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Leslie, Esther (2012) The black spectrum – from coal to colour. In: The Penzance Convention, 17-20 May 2012, Penzance, UK. (Unpublished)

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Esther Leslie: The Black Spectrum – From Coal to Colour

Some time ago I wrote a book about coal, about how this dark substance from deep in the ground released from itself a rainbow of colours, inaugurating a synthetic world. The story I tell is a specifically German one. The coal-based chemical industries of colour synthesis develop from the middle of the nineteenth century. The story of Hoechst AG is typical. The factory was founded in 1863 (under the name “Tar Colour Factory Meister Lucius & Co.”) for the production of aniline dye. The first colouring material produced there was a red magenta dye (fuchsia). Characteristic of Hoechst, as of all the German chemical industry, was its ability to devise substitute (or *ersatz*) materials to compensate for lacking natural resources. German chemistry was cooked up in the pans and glass tubes of hobby scientists with alchemical zeal. They sought substances such as synthetic colours in red and blue, cheaply coaxed metallic matter and gemstones, or industrially produced soda ash and guano. Time's dominion was to be cracked too through the accelerating power of chemical reaction. Artificial treasures were chased, to supply burgeoning industries in a land without colonies and without its own expansive natural resources. Hoechst's story is repeated in part at Badische Anilin- & Soda-Fabrik. BASF was founded in 1865 to produce coal-tar dyes. Its first products were aniline dyes, whose success was enmeshed with that of the textile industry. In 1871 the red dye alizarin, a pure alumina lake, was synthesised. Other synthetic pigments followed, of which indigo was probably most important. Later, in the years of two world wars, German industrial chemistry came to play a devastating role on the world stage, most notoriously under the name of IG Farben. My book traced some of that story.



[The purpose-built headquarters of IG Farben in Frankfurt, festooned with National Socialist flag. Photo credit: taken from *Erzeugnisse unserer Arbeit*, IG-Farbenindustrie-Aktiengesellschaft (Frankfurt, Main), 1938]



Zyklon B, the lethal gas manufactured by an I.G. dominated company and made for use at Auschwitz without the indicator, a warning odor.

[A can of Zyklon B gas, product of the German chemical industry, under control of IG Farben. Photo credit: From Joseph Borkin, *The Crime and Punishment of IG Farben*, The Free Press, New York, 1978]

My interest was to find out something about capitalism as a mode of extraction. It is a double extraction, firstly of nature's subterranean treasures, to put it somewhat Romantically, and then secondly, as science and technology extracts from that darkness a panoply of colours. In my book, there is, in a sense, a parallel proposed between that nature down there, that is subject of extraction, which is then converted into riches, and that factory proletariat down there, the class at the bottom, who comes to process the chemicals, and from whom labour power is extracted. From this working class, in turn, there is a second extraction, that of surplus value. This is a conversion too: the conversion of labour power into profit.

Coal into colour - this is for me an emblem of the processes of capitalism, with its peculiar mode of turning something into its opposite, transforming something darkly inaccessible into something dazzling, captivating and attractive, transmuting human activity into private property, turning the universal metals of nature into the particular metals of money – and then, later, into paper or liquid crystal registrations on a screen, or turning fantastical Romantic philosophy of nature into nightmarish rational science.

There is a vignette in Walter Benjamin's 1930s memoir *Berlin Childhood around 1900* called 'At the Corner of Steglitzer and Genthiner'.¹ Benjamin conjures up a visit to an aunt. In a preparatory note for this vignette Benjamin jots down the line 'The mineworks of Falun on the dining room table. How, out of fear, I bent myself further and further over the table'.² Falun was the site of a mine in Sweden, well-known for its copper, extracted from iron pyrites, and for its gold, silver, lead, sulphur and green vitriol, interred in its many kilometres of talc and mica-lined tunnels, galleries and shafts. The mineworks at Falun were notorious for fateful cave-ins, which took on fantastical forms in literature and music.³ In the times between implosion and explosion wealth was amassed at Falun, as elsewhere, through hard graft. In the darkest tunnels lay the brightest gemstones and metals. Benjamin observes of the model of the mineworks:

¹ See Walter Benjamin, 'Berliner Kindheit um 1900' [1938], *Gesammelte Schriften* volume VII, part 1 (hereafter G.S.), Suhrkamp, Frankfurt/Main 1991 pp.398–400. Another version appears in *Berliner Chronik* [1932] G.S.VI, Suhrkamp, Frankfurt/Main 1991 p.472. It is in English as 'Berlin Childhood around 1900', Walter Benjamin, *Selected Writings* volume 3, 1935–1938, Harvard University Press, Cambridge MA 2002. 1932's *A Berlin Chronicle* is in Walter Benjamin, *Selected Writings* volume 2, 1927–1934, Harvard University Press, Cambridge MA 1999 pp.600–1.

