Susanne Kriemann: Ge(ssenwiese), K(anigsberg) – Library for Radioactive Afterlife
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Exclusion Zones

Eva Wilson

States of decay

Uranium-235, used in power plants and nukes, has a half-life of 703.8 million years; caesium-137's half-life is approximately 30 years. You might encounter the latter during radiation therapy, or when authenticating wine, or simply because it spreads easily in nature, for example after a nuclear disaster. Both isotopes are instable and, as is the nature of nuclear radiation, in a state of constant decay. Their energies are highly excited and nervously discharge in all directions as beta and then gamma rays, like an itchy impulse, an involuntary seepage, until their spent nuclei settle as more stable elements. At the end of its long process of entropy, uranium becomes lead, a dense and unreactive heavy metal (just consider its Latin name, *plumbum*).

Uraninite, or pitchblende, is a radioactive mineral and ore that can be refined to recover uranium and radium. Large deposits of uraninite were discovered in the Ore Mountains in the regions of Thuringia and Saxony in Germany as early as the fifteenth century. At the time, the leady, fatty black substance was deemed worthless and discarded to decay on the mine dumps. But pitchblende, which changes colour when it oxidises, was soon rediscovered and retrieved from the slag heaps, to be put to use to make olive-green, grey, and ochre pigments.

And so, painters in the seventeenth and eighteenth centuries used concoctions of oxidised uraninite mixed with fresh-egg tempera or oil made from local walnut crops to produce paintings that we now know are radioactively contaminated. Look at them and they will look back at you, not by means of the refracted sunlight glistening off their varnish in all the colours of the visible spectral range, but by the stealthy emanation of their own energies, radiating not just to your eyes, but through your clothes, your hair, and all the cells of your body.

Since 2016, Susanne Kriemann has joined a group of researchers, geologists, and biologists from, among other institutions, Friedrich Schiller University Jena, who are analysing the quantities of toxic and radiating elements in the ecosphere of the fields surrounding the mines operated by the now defunct mining company SDAG Wismut (a Soviet-German stock company) in the Ore Mountains of the former German Democratic Republic. Kriemann has gone on to collect contaminated plants from the local Gessenwiese, a meadow within the zone of rehabilitation, and Kanigsberg, a formerly mined mountain, in order to use them as active agents in her photograms or ingredients for pigments. Apart from uranium, the soil and vegetation from the former mining areas contain traces of lanthanum, ittrium, gadolinium, lead, copper, aluminium, argentum, vanadium, germanium, potassium, and other heavy metals and rare earth elements.

Her extractions from the zones of rehabilitation have since fed into a multitude of visual, archival, and textual work and research, traveling conceptually and geographically along the circuits of contemporary art. Appearing, on the surface, to set out as highly situated inquiries into the topographies of some slag heaps, some mountains, of regional flora, and locally isolated histories, her subject matter proves, at second glance, to amalgamate narratives of global political events and to permeate material, aesthetic, and energy economies as well as vast temporal expanses across geological time. Kriemann doesn't fail to bring these troves into play materially rather than merely symbolically or representationally. That is, seeing Kriemann's research and works exhibited, or reading about them in a book, also means being implicated in a most radical way: by means of radiation.

