissen sinnlichen, sittlichen, ästhetischen Zwecken anwenden lasse’ (WA II: 1, p. 357), given that he previously demonstrated that ‘eine jede Farbe einen besondern Eindruck auf den Menschen mache’ (WA II: 1, p. 357). This deliberate usage of colour to call forth a particular ‘sinnlichen, sittlichen, ästhetischen’ impact can take two forms, Goethe explains. The first of these is the ‘symbolisch’ usage, which Goethe terms as usage that ‘mit der Natur völlig übereinträfe’, or, in other words, a usage ‘indem die Farbe ihrer Wirkung gemäß angewendet würde und das wahre Verhältnis sogleich die Bedeutung ausspräche’ (WA II: 1, p. 357). This application of colour with a direct, innate reference to its impact stands in contrast to the ‘allegorisch’ use of colour, in Goethe’s eyes. Unlike the ‘symbolisch’ approach, where colour’s innate properties are in evident alignment with the object in question, the ‘allegorisch’ method is slightly more complex. In this version, the viewer must first be informed of the entities that the colours are supposed to represent, or, as Goethe puts it, ‘indem uns erst der Sinn des Zeichens überliefert werden muß, ehe wir wissen, was es bedeuten soll’ (WA II: 1, pp. 357-8). When discussing this kind of allegorical colour usage, Goethe even makes reference to a ‘Schema, worin sich die Farbenmannigfaltigkeit darstellen läßt’ (WA II: 1, p. 358), or, in other words, the precise type of key that Goethe found so useful in his and Keferstein’s geological map. When this kind of technique is deployed, Goethe explains, it can serve to add an element of immateriality to a material entity. Goethe explains that colours can be arranged in such a way that each influences the viewer’s perception of the other, stating: ‘dann wird gewiß eine besondere geheimnisvolle Anschauung eintreten, daß man diesen beiden getrennten, einander entgegengesetzten Wesen eine geistige Bedeutung unterlegen könne’ (WA II: 1, pp. 358-9). In other words, an awareness of colours and their associations can enable a ‘Wesen’ to be imbued with a ‘geistige Bedeutung’ – just as Goethe does in his geological map.

The essay written by Goethe about Keferstein’s map, ‘Bildung des Erdkörpers’, referred to above, was printed in 1822, directly after the release of Keferstein’s map in 1821. It offers Keferstein thanks both on a personal level and on behalf of geologists as a group, opening with Goethe’s admiration of Keferstein’s efforts in the field of ‘Geognosie’. Originally used as a catch-all term that became the precursor to geology (which encompasses, for example, mineralogy and petrology), by the *Goethezeit* geognosy was a science in its own right that ‘classified masses of rock and their relationships to other rock formations with particular focus on spatial relations and three-dimensional understanding of

landscapes'.<sup>105</sup> Goethe admits that he was deeply involved in the production of this cartographical work, which 'erregte [s]einen ganzen Antheil' (WA II: 9, p. 217). He is upfront about the role that he played in the project, stating that '[er] that zu Färbung der geognostischen Karte Vorschläge [...]' (WA II: 9, p. 217). Most significantly, Goethe makes explicit in this essay that he was influenced by his many years of experience in geology. Written just a decade before the end of his life, by the time that he was writing this piece, he could look back over a lengthy, illustrious career, as he makes clear:

Wenn ich gedenke, was ich mich seit fünfzig Jahren in diesem Fache gemüht, wie mir kein Berg zu hoch, kein Schacht zu tief, kein Stollen zu niedrig und keine Höhle labyrinthisch genug war, und nun mir das Einzelne vergegenwärtigen, zu einem allgemeinen Bilde verknüpfen möchte; so kommt mir vorliegende Arbeit [...] sehr günstig zustatten. (WA II: 9, p. 217)

In this passage, Goethe is primarily concerned with emphasising the utility of the geological map, which, as he explains, means that future geologists will be spared the fifty years of effort he has expended climbing to the heights of mountains and descending to the depths of mines in an attempt to form an overarching image of the geological space. This extract sees Goethe discuss in general terms the activities he has undertaken in the field of geology over the course of his lifetime, but it is doubtless the case that his references to shafts and tunnels were written with Ilmenau in mind, given that this was the mine with which he had the most involvement, by far.

While the above passage sees Goethe explore the impact that his previous geological research had had on his development, a later point in the 'Bildung des Erdkörpers' text sees him implicitly credit the effect of his previous work on colour theory, too. As Goethe explains the reasoning behind the various colourings suggested, he underscores his commitment to principles of wholeness and harmony, as evinced in his *Farbenlehre*. As he goes on to explain, the choice of colours for the map was neither arbitrary nor simply based on aesthetic principles. Instead, it revolved around the associations of each colour and how they fitted within Goethe's own theory of colour harmony. Goethe was well aware of the resonances that each colour exuded, and he knew how to deploy them to stimulate a particular effect:

Man durfte sich nicht schmeicheln eine dem Auge vollkommen gefällige aesthetische Wirkung hervorzubringen; man suchte nur die Aufgabe zu lösen: daß der Eindruck, welcher immer bunt bleiben mußte, entschieden bedeutend und nicht widerwärtig wäre. Die

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<sup>105</sup> Susannah Gibson, *Animal, Vegetable, Mineral?: How Eighteenth-Century Science Disrupted the Natural Order* (Oxford: Oxford University Press, 2015), p. 133.

Hauptformation, welche Granit, Gneis, Glimmerschiefer mit allen Abweichungen und Einlagerungen enthält, erteilte man die Karminfarbe, das reinste schönste Roth; dem unmittelbar anstossenden Schiefer gab man das harmonisierende reine Grün; darauf dem Alpenkalk das Violette, auch dem Rothen verwandt, dem Grünen nicht widerstrebend. (WA II: 9, pp. 217-218).

In this extract, Goethe describes the reasoning behind choosing the particular colours he has selected. He has to toe a fine line, neither focusing solely on creating a map that is ‘dem Auge vollkommen gefällig’, or simply aesthetically pleasing, nor something that is quite the opposite, ‘widerwärtig’. The manner in which Goethe expresses this desire, talking of colours that are ‘harmonisierend’, ‘verwandt’ and ‘nicht widerstrebend’, also enables a secondary aim to be identified. Namely, this subordinate objective was to create a map that featured the same sense of wholeness on a visual level (provided through the colours) as the rocks themselves provided on a geological level. Thus, for example, by pairing red with green, Goethe uses these harmonious colours to create an overriding aura of wholeness that reflects the adjoining grouping of granite and slate, and so on across the map.

Indeed, Goethe’s essay ‘Bildung des Erdkörpers’ is replete with references to wholeness, totality and entirety, whether in his description of the map that ‘[a]uf der allgemeinen Karte von Deutschland fühlt man die Totalität’ (WA II: 9, p. 218) or in his reference to the project as a whole being an act ‘indem ich mich an ein Ganzes anschließe, zu einer gewissen Einheit gelangen kann’ (WA II: 9, p. 217). This sense of wholeness created by the colours as a group functions in a manner not dissimilar to the emotional resonances of each separate colour, except that, in this instance, it is triggered by the map’s colouring as a whole rather than individually. There is one final layer of wholeness to be uncovered in the text, too. At the very end, Goethe takes a step back to discuss his hopes for the geological map in general. He states:

Wird nun der intendirte geognostische Atlas auf solche Weise durchgeführt, so wäre zu wünschen, daß die Freunde dieser Wissenschaft sich vereinigten und dieselben Farben zu Bezeichnung eben desselben Gesteins anwendeten, woraus eine schnellere Übersicht hervorträte und manche Bequemlichkeit entstünde (WA II: 9, p.219).

Not only does Goethe want to use the holistic colouring of the physical map to reflect the holism of the geological world: he also hopes it will go on to create a sense of wholeness in the real world by laying the foundations for a new framework of map colouring. In itself, this is an ambitious aim. However, when viewed from the perspective of (im)materiality, it appears even more ambitious still: Goethe was implicitly hoping to use the association between a particular colour and a particular rock to imbue the colour in question with a new immaterial association, that of the (material) rock in question.

While these lofty ambitions did not come to bear to the extent that Goethe hoped, some of his suggestions for colouring are indeed still used in geological maps today.<sup>106</sup> As such, the connection between colour and geology forged in the geological map goes beyond simply assigning colours to particular stones: it also served as a way for Goethe to put his theories relating to colour into practice, both in the map itself and in his writings on it. In turn, it adds an additional layer of complexity to the interplay of (im)materiality in the geological space: aside from the ‘connotative powers’, to use Wiseman’s term discussed in the introduction to this chapter, of the colours that link them to immaterial emotions, memories and the like, they now have ‘representative powers’ that connect them back to material rock types. In this regard, the colours bridge the world as we see it and the world as it is represented: being (im)material themselves while also being part of the material rock and offering a connection to its immaterial characteristics.

### **Geological colourings**

The association between colours and their immaterial associations that was so central to Goethe’s work on the map project is further reinforced in section 75 of the ‘Physiologische Farben’ part of the *Farbenlehre*. In this instance, it is illustrated with reference to rocks and gemstones. In this section of the *Farbenlehre*, Goethe retrospectively recounts a situation he stumbled across while travelling through the Harz mountains at dusk in December 1777, during the period when he was deeply engaged with the Ilmenau project. Indeed, this trip served the specific purpose of furnishing Goethe with information that could assist him with running the mine at Ilmenau, as Wolf von Engelhardt has argued: ‘es ist jedoch nicht daran zu zweifeln, dass Goethes Wunsch, mit eigenen Augen einen Eindruck von den Einrichtungen moderner Bergbaubetriebe zu gewinnen, maßgeblicher Grund und Anlaß für die Harzreise war’.<sup>107</sup> Consequently, questions of geology were very much at the forefront of Goethe’s mind during his trip and had a visible impact on his *Farbenlehre*, too. In this passage, as the light becomes dimmer, his surroundings seem to change colour and become imbued with an almost magical quality. Goethe states:

Als aber die Sonne sich endlich ihrem Niedergang näherte und ihr durch die stärkeren Dünste höchst gemäßigter Strahl die ganze mich umgebende Welt mit der schönsten Purpurfarbe überzog, da verwandelte sich die Schattenfarbe in ein Grün, das nach seiner Klarheit einem

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<sup>106</sup> See the commentary in FA I/25: 1236, which states that ‘Die von Goethe gewählten Formationsfarben werden z.T. heute noch in geologischen Karten verwendet’.

<sup>107</sup> Wolf von Engelhardt, *Goethe im Gespräch mit der Erde: Landschaft, Gesteine, Mineralien und Erdgeschichte in seinem Leben und Werk* (Weimar: Böhlau Nachfolger, 2003), p. 44.

Meergrün, nach seiner Schönheit einem Schmaragdgrün verglichen werden konnte. Die Erscheinung ward immer lebhafter, man glaubte sich in einer Feenwelt zu befinden, denn alles hatte sich in die zwei lebhaften und so schön übereinstimmenden Farben gekleidet [...]. (WA II: 1, p. 35)

This 'Erscheinung' described here is evoked by the colours in question: Goethe's surroundings themselves do not change. Instead, they are simply bathed in light of a different colour, a light that somewhat paradoxically is associated with 'Klarheit' despite the situation offering rather more in the way of mystery and intrigue than clarity. This is, indeed, merely an 'Erscheinung', as Nicholas Boyle points out in his article on cognition and Goethe's colour theory. He considers that this passage provides

the gentle suggestion that in the perfection of the completed colour-harmony we are briefly translated into an ideal world, a paradise that is always implicit and attainable in the here and now, but of which in normal circumstances we see only hints and fragments.<sup>108</sup>

This perfect image of wholeness created here is central to Goethe's *Farbenlehre*. In his seminal work *Goethes Farbentheologie*, Albrecht Schöne has summarised Goethe's objective for this project by stating 'war es Goethe um den "Allgemeinen ewigen Grund" der Farbenlehre zu tun, dann heißt es, ihm ging es ums Ganze'.<sup>109</sup> However, this 'harmony of totality',<sup>110</sup> as Boyle puts it, is, I believe, nevertheless imbued with an unsettling evocation of the 'fragments' that we normally have to contend with. By invoking a reference to a gemstone to describe the nature of the green ('Smaragdgrün'), Goethe reminds the reader of the inherent fragility of this seemingly perfect setting, given that cut gemstones, by definition, are a fragment of a greater whole, and even rough-hewn gems are a fragment of a larger geological mass. When they interact with the light, this sense of fragmentation is heightened further, as they splinter and refract the individual rays, creating a beautiful but no less fractured effect. This complex implicit interplay of wholeness and fragmentation in this brief extract mirrors the complexity of the interaction between materiality and immateriality within it, too. It paints a picture of a shifting 'Feenwelt', a world that is anything but material and merely an apparition, a trick of the light. This immaterial 'Feenwelt', in turn, is associated with the brittle, indisputable materiality of gemstones, and the immaterial colours that are both inherently housed within them and inevitably radiated outward by them when they are struck by the light.

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<sup>108</sup> Nicholas Boyle, 'Embodied Cognition: Goethe's *Farbenlehre* as Phenomenology', *German Life and Letters*, 70.4 (2017), 478-90 (p. 482).

<sup>109</sup> Albrecht Schöne, *Goethes Farbentheologie* (Munich: C.H. Beck, 1987), p. 94.

<sup>110</sup> Schöne, p. 94.

This association between light and colour, gemstones and fragmentation is reinforced in Goethe's 'Märchen', published in 1795. This tale, forming the culmination of his *Unterhaltungen deutscher Ausgewanderten*, sees the reader follow the twisting movements of a snake as she explores a land where will-o'-the-wisps can gobble up gold and a beautiful princess can bring the dead back to life. It is also deeply rooted in references to the geological realm. We first meet our guide, the snake, in her home in an 'ungeheure Kluft' located 'zwischen hohen Felsen' (WA I: 18, p. 227), and from there, the geological references begin to unfold. The tale opens with a ferryman transporting three will-o'-the-wisps across a river, who attempt to pay him in gold coins. However, the ferryman becomes agitated, fearing that the gold might touch the water and put a curse on him, and so he takes the gold coins to a mountainous area and hides them there, where they will be far from the risks of the water. These coins are discovered by our friendly snake, who eats them and then begins to glow. This light has a magical effect, giving living plants the appearance of being inanimate gems. The snake realises that she is alone, but:

Desto angenehmer war es ihr, sich selbst, da sie zwischen Kräutern und Gesträuchen hinkroch, und ihr anmutiges Licht, das sie durch das frische Grün verbreitete, zu bewundern. Alle Blätter schienen von Smaragd, alle Blumen auf das herrlichste verklärt. (WA I: 18, p. 228)

This mention of the emerald-coloured leaves is the only time that a gemstone is referred to by name in this part of the text, imbuing the gem with further significance – and offering a key point of contact with the 'Smaragdgrün' in the *Farbenlehre* extract above. Indeed, this association goes further than might initially be assumed. It is striking that, in the passage from the *Farbenlehre*, Goethe describes the green hue as being both like an aquamarine 'Meergrün' and a rich, royal 'Smaragdgrün' given the clear distinction between these two colours. From a mineralogical perspective, however, both aquamarine and emerald are members of the beryl family, with aquamarine described as emerald's 'sister stone'.<sup>111</sup> Despite their differences in terms of colour, their mineralogical similarities would not have been lost on an expert geologist like Goethe. Their location on the same continuum in this passage can be read as a subtle acknowledgement of the gemmological similarities of the stones which give these colours their name, and, by extension, their resonances too. In turn, this implies that this point in Goethe's *Farbenlehre* was informed by his in-depth knowledge of geology, as well as of optics. In turn, this suggests that the two texts themselves are rather more interlinked than their distinctly separate genres might suggest.<sup>112</sup>

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<sup>111</sup> G.F. Herbert Smith, *Gemstones* (London: Methuen, 1958), p.303.

<sup>112</sup> For further details on the theory that this *Farbenlehre* text and the 'Märchen' are more closely connected than their disparate genres would suggest, see Jennifer Caisley, 'Goethe's "Märchen": an exploration of (im)materiality', *German Life and Letters*, 72.3 (2019), 262-278.

## **Emeralds: an illustration of the connection between light and gemstones**

It is of note that emeralds, in particular, play a central role in both the 'Märchen' and Goethe's other literary and scientific work. Above all else, this gem is primarily used to illustrate references to the colour green. Indeed, the emerald's distinctive bright green hue appears to be its most significant property in both a literary and a scientific context, jointly emphasising the materiality of the physical gem and the luminous immateriality of the colour which it radiates. The significance of this colour can be seen in a different section of the *Farbenlehre*, 'Sinnlich-Sittliche Wirkung der Farbe' within the 'Didaktischer Teil', completed in 1807. In this section, Goethe explains the metaphorical associations connected to various primary and secondary colours. The entry for 'Grün' is substantially shorter than that for many other colours, and a large proportion of it focuses on explaining that green is the product of the combination of blue and yellow light. However, Goethe goes on to explain that green offers a 'reale Befriedigung' for the eye, to the extent that 'man will nicht weiter, und man kann nicht weiter' (WA II: 1, p. 320). In Goethe's mind, the colour green is associated with contentment, satisfaction and, ultimately, attainment: given the happy ending of the 'Märchen', this would seem to be an apt colour for the text.

However, there is a slight hint of something unsettling in this description. Agency is removed from the person faced with the colour green, or as Goethe puts it, 'man kann nicht weiter'. This also aligns with the plot of the 'Märchen', in which the protagonists are moved through a series of events like puppets on a stage. The snake, whose movements through the fictional landscape also guide the reader through the fairy tale, is directly associated with the colour green by being described as a 'grüne Schlange' (WA I: 18, p. 227), which in turn associates the narrated events with this colour. While the characters can make decisions and exercise what appears to be free agency, this is always within an unexplained framework shaped by overtones of control. Thus, for example, the old woman in the tale can independently decide to dip her hand in the river, but the impact of this action, the hand withering away, comes about as a result of mysterious laws that are outside her realm of comprehension, let alone control. This ambivalence inherent in the 'Märchen' offers a literary version of Goethe's description in the *Farbenlehre* which presents the duality of the feeling of satisfaction and the controlling influence offered by the colour green – and the power of both these immaterial properties.

This blend of attainment and loss of control that might strike the reader as unsettling is heightened further when the emerald itself is brought into play. In his 1941 essay on the use of gemstones in fairy tales, one of the few pieces of criticism to focus its gaze on gems themselves, Franz Strunz describes the stone as follows:

Ein berühmter Schutz gegen Unreinheit des Herzens, Geisterspuk, Vergesslichkeit ist der Smaragd, er öffnet die Augen und den Geist, macht alles durchsichtig und trübt sich, ja, er zerspringt, wenn sein Träger ein unsittliches Leben führt.<sup>113</sup>

The uneasy pairing of contentment and (lack of) agency and control is also evident in this passage. While emeralds can offer reassurance and assistance, they can also shatter without warning if they suspect wrong-doing. The emerald's shift from transparency to opacity, likely a mere trick of the light in reality rather than a change in the gem itself, are lent moral symbolism, with the radiant, clear emerald (as in the 'Märchen') being representative of purity and protection. Strunz is not the only critic to discuss the associations with emeralds when used as a symbol in literature. George Kunz also discusses the role of precious stones in literature, and states that emeralds have been ascribed 'great curative power'.<sup>114</sup> Alongside this healing effect, however, he too discusses how emeralds have supernatural abilities. It was widely believed that emeralds gave people the power 'to predict future events',<sup>115</sup> and Kunz repeats Strunz' statement that emeralds were able to assess truth or falsity. To illustrate this, Kunz cites a (possibly apocryphal) tale about King Bela of Hungary who, attempting to embrace his wife while wearing an emerald ring, suddenly saw the stone shatter into three pieces in an apparent attempt to reveal the lovers' infidelity to one another.<sup>116</sup> Although this anecdote about King Bela is unlikely to have directly influenced Goethe's depiction of emeralds as markers of ambivalence, his representation of them as such fits neatly within this mythological landscape, and serves to emphasise the strength of the associations with which they are imbued.

The tale of the Hungarian king told by Kunz further emphasises a core attribute of emeralds: the explicit materiality of their brittle hardness, which makes them prone to shattering, as illustrated by King Bela's stone. This, combined with the focus on an emerald ring, resonates with Goethe's poem 'Bedenklich', drawn from the 'Buch der Liebe' of the *Divan*. In the poem, the poet-protagonist compares the emerald worn on his lover's finger to the coldness of her (lack of) affection for him:

Soll ich von Smaragden reden,  
Die dein Finger niedlich zeigt?  
Manchmal ist ein Wort vonnöten,  
Oft ist's besser daß man schweigt.

Also sag' ich: daß die Farbe

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<sup>113</sup> Franz Strunz, 'Zaubersteine', *Sudhoffs Archiv für Geschichte der Medizin und der Naturwissenschaften*, 33.3/4 (1941), 233-48 (p. 240).

<sup>114</sup> George Frederick Kunz, *The Curious Lore of Precious Stones* (New York: Halcyon House, 1913), p. 28.

<sup>115</sup> Kunz, p. 79.

<sup>116</sup> Kunz, p. 78.



Grün und augerquicklich sei!  
Sage nicht: daß Schmerz und Narbe  
Zu befürchten nah dabei!

Immerhin! du magst es lesen!  
Warum übst du solche Macht!  
“So gefährlich ist dein Wesen  
Als erquicklich der Smaragd.”  
(WA I: 6, p. 55)

Julius Schiff's 1932 assessment of the poem as part of a broad-based survey of scientific metaphors in Goethe's literary works sees it as a simple description of opposites: displaying the 'Gegensatz zwischen dem augenerquickenden Smaragd und dem bösen Wesen der Geliebten'.<sup>117</sup> However, Schiff's allegation that the line drawn between the opposites of the emerald and the cold-hearted lover is fixed and impermeable is not quite accurate, with the emerald being a rather more ambivalent stone than Schiff appears happy to assume. First, the emerald stone and the cruel lover are physically intertwined: with the setting of the stone wrapped around his lover's finger, the poet-protagonist would never see the stone if she were not also present. Second, and most significantly, the emerald and the cold lover are equated not only on a physical level, but also on a grammatical and conceptual one at the end of the poem. Spoken directly by the poet-protagonist, the closing lines read: 'So gefährlich ist dein Wesen | Als erquicklich der Smaragd', creating an unusual collocation with the notion of a 'refreshing' emerald. The 'so...als' construction places the emerald and the lover on the same plane, tainting the emerald's positive properties with the risks associated with the lover as a result of the direct comparison between the two. Goethe even went so far as to write to his fellow geologist Karl Cäsar von Leonhard in 1815, asking 'Könnten Sie mir eine Notiz über Geologie und Mineralogie Persiens nachweisen, so geschähe mir gegenwärtig ein besonderer Gefalle' (WA IV: 25, p. 295). Sadly, von Leonhard was unable to supply Goethe with the necessary information on this subject, but as Monika Lemmel has shown, Goethe knew from other sources that the use of jewels as talismans was common in the Eastern tradition, with onyx and carnelian being particularly prized.<sup>118</sup> Throughout the *Divan*, Goethe adapted these traditions to suit his needs, and this is the case here: unlike onyx and carnelian, emeralds did not seem to be as significant in Eastern cultures. This makes

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<sup>117</sup> Julius Schiff, *Naturwissenschaftliche Gleichnisse in Goethes Dichtungen, Briefen und literarischen Schriften* (Berlin, Heidelberg: Springer, 1932), p. 234.

<sup>118</sup> See Monika Lemmel, *Poetologie in Goethes West-Östlichem Divan* (Heidelberg: Carl Winter Universitätsverlag, 1987).

the appearance of this stone in the Divan poem even more striking and suggests that Goethe deliberately chose it because of its resonances.

Goethe's description of the emerald in 'Bedenklich', in which this stone is referred to as both 'augerquicklich' and simply as 'erquicklich', mirrors the description of the colour green in the *Farbenlehre*, where Goethe explains that it offers a 'reale Befriedigung' for the eye. This is precisely the same adjective that Goethe uses to refer to the numerous sources of Eastern knowledge on which he based his *Divan* poems, as referenced in a discussion in the 'Einleitung' to the section in the *Divan* entitled 'Besserem Verständnis'. In this introduction, he talks of 'die Quellen und Bäche [...] deren erquickliches Naß ich auf meine Blumenbeete geleitet' (WA I: 7, p.4). This phrase makes explicit the association with water implied by the word 'erquicklich'. The liquid properties of water stand in stark contrast to the solid materiality of the emerald as stone, rendering the presentation of this gem's materiality even more ambiguous. It is worth noting, however, that the emerald is associated with a different element in the *Divan* compared to the 'Märchen'. While in the *Divan*, emerald is paired with the element of water, the reference to emerald in the 'Märchen' is more closely aligned with the element of air, as a result of this gem's impact on the surrounding atmosphere. This is also reflective of the function that the emerald plays in these texts: while in the 'Märchen' it is used metaphorically, foregrounding its immateriality, in the *Divan* poem it refers to a solid, tangible object. In turn, this serves as an illustration of the dual (im)materiality of gemstones, and, indeed, geological objects more broadly: the lines between the immaterial and the material are rather more fluid than they might seem.

### **Vision and subjectivity**

For Goethe, colours (and light more broadly) were intrinsically connected to the sense of vision, and this is no different in the two passages from the *Farbenlehre* and the 'Märchen' discussed above. Indeed, the problematic nature of vision forges a link between both scenarios. The extract from the *Farbenlehre* is replete with terms associated with the verbs 'scheinen', 'glauben' and 'können':

Als aber die Sonne sich endlich ihrem Niedergang näherte und ihr durch die stärkeren Dünste höchst gemäßigter Strahl die ganze mich umgebende Welt mit der schönsten Purpurfarbe überzog, da verwandelte sich die Schattenfarbe in ein Grün, das nach seiner Klarheit einem Meergrün, nach seiner Schönheit einem Schmaragdgrün **verglichen werden konnte**. Die **Erscheinung** ward immer lebhafter, **man glaubte sich** in einer Feenwelt zu befinden, denn alles hatte sich in die zwei lebhaften und so schön übereinstimmenden Farben gekleidet. (WA II: 1, p. 35, my emphasis)

This highlights the subjective, uncertain nature of the ‘Erscheinung’ in question and the fact that it is mediated through a fallible sensing subject. This is then repeated in the extract from ‘Märchen’, mentioned above, which also serves to emphasise the tripartite association amongst gems, light and (subjective) vision through the verb ‘scheinen’:

Desto angenehmer war es ihr, sich selbst, da sie zwischen Kräutern und Gesträuchen hinkroch, und ihr anmutiges Licht, das sie durch das frische Grün verbreitete, zu bewundern. Alle Blätter **schienen** von Smaragd, alle Blumen auf das herrlichste verklärt. (WA I: 18, p. 228)

The verb ‘scheinen’ at once makes explicit the immaterial light emanating outwards from the material gemstone itself, while emphasising the snake’s gaze that travels towards the emerald, thereby foregrounding the interconnected nature of subjective vision and experience. In addition to making visible the link between light, vision, and precious stones, the term ‘scheinen’ also subtly references the fantastic nature of this passage. The leaves are not actually made of emerald: they merely appear to be so, positioned within a fantasy world where appearance, rather than reality, reigns sovereign. As such, the choice of this verb seems to also play a role in situating the narrative of the ‘Märchen’ within the genre of fairy tales where nothing is quite as it would be expected in the real world.