² Walter Benjamin, Notes for *Berliner Chronik*, in G.S.VI Suhrkamp, Frankfurt/Main 1991 p.800.

³ In 1819 ETA Hoffmann wrote a story about a miner's death at Falun in 1670. Others were inspired by the same true story. Heinrich Heine wrote a ballad. Richard Wagner sketched the outline for an opera called *Die Bergwerke von Falun*. Later Georg Trakl and Franz Fühmann used the theme.

For no sooner had I entered than she took care to see that the big glass cube was set before me – a cube enclosing a whole living mining operation, with little miners, face workers, and pit foremen with carts, hammers, lanterns moving with the precision of clockwork. This toy – if one may call it that – dated from a time when even the child of a wealthy bourgeois family was permitted a view of workplaces and machines. And of all of them, the mine had always been singled out, because it could point not only to the treasures that hard labour had wrung from it for the benefit of all industrious workers, but also to the silver gleam in its veins to which the Biedermeier period, along with Jean Paul, Novalis, Tieck and Werner had lost its heart.

Benjamin evokes the double-sidedness of the mine – industry and fantasy. First industry: the mine is a place of labour, wealth, production. Benjamin points out the ideology of this toy mineworks – it presents the virtue of hard labour, carried out by another class than the one who hosts its replica in its fine drawing rooms. As coal mine, it is the basis of all other industrial production – coal transforms into energy for further production, but it also forms the basis of chemically-derived substitute products, and as metals mine or minerals mine it is a place where concentrated natural deposits could be wrung from an earth that gave up its riches only reluctantly, and sometimes took life in return in notorious cave-ins and explosions. Through labour, wealth is amassed and nature is transformed. Coal is the very matter of transformation. Gold and silver and gems can be collected virtually in their natural state and their beauty brought up to the upper world, where they transform into concentrated value. Through labour, wealth is amassed and nature is transformed.



[Concept art for the Seven Dwarfs Mine Train roller coaster ride under development at Fantasyland in Disney's Magic Kingdom Park. Photo credit: <http://entertainmentdesigner.com/>]

Many of the hippest intellectuals studied mining, and geology, Germany's fashionable new sciences, in the early 19th century. And Goethe, who administrated the reopening the silver mines at Ilmenau,

keen not to be simply a bureaucrat, familiarised himself with the technological aspects of mining. Friedrich von Hardenberg was a student at the Bergakademie (Mining Academy) in Freiberg in 1800, and completed a geological inventory on 'bituminöse Holzerdenlager' (bituminous carboniferous layers) in Central Germany.⁴ He worked as an inspector of saltworks and mines till his early death in 1801, and his reports on the different extraction methods and processes of brown coal, which until then had been used only by chance as a fire material, nudged the Industrial Revolution into being, though coal took a while to be established as major energy source in Germany. Factory owners were not keen, in the absence of good channels of distribution, and peasants and agricultural workers were keener to take their fuel illegally and for free from fallen branches in the forest, as Marx's first political-journalistic writings would note in its examination of the implications around the fact that the theft of wood was the most frequent crime in nineteenth century Saxony. By night, under the pen name Novalis, von Hardenberg writes more on the mines, but this time Romantically, fantastically. He writes of the wise miner, who possesses a peculiar happiness that eludes the mechanisms of exchange, his relationship to matter aesthetic and sensual. It is enough for him that he knows where the sparkly and glittery deposits lurk, and that he is able to draw them into the light. Novalis picks out metals and minerals as inherently socialistic – and if their nature is abused, they turn against the abuser, dragging their opponent down by nature's revenge.⁵

Coal was the key substance for making machinery turn its wheels and fire its pots and produce its gases. Made at the back of time and in the belly of the earth, this compact substance was hauled up to produce rapid change on the earth's surface. Philosophers speculated on the origins of the earth and all its contents. Natural philosophers turned natural historians probed and gazed and poked and fondled matter. Alchemists turned chemists and the world was not only to be known in all its parts: it might too be remade in theory and recast in laboratories. In the 1830s the most spectacular transformation occurred. Coal gave up the entire spectrum of colour, releasing the deposits of the past that had been locked in to its compact darkness. Colour glittered forth from blackness. It was a kind of magic. Coal reintroduced wonderment into chemistry. What it conjured forth was miscellany from non-appearance. Coal's apparent magic was in its ability to transform into its opposite. Coal is the sedimentation of everything, a concentration that might come poetically to

⁴ See F. v. Hardenberg (Novalis), Bericht an Abraham Gottlob Werner vom 28. April 1800 (Über unsere Erdkohlenlager). Faksimileausgabe der Bergakademie Freiberg, Freiberg 1992, p773-790.