Extraction

The history of SDAG Wismut begins with the German capitulation in 1945, which put an end to the proclaimed eternity of the Thousand-Year Reich that reigned for twelve interminable years. While American forces were scrambling to secure German V-2 ballistic missile technology and human intelligence in the Harz Mountains, Soviet specialists set out to investigate the uranium deposits in Saxony and Thuringia that had until then remained largely overlooked. On September 14, little more than a month after Little Boy and Fat Man detonated over Hiroshima and Nagasaki, the Soviet Union founded the Sächsische Erzsuchabteilung, the so-called Saxon ore search unit, which operated under military direction. In 1947, the mines in the Ore Mountains quarried 145 tonnes of uranium and quickly went on to become the largest provider of the element for the USSR, producing, in secret, around 10,000 tonnes by the end of 1953. Several mines in the areas of Schneeberg, Johanngeorgenstadt, Annaberg-Buchholz, Marienberg, and Ronneburg were annexed by the USSR and became part of the state-run Wismut AG.
Workers were initially recruited from the surrounding area by way of forced labour, following Gulag discipline methods such as the withdrawal of food rations and military tribunals for alleged misconducts. Wismut's sites became closed military zones and were heavily guarded by Soviet troops. After 1947, following protests, conditions for workers improved, and by the 1950s, the notoriously arduous and dangerous work at the Wismut mines came with extra privileges to sweeten the deal: high wages, regular deliveries of schnapps, access to desirable apartments, and moreover a growing pride in the mining culture and community of *Kumpel* (pitmen). At its zenith, the Wismut AG employed more than 130,000 people and generated the majority of uranium required for the Soviet nuclear program.
Three decades later, by the end of the 1980s, with global prices for uranium falling and resources in the Ore Mountains depleted, Wismut's main buyer, the USSR, failed to pay for its debts or uphold deals, plunging the company into grave financial trouble. In 1990, the GDR and USSR agreed to halt all production. Following the fall of the Wall and later the breakup of the Soviet Union, the SDAG Wismut AG was dissolved and absorbed by the Federal Republic of Germany. All responsibilities for the clean-up of the gigantic ecological damage caused by the now defunct mining company subsequently fell to the Federal Republic of Germany. Today's Wismut GmbH (now a limited liability company) employs around a thousand people whose task it is to rehabilitate an area that will most likely remain contaminated for thousands of years.
And so, the long history of extraction and global dissemination of natural resources from the area ended abruptly with the collapse of the nation states whose territorial and exterritorial claims to the land evaporated with them. Nuclear half-life, however, is not subject to geopolitics. Agriculture in the densely populated Wismut area has today made way for vaguely hazardous recreation grounds. The harvesting and extraction on the Gessenwiese test field in East Thuringia now serves the purpose of attempting to protect animals and humans from the dangers of its contamination, however limited this may be in comparison to other global sites of radioactive fallout. The experience gathered here is exemplary of contemporary remediation of radiologically polluted areas and shared by Wismut with other post-nuclear locations internationally.
There has been speculation that the yellow cake for the Chernobyl power plant was created from pitchblende mined in the Ore Mountain mines, though forensic studies have not yet been made to prove such a hypothesis. Despite being a key source of the raw material that has lead to greater, catastrophic contamination elsewhere, the degrees of radioactivity in the area itself are diffuse and murky, and nearly impossible to zone off. Still, it is thought that safe human consumption of groundwater, soil, and air from the area will not be possible for another 100,000 years.
And so, in the grey zone of geopolitics and elevated but not disastrous radiation levels, nature has resumed its wild proliferations. Oblivious local livestock continues to ruminate the fresh grass that grows on fields just beyond the confines of the exclusion zone — boundaries that are the consequence of policies that choose to ignore the expansive nature of industrial contamination in favour of a fictional reality geared toward the parameters and perimeters of Strahlenschutz

(radiation protection). The two monumental cone-shaped slag piles of mining waste that for years dominated the horizon near Ronneburg as man-made Alps (*Alptraum* also means "nightmare" in German) were removed to make way for the Bundesgartenschau, the German federal horticulture show of 2007. The current Wismut GmbH, the federal successor of the old SDAG, is actively remediating 570 hectares of sludge ponds containing the tailings from the uranium refinement process. When left to dry out, the radioactive dust of these tailings can be carried great distances by the wind, reaching the doors and windows of most of the taxpayers who contributed to the 6 billion euros spent on remediation processes to date.

Energy fatigue

O sun, you middle-aged star. For the past 4.5 billion years, you have been embroiled in a process of incessant nuclear reaction — one that will continue for the same amount of time, until the hydrogen fusion in your core has diminished, your outer layers expand, you swell to become a Red Giant, and, in the process, you swallow the planets closest to you, including, most likely, Earth.
The sun's radiation, the symptom of its entropic decay, is the source not only of life, but also of time on Earth. Spiralling around our ageing star, we measure our lives in revolutions. Another ten or twenty revolutions from now, fossil fuels will be diminished and spent to the point of exhaustion. For the past few hundred million years, these fossils have harboured the energy of our sun deep under the pressure of the Earth's mantle and in the heat of its core. These are the sediments of prehistoric organic matter that at one time basked at the surface, responding to the spectral range of light that facilitates photosynthesis by consuming carbon dioxide and leaking oxygen, before sinking deeper toward the Earth's centre. Only much later would organisms develop the ability to break down cellulose, eventually preventing organic remains from fossilising.