In line with the apparent primacy of vision in this extract, critics have often explored the ‘Märchen’ from the perspective of Goethe’s work on optics. One such critic is Heather Sullivan, mentioned previously in this chapter for her work on colour and materiality in the context of Goethe’s *Farbenlehre*. In her article on the ‘Märchen’, light is the focus of her argument, and, indeed, the focus of how she reads the fairy tale, too, as she makes clear from the very first line: ‘Light permeates Goethe’s enigmatic 1775 *Märchen*, appearing in such manifold forms and reflections that it may come as a surprise that it refers rather straightforwardly to, well, light’.<sup>119</sup> Sullivan repeats this assertion throughout her article, saying, for example, that ‘*Das Märchen* opens and closes with light, and it is at every step infused by and driven forward by movement of light.’<sup>120</sup> This movement of light is illustrated later on in Sullivan’s article, when she discusses the scene in the fairy tale where the snake reveals the light with which she is illuminated originated from the gold that was thrown into her mountain chasm by the will-o’-the-wisps. Sullivan reads this occurrence as demonstrating that there is a ‘*Steigerung* from gold to light’, with gold being heightened into light.<sup>121</sup> However, other scholars have read this process not as one of ‘heightening’, but as one marked by a shift in materiality. This

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<sup>119</sup> Heather I. Sullivan, ‘Seeing the Light: Goethe’s Märchen as Science-Newton’s Science as Fairy Tale’, *Goethe Yearbook*, 14.1 (2006), 103-27 (p. 103).

<sup>120</sup> Sullivan, ‘Seeing the Light: Goethe’s Märchen as Science-Newton’s Science as Fairy Tale’, p. 105.

<sup>121</sup> Sullivan, ‘Seeing the Light: Goethe’s Märchen as Science-Newton’s Science as Fairy Tale’, p. 115.

magical process by which the light is generated was interpreted by Rudolf Geiger in his 1993 work *Goethes Märchen: Bilder einer konkreten Utopie* as suggesting that, in the topsy-turvy fairytale world of the ‘Märchen’, the boundaries between solidity and fluidity are blurred at best: ‘Vor Ur-Urzeiten zerrann einmal Licht zu Gold, Licht verdichtete sich, wurde metallische Substanz. Hier wird eine Umkehrung angedeutet, wie sich das Kompakte, Dichte wieder aufzulösen verlangt ins Lichte. Gold kann wieder Licht werden’.<sup>122</sup> In his understanding of the tale, light can magically transform into a cold, hard metal, while tangible, inert gold can turn into an immaterial ‘substance’ that is anything but solid. The disparity in the framing of light in both texts, and Geiger’s helpful reminder that the normal rules of science do not apply in this fairytale world, emphasises the differences in the genres of the two texts, with the artificially created light in the ‘Märchen’ highlighting the constructed nature of this tale, by contrast to the natural lighting conditions shown in the *Farbenlehre* excerpt, which purportedly reflects scenes from real life. Yet, this difference also makes the similarities between the two instances even more striking. Both texts seem to suggest that, for Goethe, gemstones and light cannot be separated from each other, with the gems’ brilliant colours only coming to bear when struck by a ray of light. By extension, this parallel suggests the materiality of precious stones cannot be separated from the immaterial properties of light, and of the colours that it brings into being.

Man fragte nicht, wie geht die Natur zu Werke, um diese und jene Farbe auf ihrem innern lebendigen Wege hervorzubringen, sonder wie belegt der Maler das Todte, um ein dem Lebendigen ähnliches Scheinbild darzustellen. (WA 2: 1, p. 245)

This extract from Goethe’s *Farbenlehre* is taken from a discussion of the interplay between natural and man-made colours, in which Goethe highlights the irony of having painters create samples of colours that then serve to lend their names to natural entities. This is particularly striking, he alleges, because the colours are actually created by these natural entities ‘auf ihrem innern lebendigen Wege’, in stark contrast to the painter’s work to give the appearance of life to ‘das Todte’. At first glance, it is not at all surprising to allege that colour is created through living process for natural entities – except for the fact that this quotation is drawn from the ‘Mineralien’ section of the ‘Chemische Farben’ chapter of the *Farbenlehre*. Goethe is not talking about plants or animals, namely natural entities that would be expected to have internal lives: he is talking about stones, rocks and minerals that seem to be anything but alive, although, as the next chapter will demonstrate, Goethe and his contemporaries took a rather different view of this concept. Colour is intrinsically a part of these minerals, being ‘hervorgebracht’ by nature within them, and yet it can exert an influence on the viewer that extends far beyond the mineral itself. Colour, then, is emblematic of the (im)materiality of geological entities

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<sup>122</sup> Rudolf Geiger, *Goethes Märchen: Bilder einer konkreten Utopie* (Stuttgart: Urachhaus, 1993), p. 47.

(as well as being part of them): at once material and immaterial, with neither of these properties taking precedence over the other.

The connections forged between Goethe's work on geology and his research on light and colour took many forms and were frequently inspired by both the direct engagement with geological matters that he undertook in Ilmenau and the people, such as his fellow map-maker Johann Carl Wilhelm Voigt, with whom he interacted there. His engagement on geological mapping projects synthesised his activity in both fields, while Goethe also referenced geology in his *Farbenlehre* and, conversely, mentioned colours in his geological writings. In a more general sense, the interactions between the two disciplines are most immediately obvious in terms of the colour of the rocks themselves. However, this self-evident link unfolds to create a connection that is anything but self-evident, whereby the geological material in question (whether a gemstone, a rock or a crystal) becomes freighted with immaterial allusions linked more closely to its colour per se than the overarching entity at hand. This is exemplified by the case of emeralds and the colour green, with the gem taking on the associations of the colour itself. However, the interaction between colour and geology is much more than the sum of its parts. When taken together, the two disciplines also emphasise the theme of totality, wholeness and completeness that imbued all of Goethe's world-view: these two fields of study are just as interconnected as the natural world that their practitioners seek to explore. In turn, and in alignment with this belief in inevitable wholeness, this interdisciplinary overlap reinforces his belief in the total, inextricable link between the material and the immaterial.

## Chapter Four: The immaterial forces within rocks

Jane Bennett's 2010 monograph *Vibrant Matter* is based on the proposition that the long-held division between dead, inert matter and living, active entities is artificial and inaccurate. Concepts of 'forces and flows' (which she terms 'materialities') within matter are key to her argument, with these flows bringing matter to life and bridging this erroneous divide that she believes has been drawn between humans and the broader environment:

In lieu of an environment that surrounds human culture, or even a cosmos that cleaves into three ecologies, picture an ontological field without any unequivocal demarcations between human, animal, vegetable, vitality and self-interest or mineral. All **forces and flows** (materialities) are or can become lively, affective, and signaling. And so an affective, speaking human body is not radically different from the affective, signaling nonhumans with which it coexists, hosts, enjoys, serves, consumes, produces, and competes.<sup>123</sup> (emphasis mine)

Within her work, Bennett coins the term 'thing-power', which refers to the notion of things being able 'to exceed their status as objects and to manifest traces of independence or aliveness'.<sup>124</sup> While the above extract makes mention of 'things' in rather general terms, Bennett's discussions of 'thing-power' primarily focus on the forces embedded within man-made objects. However, aligning Bennett's work with Goethe's geological writings shines a light on his belief in a similar kind of force – albeit one to be found within naturally occurring geological entities.

Two hundred years prior to Bennett's monograph, Goethe wrote a brief essay entitled 'Über Bildung von Edelsteinen', which formed part of a letter sent to his fellow geologist Karl Cäsar von Leonhard. This text opens with the following statement:

Alle Gebirgsmassen trennen und bilden sich kosmisch, innerhalb der Masse aber erzeugt sich eine Neigung, sich eigenst gestaltet darzustellen. (WA II: 10, p. 85)

Just as Bennett alleges that all solid objects (specifically including 'mineral' entities) can be viewed as living beings, Goethe believes that mountains, too, are home to similar 'forces and flows', to borrow Bennett's phrase. Goethe expresses this in even more resonant terms than Bennett does, using the word 'Neigung' to describe these forces. The use of this word suggests that the mountains are not merely vividly alive, as Bennett asserts with her 'forces and flows': they are also able to shape

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<sup>123</sup> Jane Bennett, *Vibrant Matter: A Political Ecology of Things* (Durham, North Carolina: Duke University Press, 2010), p. 117.

<sup>124</sup> Bennett, p. xvi.

themselves in one particular way or another (to accord with their ‘Neigung’). In Goethe’s eyes, rocks are ‘lively’, as Bennett puts it, having the ability to ‘trennen und bilden sich’ while also being both ‘affective and signaling’. In an anthropomorphic move not dissimilar to Goethe’s use of the term ‘Neigung’, Bennett asserts that any material object is ‘affective’, or, in other words, can experience moods, feelings or attitudes. They are also ‘signaling’, or able to express these emotions, in a manner not unlike Goethe’s belief that parts of rocks are guided by their ‘Neigung’ to turn into gemstones. Reading Goethe’s ‘Über Bildung von Edelsteinen’ and other work on geological formation, as well as the writings of his contemporaries and predecessors, alongside Bennett’s theories of vibrant matter at once brings to the fore moments of material vibrancy in Goethe’s texts and challenges Bennett’s understanding of what, exactly, these ‘forces and flows’ are. In turn, Bennett’s notion of vibrant matter serves to highlight and expand on Goethe’s understanding of the interconnected nature of materiality and immateriality, both within the geological realm specifically and the natural world more broadly.

### **The theory of immaterial forces**

Bennett is not the only modern-day theorist to allege that matter itself is home to such forces. Geographers Alan Latham and Derek P. McCormack, in their essay ‘Moving Cities: Rethinking the Materialities of Urban Geographies’, make reference to their belief in the existence of such forces within seemingly solid objects. They state:

It is not enough to use the ‘material’ and ‘materiality’ in such a way as to invoke a realm of reassuringly tangible or graspable objects defined against a category of events and processes that apparently lack ‘concreteness’. Rather, we only begin to properly grasp the complex realities of apparently stable objects by taking seriously the fact that these realities are always held together and animated by processes excessive of form and position.<sup>125</sup>

These ‘processes excessive of form and position’ are analogous to the ‘flows’ of Bennett’s matter – and of Goethe’s rocks. Accepting, and attempting to understand, these ‘processes’ is central to gaining insight into matter and objects themselves, and neglecting them would, as they suggest, make it impossible to ‘properly’ comprehend materiality. Indeed, this belief that physical objects are an inextricable compound of matter, on the one hand, and a force that brings it into a particular form, on the other, dates back to Aristotle. In his *Physics*, Aristotle explains this belief, hylomorphism, as follows:

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<sup>125</sup> Alan Latham and Derek P. McCormack, ‘Moving Cities: Rethinking the Materialities of Urban Geographies’, *Progress in Human Geography*, 28.6 (2004), 701-24 (pp. 704-5).

Thus if, of things by nature, there are causes of principles of which those things are composed primarily and from which they come to be not accidentally, but come to be what each of them is called according to its substance, then everything which is generated is generated from a subject and a form [...].<sup>126</sup>

Here, the term ‘form’, as used by Aristotle, does not solely refer to the shape which the object in question finally takes: it also refers to its essence, which drives it to take this shape and imbues it with the necessary qualities. The ‘cause’, which Aristotle later refers to as the ‘moving cause’ or ‘efficient cause’, is the stimulus behind the transformation of matter from one form to another, before it ultimately reaches its function, or ‘final cause’. Bennett and Goethe, like Aristotle, pursue an approach which acknowledges that material artefacts are composed of more than matter alone; that is to say, that the overarching structure of Aristotle’s approach accords, to some extent, with Goethe and Bennett’s, particularly in its holistic, balanced nature that privileges neither form nor matter above the other.<sup>127</sup> Goethe himself, in his brief 1818 note ‘Bildungstrieb’, used the terms ‘Stoff’ and ‘Form’ as opposing points on a schema he sketched out to elucidate the nature of organic material, which suggests he was influenced, to some extent, by this Aristotelean approach (WA II: 7, p. 71). However, ‘Stoff’ and ‘Form’ were merely the endpoints in Goethe’s schema: between the two, Goethe included ‘Vermögen’, ‘Kraft’, ‘Gewalt’, ‘Streben’ and ‘Trieb’. This list of forces that facilitate a movement between ‘Stoff’ and ‘Form’ highlights the inherently active, energetic nature of this balance for Goethe – a balance which can only be struck with the help of these forces that ensure matter can proceed to its essence, and one in which an entity’s ‘form’ can be negotiated and re-negotiated anew as a result. This highlights a striking difference between Goethe’s and Aristotle’s approaches in this respect: despite both displaying a commitment to the mutual existence of matter and forces within this matter, they emphasise different aspects of this duality. For Aristotle, the focus lies on the ultimate attainment of the final form, whereas for Goethe, the emphasis is placed on the fact that this is achieved by a gradual, yet continuous process of transformation,<sup>128</sup> not dissimilar to the Leibnizian *lex continui*.<sup>129</sup>

In ‘Bildungstrieb’, Goethe merely presents the reader with this list, after a brief preamble, and does not explain how, exactly, he sees these various forces as working, nor what he identifies as the primary differences between them. However, Latham and McCormack do go further and explicitly

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<sup>126</sup> Aristotle, *Physics*, trans. by H. G. Apostle (Bloomington, Indiana: Indiana University Press, 1969), 190b18 – 190b22

<sup>127</sup> See Claus Günzler, ‘Die Bedeutung des aristotelischen Hylemorphismus für die Naturbetrachtung Goethes’, *Zeitschrift für philosophische Forschung*, 21.2 (1967), 208–41 (p. 212)

<sup>128</sup> For a more in-depth comparison of Aristotle and Goethe on this point see Astrida Tantillo, *The Will to Create* (Pittsburgh, Pennsylvania: University of Pittsburgh Press, 2002), p. 79.

<sup>129</sup> See Hugh Barr Nisbet, *Goethe and the Scientific Tradition* (London: Institute of Germanic Studies, 1972), p. 8.



align their ‘processes’ (which are akin to Goethe’s ‘Kraft’, ‘Gewalt’, and so on) with immateriality. They explain that:

The immaterial needs to be understood more expansively so as to include the prepersonal force of a multiplicity of nonrepresentational forces and practices and processes through which matter is always coming into being.<sup>130</sup>

Once again, these ‘processes through which matter is always coming into being’ sound not dissimilar to Bennett’s ‘thing-power’, or to Goethean ‘Neigung’. They are also ‘prepersonal’: they precede the existence of humans and can, therefore, be applied to non-human objects, too. For Latham and McCormack, the forces that exist within and between material objects are inherently immaterial, without necessarily being either superior to the objects in question or subject to them. This is the understanding of generative forces that I draw on in this chapter, considering them to be immaterial and, by extension, further emphasising the innate existence of (im)materiality in Goethe’s view of the geological space.

Indeed, even Goethe himself discussed the existence of such forces with reference to their immateriality. In his *Metamorphose der Pflanzen*, composed and published in 1790, the question of natural, generative forces is at the forefront of his enquiry. These forces take various forms, but the ‘regelmäßige Metamorphose’ (WA II: 6, p. 26), which Goethe glosses as the productive, ‘fortschreitende’ version of metamorphosis is described as the version that:

durch Umwandlung einer Gestalt in die andere, gleichsam auf einer geistigen Leiter, zu jenem Gipfel der Natur, der Fortpflanzung durch zwei Geschlechter hinaufsteigt. (WA II: 6, pp. 26-7)

Here, the ‘Umwandlung einer Gestalt in die andere’ refers to the changing of cotyledons, or seed leaves, into fruit, reaching the ‘Gipfel der Natur’ of sexual reproduction. Despite connoting a material mountain peak in its literal usage, in this instance, the ‘Gipfel’ is metaphorical and, by extension, immaterial. This is not the only instance of immateriality in this brief extract. The process by which one botanical form metamorphoses into another is described as being a ‘geistige Leiter’. Just like the metaphorical, immaterial ‘Gipfel’, this ‘Leiter’ has here been stripped of its materiality. The use of the term ‘geistig’ in this context is particularly resonant. As discussed in the Introduction to this thesis, Goethe established ‘Geist’ as the opposite to ‘Materie’ in his ‘Erläuterung zu dem aphoristischen Aufsatz “Die Natur”’ (WA II: 11, pp. 10-12). As such, a reference to ‘Geist’, as in this extract from the *Metamorphose der Pflanzen*, is implicitly also a reference to immateriality. Given that Goethe

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<sup>130</sup> Latham and McCormack, p. 705.

views these transformational forces in the realm of botany as immaterial, it is logical to conclude that he subsequently viewed the transformational forces in the realm of geology as immaterial, too.

### **The agency of matter**

Whilst it may appear striking to a 21<sup>st</sup>-century reader, Bennett's theory of flows within matter is not, however, unusual when viewed from the perspective of eighteenth and nineteenth-century geology. Frank Dawson Adams' early 20<sup>th</sup>-century overview of the history of the geological sciences explains various theories relating to the genesis of stones. Described in an obituary as 'one of the best known and most deeply honoured scientists in Canada and the western hemisphere',<sup>131</sup> Adams' study is a comprehensive work that covers geological thought from Ancient Greeks through to the eighteenth century and beyond. One prominent theory included by Adams in this historical overview of geological thought is that of 'lapidifying juice' (the translation Adams uses for the Latin phrase *Succus Lapidificus*), which circulated around the Earth's crust and was able to turn materials of various kinds into stone.<sup>132</sup> This concept of the Earth as a living, changing organism in its own right took on different guises over time, from Copernicus' heliocentrism that needed planet Earth to be physically in a state of motion,<sup>133</sup> to Buffon's eighteenth-century theory of the cooling of the Earth,<sup>134</sup> which posited that the changes in its material state were caused as it progressively lost the heat with which it was formed. The theory of 'lapidifying juice' had long been refuted by the time Goethe was writing, but the fundamental concept of the physical activity, if not deliberate agency, of rocks remained and was drawn on by other contemporary authors.

This is highlighted by Theodor Ziolkowski, who devotes a chapter of his monograph on *Romanticism and its Institutions* to mining and the Romantic fascination with the subterranean world, underlining the importance of geology and mineralogy for Goethe's contemporaries. As Ziolkowski summarises, 'the conception of a mineral kingdom eternally *in statu nascendi* and constantly sublimating itself into ever nobler forms was intensely exhilarating' for the German Romantics.<sup>135</sup> This connection between German Romanticism and an adherence to the belief in the agency of rocks, stones and minerals goes

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<sup>131</sup> John S. Flett, 'Frank Dawson Adams. 1859-1942', *Obituary Notices of Fellows of the Royal Society*, 4:12 (1943), 381–393 (p. 381).

<sup>132</sup> Frank Dawson Adams, *The Birth and Development of the Geological Sciences* (London: Bailliere, Tindall and Cox, 1938), p. 90.

<sup>133</sup> See David Wootton, *The Invention of Science* (London: Penguin, 2015), p. 158.

<sup>134</sup> See Martin Rudwick, *Earth's Deep History: How It Was Discovered and Why It Matters* (Chicago: Chicago University Press, 2014), p. 62.

<sup>135</sup> Theodore Ziolkowski, *German Romanticism and Its Institutions* (Princeton: Princeton University Press, 1990), pp. 30-31.

some way to explaining why this belief was so widespread among authors of the period, such as Schelling, Steffens and Novalis, despite the relatively advanced state of geological science at the time. Famous as a Romantic poet and author, Novalis' professional career, like Goethe's, focused on mining. Specifically, his work centred on the Saxon salt mines, which exposed him to various scientific disciplines, including geology, mathematics and chemistry. In turn, this informed his literary works, notably *Heinrich von Ofterdingen*, which contains an array of references to the belief in the active genesis of metals and rocks in mines. One such instance occurs at the start of Heinrich's journey, when he meets an unnamed older man who talks about rock formation at length. The old man is concerned that the natural world is in a period of stasis, with no new stones, gems or metals currently being produced. He states 'mag es sein, dass die Natur nicht mehr so fruchtbar ist, dass heutzutage keine Metalle und Edelsteine, keine Felsen und Berge mehr entstehen, [...]: je mehr sich ihre erzeugende Kraft erschöpft hat [...]'.<sup>136</sup> Nature is not home to a mechanical, constant force; instead, it waxes and wanes like the living entities of which it is composed. In turn, this fluid, ever-changing 'erzeugende Kraft' facilitates the creation of metals and gemstones, generating geological matter in a manner more akin to the growth of a plant or tree.

Indeed, the late eighteenth century saw a veritable explosion of interest in mineralogy, which 'emerged somewhat uneasily from [...] developments [in geology]'.<sup>137</sup> This era can be seen as the origin of studies in this field, with critics contending that 'the establishment of mineralogy as a science must be placed in the decade of the 1780s'.<sup>138</sup> This discipline focused squarely on minerals specifically rather than rocks more generally. Within this burgeoning field, Goethe was well-networked among his scientific contemporaries. Alongside Karl Cäsar von Leonhard, to whom Goethe sent his 'Über Bildung von Edelsteinen', he also interacted with an array of other German geologists. They included Abraham Gottlob Werner, who complained in his 1774 treatise on mineralogy that 'viele dieselbe [die Mineralogie] im Vortrage mit andern Wissenschaften vermengen',<sup>139</sup> thereby diluting its importance and hindering further study of this science specifically. Goethe and Werner met on multiple occasions and discussed geological matters, but they had one further connection in common, too: Werner had been the teacher of Goethe's colleague at the Ilmenau mine, J.C.W. Voigt, during his training at the Bergakademie Freiberg.<sup>140</sup> While Werner's treatise

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<sup>136</sup> Novalis, and Gerhard Schulz, *Novalis Werke* (Munich: Beck, 1981), p. 98.

<sup>137</sup> Marcia R. Pointon, *Brilliant Effects: A Cultural History of Gem Stones and Jewellery* (London: Paul Mellon Centre for Studies in British Art, 2009), p. 316.

<sup>138</sup> John C. Greene and John G. Burke, 'The Science of Minerals in the Age of Jefferson', *Transactions of the American Philosophical Society*, 68.4 (1978), 1–113 (p. 5).

<sup>139</sup> Abraham Gottlob Werner, *Von den äusserlichen Kennzeichen der Fossilien* (Leipzig: n.pub., 1774), p. 16.

<sup>140</sup> Michaela Haberkorn, *Naturhistoriker und Zeitenseher: Geologie und Poesie um 1800: Der Kreis um Abraham Gottlob Werner (Goethe, A.v. Humboldt, Novalis, Steffens, G.H. Schubert)* (Frankfurt am Main; New York: Lang, 2004), p. 119.

focuses on his attempts to classify minerals, it also offers insight into his belief that they were not merely static beings. Rather, they were home to forces that shaped them, as Werner mentions in a description of the three prerequisites for a stone, or as he later explicitly states, a crystal, to be transparent:

Zweytens, dass sich bey der Entstehung eines dergleichen Foßils seine einzelnen Theile vorhero in einem Zustande der Flüßigkeit befinden, d. h. innig aufgelöst sind, um sich, nach der ihnen eignen Anziehungskraft, in die gedachte Lage an einander setzen zu können:  
Drittens, daß die innige Auflösung, aus der sich ein dergleichen Foßile erzeugen will, völlig in Ruhe sey.<sup>141</sup>

For Werner, a transparent mass must have been created from a liquid, and this process must take place in an environment shaped by tranquillity ('völlig in Ruhe'). More significant, however, than the prerequisites explicitly listed is the suggestion, firstly, of forces within the rock, and secondly, of some kind of agency on the part of the rock's components. The force of 'Anziehungskraft' is responsible for bringing the rock's particles together into the necessary alignment. This 'Anziehungskraft' is 'ihnen eigenen', with the components housing not only matter but the forces needed to shape it, too. Goethe would go on to criticise Werner's later work, saying, for example, 'Die Lehre von den Gängen, wie sie Werner anno 1791 vorträgt, ist unhaltbar.' (WA II: 10, p. 88). Indeed, critics have summarised their relationship by stating that they were brought together by 'ein reger Gedankenaustausch und nicht eine Übereinstimmung', particularly when it came to debates relating to Neptunism and Vulcanism, two opposing theories which argued that the primary causes of geological change were the impact of water and heat respectively.<sup>142</sup> Nevertheless, Werner's treatise serves as a useful illustration of the contemporary understanding of seemingly inert geological masses as being anything but.

Novalis and Werner were not the only of Goethe's fellow scientists to be keenly interested in the concept of generative forces within matter. Barthold Heinrich Brockes, a German poet, physicotheologian and scientist who died just two years before Goethe was born, discussed similar forces. This is the case in Brockes' poem 'Einige Natur-Kräfte, Gesetze und Eigenschaften, zu Ehren ihres allmächtigen Beherrschers, bey dem Jahrs-Wechsel des 1731. Jahrs betrachtet', which was included in his book of poetry *Irdisches Vergnügen im Gott*. This lengthy poem in free verse discusses a wide range of topics such as gravity, evaporation and atoms. One section of the poem describes the process of cutting objects into smaller and smaller pieces. Brockes begins this discussion by comparing the number of pieces that can be gained from a thumb-shaped object to the number that could result from a cube-shaped object, and concludes that the cube can be divided into many more

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<sup>141</sup> Haberkorn, p. 232.

<sup>142</sup> Haberkorn, p. 124.

pieces until they become so very small that they are no longer visible. He extends this analogy of tiny, invisible particles to water, air and soil to create an early understanding of atomic structure, saying that ‘auch im Wasser, Lufft und Erden so viel Millionen Theile seyn, und auch beweget werden’.<sup>143</sup> Water, air, and most importantly for our purposes, earth, are, in Brockes’ eyes, composed of millions of tiny pieces in motion (‘beweget’). How, exactly, these particles are set in motion, and what held them together, is not, however, clarified by Brockes.

Even Goethe’s predecessor Isaac Newton, whom he later famously and vehemently opposed when it came to colour theory, espoused the belief that matter was not composed of one solid, indivisible mass. Rather, he believed it was the product of forces holding particles together. He states in his *Opticks* that ‘there are therefore Agents in Nature able to make the Particles of Bodies stick together by very strong Attractions’.<sup>144</sup> This view, namely that nature was home to mysterious forces, or ‘agents’, that were responsible for stabilising, if not creating, matter was widespread in the eighteenth century, and was espoused by the atomists, who considered matter to be fundamentally particle-based. For atomists, the spaces between the individual atoms were just as important as the atoms themselves, with critics summarising that ‘it seems to be that all atomists prior to the twentieth century were always concerned not only with the particles that composed the substance but also the matter or lack of it within the interstices’.<sup>145</sup> These spaces represented the areas where the forces holding the individual atoms together did their work, creating matter from nothing. While Goethe rejected atomism, his work on generative forces, and, specifically, his belief in the generative nature of the gaps between the grains of matter, was arguably informed by atomist thought.

### **Goethe’s writings on vibrant matter: ‘Über Bildung von Edelsteinen’**

The philosopher Howard Caygill has discussed in great detail the interplay between energy flows and life, and the crossovers between the concepts of energy, forces and power. As part of this discussion, Caygill asks the following question: ‘Is the choice simply between subordinating the vital to the physical, or the physical to the vital, or are there other possible options?’<sup>146</sup> Goethe’s 1816 essay

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<sup>143</sup> Bartold Heinrich Brockes, *Irdisches Vergnügen im Gott* (Hamburg: König & Richter, 1735), p. 373.

<sup>144</sup> Isaac Newton, *Opticks: Or, A Treatise of the Reflections, Refractions, Inflexions and Colours of Light. The Second Edition, with Additions* (London: n.pub., 1718), <<http://www.newtonproject.ox.ac.uk/view/texts/normalized/NATP00051>> [accessed 28 September 2020] (p. 369).