⁵ Just as Adorno and Horkheimer would insist in 'Dialectic of Enlightenment'. For example, in relation to one's own body as natural, they write: 'In man's denigration of his own body, nature takes its revenge for the fact that man has reduced nature to an object for domination, a raw material.' (T. W. Adorno and Max Horkheimer, *Dialectic of Enlightenment*, Verso, London, 1979, pp. 232-233). Until eventually: 'All the contrived machinery of modern industrial society is merely nature tearing itself to pieces'. Nature's revenge is expressed specifically in fascism.

seem like the very ‘night of the world’⁶, which replaces all that has disappeared from it – warmth and light and colour. Its antitheses are contained within it. It can be coaxed to release these things again. As a book published by IG Farben on the history of organic chemistry, the chemistry of carbon and its compounds, expressed it in 1938: the shiny black of coal deposits had locked inside of them a previous world of life, and all its colours.⁷



[Fabrics from the 1930s, coloured by the then latest long-lasting synthetic dyes. Photo credit: taken from *Erzeugnisse unserer Arbeit*, IG-Farbenindustrie-Aktiengesellschaft (Frankfurt, Main), 1938]

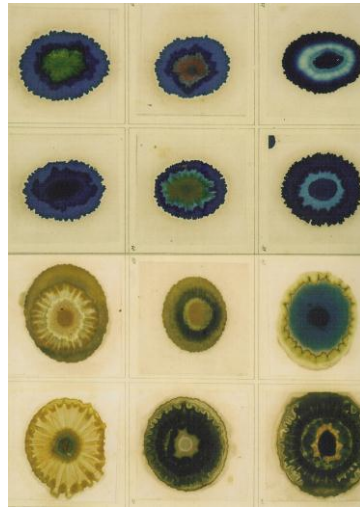
That composite deadness, black but multi-coloured, dead but once teeming with original life, could again release from itself life, for, as Goethe put it in *Faust*, ‘Am farbigen Abglanz haben wir das Leben’, ‘Life exists in colourful reflections’. The transformation must seem alchemical, like rubbish into gold, decomposed matter becomes coal, and then in addition, that waste’s waste, coal tar, becomes colour. Dark coal becomes the very stuff of organic chemistry, as well as industry. It is the bringing of waste back into circulation. Nothing is foreign to the system, rather it is all a matter of how it re-circulates. This was the future work of chemistry, the rising industrial science: to reproduce the world synthetically and from the cheapest stuffs. The chemist Friedlieb Ferdinand Runge made the first step into this region isolating aniline from coal tar. From the tarry waste of Novalis’ coal Runge painted a synthetic rainbow.

⁶ This is an image from Hegel’s *Jena Realphilosophie*.

⁷ *Erzeugnisse Unserer Arbeit*, (no author given) IG Farbenindustrie Aktiengesellschaft, Frankfurt/Main 1938 p.25.



[One of Runge's chromatographic patterns. Photo credit: Senckenbergische Bibliothek, Universitaet Frankfurt]



[Friedlieb Ferdinand Runge's chemical reactions on blotting paper, from the 1850s. With these he identified what he called a 'creative drive' (Bildungstrieb) in matter. Photo credit: Senckenbergische Bibliothek, Universitaet Frankfurt]

The locus of production and profit, the mine is also something else: a place of dreaming. In the mine, the Romantics found a fantastic subterranean realm in which beauty and mystery ruled. Just at the same time as a burgeoning science meshed with industrial needs and much energy was expended on novel chemical wonders, fabricated in new factories that sprang up alongside the rivers and in the forests, marking anew the German landscape, the Romantics were dreaming of another world of easy natural abundance.