Which is why, my coevals: we will never become fossils.

About 2.5 billion years ago, the chemical reactions of photosynthesis led to the so-called Great Oxydation Event (also known as the Oxygen Catastrophe or the Oxygen Revolution, depending on your perspective). This first event of mass extinction, thought to have been brought about by cyanobacteria, wiped out oxygen-intolerant, anaerobic organisms and created our current oxygen-based ecosphere. Maybe we can empathise, across the eons, while our ecosystem once again falls victim to mass extinction and our atmosphere transforms in preparation for future populations who might thrive on the toxic legacy of humanity. Toxicity is relative.
Notably, the spectral range of solar light visible to humans approximately matches the range of photosynthetically active radiation. Our eye has evolved to respond to stimulation by electromagnetic radiation within this spectrum as perception of colour, while a plant's pigments are able to convert it into chemical energy, releasing oxygen as a waste product, the air that we breath.

Underground, where there is no light, colour does not exist.

Today, the mechanics of extraction produced under the rule of a consumptive economy have excavated and brought to light — to the same nuclear light that formed them — the coal and oil and gas whose combustion sustains (and endangers) life on Earth. We live in a global economy of the sun, commodities' creation running on radiation, burning up time, millions of years, in just a century.
The vast majority of energy consumed on Earth is still solar, stellar. Nuclear reactor fuels, however, have no solar source. They are the product of several supernovae, the input of explosive debris of Earth's progenitor stars at the time of the planet's formation. Whether the origin of radioactive energy is extraterrestrial, or rather forms the core of the planet itself, its astronomical make-up and inception, is effectively indistinguishable.
And as much as human future is radioactive, what we know of the age of the Earth is too: human

knowledge of the past is extraterrestrial, irradiating, and entropic. In 1956, Clair Cameron Patterson, a US-American researcher who was previously involved in the Manhattan Project, developed uranium-lead (U-Pb) radiometric dating, using the decay chain of uranium incorporated in zircon (Earth's oldest mineral) as an indicator of time.[1] Uranium decays into lead with a half-life of 4.46 billion years. In Pasadena, Patterson created one of the first "clean rooms," a laboratory that prevented lead contamination from outside sources, in order to analyse the age of a Canyon Diablo meteorite (which had crash-landed in today's Arizona state 50,000 years ago) and from this, that of the solar system. Earth is only slightly younger than the sun: over a course of approximately 50 million years, the solar nebula collapsed into the solar disk, its dust agglomerating into planets and meteorites. (But of course it is tautological to assume the dimension of years here, there having been no Earth to orbit the toddling sun.)

Dispersion

While radiation is invisible to the naked eye, some photosensitive carriers can record it beyond the limits of the visible spectrum: this is how Susanne Kriemann was able to record autoradiographs of radioactive uranium sourced from the Johannesgeorgenstadt mine in Saxony from within a darkroom in a laboratory at the American Museum of Natural History in New York (*Pechblende (Prologue)*, 2014–2015). Some of the first dosimeters, personal film badges used to monitor cumulative radiation doses, were developed after scientists of the Manhattan Project realised that photographic film stored in the vicinity of radioactive materials had been exposed (in both senses). The image conjured from the film indicated invisible gamma rays, X-rays, and beta particles that were shooting through the labs, through the scientists, across time.

In fact, it had been a similar discovery by Antoine Henri Becquerel in 1896 that led him and Marie Curie to begin their research into the radioactive properties of elements: having left uranium salts on photographic plates in the confines of his bureau drawer in anticipation of an experiment that was supposed to expose the plates to the "excitation of incident rays" of the sun, he realised that the salt had affected and exposed the photographic emulsions even in darkness, leading him to investigate the invisible rays he had thus found. Two years later, Curie discovered polonium and radium using pitchblende from Thuringia. She named polonium after her native Poland, which, however, did not exist as an independent country at the time: divided under Russian, German, and Austro-Hungarian rule, Curie was drawing attention to its disintegration.