<sup>145</sup> Cyril Stanley Smith and John G. Burke, *Atoms, Blacksmiths, and Crystals; Practical and Theoretical Views of the Structure of Matter in the Seventeenth and Eighteenth Centuries* (Los Angeles: William Andrews Clark Memorial Library, University of California, 1967), p. 42.

<sup>146</sup> Howard Caygill, ‘Life and Energy’, *Theory, Culture & Society*, 24.6 (2007), 19-27 (p. 24).

‘Über Bildung von Edelsteinen’ offers, I contend, one answer to Caygill’s question, suggesting that the ‘vital’ (which, in my reading, comes under the broader heading of the ‘immaterial’) and the ‘physical’ (which, in my reading, is subsumed under the ‘material’) need not be viewed as competing with each other or positioned within a hierarchy: rather, they mutually co-exist on an even plane. Created during the otherwise much-studied *Divan* years, Goethe’s ‘Über Bildung von Edelsteinen’ is barely discussed by Goethe scholars, rarely receiving even marginal attention in scholarship. One of the few explicit references to the piece comes in the entry dedicated to ‘Edelsteine’ in the supplement to the *Goethe-Handbuch*, which provides not only an overview of Goethe’s understanding of gemstone formation, but also an insight into the documents and correspondence that enabled this understanding to be formed. There was (and still is) no formal mineralogical definition of gemstones, as the *Goethe-Handbuch* entry makes clear, calling the term ‘Edelstein’ a ‘mineralogisch nicht definierte Begriff’ that describes ‘harte, meist durchsichtige und seltene Mineralien’.<sup>147</sup> As a result, eighteenth and nineteenth-century scientific explorations focused on gemstones first had to contend with the very identity of the objects under examination, regardless of questions relating to their origin or development.

Goethe did not compose ‘Über Bildung von Edelsteinen’ with the intention of publishing it as a standalone piece. Instead, he wrote it to enclose within a letter to Karl Cäsar von Leonhard, a prominent geologist of the time and an interlocutor of Goethe’s on geological matters. In this instance, von Leonhard was an ideal partner for Goethe’s quest. Von Leonhard’s geological work had focused on developing a system through which it would be possible for rocks to be classified into various groupings, thereby enabling conclusions to be drawn about rocks within the same group. This grew to become ‘the first detailed system of rock classification’ by 1823,<sup>148</sup> but it was not without its faults. The main issue was a lack of certainty in terms of how rocks were created, ‘because geologists were not yet in full accord regarding the origin of many rocks’.<sup>149</sup> Consequently, von Leonhard’s scheme focused more on the key characteristics of rocks as we see them today, and less on their purported origins (which was Goethe’s primary focus in the essay). It is against this backdrop of inadequate knowledge that Goethe wrote his note ‘Über Bildung von Edelsteinen’. The text opens with a proclamation of Goethe’s understanding of how gemstones are formed, followed by a list of the various kinds of gemstones to be found within other types of rock. This section also contains a comment on the eternality of gemstone formation, a process Goethe believes to be continuing to the present day. From here, Goethe proceeds to a slightly more detailed exposition of gemstone

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<sup>147</sup> Shu Ching Ho, ‘Edelsteine’, in *Goethe-Handbuch Supplemente: Band 2: Naturwissenschaften*, ed. by Manfred Wenzel (Weimar, Stuttgart: J.B. Metzler, 2012), pp. 373-374 (p. 373).

<sup>148</sup> Davis A. Young, *Mind over Magma* (Princeton, New Jersey: Princeton University Press, 2003), p. 110.

<sup>149</sup> Young, p. 110.

formation, and makes a brief reference to an exploratory walk he had undertaken. Finally, he ends the text with two rhetorical questions and attempts to answer them, asking how gemstones themselves can be classified and defined, and how old gemstones could be.

By 1816, Goethe had not spent a substantial amount of time in Ilmenau for twenty years or so (barring his brief visit from 26 August to 2 September 1813) – and yet he explicitly acknowledges the impact that the town and its geological features had had on the formation of his geological theories. When listing the various types of rock that he had found embedded within others (stating, for example, that ‘wir haben Granit im Granit krystallisirt in Karlsbad’ [WA II: 10, p. 85]), he also makes reference to the geological formations to be found near Ilmenau. He says ‘in dem Porphyr bilden sich Krystalle, jener Urform ähnlich; in Ilmenau und Töplitz sind sie entschieden, aber nicht häufig gefunden werden’ (WA II: 10, p. 85). Despite the length of time that had elapsed since his engagement with the town, Goethe has a clear memory of the rocks to be found near it, even if they were found ‘nicht häufig’. In turn, this is a striking demonstration of the impact that Ilmenau continued to exert on Goethe, and his geological work specifically, long after his professional involvement in the town and its mine had been completed.

The concept of the natural yet directional formation of gemstones is made clear from the outset of the essay, with this process being led by a ‘Neigung’. As Goethe states in the opening sentence:

Alle Gebirgsmassen trennen und bilden sich kosmisch, innerhalb der Masse aber erzeugt sich eine Neigung, sich eigenst gestaltet darzustellen. (WA II:10, p. 85)

As this brief sentence makes clear, mountains are shaped by division and re-formation. Goethe makes another reference to this process two years later in his 1818 ‘Wiegenlied’, a poem written by Goethe for his grandson, Walther von Goethe, and addressed to ‘dem jungen Mineralogen’. In it, Goethe instructs his grandson to:

Schau in die Klüfte des Berges hinein,  
Ruhig entwickelt sich Stein aus Gestein.

Ewig natürlich bewegende Kraft  
Göttlich gesetzlich entbindet und schafft;  
Trennendes Leben, im Leben Verein,  
Oben die Geister und unten der Stein.

[...] (WA I: 4, p. 47)

When he peers into the mountain chasms, Goethe says, his grandson will be able to see the development of stone at work. This is masterminded by an ‘ewig natürlich bewegende Kraft’ operating in the very same way as the ‘Neigung’ in ‘Über Bildung von Edelsteinen’. The productive division and re-formation of the rock is heavily emphasised in these verses, being mentioned on two separate occasions. The poet-protagonist first explains how the immaterial force within the rocks ‘entbindet und schafft’ the material from which they are made, before making the nature of this activity even clearer with the phrase ‘trennendes Leben, im Leben Verein’. This statement expounding on the life to be found within the ‘Stein’ makes explicit that, in Goethe’s eyes, the rocks in question are not merely active: they are quasi-alive, too.

As this poem suggests, Goethe’s fascination with the genesis of crystals within stones, as discussed in ‘Über Bildung von Edelsteinen’ reached its zenith in the 1810s. Questions relating to the creation of crystalline structures within rocks are discussed in Goethe’s unpublished note ‘Über den Ausdruck porphyrtig’, written in March 1812. ‘Über den Ausdruck porphyrtig’ sees Goethe explore the use of the term ‘porphyrtig’, originally used to refer to the stone ‘porphyr’, but, as a result of this rock’s propensity to house crystals of other minerals, had become a common way of referencing any kind of rock with crystalline formations of a different mineral within it. As Goethe explains, this type of embedded formation can be found in various varieties of rock, from granite to mica and gneiss. This particular formation is described as giving rise to a rock distinguished primarily by the fact that ‘etwas fremdartig Scheinendes, aber in der Masse selbst uranfänglich Entwickeltes und zugleich mit ihr consolidiertes in derselben sich, mehr ohne weniger gebildet, zeigt’ (WA II: 10, p. 8). The ‘etwas fremdartig Scheidendes’ is the crystal created within the rock itself, being both an integral part of it and different to it. This is not a modern development, but rather something that occurred back in the depths of time (‘uranfänglich’). Wolf von Engelhardt’s detailed chronological survey of Goethe’s geological writings illustrates this process of development particularly clearly. As part of this step-by-step exposition of Goethe’s work on geology, Engelhardt discusses this essay and provides a gloss of Goethe’s statement relating to the term ‘porphyrtig’. Engelhardt defines this as referring to ‘Gesteine, deren Gefüge sich auch nach heutigem Verständnis aus homogenem Material durch Kristallisation differenziert hatte, wie porphyrtiger Granit, Gneis und Syenit.’<sup>150</sup> Explicitly using the term ‘Kristallisation’ to refer to the separate mass within the rock itself, Engelhardt discusses how the homogenous material of the stone differentiates itself into a crystal-type structure. Written four years before ‘Über Bildung von Edelsteinen’, ‘Über den Ausdruck porphyrtig’ deals with many of the same topics, from the notion of rocks housing different materials that develop within them, to the question of the genesis of crystals and crystalline minerals. This suggests that the theories proposed in

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<sup>150</sup> Engelhardt, *Goethe im Gespräch mit der Erde*, p. 262.



‘Über Bildung von Edelsteinen’ were not merely an isolated consideration on Goethe’s part. Rather, they reflected one aspect of a coherent geological worldview that he had honed over many years and with reference to many different types of rock.

In ‘Über Bildung von Edelsteinen’, this process of separation and unification is described as occurring cosmically, or ‘kosmisch’. This word ‘kosmisch’ only appears a handful of times across Goethe’s oeuvre, usually in conjunction with references to the planets or the cosmos in the celestial sense, but here it seems to be suggesting that the mountain in question functions as a cosmos of sorts, with the division and re-formation occurring en masse and on a blanket scale. In turn, this activity stands in contrast to the effect of a ‘Neigung’ which, in Goethe’s eyes, refers to the force that causes certain patches of rock to turn into gemstones. In this short statement, the agency of the rock itself is stressed on multiple levels. The rocks’ evident agency is made clear in this first short passage: the mountains not only undertake particular actions (such as ‘trennen und bilden’) on their own but are even guided in this by their innate ‘Neigung’. In short, the activity in ‘Über Bildung von Edelsteinen’ not only sees the rock (re)create itself, but also sees this (re)creation be depicted as directional, too.

In this specific context, the ‘Neigung’ sees a rock (of whatever kind) develop into the ‘Gestalt’ of a crystalline gemstone. Goethe’s concept of natural objects, whether organic or inorganic, housing a force that pushes forward their development has been discussed at length by critics, including Astrida Tantillo. In her monograph, she explores various tenets of Goethe’s philosophy of the natural world, explaining how each of them reveals the existence of ‘nature’s will to create, evolve, struggle, transform and metamorphose’.<sup>151</sup> It is under the overarching umbrella of this inherent will, which Tantillo describes elsewhere as an ‘inner drive’,<sup>152</sup> that I contend geological ‘Neigung’ can be positioned. Tantillo views nature’s ‘will’ or ‘drive’ as having one specific direction in particular, from a generic state to a specialised one, from imperfection to perfection. She aligns this with Goethe’s belief in the innate sense of ‘Steigerung’, or heightening, with nature’s ‘drives’ being the vehicle that encourages matter to progress along this pathway. In the geological space, this process driven by ‘Neigung’ often represents the transition from stone to gemstone, or, indeed, from the general to the specific – just like the ‘Steigerung’-based ‘will’ that Tantillo identifies. Indeed, Goethe’s use of the term ‘Neigung’ aligns with Tantillo’s description of nature as a ‘dynamic, creative entity’ and illustrates how this is put into practice in the context of geology.<sup>153</sup>

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<sup>151</sup> Astrida Tantillo, *The Will to Create* (Pittsburgh, Pennsylvania: University of Pittsburgh Press, 2002), p. 6.

<sup>152</sup> *Ibid.*, p. 109.

<sup>153</sup> *Ibid.*, p. 91.

Indeed, this choice of word is particularly resonant in the context of Goethe's writing as a scientist. Across Goethe's scientific output, he describes his drive to investigate science as a 'Neigung'. For example, in his 1820 'Verhältnis zur Wissenschaft, besonders zur Geologie', Goethe explains that it was 'aus Neigung und zu praktischen Zwecken' that he began to investigate this science (WA II: 9, p. 292), while in his 1792 essay on scientific philosophy, 'Der Versuch als Vermittler von Objekt und Subjekt', he discusses the 'Neigung zu Hypothesen, zu Theorien, Terminologien und Systemen' that he deems innate to the human mind (WA II: 11, p. 29). This use of the term 'Neigung' by Goethe to refer to an investigator's personal inclinations underlines the striking nature of the use of this word to refer to a seemingly static, solid rock in 'Über Bildung von Edelsteinen', imbuing it with properties normally only associated with living entities. Indeed, Max Semper's monograph *Die geologischen Studien Goethes* includes a discussion of 'Über Bildung von Edelsteinen', where he obliquely references the essay. He never actually mentions it by name, but he nevertheless discusses the concepts and examples Goethe deploys in it. In this discussion, Semper glosses the term 'Neigung' as 'der Intention nach', further reinforcing this association between 'Neigung' and an expression of intent.<sup>154</sup> This connection is strengthened yet more by the term 'eigenst' in Goethe's 'Über Bildung von Edelsteinen', an unusual word which creates a superlative from the adverb 'eigens'. By using this term, Goethe emphasises that the rocks do not merely take on their own shape, but their very own, utterly independent shape at that, just as Werner mentioned that the 'Anziehungskraft' within the individual parts of a rock was 'ihnen eigenen'.<sup>155</sup> This does not imply that Goethe drew this understanding directly from Werner but it does highlight the apparently commonly held belief at the time that geological masses were home to their very own innate, directional forces.

This process of formation is also reflected on a grammatical level. The first section of this extract sees 'Gebirgsmassen' act as the subject of the two verbs ('alle Gebirgsmassen trennen und bilden sich'). This involves the mountains themselves, somewhat paradoxically, taking an active grammatical position with a verb that would usually only apply to living entities. Indeed, this is not simply 'Gebirgsmassen' in general, but rather 'alle Gebirgsmassen', which serves to highlight the universal applicability of this statement. In turn, this universality is made clear by the tenses of the verbs in the phrase. The use of the present tense throughout ('trennen', 'bilden', 'erzeugt') fulfils a double function. Firstly, it presents the information about rock formation as an unquestionable statement of fact. At the same time, it also subtly reminds the reader that such patterns of formation are still in effect today, in the present. Finally, the overarching grammatical structure of the sentence hinges on

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<sup>154</sup> Max Semper, *Die geologischen Studien Goethes* (Leipzig: Verlag von Veit & Comp., 1914), p. 152.

<sup>155</sup> Werner, p. 16.

the word ‘aber’, setting up a dichotomy between the ways in which rocks can be created (or create themselves). The two halves of this dichotomy relate to creation via a ‘kosmisch’ process or via a process steered by a ‘Neigung’, but the two processes are not necessarily mutually exclusive, unlike the grammatical contrast established by ‘aber’: the overarching division and re-formation within the mountain does not impede the activity of the ‘Neigung’ felt by areas within it.

Goethe’s statement regarding the division and re-formation of mountains in itself offers an intriguing, concise formulation of his theory, suggesting that matter is home to a tendency or a desire to shape itself in a particular way (alongside the fundamental ability to do so). However, there is little detail given in his ‘Über Bildung von Edelsteinen’ essay as to the precise nature of this ‘Neigung’. After this short sentence, Goethe moves on to list the various kinds of minerals and rocks that have been found within other rock types, without returning to discuss this ‘Neigung’ further. Indeed, even in Goethe scholarship, the term has met with varying interpretations. In his 2015 article on ‘Goethe’s Petrofiction’, Jason Groves explored the term ‘Neigung’ in Goethe’s writing with specific reference to geology, and identified no fewer than four separate readings of it. Groves lists that this ‘Neigung’ can refer to a ‘magnetic “attraction” of stone’<sup>156</sup> that rocks exuded towards humans, the ‘erotic “affection” for a mineral other’<sup>157</sup> experienced by some humans, an 18<sup>th</sup>-century belief in the ‘“tendency” of the planet’s climate towards a crystalline state of absolute zero’<sup>158</sup> and even the ‘“draw” of minerals in an emerging capitalist system based on resource extraction’.<sup>159</sup> Groves’ survey of the resonances of the term ‘Neigung’ during the *Goethezeit* offers an insight into the sheer breadth of meanings that this term carried – and yet Goethe’s use of the word to refer to vivid, generative forces within rocks does not align with any of the four overarching definitions Groves suggests. Instead, I contend ‘Neigung’ has a much broader meaning here, as opposed to Groves’ highly specific, nuanced definitions, and instead is best understood as an instance of the directional force inherent within natural matter identified by Tantillo that, in Goethe’s eyes, encourages matter’s transformation and sublimation.

In fact, the concept of matter having a ‘tendency’ is also reflected by Bennett in *Vibrant Matter*, in a manner not dissimilar to Goethe. As a result, Bennett’s more detailed exploration of this concept enables a better understanding of Goethe’s use of the term, too. In the preface within which she sets out her hypothesis, Bennett explains that she ‘move[s] from the vitality of a discrete thing to vitality as a (Spinozist) function of the tendency of matter to conglomerate or form heterogeneous

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<sup>156</sup> Groves, Jason, ‘Goethe’s Petrofiction: Reading the Wanderjahre in the Anthropocene’, *Goethe Yearbook*, 22.1 (2015), 95–113 (p. 95).

<sup>157</sup> Groves, p. 95.

<sup>158</sup> Groves, p. 95.

<sup>159</sup> Groves, p. 95.

groupings.<sup>160</sup> In other words, Bennett does not believe that a chair, or a bag, or a plate has vitality in and of itself. Rather, the matter of which these objects (and every other object) are composed is fundamentally home to vital forces, regardless of the form that it takes. Later, she states that matter expresses ‘a tendency in favor of stable formations.’<sup>161</sup> In this statement, Bennett is explaining that, while matter does have agency and activity, it aims to position itself in groupings that mean it can cease this activity. Bennett’s understanding of this striving towards ‘heterogenous groupings’ or ‘stable formations’ grants matter a similar kind of directional agency, as Goethe grants to the rocks he explores by stating that they are home to a ‘Neigung’. For Bennett, the driving force behind this ‘tendency’ is a desire for stability and uniformity, as matter attempts to position itself in relation to other instances of matter. Subsequently, she discusses the ‘élan vital, [which] like entelechy, is this “inner directing principle.”’<sup>162</sup> This in itself is akin to Goethean ‘Neigung’, as a force located within the rock that guides and steers its movement to a higher state. In turn, this is further underscored by Bennett’s summary that élan vital and entelechy both function by way of a ‘peculiar kind of self-division, by which the vital impulse gains strength as it distributes itself’.<sup>163</sup> This ‘self-division’ immediately evokes images of Goethe’s mountain rocks that ‘trennen und bilden sich’ – seemingly without ceasing. This is not to say that Goethe and Bennett’s arguments are identical; far from it. For Bennett, for example, the groupings of matter are driven by a desire for stability and uniformity, rather than a desire for change and for refinement of the characteristics of the rock, as Goethe’s theory supposes.

This concept of refinement is made clear a little later in Goethe’s essay, where he gives a fuller explanation of his theory of gemstone creation. He discusses the importance of

[...] die Veredelung in Freiheit, wenn die Masse Räume läßt, daß die in denselben von den frühesten bis in die spätesten Zeiten ewig circulierenden Gasarten die Eigenthümlichkeiten des Gebirgs auflösen, befreien, verwandeln, zu Verwandtem Geselligkeit verstaten. Hier scheinen diejenigen Körper entstanden, die wir Edelsteine nennen. (WA II: 10, p. 86)

As Goethe explains in this passage, gemstones are formed in two phases. Firstly, the rock itself actively creates space within itself (‘wenn die Masse Räume läßt’). In turn, the gases circulating around the subterranean world then act as a catalyst for the rock to release properties that, in turn, serve to create gemstones. Most significantly, this occurs ‘in Freiheit’, in the spaces where the matter ‘Räume läßt’, or, in to use the term used to describe the atomists, in the ‘interstices’ between the

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<sup>160</sup> Bennett, p. xvii.

<sup>161</sup> Bennett, p. 76.

<sup>162</sup> Bennett, p. 78.

<sup>163</sup> Bennett, p. 78.

individual pieces of matter. Consequently, the development occurs by forces acting in the spaces where matter is not to be found – and Goethe could not have seen these forces, by extension, as being material, as they exist in the total absence of matter. This ‘Freiheit’ is also not tied to a particular temporal moment. The gases that facilitate this process are ‘ewig zirkulierend’, and more than that alone, they have been flowing ‘von den frühesten bis in die spätesten Zeiten’. In other words, these gases have been circulating ceaselessly under the ground since eternity, and, presumably, will continue to do so going forward for eternity.

Examining this quotation from ‘Über Bildung von Edelsteinen’ in more depth enables one of the major differences between Goethe and Bennett to be revealed, namely, the role of humans in such natural geological developments. All of the processes in the mountain rock described in Goethe’s passage above occur naturally, without human intervention of any kind. Indeed, some of the activities that play a role in the formation of gemstones presumably pre-date human existence in itself, such as the ‘ewig zirkulierenden’ gases that have been circulating around the subterranean space since time began. Far from there being human agency involved, the rock itself begins to take on anthropomorphic attributes, blurring the lines between living human entities and inert non-human objects. This is clearest in its activity of ‘zu Verwandtem Geselligkeit verstatten’, as the various characteristics of the rock go through a process of recognising themselves, identifying others as similar to themselves, and then moving towards them, almost akin to a human associating with their relatives. Similarly, it is also evidenced in the use of the term ‘Veredlung’, which appears multiple times in this ‘Edelsteinen’ text. The term ‘Veredlung’ suggests not only an objective movement, but also the subjective evaluation of the outcome of that movement that sees it be considered in some way superior to the initial starting point. While human agency is obviously involved to some extent in the preparation of the statement above (writing down the explanation, and subsequently reading it, for example), the act of the rock’s transformation occurs fully without human input. Indeed, Goethe omits any explicit reference to human intervention of any kind and at any stage, making no mention of, say, the mining of the gemstones or the process by which they are cut and polished. Conversely, Goethe had previously used mining-related metaphors to describe humans, writing in a letter to his friend Ludwig Julius Friedrich Höpfer on 7 May 1773 that ‘ich will nur sehn wie weit ich dem Menschen in seinen Schachten und Erzgängen nachkomme’ (WA IV: 2, p. 85). Just as rocks were able to associate with their kin and home a ‘Neigung’ more commonly associated with humans, so too are humans home to figurative shafts and lodes akin to those that are actually to be found buried in the depths of the earth. Of course, while the ‘Erzgängen’ are formed naturally, the ‘Schachten’ are man-made – and yet they are swiftly subsumed within the natural subterranean world.

Despite the borrowing of traits from humans to describe rocks, and vice versa, in his other writings, Goethe's theory does lack any explicit mention of human involvement. This absence is thrown into sharp relief by Bennett's text, which sees her place much greater emphasis on the role played by humans. For Bennett, human agency and affect is inextricably linked to the agency and affect of non-human entities, while not necessarily taking a superior position to them: human agency merely serves to illustrate the affect of non-human entities. In her discussions of metal and metal creation, she states:

I have so far been speaking of metal as if it existed independently of other materials. But metal is always metallurgical, always an alloy of the endeavors of many bodies, always something worked on by geological, biological, and often human agencies. And human metalworkers are themselves emergent effects of the vital materiality they work. [...] While I agree that human affect is a key player, in this book the focus is on an affect that is not only not fully susceptible to rational analysis or linguistic representation but that is also not specific to humans, organisms, or even to bodies: the affect of technologies, winds, vegetables, minerals.<sup>164</sup>

As this passage makes clear, in Bennett's eyes, there is no difference between the life inherent to non-human objects and the life that resides within humans, both of which are marked by agency and vitalism. This is made clear on the linguistic level within this passage, with Bennett using the term 'bodies', most commonly and most immediately associated with humans or other living things, to refer to 'things' more broadly. She even aligns the metal with the humans working on it, with the humans being subjected to its 'vital materiality' just as the metal itself is shaped by the material vitality, as it were, of the humans in question. As a result, it is not contradictory or inappropriate to suggest that humans also play a part in shaping the existence and creation of such objects, given that humans are, to all intents and purposes, little different from inanimate objects. For Goethe, this is far from his understanding of a world of organically developing natural forms, guided solely by nature, as he makes clear at the end of the essay itself. He states: 'Was mich betrifft, so traue ich der Natur zu, daß sie noch am heutigen Tage Edelsteine uns unbekannter Art bilden könne' (WA II: 10, p. 87). Nature masterminds the whole process, creating and forming the gems, even of varieties that surpass humans' current level of knowledge. This process, furthermore, is not relegated to history: it may have started back in the mists of time, but it is continuous and ongoing in the present ('heute noch'), and given the eternity of nature, is likely to continue well into the future, too.

While Bennett focuses much more on metals than geology, both here and throughout her monograph, this does not mean that her statements cannot be viewed alongside Goethe's geological work. In fact,

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<sup>164</sup> Bennett, pp. 60-61.

Goethe's 'Edelsteinen' essay also includes reference to metals, which seem to be created in a similar fashion to gemstones. He states that 'Ja die Metalle selbst, Zinn, Wolfram und das Verwandte, haben in Masse Gestalt angenommen' (WA II: 10, p. 86). The 'Masse' referred to is the 'Masse' of the rock itself, serving a reminder of the central association between metals and geological entities: they are produced side-by-side in the Earth's crust, and many metals naturally form as rock-based ores that need to undergo further extraction for the metal itself to be removed and purified. Conversely, at one point, Bennett even likens metals to gemstones, stating:

Aeschylus [the Greek tragedian] presented Prometheus's chains as fixed matter. The chains are strong because their metal is uniform and homogeneous, devoid of any internal differences (variations in texture, ductility, rates of decay, etc.) that Prometheus might have exploited to break it apart. The chains are impregnable, we are told, because their matter does not vary across its own surface or depth. It seems, however, that this is not a good empirical account of the microstructure of metals, which consists in irregularly shaped crystals that do not form a seamless whole.<sup>165</sup>

Bennett's assertions that metals, or rather, their 'microstructure', is composed of 'irregularly shaped crystals' create a parallel between metals and gemstones on the level of form, with metal's crystalline structure evoking geological crystals, too. Furthermore, this notion of inherent irregularity, and the implicit suggestion of fragility, contrary to Aeschylus' presentation of Prometheus' metal chains, offers a further point of contact with the innate brittleness of gemstones' materiality as discussed in the previous chapter. Once again, it also highlights the existence of interstitial spaces within otherwise material objects, within which immaterial forces can come into play. If the microstructure of metals is indeed formed of 'irregularly shaped crystals', this suggests that these crystals do not tessellate neatly next to each other, rendering it inevitable that there are gaps between them within which immaterial forces are at work. Of course, Bennett is not arguing that metals are made from crystals, in the geological sense, merely that the structure of the metal evokes that of a crystal. Nevertheless, her argument offers a timely reminder that both metals and crystals are subterranean masses formed within the geological realm – and, by extension, share some similarities.

It is certainly possible to view Bennett's comments on metals alongside Goethe's discussion of the creation of gemstones and geological masses more broadly. Indeed, Bennett's description of the formation of metal itself does exhibit striking parallels with Goethe's description of gemstone formation:

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<sup>165</sup> see Bennett, p. 58.