[Ten Tola Swiss Gold Bars. Photo credit: From Andrej Anikin, Gold, Verlag Die Wirtschaft Berlin (East), 1980]

Riches, gemstones, diamonds, gold and silver were experienced as trapped under the crust of Germany's earth or buried in the German mountains. How did the chemical and geological investigations of a banal material – coal, as well as other minerals and chemicals – give rise to a 'poetics', framed against the backdrop of an emergent mining industry and in relation to traces of alchemical thought and Romantic natural history and philosophy? German Romantics, in their stories and fairytales, recognised that beneath the crust of the earth was a realm of untold riches.

Typical of Romantic thought is the following scenario: miners or poets spy the secret centre of the earth, generous and bountiful and endlessly beautiful. They also see a guarding spirit, whom they betray, casually revealing the treasures or misusing them for personal gain. This is as familiar from the folktale of Grimm as from the artistic fairy tales of Tieck or others. In both, industry opens up to fulfilment only to slam shut again, leaving just desire and recollection. The mine's precious contents mirror the mind's precious contents, desires and memories that fuel life, but may evaporate when exposed to the cold air of reason. Raised to the surface, the mine's contents are forced into social time and social histories. Still down below, time goes awry, or as folklore thought, was immobilized. The multiply told tale of the petrified body of a miner at Falun was emblematic of these. In 1719, in the copper mines at Falun, at a depth of 130 metres, the perfectly preserved body of a young man was found. In 1670 this young miner had died in the mine. His body, found between two shafts, had lain seeped in green vitriol for half a century. The body was soft at first and then, when brought to the surface, turned hard as stone, its features fixed as at the moment of death. Time goes awry in the cave. The corpse was placed, Snow-White-like, under glass to protect it from the elements, but the efforts failed. It crumbled into dust, but not before a grey-haired old lady, passing on crutches, happened to recognise the still youthful features of her fiancé. One dead man raised from the grave, with the face of a youth, and one decrepit old body seized by youthful love.⁸

In the cave, the past juts into the present - the ancient actions of water, heat, animal and plant decomposition form rock and coal and gemstones. In the mine too, the kingdoms of separation go awry. The Romantically inclined geologists believed that the mineral world paralleled our own world. The contents of the earth were born of a tumultuous earth copulation, and since that time - at a slower pace than us - it too, like us, was striving to refine itself.⁹ Metals are combustible, suggesting a chemical affinity with organic matter, and their colours and shapes resemble forms in the upper world. Minerals and metal reflect us, as they strive to inhabit the higher world, just as we strive to be closer to God. The forces of anorganic nature repeat themselves at a higher strength in organic nature. Gotthilf Heinrich Schubert's influential study, *Ansichten von der Nachtseite der Naturwissenschaft* (Views from the Dark Side of Science) [1808], reported on a realm of nature that was not visible simply from or to our perspective, but which is close to us and in some way is a memory of our own past as we emerged from mud. The transition from the kingdom of minerals to that of plants and animals passes through metal, writes Schubert - that is we emerge of metal

⁸ G.H. Schubert, *Ansichten von der Nachtseite der Naturwissenschaft*, Dresden in der Arnoldischen Buchhandlung 1808 pp.215–6.

⁹ See S.T. Coleridge's marginalia on his copy of G. Schubert's *Nachtseite der Wissenschaft*, as held in the British Library

'The whole kingdom of metals seems to have arisen at the boundaries of the two worlds, from the decline and deterioration of the anorganic, and to bear within itself the seeds of the new organic age.

Schubert was seeking the point of continuity from anorganic life to organic life and chose metal - when later scientists would discover carbon – 'the organic element' - as the link, relating us rather to diamond, graphite, coal.

In grasping this beautiful and manifold world of coal, minerals or chemicals, investigators were directed by a Romantic philosophy of nature, with its sense of animism of the object world of nature and its notion of dynamic and polar forces at play. The poles meet – polar thinking can be dialectical. In exposing to the light of day and dream of night this new layer, they inaugurated a logic of extraction that would commute human labour power into an extractable substrate.

What type of extractions fill our factories and our fantasies now? We live in a new age of extractivism, the name for a wave of vast destructive pillaging of old and rare earth metals. The delicate responsiveness of the surfaces of our touchscreen devices derives from a violent cracking and plundering deep into the earth's crust. But dreams or thoughts of that hard act are rarely evoked by the bright attractions of the screen.

Extraction too becomes somewhat invisible, immaterial even. Our oil rigs may be joined by new structures, moored off the coast of California, in order to evade visa restrictions. These seasteading platforms, such as Blueseed, near Silicon Valley, provide living and office space in order to 'incubate' the idea of visaless 'entrepreneurs'. What novel extractions are yet to be dreamt up?