Working with plants harvested from the Gessenwiese in Thuringia, back in her darkened studio, Kriemann placed her crop on photosensitive paper, weighted the corners down with books that were at hand (issues of *Camera Austria, Afterall*, and *Texte zur Kunst*, Jonathan Crary's 24/7, and an Agatha Christie novel), and exposed the photograms by using the LED flashlight of her smart phone.[2] For a brief instant, the rare earth minerals inside her mobile device illuminated the harvested plants and their kindred elements, thereby exposing the photosensitive paper. Produced by electricity generated from coal, from nuclear and renewable sources, the discharge of the phone's flash completes a Promethean loop that spans an epic transnational industrial circumference, entangling stone coal from Columbia, Congolese coltan, Mongolian europium, numerous other raw materials, and countless hours of global labour, wrapped up in the strange credo emanating from the heliocentre's heart at 1 Infinite Loop, Cupertino, California. The photograms (simultaneously icon and index) show the black-and-white silhouettes of proliferating shoots and explosions of pollen that resemble images taken in cloud chambers or some kind of abstract expressionist firework.

Ge(ssenwiese) K(anigsberg) continues Kriemann's investigations into the hyper-lo-cal and nevertheless rhizomatic Wismut legacy. Her frequent visits to the sites have culminated in countless

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1 Clair Cameron Patterson, "Age of meteorites and the Earth," *Geochimica et Cosmochimica Acta 10* (1956): 230 – 237.

2 These works bear the name of the plants that they feature: Falsche Kamille, Wilde Möhre, Bitterkraut, 2016.

close-up photographs of native shrubs, grasses, and trees, showing us the plants in detail, often without offering a broader sense of the landscape. At times the images are repeated or superimposed on the page, like a graphic nervous tick. The accumulation of photographs is not exactly forensic, even though it encourages a gaze that searches for traces of anomaly. The viewer's revelation is that everything seems quite ordinary. It is in the insistent déjà-vu of the multiplied images that we gleam a flicker of the plants' unholy charge.

Michael Beleites' pictures, originally recorded covertly between 1986 and 1988 under high personal risk in an attempt to provide evidence of the monumental but secret activities of the SDAG Wismut, document how under the direction of the company geological volumes were shifted on a massive scale from mines to sludge landfills, replacing whole villages in the process, accumulating contaminated debris into waste dumps that resembled mountains. In some cases, as Beleites shows, the radiating rubble of the slag heaps was later used as building material for the foundations of streets, buildings, and playgrounds. In his publication *Pechblende*, he notes how through dust, wind, sandstorms, leaking trucks, wastewater and ground water, rivers, grazing animals, and harvests, contaminated soil, water, and air is dispersed far and wide.[3]

Today, the landscapes whose glacial and colossal transformation residents could witness for over thirty years have come to rest again. A gigantic effort to "repatriate" contaminated matter, to "recultivate" the slag heaps of the former mines, is underway. But of course, the spreading and diffusion of the polluted matter is unstoppable, entangled as it is with quite literally everything else. This book is Kriemann's attempt to capture, expose, and harvest material from these sites, to bind it, and also to feed it into a new circuit of distribution.

Text, itself a medium of distribution, relies on time as its agent. Despite its configuration as an immutable accumulation of letters on a page, written language is only intelligible through and in the time of its reader. Text makes multiple claims toward temporalities: it exists both across time and within the moment it is read — and, in the case of fiction, it also looks to the temporal space of its narrative diegesis, where the plotline is simultaneously immersive and distinct from the reader's, or the narrator's present.