A metallic Vitality, a (impersonal) life, can be seen in the quivering of these free atoms at the edges between the grains of the polycrystalline edifice.<sup>166</sup>

The most notable similarity between the two thinkers' approaches is the idea of movement, whether in the form of Goethean 'auflösen, befreien, verwandeln' or in Bennett's 'quivering': both thinkers see apparently inert masses as being a hive of productive, generative activity that both shapes and creates matter. Bennett takes a step back, however, when it comes to the nature of this 'life', explicitly bracketing it as 'impersonal'. This is quite the opposite of Goethe's use of anthropomorphic language to describe the formation of rocks (and, similarly, his use of mining-related language to describe humans), especially given that a linchpin of Bennett's work lies in removing the dichotomy between living entities and apparently inert ones. In spite of this difference between Goethe and Bennett, the location of this activity is another similarity between their descriptions, with Goethe's rock-activity occurring in the gaps left in the rock ('wenn die Masse Räume läßt') and Bennett's taking place at a similar site, 'at the edges **between the grains** of the polycrystalline edifice' (my emphasis). Despite the fact that the two authors use different materials, whether metals, rocks or gemstones, to illustrate their theories, their approaches to understanding questions of formation and creation align neatly with one another, not to mention their belief in gaps of immaterial space within otherwise material artefacts.

While Bennett and Goethe are both talking about metals in these passages they are looking at metals at different stages in the process of creation. Bennett's metal chains are shaped from metal that has been excavated, smelted, refined and shaped, whereas Goethe's metals residing in the rocks themselves are raw ores, untouched and unpurified. Indeed, Goethe's professional endeavours in the sphere of mining largely revolved around metals at this early stage of their refinement, rather than any other form of geological deposit: the mine at Ilmenau with which he busied himself for so many years primarily excavated copper and silver ores, which were subsequently refined into the pure metals themselves. This is described in great detail in Goethe's 1783 'Nachricht von dem Ehemaligen Bergbau bei Ilmenau in der Grafschaft Henneberg und Vorschläge ihn durch eine neue Gewerkschaft wieder in Aufnahme zu bringen', which, as the title suggests, sees Goethe provide an overview of the history of mining in Ilmenau and offer proposals for re-launching mining activities there. This essay also, however, offers insight into Goethe's view of the mine (or rather, the ores within it) as being imbued with a kind of life force. This is apparent in his description of how previous, unskilled attempts at extracting ore from the mine had seen miners even hoping 'im toten Liegenden selbst Erze zu finden' (LA I: 1, p. 34). Goethe does not provide further details about this 'totes Liegende' in this

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<sup>166</sup> Bennett, p. 59.



particular piece, but the term is defined in his essay ‘Über den Ausdruck porphyrtig’, discussed above in more detail, as follows:

Daß das sogenannte todte Liegende gar oft ein Conglomerat sei, das heißt, aus vorher entstandenen und vorhandenen, auf irgendeine Weise aufgelös'ten, zertrümmerten, vom Platz gerückten Stein- und Gebirgstheilen [...]. (WA II: 10, p. 12)

Goethe's usage of the phrase ‘totes Liegende’ serves to denote an assortment of loose stones, broken off from the body of the mountain (or rather, excavated from the depths of the mine) proper. The term is defined in Theodor Engel's 1908 *Geologischer Wegweiser durch Württemberg* as referring to rock that is ‘tot, weil es kein Erz mehr enthält.’<sup>167</sup> The rock is ‘dead’ because its generative activities, a side-effect of which is providing ore for humans to turn into pure metal, has ceased. In turn, this suggests that the opposite of this dead rubble, the intact mine or mountain, its rocks rich with ore, is that which is ‘lebendig’ – just as Goethe implies in ‘Über Bildung von Edelsteinen’.

All the examples taken from Goethe's geological works, whether ‘Über Bildung von Edelsteinen’ or his writing on the ‘tot liegendes’ in a mining context, suggest that the otherwise firmly drawn line between life and death, as we understand these terms today, was rather more permeable for Goethe, at least in the context of geological enquiry. Certainly, the notion of material rocks having agency and being able to follow their immaterial ‘Neigung’ to sublimate themselves into a higher form would not be out of place in a fairy tale. Indeed, the most striking depiction of the blurring of this division between life and death, for Goethe, can be found in his ‘Märchen’, the fairy tale discussed in the previous chapter with reference to gemstones, colour and light. This tale is riddled with instances where people and animals that seem lifeless are reanimated through the magical touch of ‘schöne Lilie’, who is able to bring gemstones back to life. This process of apparent death and apparent reanimation is central to the plot of the tale, appearing in various guises from the very start of the story to its ultimate conclusion.

In ‘Märchen’, the first of these instances of a death that is anything but comes when the will-o'-the-wisps visit the house of the elderly couple. The couple's pug dog eats one of the gold coins dropped by the mystery visitors and suffers an unexpected fate. The elderly lady returns to her house, and, describing what she sees before her, says ‘da liegt er [der Mops] am Kamine todt’ (WA I: 18, p. 237). The old woman believes her dog has died, and uses exactly the same collocation of ‘tot liegend’ to

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<sup>167</sup> Theodor Engel, *Geognostischer Wegweiser durch Württemberg: Anleitung zum Erkennen der Schichten und zum Sammeln* (Stuttgart: E. Schweizerbart'sche Verlagshandlung, 1908), p. 49.

describe it as Goethe did to describe rocks depleted of their ore. However, her seemingly dead dog is capable of remarkable transformations, magically morphing into the ‘schönsten Onyx [...], den man sich denken konnte’ (WA I: 18, p. 238). All is not lost for the little dog, however, as the beautiful maiden Lilie is able to re-animate objects made of gemstone with her touch (‘dass Ihr diesen Edelstein durch Eure Berührung beleben könnt’ [WA I: 18, p. 248]). The old lady brings the ‘verwandelten Hund’ (WA I: 18, p. 245) to the maiden, and begs for her help. Once touched by Lilie, the dog springs up, but does not seem to have left all the hallmarks of his frozen state behind. Lilie remarks, ‘so kalt du bist’, seemingly sensing the dog’s ‘halbes Leben’ in his state trapped between life and death (WA I: 18, p. 251). The latent life stored within the gemstone dog, which subsequently reveals itself and reanimates the creature, seems to prefigure the theory proposed twenty years later in ‘Über Bildung von Edelsteinen’. This is made clear in the passage from ‘Über Bildung von Edelsteinen’ discussed above:

[...] die Veredelung in Freiheit, wenn die Masse Räume läßt, daß die in denselben von den frühesten bis in die spätesten Zeiten ewig circulierenden Gasarten die Eigenthümlichkeiten des Gebirgs auflösen, befreien, verwandeln, zu Verwandtem Geselligkeit verstaten. Hier scheinen diejenigen Körper entstanden, die wir Edelsteine nennen. (WA II: 10/II, p. 86)

The similarities in the vocabulary used in these two texts suggests connections on the linguistic, as well as the contextual, level: it is not merely the case that gemstones are presented as being imbued with an unusual amount of vitality in both texts. This reading is reinforced by the old lady’s description of the animal as a ‘verwandelter Hund’. Along with ‘veredeln’, the verb ‘verwandeln’ is used in Goethe’s gemstone text precisely to describe the process by which rocks become gemstones through their mysterious internal force. While these two texts fit within very different genres and depict the two very different worlds of (assumed) reality and fantasy, they nevertheless share similarities in terms of their presentation of gemstone formation .

It is not only the onyx dog which gets caught in the shifting boundaries between animate and inanimate states, ultimately to settle somewhere between the two. Lilie’s pet canary meets a similarly unfortunate fate, flying into her owner’s bosom before ending up in exactly the same position as the elderly couple’s dog. As Lilie expresses: ‘Sieh, hier zu meinen Füßen **liegt** der arme Canarienvogel **totd**’ (my emphasis, WA I: 18, p.246). Described with the same collocation as both the pug dog and the ‘totes Liegende’ of the mine, the canary is, in fact, anything but fully dead, and is ultimately brought back to life as the dog was. All these apparent deaths and reanimations problematise what, exactly, being alive and being dead meant for Goethe. The waters are muddied yet further with the final, and most striking, death: a young man, never given a name but referred to as Lilie’s beloved. Overcome with ardour, he exclaims ‘wenn Steine an deinem Busen ruhen können, so möge ich zu

Stein werden; wenn deine Berührung tötet, so will ich von deinen Händen sterben' (WA I: 18, p. 253). He flings himself onto Lilie, 'das Bewußtsein verließ ihn', and he sinks to the ground, left 'entseelt' and as a 'schöne Last' (WA I: 18, p. 253). However, just like all the apparent deaths before, the young man is reanimated – but, in echoes of the pug dog and his 'halbes Leben', the line between life and death is rather more fuzzy than sharp in this instance, too. Once the snake has sacrificed herself to bring the young man and the canary back to life, they both regain their physical strength ('der Jüngling stand, der Canarienvogel flatterte auf seiner Schulter' [WA I: 18, p. 261]). They are not, however, fully recovered: 'es war wieder Leben in beiden, aber der Geist war noch nicht zurückgekehrt' (WA I: 18, p. 261), with the young man staring off into space, unable to participate in the goings-on around him. In the 'Märchen', then, we have apparent deaths that appear to be but a suspension of active life, and the return of life albeit in a partial form. The movements between these shifting states are facilitated by human intervention, whether in terms of Lilie's magic touch or the glow of the mysterious lamp owned by the old man. This interaction is not one marked by human superiority. Rather, if anything, the human is subordinated to the greater powers of nature, able to activate the natural forces within the gemstones that previously took human (or animal) form, but not able to harness them, change them or otherwise interfere with them.<sup>168</sup>

### **(Im)materiality: where Goethe and Bennett diverge**

Goethe's text and Bennett's theory share many similarities, but the two also differ from one another at points. This is most strikingly evident when questions of (im)materiality are considered. For Bennett, the 'forces and flows' around which her argument revolves are material, or, as she terms them, 'materialities'. In Goethe's text, these forces and flows are indeed integral to the rock in question, but, unlike in Bennett's text, they are not presented as being explicitly material in themselves. Instead, I read them as representing the immaterial counterpart of the rock's physical materiality. Goethe rarely makes mention of the question of (im)materiality in his discussions of rock and gemstone formation, but it is possible to discern his thoughts on this from implicit statements made in these texts. The word 'Masse' is used multiple times across 'Über Bildung von Edelsteinen', clearly emphasising the solid, materiality of the rock (for example, 'alle Gebirgsmassen trennen und bilden sich kosmisch', 'die Masse [will] sich in der Form veredeln', and so on [WA II:10, p. 85]). However, the forces that shape this matter are clearly described as non-material. This is clear from the very first line of the text, where Goethe contrasts the description of the mountain's materiality by saying 'innerhalb der Masse erzeugt sich eine Neigung' (WA II: 10, p. 85). This tendency exists within this matter – but it is, at the

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<sup>168</sup> For a more detailed exposition of the parallels between the 'Märchen' and 'Über Bildung von Edelsteinen', see Jennifer Caisley, 'Goethe's "Märchen": an exploration of (im)materiality'.

same time, distinct from it. In other words, Goethe is not suggesting that the 'Neigung' itself is material, and it must, therefore, be immaterial.

This 'Über Bildung von Edelsteinen' text is far from the only place in Goethe's scientific writings where this pairing of 'Neigung' and 'Masse', 'Materie' or similar is to be found. The most detailed exposition of how the interplay between 'Neigung' and 'Materie' functions is to be found in Goethe's grouping of notes entitled 'Entstehung unorganischer Formen', written around the same time as 'Über Bildung von Edelsteinen'. This collection of fragmentary statements and short paragraphs sees him repeat many of the same statements he makes in this more coherent essay. For example, Goethe writes that 'Krystallisation, das heißt Erscheinung in seiner besondern Form, setzt gleichfalls Freiheit voraus' (WA II: 10, p. 76), which mirrors both the requirement for 'Freiheit' as evinced in the 'Über Bildung von Edelsteinen' text and, with its reference to 'seiner besondern Form', the unusual usage of 'eigenst'. In a more general discussion of the creation of inorganic forms in this text, Goethe explains:

Alles Materielle kommt uns formlos vor, wenn wir unaufmerksam sind. Aber es hat eine unwiderstehliche Neigung, sich zu gestalten. Das Materielle, Körperliche läßt sich vor der Gestaltung in einem dreifachen Zustand denken. In einem *freien, gedrängten, gehäuften*. [...] Aus diesen drei Zuständen strebt das Materielle zur Form. (WA II: 10, p. 75)

Once again, there are strong parallels between this extract and the 'Über Bildung von Edelsteinen' text. Here, Goethe explains that matter appears to be without form, if it is viewed by an inattentive observer. However, presumably, a greater level of observational awareness would enable its 'Neigung' to be sensed, and, by extension, the form towards which it was striving. As this extract highlights, the 'Neigung' generated within the mass of the mountain in the 'Über Bildung von Edelsteinen' essay is not unique to mountains: rather, it is an integral component of matter itself. That said, geological entities are rather special in this regard, offering a way for us, as observers, to gain insight into the manner in which this desire towards 'Gestaltung' exerts itself. This is made explicit a little later in 'Entstehung unorganischer Formen', when Goethe goes on to explain the significance of the mountain environment:

Wir sagen also: es gibt ein allgemeines Gesetz, nach welchem alle materielle Massen sich gestalten, und dieses Gesetz offenbaren uns die Gebirge, und wer es kennt, dem sind sie offenbar. (WA II: 10, p. 76)

Goethe believes that the mountains hold the answer to understanding the 'allgemeines Gesetz' by which matter takes form. While the concept of matter itself being home to this 'Neigung' may well be universal, geological entities play a central role in understanding this concept. Similarly, like the rocks discussed in the 'Edelsteinen' essay, matter in general evidently has agency, which directs it to take on a particular form ('strebt...zur Form'). The 'Materielle' is clearly material in nature, but the same

cannot be said of the 'Neigung' that at once resides within it and shapes its development. Rather, this 'Neigung' lies squarely within the realm of the immaterial, a guiding force with which the matter is imbued, without it being part of the matter itself.

Both Goethe and Bennett posit an intriguingly provocative theory asserting that non-human entities are able to display both activity and agency. Despite the centuries between them and the different foundations upon which they construct their approach, they both share a conviction that seemingly inert bodies are actually both shaped by a hive of internal life, and, more significantly, the ability to decide for themselves how best to use the life and agency at their disposal. In many ways, Bennett's summary statement of aims would not look out of place in Goethe's 'Edelsteinen' text:

The aim here is to rattle the adamantine chain that has bound materiality to inert substance and that has placed the organic across a chasm from the inorganic. The aim is to articulate the elusive idea of a materiality that is itself heterogeneous, itself a differential of intensities, itself a life. In this strange, vital materialism, there is no point of pure stillness, no indivisible atom that is not itself aquiver with virtual force.<sup>169</sup>

Like a scientist of the long eighteenth century, Bennett views the natural (and, in her case, also the man-made) world as being alive, interconnected and ever-changing. Two hundred years earlier, Goethe had a similar understanding of the natural world. Indeed, his implicit differentiation between the material rock and the immaterial, generative 'Neigung' residing within it highlighted not only the activity of inorganic material entities, but also that materiality and immateriality can, and indeed, must, always co-exist on equal terms.

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<sup>169</sup> Bennett, p. 57.

## Chapter Five: ‘Materie’ and ‘Geist’ in Goethe

Throughout the previous chapters in this thesis, I have explored the (im)materiality of geological entities by looking at the ways in which this interplay between materiality and immateriality is expressed, whether in the form of, say, colour or internal forces. This chapter, by contrast, will return to the origins of thinking about Goethean (im)materiality and explore how Goethe himself talked about such questions, both within the realm of geology and on a conceptual level. As mentioned in the Introduction to this thesis, one of Goethe’s most resonant statements about the interaction between materiality and immateriality can be found in his reference to ‘Materie’ and ‘Geist’ within his attempt to explain the related concepts of ‘Steigerung’ and ‘Polarität’:

Die Erfüllung aber, die ihm [dem Aufsatz ‘Der Natur’] fehlt, ist die Anschauung der zwei großen Triebräder aller Natur: der Begriff von Polarität und von Steigerung, jene der Materie, insofern wir sie materiell, diese ihr dagegen, insofern wir sie geistig denken, angehörig; jene ist in immerwährendem Anziehen und Abstoßen, diese in immerstrebendem Aufsteigen. Weil aber die Materie nie ohne Geist, der Geist nie ohne Materie existirt und wirksam sein kann, so vermag auch die Materie sich zu steigern, so wie sich’s der Geist nicht nehmen läßt, anzuziehen und abzustoßen; wie derjenige nur allein zu denken vermag, der genugsam getrennt hat um zu verbinden, genugsam verbunden hat um wieder trennen zu mögen. (WA II: 11, p. 11)

These lines were written by Goethe in Weimar on 24 May 1828, four years before his death. They see him reflect on the essay ‘Die Natur’, which he dates to the 1780s. He suggests that it was written in the very same handwriting ‘deren [er sich] in den achtziger Jahren in [s]einen Geschäften zu bedienen pflegte’ (WA II: 11, p. 10). In fact, ‘Die Natur’ was not written by Goethe himself, and merely fell into his possession after Goethe received a collection of letters upon the death of Duchess Anna Amalia. Despite the fact that he was here commenting on an essay he had not actually written, it nevertheless offers an opportunity for the late Goethe to reflect on ‘Steigerung’ and ‘Polarität’ from the perspective of a life’s worth of scientific experience. As Goethe makes clear in this extract, reflecting on ‘Materie’ and ‘Geist’ also implicitly requires a reflection on ‘Steigerung’ and ‘Polarität’, given the interconnectedness of these terms in his worldview. These terms also offer an opportunity to engage with questions of (im)materiality encapsulated by the interplay between ‘Materie’ and ‘Geist’. Indeed, while ‘Materie’ and ‘Geist’ are easily glossed in English as ‘matter’ and ‘spirit’ respectively, this does not truly get to the heart of what they meant to Goethe. A more attentive exploration of these two terms, particularly within the context of Goethe’s geological work, reveals that interpreting them as ‘the material’ and ‘the immaterial’ offers a much more faithful reading of Goethe’s approach.

## ‘Steigerung’ and ‘Polarität’ as Goethean concepts

While Goethe believed that the concepts of ‘Steigerung’ and ‘Polarität’ applied to the natural world as a whole, the fullest definitions of these terms are to be found in Goethe’s *Farbenlehre*. Indeed, Peter Huber in the *Goethe-Handbuch* considers that the first time Goethe discusses the notion of polarity, for example, is in his 1791 *Beyträge zur Optik*.<sup>170</sup> Although Goethe does not mention the term ‘Polarität’ in this piece, he begins to sketch out the conceptual framework that would later represent the foundation of his thought on polarity. Talking with specific reference to light falling through a prism, Goethe states in section 72:

15. Die farbigen Ränder zeigen sich im Gegensatz. Es stehen zwei Pole unveränderlich einander gegenüber. § 48, 49, 50, 55.

16. Die beiden entgegengesetzten Pole kommen darin mit einander überein, daß jeder aus zwei leicht zu unterscheidenden Farben besteht, der eine aus Roth und Gelb, der andere aus Blau und Violett. § 51, 52.

17. Die Strahlungen dieser Farben entfernen sich vom Rande, und zwar strahlen Roth und Violett nach dem Schwarzen, Gelb und Blau nach dem Weißen zu.

18. Man kann diese Pole unendlich von einander entfernt denken. § 51, 52.

19. Man kann sie einander unendlich nahe denken. § 45, 46.

[...] (WA II: 5, p 40)

The concept of poles eternally in opposition to one another, the core of Goethean ‘Polarität’, is broached in number 15 above, before being illustrated with specific reference to colours and the production of different hues in numbers 16 and 17. This notion is then enriched in numbers 18 and 19, which introduce a layer of complexity, not to say contradiction, to the previously simple idea of eternal opposition. Now, these poles are at once ‘unendlich von einander entfernt’ and ‘einander unendlich nahe’, both infinitely close to each other and infinitely distanced from one another. The *Beiträge zur Optik* in general, and his remarks on polarity specifically, would inform Goethe’s *Farbenlehre* twenty or so years later, in which he devotes an entire discussion to the question of ‘Polarität’ in the ‘Entoptische Farben’ section. In the context of light and shade, he states the following:

[Farbe], so wie Hell und Dunkel, manifestiert sich überhaupt in polaren Gegensätzen. Sie können aufgehoben, neutralisiert, indifferenziert werden, so dass beide zu verschwinden

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<sup>170</sup> Peter Huber, ‘Polarität/Steigerung’, in *Goethe-Handbuch: Band 4/2: Personen, Sachen, Begriffe L–Z*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 863–865 (p. 864).

scheinen; aber sie lassen sich auch umkehren und diese Umwendung ist allgemein bei jeder Polarität, die zarteste Sache von der Welt. (WA II: 5, p. 261)

Polarity is generated by these polar opposites ('polare Gegensätze'), such as the difference between light and dark, and while these opposites can be brought into alignment, they can never be eliminated entirely. Instead, they merely seem to disappear ('zu verschwinden scheinen'). According to this definition, polarity is not something that is fixed, nor something that is unproductive: rather, it represents a fluid balance between two entities that may well be opposites, but which nonetheless interact with one another in ways that are 'zart' and delicate.

While both the early, loosely formulated outline of Goethe's thoughts on 'Polarität' and the detailed, fully fledged description of the concept two decades later are expressed with regard to colours and light, this is not the only context within which Goethe refers to polarity. Across his writings on science and culture, polarity makes an appearance in an array of guises, from Goethe's writing on 'Spannung' ('Spannung ist der indifferent scheinende Zustand eines energischen Wesens, in völliger Bereitschaft sich zu manifestiren, zu differenziren, zu polarisiren' [WA II: 11, p. 156]) to musical theory ('Dur- und Moll-Ton als die Polarität der Tonlehre.' [WA II: 11, p. 292]). In his *Propyläen*, Goethe makes clear the sheer breadth of fields to which 'Polarität' can apply. As part of the introduction to this publication, he writes about the association between the arts and the sciences. He discusses the notion of a painter unable to draw any utility from a physicist's research on colour, explaining that the painter might nevertheless be able to gain an understanding of colour's 'lebhaften Gegensätze' through experience, rather than theoretical study (WA I: 47, p. 15). As a result, Goethe says,

vielleicht bestätigt sich die Vermuthung, daß die farbigen Naturwirkungen, so gut als die magnetischen, elektrischen und andere, auf einem Wechselverhältniß, einer Polarität, oder wie man die Erscheinungen des Zwiefachen, ja Mehrfachen in einer entschiedenen Einheit nennen mag, beruhen. (WA I: 47, p. 16)

The painter could indeed see his suspicion of colour's polarity confirmed, with this polarity also existing in the disciplines of magnetics, electrics, and many other subjects beside. Polarity, or, as Goethe glosses it here, 'die Erscheinungen des Zwiefachen, ja Mehrfachen in einer entschiedenen Einheit', may well have its origins in the realm of colour theory, but it is of no less relevance to other fields of science. Indeed, as the implication of Goethe's statement suggests, it is of value for people working in the fields of the arts and culture, too.



Despite the fact that ‘Steigerung’ is the natural counterpart to ‘Polarität’, it does not share this concept’s origins in Goethe’s early colour theory. Rather, it was a notion that Goethe developed later in his life, borrowed in no small part from Schelling. Regardless of this difference in its genesis, Goethe saw ‘Steigerung’, like ‘Polarität’, as applying equally to literary and scientific works, saying, for example, that his interpretation of Torquato Tasso was ‘ein gesteigerter Werther’ (WA Anhang: 6, p. 119). As with ‘Polarität’, however, ‘Steigerung’ is explored to the fullest extent in the context of Goethe’s science, with the most in-depth discussions of it coming in Goethe’s *Farbenlehre*. In the ‘Chemische Farben’ section of this work, Goethe defines the concept of ‘Steigerung’ as something that ‘erscheint uns als eine in sich selbst Drängung, Sättigung, Beschattung der Farben’ (WA II: 1, p. 211). In this specific context of colour theory, ‘Steigerung’ represents a deepening of the colour in question, with it taking on a more vivid, intense hue. However, this passage also sees Goethe proffer an explanation of ‘Steigerung’ that applies in a more general context, stating:

Es ist dieses eine der wichtigsten Erscheinungen in der Farbenlehre, indem wir ganz greiflich erfahren, daß ein quantitatives Verhältniß einen qualitativen Eindruck auf unsre Sinne hervorbringe. (WA II: 1, p. 212)

Here, Goethe emphasizes the importance of ‘Steigerung’ (‘eine der wichtigsten Erscheinungen’) as a concept within colour theory, and by extension, I would contend, in natural science in general. He explains the experience-driven nature of ‘Steigerung’ as being a kind of force which is able to turn quantitative matters, or rather, countable, objective relationships into qualitative effects that act on the viewer’s emotions. In turn, this places subjective human experience at the heart of questions of ‘Steigerung’ while underlining its transformational power.

Rudolf Steiner’s 1921 work entitled *Goethes Weltanschauung* examines various aspects of Goethe’s way of seeing the world, including his approach to ‘Steigerung’ and ‘Polarität’. Focusing purely on the concepts in a philosophical context rather than applying them to a work of literature or a piece on natural science, Steiner repeats Goethe’s assertion that ‘Polarität’ is intrinsically connected to the material realm, and ‘Steigerung’ to that of the non-material. He claims that Goethe’s work on polarity and heightening marks ‘den höchsten Grad der Reife’ of his philosophical endeavours,<sup>171</sup> and sees its roots in Goethe’s work as a natural scientist: ‘Als Naturforscher mußte Goethe auch in den Erscheinungen, deren Idee nicht in ihrem individuellen Dasein sichtbar wird, die Kräfte der Natur verfolgen’.<sup>172</sup> In his summary of Goethe’s thought on this subject, Steiner writes that ‘In der Herausarbeitung des Geistigen aus dem Materiellen durch die schaffende Natur besteht das, was

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<sup>171</sup> Rudolf Steiner, *Goethes Weltanschauung* (Berlin: Philosophisch-Anthroposophischer Verlag, 1921), p. 62.

<sup>172</sup> Steiner, p.65.

Goethe Steigerung nennt'.<sup>173</sup> This summary emphasizes the process-driven nature of 'Steigerung': a process of 'Herausarbeitung' that never seems to reach a conclusion, a process that, most significantly for our purposes, revolves around the interplay between 'Materie' and 'Geist'. Indeed, as Steiner makes explicit, '[e]ine tote geistlose Materie kennt Goethe nicht'.<sup>174</sup> Consequently, in Steiner's interpretation of Goethe's theory of 'Steigerung' and 'Polarität', there is no substance that cannot undergo a process of 'Steigerung'. However, while Steiner believes that 'Steigerung' is focused on extracting 'geistige' characteristics from 'Materie', I contend that it is necessary to shift the perspective with which this is viewed. Rather than seeing 'Steigerung' as a tool that facilitates the creation of 'das Geistige' from 'Materie', I believe that 'Steigerung' can also be simply seen as emblematic of the connection between the two, without positioning them in a hierarchical relationship where one feeds into the other. By extension, 'Steigerung' and 'Polarität' can serve as a way to shed light on questions of 'Materie' and 'Geist', and, in turn, on materiality and immateriality.

The passage from Goethe's 'Erläuterung zu dem aphoristischen Aufsatz "Die Natur"' cited at the start of this chapter, and repeated below, suggests that it is possible to identify three major elements that play a role in Goethean 'Steigerung' and 'Polarität':

Die Erfüllung aber, die ihm [dem Aufsatz 'Der Natur'] fehlt, ist die Anschauung der zwei großen Triebräder aller Natur: der Begriff von Polarität und von Steigerung, jene der Materie, insofern wir sie materiell, diese ihr dagegen, insofern wir sie geistig denken, angehörig; jene ist in immerwährendem Anziehen und Abstoßen, diese in immerstrebendem Aufsteigen. Weil aber die Materie nie ohne Geist, der Geist nie ohne Materie existirt und wirksam sein kann, so vermag auch die Materie sich zu steigern, so wie sich's der Geist nicht nehmen läßt, anzuziehen und abzustoßen; wie derjenige nur allein zu denken vermag, der genugsam getrennt hat um zu verbinden, genugsam verbunden hat um wieder trennen zu mögen. (WA II: 11, p. 11)

The first, and most obvious, of these characteristics is the concept of directional movement. For polarity, this is a movement of repulsion always and inextricably paired with a opposite movement of attraction ('jene ist in immerwährendem Anziehen und Abstoßen'), while for 'Steigerung', this is a movement that is in continual ascendance ('immerstrebendem Aufsteigen'). Regardless of the direction of the movement in question, it is permanently associated with the concept of constant motion, flux and development. This is the second element that is central to both 'Steigerung' and 'Polarität', and in the passage above, it is indicated by the terms 'immerwährend' and 'immerstrebend', and the association offered by the image of 'Triebräder' as wheels in constant

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<sup>173</sup> Steiner, p.62.

<sup>174</sup> Steiner, p.63.

motion. This second element functions in parallel to the first element mentioned: for ‘Steigerung’ or ‘Polarität’ to be present, the directional movement in question must also be a dynamic one. Finally, the passage also highlights the association between ‘Materie’ and ‘Geist’ that parallels the association between ‘Steigerung’ and ‘Polarität’. This represents the third element that denotes ‘Steigerung’ and ‘Polarität’: the fact that both concepts rest on a shifting, interconnected basis of ‘Materie’ and ‘Geist’, with each of the components of these two pairs being as inseparable from each other as the overarching pairs themselves. Indeed, both ‘Steigerung’ and ‘Polarität’ are inevitably linked to questions of materiality. Given that they are both directional forces (whether in an upward or opposing direction), these transient, ever-changing forces must ceaselessly be acting upon, and between, entities which exist in space – and which must be, by extension, material in nature.

### **‘Steigerung’ and ‘Polarität’ in Goethe’s geological writings**

Questions of transience and eternity play a pivotal role in Goethe’s 1784 essay ‘Über den Granit’, too. Despite one critic’s assertion that ‘in Goethes geologischem Denken [...] die Zeit eine sehr geringe Rolle [spielte]’,<sup>175</sup> the essay is replete with references to temporality. These issues are foregrounded in the very first sentence of the essay, which states: ‘Der Granit war in den ältesten Zeiten schon eine merkwürdige Steinart und ist es zu den unsrigen noch mehr geworden’ (WA II: 9, p. 171). This sentence begins with a reference to granite’s age (‘in den ältesten Zeiten’), and then moves to emphasise that, despite this age, it is still to be found in the present day (‘zu den unsrigen [Zeiten]’). This juxtaposition between the past and the present, bridged by granite’s unwavering existence, is repeated over the next two paragraphs, the first of which talks of ‘die Alten’ and the name they gave granite, and the second of which discusses the approach that ‘die Neuern’ took to naming this stone (WA II: 9, p. 171). Granite’s age is emphasised time and again throughout the essay, whether in the protagonist’s direct call to the mountains as ‘ihr ältesten, würdigsten Denkmäler der Zeit’, or in its description as being directly connected to the ‘festen Boden der Urwelt’ (WA II: 9, p. 173). This age stands in stark contrast to the protagonist himself. Goethe explicitly sets granite, as the ‘ältesten, festesten, tiefsten, unerschütterlichsten Sohn der Natur’, in opposition to the human heart, which he terms the ‘jüngsten, mannigfaltigsten, beweglichsten, veränderlichsten, erschütterlichsten Teil der Schöpfung’ (WA II: 9, p. 173). In these strings of adjectives, headed by ‘old’ and ‘young’, these temporal descriptors are associated with others: age is connected to solidity, depth and stability, whereas youth is linked to diversity, movement, change and instability. This

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<sup>175</sup> George Albert Wells, ‘Über den Granit – Schriften zur Gestaltung der Erdrinde’, in *Goethe-Handbuch: Band 3: Prosaschriften*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 666-673 (p. 667).

juxtaposition between the changeless and the ever-changing is reinforced further in the next sentence, where the protagonist states that the ‘Abwechslungen der menschlichen Gesinnungen’ and the ‘schnelle Bewegungen derselben’ drive him to seek the ‘erhabene Ruhe’ provided by the ‘einsame stumme Nähe der großen, leise sprechenden Natur’ (WA II: 9, p. 173).

This association between age and stability has led some critics to conclude that stones, as the oldest components of the natural world, lacked many of the characteristics that Goethe associated with other natural entities. Margrit Wyder, in a discussion of Goethe’s ultimately unsuccessful efforts to align his work on geology with his work on morphology, asserts that one reason for this failure was a lack of ‘Steigerung’. As she states: ‘Es fehlte die in den organischen Reichen zentrale Steigerung, denn der Granit als ältestes Gestein war nach Goethes Überzeugung zugleich das vollkommenste.’<sup>176</sup> For her, the simple fact that granite is of near-eternal age means that it is incapable of exerting the newness and excitement that ‘Steigerung’ can bring. In turn, this meant that it was impossible for granite, in particular, to align with Goethe’s morphological system in which ‘Steigerung’ took such a lofty position. However, I contend that quite the opposite is true. Not only was the material of granite capable, in Goethe’s view, of undergoing ‘Steigerung’ itself, it was also subjected to this immaterial force so very strongly that it was able to radiate it outward to impact on people and other living entities in its vicinity.

Indeed, an examination of Goethe’s ‘Granit II’, also known as ‘Über den Granit’, reveals that the connections between these concepts and geological masses are extremely tightly forged – counter to Wyder’s assertion mentioned above that ‘es [...] die in den organischen Reichen zentrale Steigerung [fehlte], denn der Granit als ältestes Gestein war nach Goethes Überzeugung zugleich das vollkommenste’. This 1784 essay, possibly the best known of all his geological works, was likely drafted in January of that year, when Goethe was deeply engaged in his work at Ilmenau and a mere month before the mine there was officially opened. During this period, Goethe also undertook his third journey through the Harz mountains, and was in all likelihood directly influenced by his experience of the mountain environment on this trip. It starts with a brief overview of the history of this specific kind of stone, and an attempt to explain the attraction to it that so many travellers, researchers and hikers have felt. Opening with an impersonal, detached narrative, this opening section gradually becomes more subjective in nature, discussing the understanding of this stone in the present day. The remainder of the essay sees this anonymous protagonist undergo a process of reflection

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<sup>176</sup> Margrit Wyder, ‘Von der Stufenleiter der Wesen zur Metamorphosenlehre Goethes Morphologie und ihre Gesetze’, in *Von der Pansophie zur Weltweisheit*, ed. by Hans-Jürgen Schrader and Katharine Weder (Berlin, New York: De Gruyter, 2004), pp. 31-50 (p. 50).

triggered by the thought of the granite mountain, covering topics from the mountain's creation through to its surroundings, and its positioning within the natural environment more broadly. The title of the essay itself is somewhat misleading: unlike many of Goethe's other works on geology, the essay focuses less on the granite rock itself (and its properties) and more on the speaker's lived (or imagined) experience of the mountain environment.

In fact, the very concept underlying the essay, the idea of walking up and down a mountain, is inherently imbued with these movements both skyward and earthward. The notion of a mountainous summit is a concept connected more to overtones of height than of depth, and so the concept of it incorporating both ascent and descent may initially seem surprising. However, even brief consideration of the topography of a mountain peak reveals otherwise: any sketch of the inverted v-shape of a mountain requires both an upward and a downward line for the peak itself to be formed, and any physical ascent of a peak must, necessarily, be followed by a descent. Indeed, once the protagonist in 'Granit II' has made his way to the top of the mountain, he experiences a moment of mental clarity, which is described in very similar terms:

In diesem Augenblicke, da die innern anziehenden und bewegenden Kräfte der Erde gleichsam unmittelbar auf mich wirken, da die Einflüsse des Himmels mich näher umschweben, werde ich zu höheren Betrachtungen der Natur hinauf gestimmt, und wie der Menschengeist alles belebt, so wird auch ein Gleichniß in mir rege, dessen Erhabenheit ich nicht widerstehen kann. So einsam sage ich zu mir selber, indem ich diesen ganz nackten Gipfel hinab sehe, und kaum in der Ferne am Fuße ein geringwachsendes Moos erblicke, so einsam sage ich, wird es dem Menschen zu Muthe, der nur den ältesten, ersten, tiefsten Gefühlen der Wahrheit seine Seele eröffnen will. (WA II:9, p. 174)

This utterance offers a snapshot of the protagonist's interaction with 'Steigerung' and 'Polarität' in the geological space, with regard to the dynamic movements associated with each of these terms. 'Steigerung' is clearly indicated by the phrase 'zu höheren Betrachtungen der Natur hinauf gestimmt', which sees the protagonist's thoughts become ever-loftier ('höher'), with no sense of stopping, mirroring the 'immerstrebendes Aufsteigen' in Goethe's definition of 'Steigerung' in his comment on 'Die Natur'. The passage also makes reference to the oppositional movement of 'Polarität', too. This is most evident in the statement: 'da die innern anziehenden und bewegenden Kräfte der Erde gleichsam unmittelbar auf mich wirken, da die Einflüsse des Himmels mich näher umschweben' (WA II: 9, p. 174). The mysterious 'Kräfte der Erde' pull the protagonist downwards towards the centre of the earth, just as the 'Einflüsse des Himmels' get ever-closer to his reach, stretching upwards towards

the heavens. The protagonist is suspended between the pull of these two immaterial forces. These concepts are not merely implicitly present in this passage: Goethe also uses the same verb ('anziehen') and noun ('Kraft') to describe the earth's forces in this passage as he uses elsewhere in a description of matter itself, such as in his 1820-22 *Campagne in Frankreich*:

Ich hatte mir aus Kants Naturwissenschaft nicht entgehen lassen, daß Anziehungs- und Zurückstoßungskraft zum Wesen der Materie gehören und keine von der andern im Begriff der Materie getrennt werden könne; daraus ging mir die Urpolarität aller Wesen hervor, welche die unendliche Mannichfaltigkeit der Erscheinungen durchdringt und belebt. (WA I, 33: p. 196)

This 'Anziehungs- und Zurückstoßungskraft' denoting attraction and repulsion is a clear gloss of 'Polarität' at a late stage of Goethe's thinking on the concept. The same 'Kräfte' are found within the 'Materie' of the mountain in 'Über den Granit' – and are even described in the very same terms. In turn, this implies that 'Über den Granit' offers a very early prototype of the conceptual framework that would later form a linchpin of Goethe's *Weltanschauung*. The term 'Anziehungskraft' has even been used by critics to describe the impact that the mountain environment had on Goethe, in an attempt to explain why he was so fascinated by the subject of geology for so long. Thus Sigrid Damm and Hamster Damm, in their book *'Geheimnißvoll Offenbar': Goethe im Berg*, ask 'Ist es das Mythische der Tiefen, das eine unwiderstehliche Anziehungskraft ausübt?'.<sup>177</sup> It is not merely the protagonist in 'Granit II' who feels 'die innern anziehenden und bewegenden Kräfte der Erde': so too, arguably, did Goethe himself experience these immaterial forces rooted in the material geological environment.

'Steigerung' and 'Polarität' do not merely act on a psychological or spiritual level in 'Granit II': they can also be found on a physical level as the protagonist returns to earth, figuratively speaking, from his imaginings. This jump from the spiritual, psychological or super-human realm to the physical one is bridged with a bi-directional movement analogous to the movement of 'Polarität':

Ich fühle die ersten festesten Anfänge unsers Daseins; ich überschau die Welt, ihre schrofferen und gelinderen Thäler und ihre fernen fruchtbaren Weiden, meine Seele wird über sich selbst und über alles erhaben und sehnt sich nach dem nähern Himmel. Aber bald ruft die

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<sup>177</sup> Sigrid Damm and Hamster Damm, *'Geheimnißvoll Offenbar': Goethe im Berg* (Frankfurt am Main: Insel, 2009), p. 15.

brennende Sonne Durst und Hunger, seine menschlichen Bedürfnisse, zurück. (WA II: 9, pp. 174-5)

The protagonist is pulled upwards by his soul, which ‘sehnt sich nach dem nähern Himmel’, but only too soon is he brought back down by ‘seine menschlichen Bedürfnisse’ of thirst and hunger: two very earthly complaints. The almost weightless suspension offered by ‘Polarität’ appears to have been broken, with the protagonist returning to his considerations of the present day and what he can see around him. This is not to say, however, that the physical world is incapable of calling forth this sensation of ‘Polarität’. Indeed, the remainder of ‘Granit II’ is replete with references to the opposing yet intermingled actions of forces on the physical world. Thus, for example, the protagonist’s description of the creation of the earth contains the opposed pairing of ‘es senkt sich das Wasser, die höhern Berge werden grün’ (WA II: 9, p. 175), closely followed by a similar juxtaposition in the phrase ‘in der Ferne heben sich tobende Vulkane in die Höhe, sie scheinen der Welt den Untergang zu drohen’ (WA II: 9, p. 175), which contrasts the height of the volcanos with the downfall (both literal and figurative) of the world itself.

While it is the most obvious marker of polarity and heightening, directional movement (whether upwards, for ‘Steigerung’, or in opposition, for ‘Polarität’) and constancy of motion are not the only components of ‘Steigerung’ and ‘Polarität’. The third, and final, marker of ‘Steigerung’ and ‘Polarität’ identified at the opening of this chapter is the assertion that they both have a unique relationship to questions of ‘Materie’ and ‘Geist’. Raising questions of the interconnectedness of matter and spirit sits within a long philosophical tradition of exploring the concept of the duality between the spirit-focused mind and the material body. These debates began in ancient times and persisted until the *Goethezeit* and beyond. Many of them reinforce the concept of the inseparability of the immaterial and the material in the context of the soul and spirituality. Thus, for example, in his *De Anima*, Aristotle, a proponent of the hylomorphism discussed in Chapter Four of this thesis, states: ‘But we must [...] repeat that the affections of soul are inseparable from the material substratum of animal life, to which we have seen that such affections, e.g. passion and fear, attach, and have not the same mode of being as a line or a plane.’<sup>178</sup> For Aristotle, the immaterial soul is inextricably linked to the material housing within which it resides. This is similar to Goethe’s belief in the interconnectedness of ‘Materie’ and ‘Geist’, albeit with two key exceptions. Unlike Goethe, Aristotle is adamant that the soul is fixed and unable to move (‘it is an impossibility that movement should be

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<sup>178</sup> Aristotle, *De Anima*, trans. by J. A. Smith (London: Aeterna Press, 2015), 403b16 – 403b20.

even an attribute of it'). Furthermore, Goethe, contrary to Aristotle, does not limit this to the matter of 'animal life': geological matter, for example, also counts.

Most famously, this dualism between spirit and matter, mind and body, can be traced back to Descartes. Cartesian dualism would shape the world of philosophy for centuries, and stands in stark opposition to Goethe's more monist understanding of an intrinsic connection between 'Materie' and 'Geist'. In the fourth part of his *Discours de la méthode*, Descartes introduces and discusses his well-known approach as summarised in the phrase 'je pense, donc je suis'. This 'premier principe' of Descartes' philosophy (to use his own term) goes hand-in-hand with questions of (im)materiality, as he explains:

Puis, examinant avec attention ce que j'étais, et voyant que je pouvais feindre que je n'avais aucun corps [...] mais que je ne pouvais pas feindre, pour cela, que je n'étais point [...], il suivait très évidemment et très certainement que j'étais; au lieu que, si j'eusse seulement cessé de penser, encore que tout le reste de ce que j'avais jamais imaginé eût été vrai, je n'avais aucune raison de croire que j'eusse été : je connus de là que j'étais une substance dont toute l'essence ou la nature n'est que de penser, et qui, pour être, n'a besoin d'aucun lieu, ni ne dépend d'aucune chose matérielle. En sorte que ce moi, c'est-à-dire l'âme par laquelle je suis ce que je suis, est entièrement distincte du corps, et même qu'elle est plus aisée à connaître que lui, et qu'encore qu'il ne fût point, elle ne laisserait pas d'être tout ce qu'elle est.<sup>179</sup>

In his belief that the essence of a person rests solely in their mental intellect (or, as Descartes goes on to explain, their soul), Descartes also negates the importance of the physical, or, to use his term, material body. The body (or material) is not partially negated (as in Plato), but rather, fully negated: there is 'aucune' dependence on material things for the existence of a soul, and, by extension, a person. It is 'entièrement distincte' from the body: quite the opposite of Goethe's statement that 'Materie' can never exist or exert an impact without 'Geist'.

### **'Materie' and 'Geist' as Goethean concepts**

The exact nature of the 'Materie' and 'Geist' that make up this basis is not, however, defined, either in this explanatory piece or in any of the other texts. As a result, it is not necessarily clear from this passage alone what, exactly, 'Materie' and 'Geist' are, how exactly their interplay functions, nor,

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<sup>179</sup> René Descartes, *Discours de la Méthode*, 1637, ed. Josiane Schifres (Paris: Hatier, 1992), p 339.



more importantly, what they meant to Goethe. While it is convenient to gloss these individual terms as simply ‘matter’ and ‘spirit’, a deeper engagement with ‘Materie’ and ‘Geist’, and one which enables them to more easily be seen as omnipresent counterparts, requires a more in-depth investigation of the specific definitions of these terms themselves. Of the two terms, ‘Materie’ is somewhat more clear-cut than ‘Geist’, although given the complexity of the term ‘Geist’, this is hardly surprising. The Grimms’ *Deutsches Wörterbuch*, a project roughly contemporaneous with the *Goethezeit* which draws substantially on Goethe for its detailed explorations of usage, contains entries for both these terms. For ‘Materie’, the Grimms offer four definitions, specifically: ‘stoff, woraus irgend etwas verfertigt wird’, ‘auch der stoff für ein kunstwerk’, ‘in der philosophischen sprache, das stoffliche und insofern ursächliche irgend eines naturkörpers’ and ‘endlich auch eine dem körper innewohnende und seine art bedingende flüssigkeit oder feuchtigkeit’.<sup>180</sup> While all these definitions accord neatly with one another, the third definition, the ‘stoffliche und insofern ursächliche irgend eines naturkörpers’, is the most relevant for discussions of Goethe’s geology. Indeed, glossing ‘Materie’ as the ‘irgend eines’ of a natural body makes matter seem just as mysterious and full of secrets as it does in Goethe’s depictions of the natural world. ‘Geist’, conversely, takes up a rather larger portion of the *Deutsches Wörterbuch*. The Grimms offer no fewer than thirty separate definitions of this term, each of which contains many more sub-definitions and examples. These definitions range from the general and self-evident, such as the definition that states ‘Geist’ is ‘vom leben oder der seele als trägerin des lebens’, to the specific, such as the definition that states ‘auch den geist aufgeben, der geist entflieht u. ä. zeigt geist sachlich noch als leben, obwol sich da zugleich eine andere vorstellung unterlegt’.<sup>181</sup> Of particular relevance for this project, however, is definition number 20: ‘was aber der geist selber ist, scheint an seinen gegensätzen am sichersten erkennbar, also geist und körper, geist und materie, geist und natur u. ä.’<sup>182</sup> Explicitly stating that ‘Materie’ is the opposite of ‘Geist’ (as, oddly, is ‘Natur’), underlines the inherent connection between them. This is rendered even more pronounced by the lack of any real definition for ‘Geist’ in this section, other than the statement that people seeking to understand this term can gain the most clarity viewing it in conjunction with its counterpart.

Indeed, even many modern critics use the tight connection between ‘Geist’ and ‘Materie’ as a way to side-step getting to grips with ‘Geist’ itself. This is the approach taken by Helmut Koopman, in the *Goethe-Handbuch*, who proffers a definition of Geist that states it is ‘das Immaterielle, das der

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<sup>180</sup> Jakob Grimm and Wilhelm Grimm, ‘Materie’, in *Deutsches Wörterbuch*, hrsg. von der Deutschen Akademie der Wissenschaften zu Berlin < <http://www.woerterbuchnetz.de/DWB?lemma=materie> > [accessed 1 October 2020]

<sup>181</sup> Grimm and Grimm, ‘Geist’.

<sup>182</sup> Grimm and Grimm, ‘Geist’.

Zeitlichkeit nicht unterworfen ist’, thereby defining one by reference to the lack of other.<sup>183</sup> Although this, like the Grimms’ definition, primarily defines ‘Geist’ by reference to its opposition to materiality, it does, however, add some slight nuance to this. It is something which is ‘der Zeitlichkeit nicht unterworfen’, or, in other words, it exists outside the realm of temporality. ‘Geist’, then, in Koopman’s understanding of Goethe’s use of the term, is not connected to any particular sense of time. This stands in stark contrast to the understanding of the term proposed by Carl Friedrich von Weizsäcker in the material appended to the *Hamburger Ausgabe* of Goethe’s works, which includes an essay explicitly dealing with the question of ‘Materie’ and ‘Geist’. Once again, Weizsäcker here asks ‘Sind Geist und Materie zwei Wirklichkeiten oder eine?’<sup>184</sup> He summarises the piece by saying ‘für Goethe aber war, so selbstverständlich wie die Idee in der einzelnen Gestalt, der Geist in der Materie gegenwärtig’.<sup>185</sup> The precise nature of this ‘Geist’ is not defined – but in the essay preceding this one, this time on ‘Polarität und Steigerung’, he states: ‘Scheint die Materie im endlosen Wechsel ihrer Atemzüge in sich zu kreisen, so kennt der Gestein Streben. Er kennt eigentliche Zeit; er kennt den Unterschied von Zukunft und Vergangenheit.’<sup>186</sup> This version of ‘Geist’ that can recognise the difference between the future and the past is far removed from the atemporal ‘Geist’ of Koopman’s definition. Koopman and Weizsäcker appear to be at an impasse here, with one explicitly stating that ‘Geist’ is not subject to temporality, and the other clearly stating that it is. In fact, neither is wrong – and neither is right, either. If ‘Materie’ and ‘Geist’ are inextricably linked, it stands to reason that they both handle questions of temporality in the same way. Matter is at once subject to the passage of time while also standing outside of it, and ‘Geist’, I contend functions the same way. It is, as Koopman alleges, ‘der Zeitlichkeit nicht unterworfen’, in that matter, or spirit, in general terms have existed since the dawn of time and will continue to exist eternally. However, they do, as von Weizsäcker states, ‘kenn[en] eigentliche Zeit’, existing within the broader framework of time itself.

Merely comprehending what ‘Materie’ and ‘Geist’ mean in isolation (or even in relation to each other) is not, however, an adequate foundation upon which to build an understanding of Goethe’s approach to these concepts, and by extension, to (im)materiality. After all, Goethe does not merely suggest that ‘Materie’ and ‘Geist’ exist in and of themselves, but also that the existence of each one is contingent upon the existence of the other. Specifically, he states that ‘die Materie nie ohne Geist, der Geist nie ohne Materie existirt und wirksam sein kann’. Despite the fact that they are clearly separate

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<sup>183</sup> Helmut Koopmann, ‘Geist’, in *Goethe-Handbuch: Band 4/1: Personen, Sachen, Begriffe A–K*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 346-348 (p. 347).

<sup>184</sup> Carl Friedrich von Weizsäcker, ‘Einige Begriffe aus Goethes Naturwissenschaft’, in *Goethes Werke: Hamburger Ausgabe in 14 Bänden (Vol 13)*, ed. by Erich Trunz (Munich: CH Beck, 2005), pp. 539-555 (p. 549).

<sup>185</sup> von Weizsäcker, p. 550.

<sup>186</sup> von Weizsäcker, p. 549.

concepts, they are also inherently, and inextricably, connected. Consequently, solely attempting to understand the terms by defining them, whether as isolated notions or with regard to each other, does not do justice to Goethe's presentation of these concepts. Rather, the interaction between 'Materie' and 'Geist' must be considered in structural terms, as well as conceptual ones. The pairing between 'Materie' and 'Geist' can be viewed as a monist duality, with its two distinct components nevertheless forming a single unit. The complex, somewhat paradoxical arrangement of this type of structure is explored in Goethe's poem 'Gingo Biloba', from 1815, where Goethe explores this structural framework with reference to botany. Goethe sent this short three-verse poem to Marianne von Willemer along with a ginkgo leaf as a present. Intrigued by the structure of the plant, the poet-protagonist asks 'Ist es Ein lebendig Wesen, | Das sich in sich selbst getrennt?', and then wonders 'Sind es zwei, die sich erlesen, | Daß man sie als Eines kennt?' (WA I: 6, p. 152). Here, the poet-protagonist asks whether the plant is one living being that splits into two, or whether it is two that merge into one. The answer, offered in the final line of the poem, is both – and neither. The recipient need only look at the poet-protagonist's poetic works, he replies: 'Fühlst du nicht an meinen Liedern, | Daß ich eins und doppelt bin?' (WA I: 6, p. 152). Just as the poet-protagonist (and the plant, too) is 'eins und doppelt', so too is the relationship between 'Materie' and 'Geist' one where the two are at once 'eins und doppelt', existing both independently and together.

### **The poetological interplay between matter and spirit: a parallel to Goethe's geological writings**

While the structural features of the interplay between 'Materie' and 'Geist' are explored in Goethe's later poetry, the complex yet omnipresent interaction between matter and spirit is also reflected in Goethe's poetic work from the period from the 1770s to the early 1780s. This is the same period during which Goethe wrote 'Granit II' and was deeply involved in his geological work, after being invited to Ilmenau for the first time in May 1776. By the final years of the 1770s, Goethe was intensely engaged with the mining project there, producing both a set of instructions to the mining officer J. C. W. Voigt dated 1780 and a report on the mine at Ilmenau dated May 1781. In turn, the focus on questions of the interplay between spirit or soul (both of which are immaterial in the broadest sense) and matter in his poetic work from the time suggests that these considerations were very much at the forefront of his mind in this period, and flourished under his hands-on engagement with the science of geology to shape his later writings in this field.

Des Menschen Seele  
Gleicht dem Wasser:

Ragen Klippen  
Dem Sturz entgegen,

Vom Himmel kommt es,  
Zum Himmel steigt es,  
Und wieder nieder  
Zur Erde muß es,  
Ewig wechselnd.

Strömt von der hohen,  
Steilen Felswand  
Der reine Strahl,  
Dann stäubt er lieblich  
In Wolkenwellen  
Zum glatten Fels,  
Und leicht empfangen  
Wallt er verschleiernd,  
Leisrauschend  
Zur Tiefe nieder.

Schäumt er unmutig  
Stufenweise  
Zum Abgrund.

Im flachen Bette  
Schleicht er das Wiesenthal hin,  
Und in dem glatten See  
Weiden ihr Antlitz  
Alle Gestirne.

Wind ist der Welle  
Lieblicher Buhler;  
Wind mischt vom Grund aus  
Schäumende Wogen.  
Seele des Menschen,  
Wie gleichst du dem Wasser!  
Schicksal des Menschen,  
Wie gleichst du dem Wind!  
(WA I: 2, pp. 56-7)

The above verses, drawn from Goethe's 1779 poem 'Gesang der Geister über den Wassern', offer an exploration of the interplay between the soul, movement, and the geological space. These stanzas open the poem, describing how the human soul, like water, flows down from heaven, only to ascend back towards the skies before once again falling back to earth. The first stanza focuses on this connection between the 'Seele' and 'Wasser', both of which are in an unceasing state of movement and flux. This movement of the soul's 'ewig wechselnd' existence is couched in terms of verticality, with the verb 'steigen' denoting the soul's movement heavenwards before it falls 'nieder' once again. Like the flow of water, this movement is fluid, gentle, and ultimately inevitable. In the second stanza, this metaphor is expanded by the addition of mountainous cliffs. These cliffs guide the way for the movement of the soul (or the rain) down from heaven, and enable the soul (or the droplets of water) to come together to form a cloud that rises upwards. Just as this poem highlights the interconnected nature of the soul, geological masses, and the movement that they facilitate, so too is this trilogy reflected in Goethe's geological writings themselves.