Each copy of this publication comes with a special insert, pressed birch leaves and perhaps a crow leaf, collected from Gessenwiese. How should these deli-cate, preserved but disintegrating bodies be approached in the context of the book? May they be read? As a rhetorical device, a diegetic token, or a breaking of the fourth wall? As a somewhat nostalgic memento of a bygone summer and a walk in nature? As a prop, as evidence, as a gift? *Gift* in German means poison. As a threat then? By now you will suspect that Kriemann's leaves harbour another, fiercer presence: the leaves will, in ways invisible and illegible to the human eye, continue to emanate a kind of energy whose lifespan exists beyond any human dimension of time. These plants have absorbed not only an array of heavy metals and rare earths, but also traces of caesium-137, uranium-235, and other radiating substances found in the contaminated soil of the uranium mining sites in the Ore Mountains. The leaves are radioactive. Kriemann's harvest thus reclaims nature in a way that feeds into a different circulation than those that came before: she produces forensic, symbolic, and iconic evidence of the unseen hazards, evidence that is simultaneously melancholic and violent — a vicious work, harnessing radioactivity as a radical agent that continues to emit rays, entering the body of the viewer, the reader, the collector.

Exposure

The effects of radioactive contamination are cumulative and calculated on a basis of time and intensity. Low levels of radiation, such as those of Kriemann's herbarium, are harmless (some studies even suggest positive and stimulatory effects of low doses for organisms). The longer the

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3 Michael Beleites, *Pechblende – der Uranbergbau in der DDR und seine Folgen* (Lutherstadt Wittenberg: Kirchliches For-schungsheim Wittenberg, 1988); the manuscript was later published as *Altlast Wismut. Ausnahmezustand, Umweltkatastrophe und das Sanierungsproblem im deutschen Uranbergbau* (Frankfurt am Main: Brandes & Apsel, 1992).

exposure at higher levels lasts, the worse the damage. Rays and particles enter the body and damage the genome or disrupt cellular metabolic processes, causing mutations that can become carcinogenic. Particles inhaled and retained in the body continue to radiate from within, breaking chemical bonds, transmutating chromosomes. Former inhabitants of towns in the vicinity of the Fukushima Daiichi Nuclear Power Plant are only allowed to return to their houses for thirty minutes every few weeks. The lethal dose of polonium-210 that was administered to Alexander Litvinenko at the Millennium Hotel in London in 2006 was so high that aircraft, restaurants, and hotels were contaminated in the course of the assassination.

In Chernobyl's exclusion zone, wild elk, boar, and wolves roam today. It remains unclear why nature's recovery is often so swift in areas with severe radioactive contamination. One possible explanation is that the carcinogenic effects of radiation cause mutations in organisms that make them vulnerable, diminishing their chances of survival. Only animals without mutations survive and thrive in ecospheres deserted by humans. And in the wake of nuclear fallout, plants become the archivists of contamination, their roots absorbing from and returning to the soil the radioactive particles.

Can we think of text as a kind of soil? A humus gestating sordid growth, bacteria and fungi digesting raw organic matter and regurgitating it as fertile ground? What if this soil was contaminated, its crop hazardous, its dust full of ionising radiation exposing pupils and respiratory tracts and concentrating in thyroid glands? Reading assumes the proximity of a pair of eyes to the page and its matter. Reading is a prolonged exposure to text, a bodily leaning into serifs and punctuations, eyes wide to receive the reflected light. What else have you ingested? Which cells have begun to modify, to turn against you, to give up this life cycle in favour of the next: what will it hold?

How long will it take species to develop a new sense that detects ionising radiation? Will it be an evolution of an organ that already exists? Will its development coincide with the complete depletion of fossil fuels? Can you, future beings, hear radiation? Can you smell it? See it? Taste it? Or have you formed a new sense altogether, one that we cannot imagine and you could not describe to us now, those who lack the words and the nerves for that tingle.

I assume, clumsily, that the "sound" of radiation would register to us like the auditory feedback of a Geiger counter, a crackling noise whose increasing frequency raises adrenaline levels. Jean-Luc Nancy describes hearing as contagion.[4] Sound is the movement of air that sets the body in motion, that spreads within the resonating body and cannot be contained or kept either wholly inside or outside. In contrast, an ontology of radioactivity cannot be written along the lines of contagion. Radioactivity instead must be understood as a phenomenon of contamination, decay, and transmutation. Imagining this future human (?), evolved and adapted to new, ubiquitously elevated levels of radiation, her radio-sensory organ might react to a spectrum of wavelengths that is not visible now.