Every single stanza contains references to the directionally opposed movements associated with ‘Polarität’, albeit in different forms. In the first stanza, there is the pairing of ‘steigen’ and ‘nieder’, which is inverted and mirrored in the second stanza, with the ‘Strahl’ streaming down the steep rockface before vaporising and climbing back up it again in the form of a cloud, whereupon the cycle starts again. The duality between ascent and descent is slightly more opaque in the third stanza, but it is still visible. Here, it comes in the height of the ‘Klippen’ contrasting with the gradual downward movement ‘zum Abgrund’, which, once again, is inverted in the fourth stanza. In this verse, the downward movement is represented by the water’s gradual movement along the valley bottom (‘im flachen Bette’), which again is offset by an upward action. This time, this upward action is intrinsically paired with a downward motion, in the form of the stars up in the sky reflecting in the water far down below (‘Und in dem glatten See | Weiden ihr Antlitz | Alle Gestirne’). This intrinsic pairing signals the end of the apparently unceasing oscillation between upward and downward movement that the previous verses of the poem had marked, and suggests that, as in ‘Polarität’, these two movements can coexist, rather than simply follow each other in sequence. In the final verse, this duality is underpinned by the repeated phrase ‘Wie gleichst du dem [...]’, whether in the form of ‘Wie gleichst du dem Wasser’ or ‘Wie gleichst du dem Wind’. This enables the lofty, airy movement of wind to co-exist with the movement of the depths of the water in the sea, bringing together both the lowest and the highest elements at the same time, again serving as a representation of the impact of polarity within the natural world.

Many critics have connected ‘Gesang der Geister’ to Goethe’s work ‘Mahomets Gesang’, created in 1772/3. In the *Hamburger Ausgabe* of Goethe’s work, for example, Erich Trunz acknowledges that the poem was indeed created during Goethe’s ‘Schweizer Reise’, but explains that it is ‘wohl auf eine ältere Konzeption zurückgehend’ (HA I: 557). This ‘ältere Konzeption’ dates back to Goethe’s early engagement with the Orient. The same opinion is put forward in the *Münchner Ausgabe*: ‘Möglicherweise gehört die erste Konzeption des Gedichts bereits in den Umkreis der früheren Hymne und des Mahomet-Drama Projekts’ (MA 2: 576). They are not the only interpretations to have paired ‘Mahomets Gesang’ with ‘Gesang der Geister’, drawing parallels between the two on the basis of water imagery, poetic structure and the term ‘Gesang’. For example, Charles A. Williams’ 1948 article comparing three of Goethe’s poems (including ‘Mahomets Gesang’ and ‘Gesang der Geister’) gives a seven-part list detailing their similarities, such as the role played by a stream in both poems, the length of the verses in each poem, and the notion of them both being a ‘Gesang’, stating that it is ‘obvious enough’ that the two are connected in some respect.<sup>187</sup> Indeed, and pushing Williams’ exploration of the links between the poems further, this connection is even evident in terms of the

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<sup>187</sup> Charles A. Williams, ‘James Thomson’s “Summer” and Three of Goethe’s Poems’, *The Journal of English and Germanic Philology*, 47.1 (1948), 1-13 (p. 6).

pairing of opposed upward and downward movements, and, by extension, their connection to ‘Polarität’. The first two verses of ‘Mahomets Gesang’ are, on the surface, rather different from ‘Gesang der Geister’:

Seht den Felsenquell,  
Freudehell,  
Wie ein Sternblick;  
Über Wolken  
Nährten seine Jugend  
Gute Geister  
Zwischen Klippen im Gebüsch.

Jünglingsfrisch  
Tanzt er aus der Wolke  
Auf die Marmorfelsen nieder,  
Jauchzet wieder  
Nach dem Himmel.  
(WA I: 2, p. 53)

However, they feature exactly the same pairing of upward and downward movement that can be seen in ‘Gesang der Geister’. The first stanza contrasts the clouds floating upwards with the location of the ‘Geister’ on the ground, where they can be found ‘Zwischen Klippen im Gebüsch’. Clouds play a similar role in the second stanza, where the combination of upward and downward movement is made even more explicit through the word ‘nieder’ in the phrase ‘Jünglingsfrisch | Tanzt er aus der Wolke | Auf die Marmorfelsen nieder’. This phrase also emphasises an aspect of ‘Mahomets Gesang’, and ‘Gesang der Geister’ too, that this chapter has not yet considered in detail: the role played by the mountain environment in the movement depicted. These two stanzas of ‘Mahomets Gesang’ alone talk of the ‘Felsenquell’, ‘Klippen’, and ‘Marmorfelsen’, all of which play a key role in the actions depicted. The remainder of the poem, however, is no less replete with references to the mountain environment, talking of ‘Gipfelgänge’, ‘Kiesel’, ‘Flammengipfel’, and ‘Marmorhäuser’. It is a similar situation for ‘Gesang der Geister’, which is replete with references to ‘Felsen’, ‘Klippen’ and ‘Tal’. As a result, the instances of ‘Steigerung’ and ‘Polarität’ depicted within them are not just associated with the natural world in the broadest sense: they are also shown as acting on, and within, the geological space, too. While ‘Gesang der Geister’ and ‘Mahomets Gesang’ offer a clear presentation of directional movement, and, to a lesser extent, the continuity of such movement, their depiction of the interplay between ‘Materie’ and ‘Geist’ is, on the surface, less evident. ‘Gesang der

Geister', for example, does not even mention the word 'Geist' once in the poem proper. Critics have considered the 'Geister' to take the position of the poem's narrators, shaping the piece as a duet between two 'Geister', or two groups of 'Geister'.<sup>188</sup> As a result, simply eliding the 'Seele' in the opening line of the poem with the 'Geister' of the title would be tantamount to a misreading of the poem, and any reference to the interaction between 'Materie' and 'Geist' is implicit, rather than explicit.

'Mahomets Gesang', on the other hand, does offer somewhat more of a hint as to the interplay between matter and spirit. The first stanza is home to the only reference to 'Geist' in the poem, but, significantly, this 'Geist' is connected not merely to 'Materie', but to geological matter. The lines read: 'Über Wolken | Nährten seine Jugend | Gute Geister | Zwischen Klippen im Gebüsch.' (WA I: 2, p. 53). The good spirits that offered nourishment were located 'zwischen Klippen im Gebüsch', or rather, firmly within the material, geological realm. The importance of geology in the poem is further emphasised by the repeated appearance of geological entities, whether in the image of 'tanzt er aus der Wolke | Auf die Marmorfelsen nieder', mirroring the opening of 'Gesang der Geister', or in the quest to seek out 'bunte Kiesel'. More broadly, however, it also blurs the lines between humans and the natural world. This idealised journey of water coming from clouds and ultimately down into the sea sees this water be 'endowed with human qualities'.<sup>189</sup> As the water travels, 'die Flüsse von der Ebne' and 'die Bäche von Gebürgen' call out to it, saying 'Bruder! | Bruder, nimm die Brüder mit' (WA I: 2, p. 54). The poem is replete with references that see the water in the natural world (as opposed to the water that is the focus of the poem) be associated with human attributes, but even these two parallel statements serve to illustrate this, whether in the agency of the rivers and streams to identify the moving water, to express a desire to associate with it, to actively call out to it, and even to use terms drawn from human familial relationships ('Bruder') to do so. It is clear in these poems (both 'Mahomets Gesang' and 'Gesang der Geister') that water can have a 'Geist' – and Goethe's geological works suggest that rocks, mountains and the like can, as well.

### **'Geist' and 'Materie' in 'Granit II'**

Unlike these two poems, 'Granit II' contains plenty of explicit references to 'Geister' of all kinds – although these 'Geister' take many different forms. Towards the end of the essay, the protagonist starts to visualise how the world was formed, casting his mind back centuries to imagine the processes

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<sup>188</sup> See, for example, Williams p. 6.

<sup>189</sup> Jonas Jølle, 'The River and Its Metaphors: Goethe's "Mahomets Gesang"', *MLN*, 119.3 (2004), 431-50 (p. 436).

that created the mountain upon which he is sitting. The protagonist's 'Geist', in the easily glossed sense of his 'spirit', plays a key role in this – much like the (im)material imagination discussed in the second chapter of this thesis. After this 'Geist' has played its part, however, the narrator mentions two further 'Geister', of very different kinds from this first 'Geist':

Er sieht sich nach jenen Thälern um, über die sich sein Geist schon hinausschwang [...].  
Vorbereitet durch diese Gedanken, dringt die Seele in die vergangene Jahrhunderte hinauf, sie vergegenwärtigt sich alle Erfahrungen sorgfältiger Beobachter, alle Vermutungen feuriger Geister. Diese Klippe sage ich zu mir selber stand schroffer zackiger höher in die Wolken da dieser Gipfel, noch als eine meerumflossne Insel, in den alten Wassern dastand; um sie sauste der Geist, der über den Wogen brütete, und in ihrem weiten Schosse die höheren Berge aus den Trümmern des Urgebürges und aus ihren Trümmern und den Resten der eigenen Bewohner die späteren und ferneren Berge sich bildeten. (WA II: 9, p. 175)

While the speaker grammatically erases himself from this passage by avoiding using 'ich' to refer to himself and thereby covering his statements with a veneer of objectivity, the description is nevertheless a product of his creation. The first 'Geist', the protagonist's spirit, is clearly distinct from the second mention of the word in the passage, namely, the 'feurigen Geister'. Goethe does not use this collocation again in the essay and never provides further details as to what he means by it. However, it is plausible that the 'feurigen Geister' he is referring to here are the Vulcanists or Plutonists, two parties in the debate as to the earth's formation that was raging during the *Goethezeit*. Both these groups believed that the earth's geological features were created through volcanic activity. As Helmut Hölder explains, the theories espoused by Plutonists and Vulcanists alike revolved around the formative power of high temperatures. Vulcanism was the older of the two theories, and referred to the formation of the earth through volcanic eruptions at any level of depth. Conversely, Plutonism, a more recently developed approach, posited that the earth had been a red-hot ball of liquid matter. As this matter cooled to leave just a burning hot core at the centre of the earth, they believed, this process of temperature change led to mountains, valleys and the like being formed.<sup>190</sup> Both these associated beliefs stood in stark contrast to that of the Neptunists who (as in this passage) ascribed such developments to the power of the water in the primordial oceans. Goethe himself numbered among the Neptunists, favouring this more subtle approach: 'es graute ihm die Vorstellung, die Erdoberfläche sei durch laute und glühend heisse Eruptionen entstanden'.<sup>191</sup> For Goethe, the thought of the earth

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<sup>190</sup> See Helmut Hölder, *Kurze Geschichte der Geologie und Paläontologie: Ein Lesebuch* (Berlin, Heidelberg: Springer, 1989), pp. 36-37.

<sup>191</sup> Anette Mook, *Die freie Entwicklung innerlicher Kraft: Die Grenzen der Anthropologie in den frühen Schriften der Brüder von Humboldt* (Göttingen: Vandenhoeck & Ruprecht, 2012), p. 71.



having been created by such violently aggressive processes was repulsively unpleasant, and the concept of its creation through the power of water was the preferable option.

The debate between these two opposing schools of thought is illustrated vividly in ‘Hochgebirg’, in Act IV of Goethe’s *Faust II* before Faust and Mephistopheles head off to war with the Emperor. In this scene, Faust and Mephistopheles are atop a ‘starre, zackige Felsen-Gipfel’, and the mountain environment surrounding them serves as a trigger for Mephistopheles to start reminiscing about the formation of the earth (WA I: 15/1, p. 245). He evokes the period lost in the mists of time when ‘zentralisch glühend, um und um, ein ewig Feuer flammend sich durchbrannte’ (WA I: 15/1, p. 246). This fire released a gas which meant that ‘die Hölle schwoll von Schwefelstank und -säure’, and in turn, this gas developed into a vapour of such monstrous proportions ‘so dass gar bald der Länder flache Kruste, So dick sie war, zerkrachend bersten musste’ (WA I: 15/1, p. 247). Mephistopheles makes the impact of this plain, saying ‘was ehemals Grund war, ist nun Gipfel’ (WA I: 15/1, p. 247). His Vulcanist reading of the earth’s formation paints this interpretation as a violently aggressive process, bursting open the earth’s crust and causing mountains to protrude from the earth by the sheer force of a stinkingly putrid sulphurous gas. By contrast, Faust counters Mephistopheles’ theory with a much calmer, gentler understanding of the creation of the geological landscape. In his rebuttal, Faust explains how ‘Fels an Fels und Berg an Berg gereiht’, neatly lining up one after the other before ‘die Hügel dann bequem hinabgebildet’ (WA I: 15/1, p. 247). Faust’s theory of the formation of the earth is a ‘sanft’ process that is pleasant for all the natural entities involved. Indeed, the verb ‘sich erfreuen’ is used not once but twice to describe this process, for example, in the phrase ‘Der Gipfel sich, der Schluchten sich erfreut’ (WA I: 15/1, p. 247). Dismissing the volcanic theories of geological formation as ‘tolle Strudeleien’ (WA I: 15/1, p. 247), Faust leans towards a rather less dramatic theory of geological formation – as did Goethe. While Faust makes no reference to the water that was a central, if not *the* central, component of this Neptunist theory in this extract, later on in the scene he discusses the interaction between the waves of the sea and the peaks of the mountains. ‘Fluthend wie sie sei, | An jedem Hügel schmiegt sie sich vorbei’, says Faust, before reiterating this with ‘geringe Höhe ragt ihr stolz entgegen’ (WA I: 15/1, p. 252). For Faust, and for Goethe, too, water was home to a paradoxical power: strong enough to carve deep valleys and lofty mountains, yet gentle enough to do so without any hint of disorder. Just as ‘Mahomets Gesang’ and ‘Gesang der Geister’ demonstrated, water was an inherent part of the geological environment.

Indeed, the connection between geology and water is expanded to include ‘Geist’, too, in the next mention of ‘Geist’ in the passage from ‘Über den Granit’ discussed above:

Er sieht sich nach jenen Thälern um, über die sich sein Geist schon hinausschwang [...].  
Vorbereitet durch diese Gedanken, dringt die Seele in die vergangene Jahrhunderte hinauf, sie vergegenwärtigt sich alle Erfahrungen sorgfältiger Beobachter, alle Vermutungen feuriger Geister. Diese Klippe sage ich zu mir selber stand schroffer zackiger höher in die Wolken da dieser Gipfel, noch als eine meerumflossne Insel, in den alten Wassern dandand; um sie sauste der Geist, der über den Wogen brütete, und in ihrem weiten Schosse die höheren Berge aus den Trümmern des Urgebürges und aus ihren Trümmern und den Resten der eigenen Bewohner die späteren und ferneren Berge sich bildeten. (WA II: 9, p. 175)

The speaker describes the mountain as being surrounded by water that is whipped up into waves and surrounded by geological turmoil of all kinds, which ultimately give rise to the topological environment that he can experience today. The rich description is replete with sensory adjectives: the sound of the spirit of nature is onomatopoeically represented in the repeated sibilance of the letter ‘s’ in ‘sausen’, while the visual image depicted by the speaker pans cinematically from the mountain upon which he imagines he is sitting to the mountains in the far-off distance. As in ‘Gesang der Geister’, all three of the ‘Geister’ here are intrinsically linked to the material world. The first ‘Geist’ is irrevocably rooted within the protagonist’s physical, material existence, while the second use of the term, the ‘feurigen Geister’ has similar resonances, albeit by referring to a group of people rather than an individual. The third ‘Geist’ interacts directly with the water to create waves, blowing around the rocky island, that ultimately shape the form of the rock itself. The ‘Erfahrungen’ that arise in this extract are also striking. The protagonist’s experience is renewed, refreshed and replicated in the narrative present, being ‘vergegenwärtigt’ through the interplay of ‘Materie’ and ‘Geist’, despite the fact that it originally happened many years ago.

These ‘Geister’, whether facilitating the protagonist’s visualisation of the creation of the natural world, representing other people’s beliefs about the natural world, or serving as powers that actively create it, are not the only spirits to make an appearance in ‘Granit II’. The same term is used much earlier in the essay, albeit to refer to a very different kind of ‘Geist’ still. This version of ‘Geist’ is more akin to a feeling or drive within the mind than a mysterious natural force that shapes the environment, but it nevertheless is equally connected to questions of matter. These references to this second version of ‘Geist’ come as the unnamed protagonist is discussing the sense of attraction that the natural environment exerts on humans, and his related exploration of this environment. He states:

Ich fürchte den Vorwurf nicht dass es ein Geist des Widerspruchs sein müsse der mich von Betrachtung und Schilderung des menschlichen Herzens des jüngsten mannigfaltigsten beweglichsten veränderlichsten, erschütterlichsten Teiles der Schöpfung zu der Beobachtung des ältesten, festesten, tiefsten, unerschütterlichsten Sohnes der Natur geführt hat. Denn man wird mir gerne zugeben dass alle natürlichen Dinge in einem genauen Zusammenhange stehen, dass der forschende Geist sich nicht gerne von etwas Erreichbarem ausschließen läßt. (WA II: 9, p. 173)

This passage sees the narrator discuss two 'Geister': the 'Geist des Widerspruchs' and the 'forschende Geist'. In both of these instances, 'Geist' is used to refer to a particular variety of feeling or thought that drives forward a certain action, encapsulating the attitude in question. Indeed, this is not dissimilar to the concept of 'Neigung' seen in the 'Über Bildung von Edelsteinen', the force that drove particular sections of rock to 'veredeln' themselves into gemstones. While the 'Geist des Widerspruchs' did not come to bear, as the protagonist is keen to remind the reader, the 'forschende Geist' did have a significant impact on his endeavours. Goethe's statement that 'Geist' is never present without 'Materie' is borne out on multiple levels in this passage. While not explicitly noted by the protagonist, the reader is aware that both the 'Geister' in this passage are rooted in the physical materiality of the body, or more precisely, the brain, thereby marking a direct connection between material and spirit in this passage. However, an indirect connection can also be established. The 'Geist' driving the protagonist is triggered and stimulated by the protagonist's interaction with the material mountain environment. The protagonist even appears to presage this connection in his statement that 'alle natürlichen Dinge in einem genauen Zusammenhange stehen', highlighting the interconnected nature of the natural world.

This is not the only part of the text to discuss these 'Geister' that straddle the gap between the human mind and the natural world. The striking experience that the protagonist undergoes where the 'innern anziehenden und bewegenden Kräfte der Erde' impact on him does not just elevate him 'zu höheren Betrachtungen der Natur' (WA II: 9, p. 174). Furthermore, this section of the text is not only useful for illustrating the interplay between upward and downward movement. Rather, it also has an explicit connection to his 'Geist'. As the protagonist states: 'wie der Menschengeist alles belebt, so wird auch ein Gleichniß in mir rege, dessen Erhabenheit ich nicht widerstehen kann' (WA II: 9, p. 174). The protagonist becomes host to a 'Geist' analogous to the 'Menschengeist', but one which is, in this instance, sparked by his experience atop the mountain. In this image, 'Geist' is required for an object to be brought to life. In turn, this connects to the protagonist's description of the mountain peak which opens this entire scene. In it, he states 'diese Gipfel haben nichts Lebendiges erzeugt und nichts Lebendiges verschlungen, sie sind vor allem Leben und über alles Leben' (WA II: 9, p. 174). Just as

life cannot exist without the 'Menschengeist', without this 'Menschengeist' being life in and of itself, so too is the mountain environment in question intrinsically connected to life-giving in its own way. Man is matter just as the mountain is matter, and consequently both are imbued with 'Geist', in line with Goethe's statement that 'Materie' and Geist' are necessarily intertwined. The 'Geist' of the protagonist's mind therefore displays striking parallels with the solid materiality of the granite rock.

Goethe's belief in the constant, unavoidable interplay between 'Materie' and 'Geist' is certainly borne out in 'Granit II', and a closer examination of this 'Geist' itself reveals that the interaction between 'Materie' and 'Geist' can justifiably be read as the interaction between materiality and immateriality. All told, the term 'Geist', along with its related terms, such as 'Menschengeist', is used six times in 'Granit II'. Each time the term is used, it refers to a different entity or concept, with the 'Geist' of the narrator's mind that enables him to visualise the history of the mountain's creation having little in common with the 'Geist' that shaped that very same mountain from the waves of the ocean, for example. They do, however, have certain features in common. Firstly, all the 'Geister' are intrinsically immaterial by nature, no matter what they represent. The 'Geist des Widerspruchs', for example, is utterly immaterial, as is the 'forschende Geist'. Secondly, despite each of the 'Geister' being immaterial, in each case, they appear to be inextricably linked to the material world. Thus, for example, the narrator's 'Geist' in the first example provided in this chapter is only able to engage in the imaginings that it does because it is rooted in his own material body. As such, the interplay between 'Materie' and 'Geist' here reflects the duality seen elsewhere between materiality and immateriality in Goethe's worldview.

## Conclusion

Goethe believed that ‘die Materie nie ohne Geist, der Geist nie ohne Materie existirt und wirksam sein kann’ (WA II: 11, p. 11): in his eyes, although the two components of ‘Materie’ and ‘Geist’ are distinct from one another, they never exist independently of each other. Goethe never truly defines exactly what he means by ‘Materie’ and ‘Geist’, and while the definition of ‘Materie’ is a little more self-evident than that of ‘Geist’, there is little clarity provided in the rest of the essay from which this statement is drawn, Goethe’s ‘Erläuterung zu dem aphoristischen Aufsatz “Die Natur” ’ as to what, precisely, these two terms denote. As a result, I believe that this statement can be read as a broader expression of Goethe’s belief in the interaction between ‘materiality’ and ‘immateriality’, two concepts which have seen a good deal of critical debate over the past thirty to forty years – but which have received very little attention within the field of Goethe studies. Across the five chapters of this thesis, I have explored the ways in which this interaction between materiality and immateriality is expressed in Goethe’s geological writing. Whether in terms of Goethe’s belief in the agency and formation of gemstones or his understanding of the imagination as a central component of scientific (and geological) enquiry, the role that (im)materiality plays in Goethe’s work as a geologist is complex and multi-layered, but nevertheless omnipresent and of critical importance.

I started this thesis by outlining the historical context of the *Goethezeit*, a period marked by much upheaval and change both across Germany as a whole and within the Ilmenau region. This historical exploration focused on identifying the reasons that took Goethe to the town of Ilmenau in the first place, namely, a chain of events that began with a new duke acceding to the throne of a duchy facing financial ruin. This perilous economic situation led to the decision to compensate for the monetary shortfall by re-opening the mine at Ilmenau, with the acquaintance between Goethe and Carl August serving as the catalyst for the former’s appointment as its director. While the reasons behind Goethe’s initial involvement and continued engagement in Ilmenau are clear to see, at least on a superficial level, the influences that this town had on him are manifold and varied, extending far beyond the period during which Goethe was physically present there. Examining his poem ‘Ilmenau’, which serves to guide the reader through the experiences Goethe gained in the town, offers one perspective on these influences. While this poem depicts real people engaged in real (or at least, very plausible) events, it also reflects, on a broader level, Goethe’s holistic view of the natural world: a world that was shaped by its geological features, a world which was much more alive than might be assumed, and a world that could exert an impact greater than might be thought.

This poetic representation of Goethe's engagement with geology is intrinsically connected to the role of the imagination in geological enquiry. It is also tightly linked to the stages of cognition associated with scientific research and literary endeavour, passing from vision, to imagination, through to, ultimately, the act of materialising thoughts in the form of written documents – such as the 'Ilmenau' poem. Goethe's essay 'Der Kammerberg bei Eger' highlights the central function that the imagination played within Goethe's geological research, as a faculty that can both offer help and serve as a hindrance. Exploring questions of cognition demonstrates how, in Goethe's eyes, 'Einbildungskraft' encapsulates the monist duality of (im)materiality. This conception of the imagination views it as a faculty housed within the physical materiality of the embodied subject (and their mind). This mind then plays host to immaterial thoughts conjured up by the individual's imagination and triggered by the (im)materiality of the geological environment surrounding them. Given the ubiquity of the use of 'Einbildungskraft' in Goethe's scientific enquiry, the (im)materiality of this faculty and its functioning also means that his geological research is inherently imbued with this connection between the material and the immaterial, too.

This exploration of vision also encompassed a discussion of light and colour, drawing on Goethe's belief in the holism of science to justify reading his geological writings alongside his *Farbenlehre*. Colour takes various guises in terms of its connection to geology. It can be a characteristic of particular rocks, as illustrated by gemstones and all the associations triggered by their lustrous hues, but it can also fulfil a representative purpose in a more abstracted function, in the form of the colours used to highlight particular rock strata in Goethe's innovative geological map. Colour itself can be viewed as immaterial from a twofold perspective: firstly because of its creation through immaterial light, and secondly because of the array of intangible emotions, associations and resonances that it inevitably provokes. However, colour is also material, whether as a result of the particular chemical make-up of the rocks and gems in question, or in the physical pigments used to colour the geological maps. The broad spectrum of associations connected to colour offers an ideal opportunity to expand the genres within which geological theories can be identified, implicitly acknowledging that Goethe did not only explore questions of geology, and geological (im)materiality, in texts explicitly designed for a scientific readership. In fact, he did so through poem and through fairy tale, and many other types of texts besides, as references to his *Divan* and 'Märchen' alike show.

Goethe's 'Märchen' also adds an intriguing layer of depth to the exploration of the immaterial internal forces within rocks. Goethe, along with many of his contemporaries, believed in the existence of productive, generative forces within mountains that led to the creation of gemstones and minerals, among other geological products. However, his descriptions of these forces are opaque or rather

laconic, at best, rendering a focus on his work alone rather unilluminating. Pairing Goethe with a modern-day theorist who expressly believes in the existence of similar forces, Bennett, assists in teasing out Goethe's understanding of these forces. In turn, this reveals that Goethe had a deeply-held belief in such forces, one that extends over multiple texts, textual genres and time periods. These forces are inherently immaterial, as other 20<sup>th</sup> and 21<sup>st</sup>-century critics have demonstrated. Indeed, the fact that such forces are immaterial is also the logical conclusion to be drawn from Goethe's statements about a rock's 'Masse' and its 'Neigung', which is both separate from the 'Masse' and an intrinsic part of it. Given that these vivid, vital forces are an omnipresent component of geological components and their transformations, Goethe implies that the materiality of the 'Stoff' from which rocks are composed is inherently imbued with the immateriality of the generative, productive force by which they come into being, too.

All these discussions of geological (im)materiality, whether in the form of colour, life-forces or the process of scientific enquiry itself, are rooted in Goethe's belief in the interplay between 'Materie' and 'Geist'. These two terms are heavily freighted with centuries of philosophical discussion on the division (or lack thereof) between the body and the soul; a debate of which Goethe was doubtless aware. In view of the fact that Goethe's pronouncement on this subject was made within the context of a discussion of 'Steigerung' and 'Polarität', two well-known Goethean concepts that also apply to geological entities, exploring the connection between these two notions and geology is a productive endeavour. Investigating these terms contextualises the notions of 'Materie' and 'Geist', while also offering richness to the discussion of 'Steigerung' and 'Polarität' themselves. This analysis offers an opportunity to come full circle and return to Goethe's pronouncement regarding the interplay between 'Materie' and 'Geist' that was discussed in detail in the Introduction and that served as the catalyst for my investigation of his (im)materiality.

Given the sheer scale of his output on the subject, it is impossible to take all of Goethe's work on geology into account in a project of this scope, and as a result, it is necessarily the case that some pieces have been omitted. Goethe's 1831 'Geologische Probleme und Versuch ihrer Auflösung', for example, offers an exceptionally rich demonstration of Goethe's geological theories, drawing on many of the themes that can also be found in his earlier geological work, such as the notion of the movement inherent to geological masses. His 1823 essay, 'Tempel zu Puzzuol', is a fascinating study of the interplay between man-made stone structures and the natural geological environment, looking at the impact that the power of water can have on both these entities. Neither text, however, offered enough of a novel insight into Goethe's geological (im)materiality to justify inclusion in this thesis. Other texts have only received cursory treatment. This is the case with Goethe's 'Verhältnis zur

Wissenschaft, besonders zur Geologie', from 1820, for example. This brief text has suffered the same neglect as many of his other geological works, and yet it offers a clear, concise overview of Goethe's approach to scientific enquiry, both generally and specifically regarding geology, that cannot be found in any of his other writings on the discipline. In this thesis, it served to provide an additional link between the term 'Neigung' and Goethe's geological enquiry, but the text itself offers fertile ground for further study.

To navigate a path through this otherwise unwieldy and disparate collection of Goethe's geological writings, I have focused, in this thesis, on exploring the question of (im)materiality through the lens of Goethe's time in Ilmenau and the period influenced by it. This engagement was so very formative for his understanding of geological science, both as a result of the people he met and the work he undertook, and yet the little research that has been carried out on Goethe's connection to this town has primarily focused on historical events, rather than his written output. As a result, any attempt to investigate his work on geology should also take account of the impact that Ilmenau had on Goethe, and his geological research. However, exploring Goethe's geological work from a different perspective would doubtless call forth new, fresh constellations. Establishing links between his studies on the basis of the particular type of rock at hand, whether granite, gemstones or feldspar, for example, would certainly offer other productive insights into his understanding of (im)materiality.

Indeed, Goethe's geological writings are fragmentary, at best, and do not form a coherent collection. Editors of Goethe's collected works favour different groupings when it comes to assigning particular pieces to the geological collections with some (such as the Leopoldina editions) including even snippets from Goethe's literary works and entire letters, with others focusing near-exclusively on his essays. The breadth of forms that Goethe's geological output takes, whether in scientific essays per se, or in letters, fragmentary notes, or scenes from fictional narratives or poetry, is a fascinating issue that it was not possible to cover in sufficient depth in this thesis. Probing the effect that form has on the presentation of geological matters would be a fruitful avenue of enquiry, especially given that similar themes, such as the notion of gemstones having agency, appear in Goethe's explicitly scientific work and in his works that are clearly not situated within the real world, such as the 'Märchen'. A deeper engagement with the question of form could open up fascinating new avenues of enquiry not only with regard to Goethe's (im)materiality, but also in terms of forging new, creative connections between his literary and scientific output.



The question of where (im)materiality fits within Goethe's scientific output more broadly would require many theses' worth of words to answer. In this thesis, I have focused on exploring Goethe's geological work: arguably one of the scientific disciplines most strongly shaped by questions of materiality, it has put instances of immateriality into even sharper relief as a result. As such, it has served as a highly resonant concept against which to problematise a material-focused viewpoint. That is not to say, however, that Goethe's unique understanding of the interplay between materiality and immateriality only finds expression in his geological work. Quite the opposite: I believe that it underpinned his understanding of the natural world as a whole, and, by extension, all his endeavours in the realms of science and natural philosophy. Exploring this further would, again, go beyond the scope of this thesis, but it does represent an intriguing avenue for potential future study: study of Goethe's work on the morphology of plants would doubtless raise questions of (im)materiality that are not dissimilar to those discussed in the chapter of this thesis on internal forces, while study of Goethe's *Farbenlehre* from the perspective of (im)materiality would add nuance to our understanding of how Goethe approached the issue of light and colour generation, an approach that the chapter of this thesis on light and colour began to sketch out.

The argument evinced in this thesis offers a dual benefit. Firstly, it fills a gap in Goethe scholarship that has been, to date, little explored, if at all. Secondly, it creates a bridge between a thriving body of interdisciplinary work on materiality and immateriality, and work on literature studies, which has, so far, been somewhat neglected by this field. Indeed, Goethe scholars have long interpreted his works from the perspective of particular thematic movements, with the *Divan* having frequently been read with reference to questions of orientalism and post-colonialism,<sup>192</sup> and Goethe's *Faust* having seen various feminist readings of the roles played by Helena and Gretchen,<sup>193</sup> for example. The issue of materiality, though, regardless of the field of Goethe's writings, has been little explored. The main critic to do so is Heather Sullivan, who has explored this issue in short articles and chapters. Sullivan's work, however, focuses on material ecocriticism, which she defines as 'der Bereich des Ecocriticism, der sich sowohl für die materielle Umwelt [...] interessiert als auch für die Art und Weise, wie die Beziehungen zwischen den Energien, Stoffen, Lebewesen und Informationen ablaufen und gedeutet werden'.<sup>194</sup> While Sullivan does reference the role played by non-material entities (such

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<sup>192</sup> See, for example, Shafiq Shamel, *Goethe and Hafiz (Bern, Switzerland: Peter Lang UK, 2013)*; Fink, Karl J. 'Goethe's West-Östlicher Divan: Orientalism Restructured.' *International Journal of Middle East Studies*, 14. 3 (1982), 315–328; Volker C. Dörr, 'Orient und Okzident: Der West-Östliche Divan als postkoloniales Paradigma.' *Goethe Yearbook*, 16 (2009), 219–234.

<sup>193</sup> See, for example, Barbara Becker-Cantarino, 'Goethe and Gender', in *The Cambridge Companion to Goethe*, ed. by Lesley Sharpe (Cambridge: Cambridge University Press, 2002), pp. 179–92 .

<sup>194</sup> Heather Sullivan, 'Material Ecocriticism', in *Ecocriticism: Eine Einführung*, ed. by Gabriele Dürbeck und Urte Stobbe (Cologne and Weimar: Böhlau Verlag, 2015), pp. 57-67 (p. 58).

as ‘Energien’ and ‘Informationen’) in her approach to material ecocriticism, the focus is squarely on the ‘material’ component of this, and not on the intrinsic, balanced interplay between materiality and immateriality that I believe to be a more accurate reflection of Goethe’s worldview. Despite Sullivan’s efforts in this area there has been no extended-length study on materiality in any aspect of Goethe’s work at all, much less his scientific work. This is doubly surprising given the evident centrality of such questions to his understanding of the natural world.

Indeed, scholarship on Goethe’s science has tended to focus on a few key areas, at the expense of others. Thus, for example, there is no shortage of work on his *Farbenlehre*, most notably, with seminal works such as Schöne’s *Goethes Farbentheologie* and Sepper’s *Goethe contra Newton* shaping criticism in this lively field. Goethe’s understanding of the natural world and his *Naturphilosophie* more broadly has also received great attention, most notably from Rudolf Steiner, and so too has his work on the metamorphosis of plants and morphology. By contrast, his geological work has been comparatively neglected. There are some strikingly detailed studies, such as Engelhardt’s exceptionally thorough survey of Goethe’s written output in the sphere of geology and Semper’s chronological review of the development of Goethe’s thought in this field, but neither Engelhardt nor Semper undertake any deep analysis of the texts rather than simply repeating Goethe’s statements within them. Indeed, there is next to no scholarship that explores Goethe’s written output with regard to the impact that Ilmenau had on his thinking. While Hamster and Sigrid Damm’s work does trace the history of Goethe’s engagement with the town via his written output that related directly to the mining project, they do not widen this perspective to explore the impact that this involvement had on his geological work more broadly. This neglect of Goethe’s geological endeavours is particularly striking in light of the decisive role played by geology not only for Goethe the scientist, but also for Goethe the politician and statesman, too. As such, this thesis also represents a contribution to research on Goethe’s geology as a scientific discipline.

Finally, the work I have undertaken in this thesis does not only fill a pressing niche within Goethe scholarship: it fits within a broader, interdisciplinary body of work on questions of materiality and immateriality, too. Immateriality studies has emerged from the more established field of materiality studies as a vibrant new discipline. Much work in this field has focused on philosophy, architecture and social anthropology, as surveyed in more detail in the Introduction, but the connection between immateriality and literature studies in the broadest sense has been little researched. The tide is turning, however, with a smattering of studies beginning to explore the interplay between (im)materiality and literature from a theoretical perspective over the past five to ten years, many of which were discussed in Chapter Two, with reference to the cycle of (im)materiality connected to the imagination. However,

examples of these theoretical approaches being applied to written works (whether literature in the traditional sense or other written artefacts, such as scientific essays), remain few and far between. One very recent publication, James A. Knapp's *Immateriality and Early Modern English Literature*, released in April 2020, explores the presentation of immateriality in English-language literature from the early modern period. Knapp focuses on the three fields of ontology, theology and psychology, drawing on a wide range of authors, including Shakespeare, Herbert and Donne to explore their presentation of immateriality. Aside from Knapp, few critics in the overarching field of literature studies, in any language, have grappled with this precise issue. Specifically with relation to German studies, I have not been able to identify a single study with a focus on illuminating questions of both materiality and immateriality with reference to German literature, from any period. As a result, my investigation of (im)materiality within the specific framework of Goethe's geological writing not so much fills a niche as makes an initial contribution to bridging a vast swathe of uncharted territory.

Above all else, exploring the (im)materiality of geological entities emphasises the interconnectedness of the natural world. Everything, whether mountain, plant or human, is home to both material and immaterial characteristics in a balanced equilibrium. As a result, this also erodes the divisions that have been drawn between humans and the natural world. Just as geological matter is home to a 'Geist', in the loosest sense of the world, humans are no less made of 'Materie', either. Goethe's scientific enquiry is fundamentally underpinned by this notion of harmony and unity, as he makes clear in his 1785 'Studie nach Spinoza':

In jedem lebendigen Wesen sind das, was wir Theile nennen, dergestalt unzertrennlich vom Ganzen, daß sie nur in und mit demselben begriffen werden können, und es können weder die Theile zum Maß des Ganzen noch das Ganze zum Maß der Theile angewendet werden, und so nimmt, wie wir oben gesagt haben, ein eingeschränktes lebendiges Wesen Theil an der Unendlichkeit oder vielmehr es hat etwas Unendliches in sich, wenn wir nicht lieber sagen wollen, daß wir den Begriff der Existenz und der Vollkommenheit des eingeschränktesten lebendigen Wesens nicht ganz fassen können, und es also eben so wie das ungeheure Ganze, in dem alle Existenzen begriffen sind, für unendlich erklären müssen. (WA II: 11, pp. 316-7)

Every living entity, Goethe states, is made up of 'Theile' that are utterly indivisible from the whole and can only be understood as part of it. In turn, this inextricable connection between the 'Theile' and 'das Ganze' extends between objects too, creating 'das ungeheure Ganze' encompassing all 'Existenzen' for eternity. While Goethe is talking about 'lebendige Wesen' here, this understanding of endless unity is clearly applicable to inorganic entities, such as geological masses, too. Indeed, it is only by being alert to the material and the immaterial properties of geological entities that Goethe's

holistic view of nature can be understood in its fullest form and applied to the entire natural world – organic and inorganic alike.

This holism of the natural world is reflected nowhere better than in Goethe's 'Wandrer's Nachtlid'. This poem, which Goethe composed atop the 'Kickelhahn' mountain in Ilmenau, illustrates the shared fate of the mountains, their fauna, and, ultimately, humanity itself. It has been the subject of a wealth of critical readings, with August Nechanksy's 1911 interpretation placing particular emphasis on this notion of holism. 'Die Umgegend und das Ich waren in Harmonie gekommen, in die Harmonie der Ruhe,' he writes, continuing 'Nicht an die ewige Ruhe dachte Goethe, nur an diese Harmonie.'<sup>195</sup> The peace with which the poem is imbued is not a peace marked by ending and finality, but rather a peace shaped by unity and wholeness.

Über allen Gipfeln  
Ist Ruh',  
In allen Wipfeln  
Spürest du  
Kaum einen Hauch;  
Die Vögelein schweigen im Walde.  
Warte nur, balde  
Ruhest du auch.  
(WA I: 1, p. 98)

Even the process by which the poem came into being is an exercise in the interplay between materiality and immateriality. Goethe wrote the poem as he sheltered overnight in a small, simple mountain hut, likely on 6 September 1780. As part of this process, Goethe took a pencil and inscribed the poem on the wooden wall of the hut, thereby turning the immaterial poetic stanza into part of the material mountain landscape. Indeed, the entire poem is a multi-layered interplay of materiality and immateriality, epitomised by the material 'Gipfel' and the immaterial 'Ruh' in the first two lines. This connection between mountains and serenity prefigures the phrase 'ruhig grünet' used to describe the 'Berg' in Goethe's poem 'Ilmenau', and sets up a pairing of conceptual opposites that continues throughout the entire poem. This polarisation is repeated throughout the poem, with the material 'Wipfeln' and the rather-less-material 'Hauch', and even the 'Vögelein' and their immaterial silence.

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<sup>195</sup> August Nechanksy, 'Über allen Gipfeln ist Ruh...', *Chronik des Wiener Goethe-Vereins*, 25 (1911), 25-26 (p. 25).

The poem is rooted in the natural world, with the geological landscape itself central to these surroundings. With the ‘Gipfel’ of the first line looming over both the text on the page and the scene that this text describes, it is easy to forget that geological masses are more than mere mountain peaks: all the other features in the poem, whether the wood, the treetops, or the birds, have only been able to make their home in this environment because of the topography created by its geological foundation. This environment exercised such a thrall over Goethe that, in August 1831, when he returned to Ilmenau after three decades away, one of his requests was to re-visit the Kickelhahn, atop which he had composed ‘Wandrer’s Nachtlid’. This adventure is reported by Johann Christian Mahr, Goethe’s friend and fellow mining enthusiast. Mahr recounts how Goethe, now in his eighties, realised he was near the small wooden hut that he used to visit, exclaiming ‘Ich kann zu Fuß dahin gehen und die Chaise soll hier so lange warten, bis wir zurückkommen’ (WA Anhang: 8, p. 107). Upon entering the hut, Goethe immediately sought out the verses he had inscribed on its wall some thirty years previously. In a moving scene,

Goethe überlas diese wenigen Verse, und Thränen flossen über seine Wangen. Ganz langsam zog er sein schneeweißes Taschentuch aus seinem dunkelbraunen Tuchrock, trocknete sich die Thränen und sprach in sanftem, wehmüthigem Ton: "Ja: warte nur, balde ruhest du auch!" schwieg eine halbe Minute, sah nochmals durch das Fenster in den düstern Fichtenwald und wendete sich darauf zu mir mit den Worten: "Nun wollen wir wieder gehen!" (WA Anhang: 8, p. 108)

Even after such a long time, these words were freighted with emotional resonance for Goethe, calling to mind, memories of his late friend Carl August, as Mahr reports. They doubtless also evoked reminiscences of his time with Carl August in Ilmenau itself, a city marked both by its productive impact on his geological studies and by the abject failure of the mining endeavours that were to have been Goethe’s flagship project. Indeed, as Goethe and Mahr left the wooden hut, questions of geology were very much on his mind, as Mahr reports: ‘Auf dem Rückwege nach der Allee, wo der Wagen wartete, fragte er, ob auf der Kuppe des Gickelhahns auch das Vorkommen des verschmolzenen Quarzes, wie auf der Hohen Tanne bei Stützerbach stattfinde’ (WA Anhang, 8: p. 108-9), remembering the geological features with which he had long been so fascinated. Ilmenau’s ‘Kickelhahn’, then, was a place where Goethe’s geological and literary interests coalesced and crystallised, with enduring effect.

In its bewitching presentation of the holism of the interlinked natural world, 'Wanders Nachtlid' offers a subtle but no less striking representation of the (im)materiality of the geological landscape, an issue which was at the forefront of Goethe's mind during, and as a result of, the Ilmenau years. Just like 'Materie' and 'Geist', the poem also plays delicately with questions of transience and eternity, exemplified by the 'Hauch' that makes its presence felt for the briefest of moments but is nevertheless an unchanging part of the mountain landscape. The same, too, can be said of the juxtaposition between the immediacy of 'balde' and the permanence of 'ruhest du', with 'warte nur' denoting both an action within time and one that suspends it simultaneously. The serenity that descends over the mountain peaks is at once changing and changeless – just like the interplay between materiality and immateriality.

## Bibliography

- Goethe, Johann Wolfgang von, *Werke, Tagebücher und Briefe, hg. im Auftrag der Großherzogin Sophie von Sachsen (Weimarer Ausgabe)*, ed. by Paul Raabe (Weimar: H. Böhlau, 1887-1919, 1990 reprint)
- Goethe, Johann Wolfgang von, *Die Schriften zur Naturwissenschaft. Vollständige und mit Erläuterungen versehene Ausgabe im Auftrag der deutschen Akademie der Naturforscher Leopoldina (Leopoldina Ausgabe)*, ed. by Dorothea Kuhn and Wolf von Engelhardt (Weimar: Hermann Böhlau Nachfolger, 1947)
- Goethe, Johann Wolfgang von, *Sämtliche Werke nach Epochen seines Schaffens (Münchner Ausgabe)*, ed. by Karl Richter et al. (Munich: Carl Hanser Verlag, 1989)
- Goethe, Johann Wolfgang von, *Sämtliche Werke, Briefe, Tagebücher und Gespräche (Frankfurter Ausgabe)*, ed. by Friedmar Apel, Hendrik Birus, Anne Bohnenkamp et al. (Frankfurt am Main: Deutscher Klassiker Verlag, 1992)
- Goethe, Johann Wolfgang von, *Goethes Werke: Hamburger Ausgabe in 14 Bänden*, ed. by Erich Trunz (Munich: CH Beck, 2005)
- Allert, Beate, 'J. W. Goethe and C. G. Carus: On the Representation of Nature in Science and Art', *Goethe Yearbook*, 23.1 (2016), 195–219
- Ammerlahn, Hellmut, 'Produktive und destruktive Einbildungskraft: Goethes Tasso, Harfner und Wilhelm Meister', *Orbis Litterarum*, 53.4 (1998), 83–104
- Aristotle, *De Anima*, trans. by J. A. Smith (London: Aeterna Press, 2015)
- Aristotle, *Physics*, trans. by H. G. Apostle (Bloomington, Indiana: Indiana University Press, 1969)
- Azzouni, Safia, *Kunst als praktische Wissenschaft: Goethes Wilhelm Meisters Wanderjahre und die Hefte 'Zur Morphologie'* (Cologne: Böhlau, 2005)
- Baldrige, W. Scott, 'The Geological Writings of Goethe: Despite His Keen Powers of Observation, Goethe's Ideas on Geology Reflected the Biases of His Time', *American Scientist*, 72.2 (1984), 163–67
- Barabási, Albert-László, *Linked: How Everything Is Connected to Everything Else and What It Means for Business, Science, and Everyday Life* (New York: Plume, 2003)
- Barrie, Thomas, and Julio Bermudez, 'Introduction', *Journal of Architectural Education (1984-)*, 62.2 (2008), 4–5
- Bartscht, Waltraud, *Goethe's 'Das Märchen.'* (Lexington: University Press of Kentucky, 1972)
- Becker-Cantarino, Barbara, 'Goethe and Gender', in *The Cambridge Companion to Goethe*, ed. by Lesley Sharpe, Cambridge Companions to Literature (Cambridge: Cambridge University Press, 2002), pp. 179–92
- van Beek, Gosewijn, 'On Materiality', *Etnofoor*, 9.1 (1996), 5–24
- Bennett, Jane, *Vibrant Matter: A Political Ecology of Things* (Durham: Duke University Press, 2010)

- Boyle, Nicholas, 'Embodied Cognition: Goethe's Farbenlehre as Phenomenology', *German Life and Letters*, 70.4 (2017), 478–90
- , *Goethe: The Poet and the Age* (Oxford: Oxford University Press, 1991)
- Boyle, Nicholas, and John Guthrie, eds., *Goethe and the English-Speaking World: Essays from the Cambridge Symposium for His 250th Anniversary* (Rochester, NY: Camden House, 2002)
- Brady, Emily, *The Sublime in Modern Philosophy: Aesthetics, Ethics, and Nature* (Cambridge: Cambridge University Press, 2013)
- Brockes, Bartold Heinrich, *Irdisches Vergnügen im Gott* (Hamburg: König & Richter, 1735)
- Brook, Isis Hazel, 'Dualism, Monism and the Wonder of Materiality as Revealed through Goethean Observation', *PAN: Philosophy Activism Nature*, 6 (2009), 31-39
- Brown, Bill, 'Thing Theory', *Critical Inquiry*, 28.1 (2001), 1–22
- Brown, Jane, 'Building Bridges: Goethe's Fairytale Aesthetics', *Goethe Yearbook*, 23 (2016), 1–18
- , *Goethe's Cyclical Narratives, Die Unterhaltungen Deutscher Ausgewanderten and Wilhelm Meisters Wanderjahre* (Chapel Hill: University of North Carolina Press, 1975)
- Caisley, Jennifer, 'Goethe's "Märchen": an exploration of (im)materiality', *German Life and Letters*, 72.3 (2019), 262-278.
- Cassirer, Ernst, *Rousseau, Kant, Goethe: Two Essays* (Princeton: Princeton University Press, 1945)
- Cave, Terence, 'Introduction', *Paragraph*, 37.1 (2014), 1–14
- , *Thinking with Literature: Towards a Cognitive Criticism* (Oxford: Oxford University Press, 2016)
- Caygill, Howard, 'Life and Energy', *Theory, Culture & Society*, 24.6 (2007), 19–27
- Chappell, John E., and Ian M. Matley, 'Marxism and Environmentalism', *Annals of the Association of American Geographers*, 57.1 (1967), 203–7
- Coleridge, Samuel Taylor, *The Collected Works of Samuel Taylor Coleridge*, ed. by James Engell and W. Jackson Bate (Princeton NJ: Princeton University Press, 1983)
- Cook, Karen Severud, 'From False Starts to Firm Beginnings: Early Colour Printing of Geological Maps', *Imago Mundi*, 47 (1995), 155–72
- Cronon, William, 'The Trouble with Wilderness: Or, Getting Back to the Wrong Nature', *Environmental History*, 1.1 (1996), 7-28
- Crowell, Robert M., 'The Scientific Work of Johann Goethe: A Contemporary Inquiry', *Bios*, 54.2 (1983), 60–68
- Damm, Sigrid, and Hamster Damm, '*Geheimnißvoll Offenbar*': *Goethe im Berg*, (Frankfurt am Main: Insel, 2009)
- Daston, Lorraine, 'On Scientific Observation', *Isis*, 99.1 (2008), 97–110
- Dawson Adams, Frank, *The Birth and Development of the Geological Sciences* (London: Bailliere, Tindall and Cox, 1938)
- DeMarrais, Elizabeth, Chris Gosden, Colin Renfrew, and McDonald Institute for Archaeological Research, eds., *Rethinking Materiality: The Engagement of Mind with the Material World*, McDonald Institute Monographs (Oakville, CT: McDonald Institute for Archaeological Research, 2004)



- Descartes, René, *Discours de la Méthode, 1637*, ed. Josiane Schifres (Paris: Hatier, 1992)
- Dörr, Volker C. 'Orient und Okzident: Der West-Östliche Divan als postkoloniales Paradigma.' *Goethe Yearbook*, 16 (2009), 219–234.
- Dülmen, Richard van, and Anthony Williams, *The Society of the Enlightenment: The Rise of the Middle Class and Enlightenment Culture in Germany* (Cambridge: Polity Press, 1992)
- Economides, Louise, "'Mont Blanc" and the Sublimity of Materiality', *Cultural Critique*, 61, 2005, 87–114
- , *The Ecology of Wonder in Romantic and Postmodern Literature*, Literatures, Cultures, and the Environment (New York, NY: Palgrave Macmillan, 2016)
- 'Einbildungskraft' on *Duden online*. <<https://www.duden.de/node/135940/revision/135976>>
- Endres, Johannes, 'Meaningful Complexity: Goethe's Concept of Similarity', *MLN*, 130.3 (2015), 466–86
- Engelhardt, Wolf von, and Dorothea Kuhn, 'Nicht von Goethe: "Der Dynamismus in der Geologie"', *Goethe-Jahrbuch*, 113 (1996)
- Engelhardt, Wolf von, *Goethe im Gespräch mit der Erde: Landschaft, Gesteine, Mineralien und Erdgeschichte in seinem Leben und Werk* (Weimar: Böhlau Nachfolger, 2003)
- Engel, Theodor, *Geognostischer Wegweiser durch Württemberg: Anleitung zum Erkennen der Schichten und zum Sammeln* (Stuttgart: E. Schweizerbart'sche Verlagshandlung, 1908)
- Engell, James, *The Creative Imagination: Enlightenment to Romanticism* (Cambridge MA: Harvard University Press, 2013)
- Erlin, Matt, 'Goethe's "Ilmenau" and the Origins of the Aesthetic State', *Goethe Yearbook*, 13 (2005), 53–74
- Evans, Medford, 'Naturally Immaterial', *The Sewanee Review*, 51.1 (1943), 131–47
- Fink, Karl J., *Goethe's History of Science* (Cambridge: Cambridge University Press, 1991)
- Fisher, Jaimey, and Barbara Caroline Mennel, *Spatial Turns: Space, Place, and Mobility in German Literary and Visual Culture* (Amsterdam: Rodopi, 2010)
- Flett, John S., 'Frank Dawson Adams. 1859-1942', *Obituary Notices of Fellows of the Royal Society*, 4:12 (1943), 381–393
- Förster, Eckart, 'Goethe and the "Auge Des Geistes"', *Deutsche Vierteljahrsschrift Für Literaturwissenschaft Und Geistesgeschichte*, 75.1 (2001), 87–101
- Fränze, Otto, 'Alexander von Humboldt's Holistic World View and Modern Inter- and Transdisciplinary Ecological Research', *Northeastern Naturalist*, 8 (2001), 57–90
- Freitag, Egon, 'Zum Alltagsleben des deutschen Volkes in der Darstellung Johann Wolfgang Goethes', *Forschungen Und Berichte*, 20 (1980), 567–91
- Fry, Harold P., *Physics, Classics, and the Bible: Elements of the Secular and the Sacred in Barthold Heinrich Brockes' Irdisches Vergnügen in Gott, 1721* (New York: Peter Lang, 1990)
- Fullbrook, Mary, *A Concise History of Germany* (Cambridge: Cambridge University Press, 2004)
- Furlong, EJ, *Imagination* (London: George Allen, 1961)
- Gage, John, *Color and Culture: Practice and Meaning from Antiquity to Abstraction* (Berkeley CA, University of California Press, 1999)