This more sophisticated eye (if it is an eye) might have gradually learned to distinguish ultraviolet and then X- and gamma rays, evolving into Henry Fox Talbot's dream of a camera that can record images in a darkened room,[5] a revolutionary fantasy of vision that Kriemann, too, seems to have adopted. Where her earlier autoradiographs employ photochemistry to render radiation visible in Talbot's dark room, her zooming in on the vegetation of Gessenwiese and Kanigsberg in the photographs reprinted here brings to mind a paranoid, glitchy eye, straining to detect the plants' invisible contamination.

What to do in Afterlife

After 1949, when the Soviet Union conducted its first nuclear weapons test (First Lightning) at the Semipalatinsk Test Site in Kazakhstan using Wismut's uranium, the persisting escalation of the Cold War created an uncannily stable condition of equilibrium, one that could only be perceived as

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4 Jean-Luc Nancy, *Listening*, trans. Charlotte Mandall (New York: Fordham University Press, 2007), 14.

5 William Henry Fox Talbot, *The Pencil of Nature*, (London: Longman, Brown, Green and Longmans, 1844), 30.

a new permanent state. An ever-faster accumulation of nuclear arms set in motion a process of endless radioactive fallout. Today, nuclear tests around the globe have left ubiquitous traces of radiation, markers of the advent of the Anthropocene. No life without entropy, no half-life without decay.

In the Soviet Union, the so-called Atomgrads, sealed cities in which nuclear technology was assembled and tested, would appear on no official map or street sign. In Thuringia and Saxony, villages disappeared or meandered in the wake of various mining endeavours, a gigantic sculptural exercise that could move entire cities, create new landscapes, and mutate whole environments, thus upending any notion of *Heimat* (homeland) and accelerating tectonic events as if mankind had become titanic.

But really, mankind had become tired in Wismut-Land. The miners were heavy with constant fatigue and solemnly lacked the words to describe their subterranean life *unter Tage* (literally "beneath the day"):

"People there, it was said, were apathetic and listless and they themselves even complained about their perennial fatigue and wondered about those strange moments when they were somehow absent. There was a heaviness there, which hung over everything: over the seemingly endless series of days in the courtyard, over the garden, in the labyrinth of the outbuilding of the half-dead, post-collectivization estate."[6]

Today, their wives and widows inhabit the expensive houses afforded by their husbands' diminished (half-)lives. An approximated 20,000 miners died of or suffered lung diseases from the effects of radiation and radioactive dust. Extended exposure to alpha radiation caused constant damage to the miners' y-chromosomes: their offspring were more often female than male. A generation of nuclear women is the consequence of these cellular dramas, of their fathers' necropolitical wagers and the transgressions of transnational extraction.

The question remains: where should we look, what depth of field should we focus on, in the midst of entanglements that span such vast periods of time and are acted out indiscriminately across nation states as well as within cells, through the globalised neoliberal networks of distribution as well as by way of river currents and the movements of clouds? Kriemann's repeated attempts to arrest, to expose, to grasp the contamination of nature and the nature of contamination while embedded in the landscapes of Gessenwiese and Kanigsberg speak to this quandary: what are we supposed to do with it?

Her photographs of shrubbery are, in a way, unspectacular, despite the radicality of the transformations taking place both within plant cells and human tissue penetrated by Wismut's gift. Her work (and that includes book-making) attempts to come into contact with the drama of "unspectacular time," unobserved and unobservable, an "invisible, mutagenic theatre" that defies the rules of narrative.[7] No closure, then, no bottom line, no smoking gun, no catharsis. We are left trying to assume titanic eyes, pulling away to see the drama unfolding over the ages, if we are not caught up in the tragedies of proximity, the tumours, the metastases, the nausea, the fatigue. Administered in low doses and by way of the slow violence of mutation, there is death in life, and life in death.

6 Lutz Seiler, "The Territory of Tiredness," in Susanne Kriemann, *P(ech)B(lende) – Library for radioactive afterlife* (Leipzig: Spector Books, 2016), 194–207, here 195.

7 Both quotations from Rob Nixon, "Neoliberalism, Slow Violence, and the Environmental Picaresque," *MFS Modern Fiction Studies 55*, no. 3 (Fall 2009): 443–467, here 445.