- , *Color and Meaning: Art, Science, and Symbolism* (Berkeley, CA: University of California Press, 1999)
- Garland, Henry and Mary Garland, *The Oxford Companion to German Literature* (Oxford: Oxford University Press, 1997) ebook.
- Geiger, Rudolf, *Goethes Märchen: Bilder einer konkreten Utopie* (Stuttgart: Urachhaus, 1993)
- Gibson, Susannah, *Animal, Vegetable, Mineral?: How Eighteenth-Century Science Disrupted the Natural Order* (Oxford: Oxford University Press, 2015)
- Godfrey, D. R., 'Imagination and Truth Some Romantic Contradictions', *English Studies*, 44.1–6 (1963), 254–67
- Graham, Ilse, *Goethe: Portrait of the Artist* (Berlin; New York: W. de Gruyter, 1977)
- Grandy, David, 'Light as a Solution to Puzzles about Light', *Journal for General Philosophy of Science / Zeitschrift für allgemeine Wissenschaftstheorie*, 33.2 (2002), 369–79
- Gray, Ronald, *Goethe the Alchemist* (Cambridge: Cambridge University Press, 1952)
- Greene, John C., and John G. Burke, 'The Science of Minerals in the Age of Jefferson', *Transactions of the American Philosophical Society*, 68.4 (1978), 1–113
- Griffiths, Devin, 'Romantic Planet: Science and Literature within the Anthropocene', *Literature Compass*, 14.1 (2017), e12377
- Grimm, Jakob and Wilhelm Grimm, *Deutsches Wörterbuch, hrsg. von der Deutschen Akademie der Wissenschaften zu Berlin* <<http://www.woerterbuchnetz.de/DWB> >
- Groat, Lee A., and Brendan M. Laurs, 'Gem Formation, Production, and Exploration: Why Gem Deposits Are Rare and What Is Being Done to Find Them', *Elements*, 5.3 (2009), 153–58
- Groves, Jason, 'Goethe's Petrofiction: Reading the Wanderjahre in the Anthropocene', *Goethe Yearbook*, 22.1 (2015), 95–113
- Günzler, Claus, 'Die Bedeutung des aristotelischen Hylemorphismus für die Naturbetrachtung Goethes', *Zeitschrift für philosophische Forschung*, 21.2 (1967), 208–41
- Guyer, Paul, ed., *The Cambridge Companion to Kant* (Cambridge: Cambridge University Press, 1992)
- Haberkorn, Michaela, *Naturhistoriker und Zeitenseher: Geologie und Poesie um 1800: Der Kreis um Abraham Gottlob Werner (Goethe, A.v. Humboldt, Novalis, Steffens, G.H. Schubert)* (Frankfurt am Main; New York: Lang, 2004)
- Hamm, E. P., 'Unpacking Goethe's Collections: The Public and the Private in Natural-Historical Collecting', *The British Journal for the History of Science*, 34.3 (2001), 275–300
- Hansen, Volkmar, 'Goethe und der (Ilmenauer) Bergbau', in *Bergbau und Dichtung. Friedrich von Hardenberg (Novalis) zum 200. Todestag*, ed. by Eleanor Sent (Weimar & Jena: Hain, 2003), pp. 127–50
- Hazen, Robert M., 'Mineralogy: A Historical Review', *Journal of Geological Education*, 32.5 (1984), 288–98
- Helbig, Holger, *Naturgemässe Ordnung: Darstellung und Methode in Goethes Lehre von den Farben* (Köln: Böhlau, 2004)
- Herbert Smith, George F., *Gemstones* (London: Methuen, 1958)
- Heusser, Peter, 'Goethes Verständnis von Naturwissenschaft', *Goethe-Jahrbuch*, 125 (2008), 110–21

- Hicks, Dan, and Mary Carolyn Beaudry, eds., *The Oxford Handbook of Material Culture Studies* (Oxford: Oxford University Press, 2010)
- Hitt, Christopher, 'Toward an Ecological Sublime', *New Literary History*, 30.3 (1999), 603–23
- Ho, Shu Ching, 'Edelsteine', in *Goethe-Handbuch Supplemente: Band 2: Naturwissenschaften*, ed. by Manfred Wenzel (Weimar, Stuttgart: J.B. Metzler, 2012), pp. 373-374
- Hölder, Helmut, 'Neptunismus — Plutonismus — Vulkanismus', in *Kurze Geschichte der Geologie und Paläontologie: Ein Lesebuch*, ed. by Helmut Hölder (Berlin, Heidelberg: Springer, 1989), pp. 36–54
- Holland, Jocelyn, *German Romanticism and Science: The Procreative Poetics of Goethe, Novalis, and Ritter* (New York; London: Routledge, Taylor & Francis Group, 2012)
- Homann, Karl, 'Zum Begriff Einbildungskraft nach Kant', *Archiv für Begriffsgeschichte*, 14 (1970), 266–302
- Huber, Peter, 'Polarität/Steigerung', in *Goethe-Handbuch: Band 4/2: Personen, Sachen, Begriffe L–Z*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 863–865
- Hufbauer, Karl, *The Formation of the German Chemical Community, 1720-1795* (Berkeley: University of California Press, 1982)
- Hughes, Jonathan, *Ecology and Historical Materialism* (Cambridge: Cambridge University Press, 2000)
- Hume, Robert D., 'Kant and Coleridge on Imagination', *The Journal of Aesthetics and Art Criticism*, 28.4 (1970), 485–96
- Hurcombe, Linda, 'A Sense of Materials and Sensory Perception in Concepts of Materiality', *World Archaeology*, 39.4 (2007), 532–45
- Ibrahim, Yasmin, 'Transacting Memory in the Digital Age: Modernity, Fluidity and Immateriality', *Fudan Journal of the Humanities and Social Sciences*, 11.4 (2018), 453–64
- 'Imagine' on *Merriam-Webster online*. <<https://www.merriam-webster.com/dictionary/imagine>>
- Ishihara, Aeka, *Goethes Buch der Natur: ein Beispiel der Rezeption naturwissenschaftlicher Erkenntnisse und Methoden in der Literatur seiner Zeit* (Würzburg: Königshausen & Neumann, 2005)
- Jackson, Myles W., 'Goethe's Economy of Nature and the Nature of His Economy', *Accounting, Organizations and Society*, 17.5 (1992), 459–69
- Jacobs, Wilhelm G., 'Materie – Materialität – Geist', *editio*, 23.2009 (2009), 14–20
- Jaffé, David, 'Aspects of Gem Collecting in the Early Seventeenth Century, Nicolas-Claude Peiresc and Lelio Pasqualini', *The Burlington Magazine*, 135.1079 (1993), 103–20
- Janlert, Lars-Erik, and Erik Stolterman, 'The Character of Things', *Design Studies*, 18.3 (1997), 297–314
- Jeßing, Benedikt, 'Bergbau und Fürstenlob: Goethes Gedicht "Ilmenau am 3. September 1783"', *Der Anschnitt*, 69 (2017), 249-261
- John, David G., 'The Duality of Goethe's Materialism', *Lumen: Selected Proceedings from the Canadian Society for Eighteenth-Century Studies*, 32 (2013), 57-71
- Jølle, Jonas, 'The River and Its Metaphors: Goethe's "Mahomets Gesang"', *MLN*, 119.3 (2004), 431–50

- Kant, Immanuel, *Kritik der Urteilskraft (Berliner Ausgabe)*, ed. by Michael Holzinger (Frankfurt am Main: Suhrkamp, 2014)
- Kater, Michael H., *Weimar: From Enlightenment to the Present* (New Haven, CT: Yale University Press, 2014)
- Keller, P. C., *Gemstones and Their Origins* (New York: Springer Science & Business Media, 2012)
- Klausmeyer, Bryan K, 'Signs of Life: Form, Life, and the Materiality of Writing around 1800 (Georg Christoph Lichtenberg - Jean Paul - Goethe)' (unpublished doctoral thesis, Johns Hopkins University, 2016)
- Klauß, Jochen, *Goethes Deutschland: Orte Und Stätten von Aachen Bis Zwickau Aus Der Sicht Des Dichters* (Stuttgart: Deutsche Verlags-Anstalt, 1998)
- Knapp, James A., *Immateriality and Early Modern English Literature* (Edinburgh: Edinburgh University Press, 2020)
- Knight, David M., *Ideas in Chemistry: A History of the Science* (London: The Athlone Press, 1992)
- , *Public Understanding of Science: A History of Communicating Scientific Ideas*, (London; New York: Routledge, 2006)
- Köhler, Rafael, 'Der Kristall als ästhetische Idee. Ein Beitrag zur Rezeptions- und Ideengeschichte der zweiten Wiener Schule', *Archiv für Musikwissenschaft*, 42.4 (1985), 241–62
- Koopmann, Helmut, 'Geist', in *Goethe-Handbuch: Band 4/1: Personen, Sachen, Begriffe A–K*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 346-348
- Kozák, Jan, Alena Čejchanová, Zdeněk Kukal, and Karel Pošmourný, *Early Geological Maps of Europe: Central Europe 1750 to 1840* (New York: Springer International Publishing, 2016)
- Krolzik, Udo, 'Das Physikotheologische Naturverständnis und sein Einfluß auf das Naturwissenschaftliche Denken im 18. Jahrhundert', *Medizinhistorisches Journal*, 15.1/2 (1980), 90–102
- Kronick, David A., 'The Commerce of Letters: Networks and "Invisible Colleges" in Seventeenth- and Eighteenth-Century Europe', *The Library Quarterly: Information, Community, Policy*, 71.1 (2001), 28–43
- Kuhn, Bernhard Helmut, *Autobiography and Natural Science in the Age of Romanticism: Rousseau, Goethe, Thoreau* (Farnham, England; Burlington, VT: Ashgate, 2009)
- Kunz, George Frederick, *The Curious Lore of Precious Stones* (New York: Halcyon House, 1913)
- Lamb, Jonathan, 'Imagination, Conjecture, and Disorder', *Eighteenth-Century Studies*, 45.1 (2011), 53–69
- Lande, Joel B., 'Acquaintance with Color: Prolegomena to a Study of Goethe's Zur Farbenlehre', *Goethe Yearbook*, 23.1 (2016), 143–69
- Lange, Friedrich Albert, *Geschichte des Materialismus und Kritik seiner Bedeutung in der Gegenwart* (Frankfurt am Main: Holzinger, 1974)
- Latham, Alan, and Derek P. McCormack, 'Moving Cities: Rethinking the Materialities of Urban Geographies', *Progress in Human Geography*, 28.6 (2004), 701–24
- Lees, Loretta, 'Rematerializing Geography: The "New" Urban Geography', *Progress in Human Geography*, 26.1 (2002), 101–12
- Lemmel, Monika, *Poetologie in Goethes West-Östlichem Divan* (Heidelberg: Carl Winter Universitätsverlag, 1987)

- Levere, Trevor Harvey, *Chemists and Chemistry in Nature and Society, 1770-1878* (Aldershot, Hampshire, Great Britain; Brookfield, VT: Variorum, 1994)
- Lützeler, Paul Michael, 'Goethe and Europe', *South Atlantic Review*, 65.2 (2000), 95–113
- Manger, Klaus, 'Goethe und die deutschen Aufklärer', *Goethe-Jahrbuch*, 118 (2001), 46–57
- Mann, Gunter, Dieter Mollenhauer, Stefan Peters, Willi Ziegler, and Senckenbergische Naturforschende Gesellschaft, eds., *In der Mitte zwischen Natur und Subjekt: Johann Wolfgang von Goethes Versuch, die Metamorphose der Pflanze zu erklären, 1790-1990: Sachverhalte, Gedanken, Wirkungen* (Frankfurt am Main: Waldemar Kramer, 1992)
- Markosian, Ned, 'What Are Physical Objects?', *Philosophy and Phenomenological Research*, 61.2 (2000), 375–95
- Marsden, Simon, 'Imagination, Materiality and the Act of Writing in Emily Brontë's Diary Papers', *Nineteenth-Century Contexts*, 28.1 (2006), 35–47
- Marshall, Donald G., 'Ideas and History: The Case of "Imagination"', *Boundary 2*, 10.3 (1982), 343–59
- Metz, Friedrich, 'Der Bergbau und seine Bedeutung für die Ausbreitung des Deutschtums', *Geographische Zeitschrift*, 35.3 (1929), 131–49
- Michel, Christoph, "'ein Kontinent mitten im Kontinente" - Goethe in Böhmen', *Goethe-Jahrbuch*, 120 (2003), 111–22
- Miller, Daniel, ed., *Materiality* (Durham, N.C: Duke University Press, 2005)
- , 'Why It's Safer to Build on Concrete Than Epistemology: A Comment on "On Materiality" by Gosewijn van Beek', *Etnofoor*, 9.1 (1996), 25–27
- Mook, Anette, *Die freie Entwicklung innerlicher Kraft: Die Grenzen der Anthropologie in den frühen Schriften der Brüder von Humboldt* (Göttingen: Vandenhoeck & Ruprecht, 2012)
- Mommsen, Katharina, *Märchen* (Frankfurt am Main: Insel-Verlag, 1996)
- Moretti, Franco, *Distant Reading* (London; New York: Verso, 2013)
- Muenzer, Clark, 'Ihr ältesten, würdigsten Denkmäler der Zeit', in *Ethik und Aesthetik. Werke und Werte in der Literatur vom 18. bis 20. Jahrhundert*, ed. by Richard Fishes (Frankfurt: Peter Lang, 1995), pp. 181-198
- , 'Wandering among Obelisks: Goethe and the Idea of the Monument', *Modern Language Studies*, 31.1 (2001), 5–34
- Nassar, Dalia, "'Idealism is nothing but genuine Eempiricism": Novalis, Goethe, and the Ideal of Romantic Science', *Goethe Yearbook*, 18 (2011), 67–95
- Nechansky, August, 'Über allen Gipfeln ist Ruh...', *Chronik des Wiener Goethe-Vereins*, 25 (1911), 25-26
- Newton, Isaac, *Opticks: Or, A Treatise of the Reflections, Refractions, Inflexions and Colours of Light. The Second Edition, with Additions* (London: n.pub., 1718),  
<<http://www.newtonproject.ox.ac.uk/view/texts/normalized/NATP00051>>
- Nicholls, Angus, 'Between Natural and Human Science: Scientific Method in Goethe's "Noten Und Abhandlungen Zum West-Östlichen Divan"', *Publications of the English Goethe Society*, 80.1 (2011), 1–18
- Nisbet, H. B., *Goethe and the Scientific Tradition* (London: Institute of Germanic Studies, University of London, 1972)

- Novalis, and Gerhard Schulz, *Novalis Werke* (Munich: Beck, 1981)
- Perels, Christoph, *Goethe in seiner Epoche: Zwölf Versuche* (Tübingen: M. Niemeyer, 1998)
- Peterfreund, Stuart, 'Dissent and Ontological Space in Romantic Science and Literature', *The Wordsworth Circle*, 36.2 (2005), 59–65
- Pointon, Marcia R., *Brilliant Effects: A Cultural History of Gem Stones and Jewellery* (London: Paul Mellon Centre for Studies in British Art, 2009)
- Polenz, Kathrin, 'Christian Keferstein — Ein Amateurgeologe Im Mitteldeutschen Raum Um 1800 Und Seine Zeitschrift „Teutschland, Geognostisch-Geologisch Dargestellt“', *Sudhoffs Archiv*, 95.1 (2011), 30–47
- Powers, Elizabeth, 'The Sublime, "Über den Granit," and the Prehistory of Goethe's Science', *Goethe Yearbook*, 15 (2008), 35–56
- Probst, Gerhard F., 'Conrad Ferdinand Meyers Gedicht "Der römische Brunnen" und "Goethes Gesang der Geister über den Wassern"', *The German Quarterly*, 47.2 (1974), 233–44
- Read, Peter G., *Beginner's Guide to Gemmology* (Oxford: Butterworth-Heinemann, 1988)
- Rexer, Lyle, 'The Materiality Of Immaterial Things', *Art on Paper*, 14.1 (2009), 66–75
- Richards, Robert J., *The Romantic Conception of Life: Science and Philosophy in the Age of Goethe* (Chicago: University of Chicago Press, 2002)
- Rorty, Richard, 'Incorrigibility as the Mark of the Mental', *The Journal of Philosophy*, 67.12 (1970), 399–424
- Ross, James, 'Immaterial Aspects of Thought', *The Journal of Philosophy*, 89.3 (1992), 136–50
- Rudwick, Martin J. S., 'The Emergence of a Visual Language for Geological Science 1760-1840', *History of Science*, 14.3 (1976), 149–211
- , *Earth's Deep History: How It Was Discovered and Why It Matters* (Chicago: Chicago University Press, 2014)
- Rusnock, Andrea, 'Correspondence Networks and the Royal Society, 1700-1750', *The British Journal for the History of Science*, 32.2 (1999), 155–69
- Saine, Thomas P., 'The World Goethe Lived in: Germany and Europe, 1750–1830', in *The Cambridge Companion to Goethe*, ed. by Lesley Sharpe (Cambridge: Cambridge University Press, 2002), pp. 6–22
- Sandino, Linda, 'Here Today, Gone Tomorrow: Transient Materiality in Contemporary Cultural Artefacts', *Journal of Design History*, 17.3 (2004), 283–93
- Savaton, Pierre, 'The First Detailed Geological Maps of France: Contributions of Local Scientists and Mining Engineers', *Earth Sciences History*, 26.1 (2007), 55–73
- Schäfer-Weiss, Dorothea, and Jens Verseemann, 'The Influence of Goethe's Farbenlehre on Early Geological Map Colouring: Goethe's Contribution to Christian Keferstein's General Charte von Teutschland (1821)', *Imago Mundi*, 57.2 (2005), 164–84
- Schäring, Jeanette, *Matter in Motion and the Mysticism of Nature's Colour* (Billdal: Förlaget 284, 2017)
- Schiff, Julius, *Naturwissenschaftliche Gleichnisse in Goethes Dichtungen, Briefen und literarischen Schriften* (Berlin, Heidelberg: Springer, 1932)
- Schilperoord, Peer, 'Anschauende Urteilskraft', *Elemente der Naturwissenschaft*, 89 (2008), 42–59

- Schmitz, Kenneth L., and Paul O'Herron, *The Texture of Being: Essays in First Philosophy* (Washington, DC: Catholic University of America Press, 2007)
- Schnyder, Peter, 'Die Dynamisierung des Statischen. Geologisches Wissen bei Goethe und Stifter', *Zeitschrift Für Germanistik*, 19.3 (2009), 540–55
- Schöne, Albrecht, *Goethes Farbentheologie* (Munich: C.H. Beck, 1987)
- Schreiber, Georg, *Der Bergbau in Geschichte, Ethos Und Sakralkultur* (Cologne and Opladen: Westdeutscher Verlag, 1962)
- Schweiger, Franziska, 'Networking Matters: Literary Representations of Materiality in Stifter's "Nachsommer"', *Colloquia Germanica*, 47.3 (2014), 201–16
- Segebrecht, Wulf, *Johann Wolfgang Goethes Gedicht 'Über allen Gipfeln ist Ruh' und seine Folgen: Zum Gebrauchswert klassischer Lyrik: Text, Materialien, Kommentar* (Munich, Vienna: Hanser, 1978)
- Semper, Max, *Die geologischen Studien Goethes* (Leipzig: Verlag von Veit & Comp., 1914)
- Sengle, Friedrich, *Das Genie und Sein Fürst: Die Geschichte der Lebensgemeinschaft Goethes mit dem Herzog Carl August von Sachsen-Weimar-Eisenach: Ein Beitrag zum Spätfeudalismus und zu einem Vernachlässigten Thema der Goetheforschung* (Stuttgart: Metzler, 1993)
- Sepper, Dennis L., *Goethe Contra Newton: Polemics and the Project for a New Science of Color* (Cambridge: Cambridge University Press, 1988)
- Shaffer, Elinor S., 'Metaphysics of Culture: Kant and Coleridge's Aids to Reflection', *Journal of the History of Ideas*, 31.2 (1970), 199–218
- , *The Third Culture: Literature and Science* (Berlin: De Gruyter, 1997)
- Shamel, Safiq, *Goethe and Hafiz* (Bern, Switzerland: Peter Lang UK, 2013)
- Shapshay, Sandra, 'Contemporary Environmental Aesthetics and the Neglect of the Sublime', *The British Journal of Aesthetics*, 53.2 (2013), 181–98
- Sheehan, James J., *German History: 1770-1866* (Oxford: Clarendon Press, 1994)
- Silver, Brian L., *The Ascent of Science* (Oxford: Oxford University Press, 1998)
- Sitter, John, 'Eighteenth-Century Ecological Poetry and Ecotheology', *Religion & Literature*, 40.1 (2008), 11–37
- Smith, Cyril Stanley, and John G. Burke, *Atoms, Blacksmiths, and Crystals; Practical and Theoretical Views of the Structure of Matter in the Seventeenth and Eighteenth Centuries* (Los Angeles: William Andrews Clark Memorial Library, University of California, 1967)
- St. Clair, William, *The Reading Nation in the Romantic Period* (Cambridge: Cambridge University Press, 2004)
- Steiner, Rudolf, *Goethes Weltanschauung* (Berlin: Philosophisch-Anthroposophischer Verlag, 1921)
- Stephenson, R. H., *Goethe's Conception of Knowledge and Science* (Edinburgh: Edinburgh University Press, 1995)
- Steuer, Daniel, 'Goethe and Wittgenstein on the Limits of Science: Towards a Critique of Abstraction', *Publications of the English Goethe Society*, 71.1 (2001), 50–61
- Strunz, Franz, 'Zaubersteine', *Sudhoffs Archiv für Geschichte der Medizin und der Naturwissenschaften*, 33.3/4 (1941), 233–48

- Sullivan, Heather I., 'Seeing the Light: Goethe's Märchen as Science-Newton's Science as Fairy Tale', *Goethe Yearbook*, 14.1 (2006), 103–27
- , 'Ecocriticism, Goethe's Optics and "Unterhaltungen Deutscher Ausgewanderten": Emergent Forms versus Newtonian "Constructions"', *Monatshefte*, 101.2 (2009), 151–69
- , 'Dirty Nature: Ecocriticism and Tales of Extraction - Mining and Solar Power - in Goethe, Hoffmann, Verne, and Eschbach', *Colloquia Germanica*, 44.2 (2011), 111-131
- , 'Faust's Mountains: An Ecocritical Reading of Goethe's Tragedy and Science', in *Heights of Reflection: Mountains in the German Imagination from the Middle Ages to the Twenty-First Century*, ed. by Sean Ireton and Caroline Schaumann (Rochester, New York: Camden House, 2012), pp. 116–33
- , 'Material Ecocriticism', in *Ecocriticism: Eine Einführung*, ed. by Gabriele Dürbeck und Urte Stobbe (Cologne and Weimar: Böhlau Verlag, 2015), pp. 57-67
- Swales, Martin, 'Enlightenment and the Transnational Literary Text: Reflections on Goethe's Faust. A Tribute to T. J. Reed', *Publications of the English Goethe Society*, 86.3 (2017), 131–38
- Tanner, Laura E., 'Holding On to 9/11: The Shifting Grounds of Materiality', *PMLA*, 127.1 (2012), 58–76
- Teal, Randall, 'Immaterial Structures: Encountering the Extraordinary in the Everyday', *Journal of Architectural Education (1984-)*, 62.2 (2008), 14–23
- Thalberg, Irving, 'Immateriality', *Mind*, 92.365 (1983), 105–13
- Treadaway, Cathy, 'Materiality, Memory and Imagination: Using Empathy to Research Creativity', *Leonardo*, 42.3 (2009), 231–37
- Trybulec, Marcin, 'Bridging the Gap between Writing and Cognition: Materiality of Written Vehicles Reconsidered', *Pragmatics & Cognition*, 21.3 (2013), 469–83
- Turner, Henry S., 'Lessons from Literature for the Historian of Science (and Vice Versa): Reflections on "Form"', *Isis*, 101.3 (2010), 578–89
- Vine, Steve, 'Blake's Material Sublime', *Studies in Romanticism*, 41.2 (2002), 237–57
- Vogel, Jakob, 'Stony Realms: Mineral Collections as Markers of Social, Cultural and Political Spaces in the 18th and Early 19th Century', *Historical Social Research / Historische Sozialforschung*, 40.1.151 (2015), 301–20
- Wagenbreth, Otfried, *Goethe und der Ilmenauer Bergbau* (Weimar: NFG, 1983)
- Warr, Cordelia, 'Materiality and Immateriality', *Material Religion*, 6.3 (2015), 372-373
- Watts, W. W., 'Geological Maps', *The Geographical Teacher*, 2.4 (1904), 166–68
- Wellbery, David E, *Johann Wolfgang von Goethe: Harzreise im Winter. Eine Deutungskontroverse*. (Paderborn: Ferdinand Schoeningh, 1984)
- Wells, George A., *Goethe and the Development of Science, 1750-1900* (Alphen aan den Rijn - The Netherlands: Sijthoff & Noordhoff, 1987)
- , 'Über den Granit – Schriften zur Gestaltung der Erdrinde', in *Goethe-Handbuch: Band 3: Prosaschriften*, ed. by Hans-Dietrich Dahnke and Regine Otto (Stuttgart: J.B. Metzler, 1998), pp. 666-673
- Wenzel, Manfred, 'Der Ilmenauer Bergbau und sein Einfluß auf Goethe als Dichter und Naturforscher', *Medizinhistorisches Journal*, 22.1 (1987), 3–27



- Werner, Abraham Gottlob, *Von den äusserlichen Kennzeichen der Fossilien* (Leipzig: n.pub., 1774)
- White, Lynn, 'The Historical Roots of Our Ecologic Crisis', *Science*, 155.3767 (1967), 1203–7
- Wilkinson, Elizabeth M., "'Tasso: Ein Gesteigerter Werther" in the Light of Goethe's Principle of "Steigerung": An Inquiry into Critical Method', *The Modern Language Review*, 44.3 (1949), 305–28
- Williams, Charles A., 'James Thomson's "Summer" and Three of Goethe's Poems', *The Journal of English and Germanic Philology*, 47.1 (1948), 1–13
- Williams, John R., *The Life of Goethe: A Critical Biography* (Oxford: Blackwell, 2001)
- Willis, Martin, *Vision, Science and Literature, 1870-1920: Ocular Horizons* (London: Pickering & Chatto, 2011)
- Wiseman, Boris, 'The Materiality of Color', *The Senses and Society*, 8.2 (2013), 223–31
- Wolff, Hans, 'Goethes Kenntnisse der Alpen im Lichte der modernen Geologie', *Sudhoffs Archiv*, 70.2 (1986), 143–52
- Wootton, David, *The Invention of Science* (London: Penguin, 2015)
- Wright, C. J., 'The "Spectre" of Science. The Study of Optical Phenomena and the Romantic Imagination', *Journal of the Warburg and Courtauld Institutes*, 43 (1980), 186–200
- Wunderlich, Falk, 'Materialism in late Enlightenment Germany: a neglected tradition reconsidered', *British Journal for the History of Philosophy*, 24:5 (2016), 940 – 962
- Wyder, Margrit, 'Von der Stufenleiter der Wesen zur Metamorphosenlehre: Goethes Morphologie und ihre Gesetze', in *Von der Pansophie zur Weltweisheit*, ed. by Hans-Jürgen Schrader and Katharine Weder (Berlin, New York: De Gruyter, 2004)
- Young, Davis A., *Mind over Magma* (Princeton, New Jersey: Princeton University Press, 2003)
- Zemplén, Gábor Áron, 'Structure and Advancement in Goethe's Morphology', in *Marking Time*, ed. by Joel Faflak, *Romanticism and Evolution* (Toronto: University of Toronto Press, 2017), pp. 147–72
- Zietze, Sylvia, *Light and Consciousness: Analysis and Stage Concept of Goethe's Fairytale of the Green Snake and the Beautiful Lily* (Frankfurt am Main: Lang, 2005)
- Ziolkowski, Theodore, *German Romanticism and Its Institutions* (Princeton: Princeton University Press, 1990)
- Zumbusch, Cornelia, 'The Metamorphoses of Otilie: Goethe's *Wahlverwandtschaften* and the Botany of the Eighteenth Century', *European Romantic Review*, 28.1 (2017), 7–20