KUNST HAUS WIEN
MUSEUM HUNDERTWASSER

PRESS RELEASE

Lake Bed Developing Process, 2013 © Optics Division of the Metabolic Studio

MINING PHOTOGRAPHY.
The Ecological Footprint of Image Production

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Just how sustainable is the 'eternal moment'? To what extent does the production of photographs contribute to man-made climate change? The exhibition MINING PHOTOGRAPHY. The Ecological Footprint of Image Production **looks at the extraction of the key raw materials used in photography from the perspective of science and art: how they are mined initially, how they are disposed of, and the impact on our environment. A history of materials in five acts!**

'The new *Mining Photography* exhibition is the highlight of the series of exhibitions at KUNST HAUS WIEN focusing on photography. In 170 works, numerous artists take a critical look at the sustainability of photographic art and its production. Through this exhibition, KUNST HAUS WIEN, as the first 'green museum', once again lives up to its role as interface between ecology, sustainability and art,' says Kurt Gollowitzer, Managing Director of the Wien Holding Group.

Gerlinde Riedl, Director, KUNST HAUS WIEN: 'The exhibition represents an exciting change of perspective. *Mining Photography* does not showcase photography as a medium for depicting, documenting and mediating notions of climate change. Rather, it asks what the art form itself can tell us about a future beyond climate change – not in its illustrative function, but as a driving force that has altered nature in a fundamental way. In this moment of self-reflection, as it were, lies the particular strength of the exhibition.'

At the exhibition, historical photographs, contemporary artistic stances and interviews with experts tell the story of art photography from the perspective of its industrial production. Where, for example, did the copper come from that was used for Hermann Biow's famous daguerreotype of Alexander von Humboldt? Showcasing 170 works, the exhibition impressively

illustrates how, ever since its invention, the medium of photography has contributed to man-made changes in nature – and continues to do so to this day.

Esther Ruelfs, exhibition curator: 'This exhibition is not about pointing the finger at 'evil' photography, but about putting our own house in order through the example of photography. There are lots of projects about climate change, something that is a matter of concern for all of us. Photography's usual role is that of documenting the impact, capturing evidence of the droughts and floods. But in this exhibition, we wanted to highlight how the invention of photography and industrialisation are intertwined, and how its rise as a mass medium is linked to the exploitation of natural resources.'

From the very outset, the production of photographs has depended on the extraction and exploitation of natural raw materials. In the 19th century, salt, copper and silver were used to create the first images on copper plates and for salt prints. Following the advent of gelatin silver prints, the photography industry became the most important consumer of silver in the late 20th century, accounting for more than half the global consumption. Today, in the age of smartphones and digital photography, image production relies on rare earths and metals such as coltan, cobalt and europium. The storage of images and their dissemination also produce large quantities of CO_2.

The exhibition MINING PHOTOGRAPHY tracks down individual trade and production chains. How has the actual materiality of photographs, frequently invisible to the naked eye, changed over the decades? The five exhibition sections follow the trail of the materials used in photographic production: copper, coal, silver, paper and rare earths. In one way or another they are all used as a backing medium, in printing or in digital photography: the copper for daguerreotypes; the fossil fuels such as coal and bitumen for photo prints; the silver for the gelatin silver prints in widespread use in the 20th century; the paper as a backing material; and the rare earths for our ever more compact cameras and smartphones. Interviews with M. Susan Barger (restorer), Hans Joosten (biologist), Hannah Pilgrim (activist), Rainer Redmann (chemist), Katrin Westner (mineralogist) and Katherine Mintie (art historian) examine the ecological footprint of materials and their extraction from a variety of perspectives in both research and science.

The artists featured at the exhibition and involved with the various materials and processes are Ignacio Acosta, Eduard Christian Arning, Lisa Barnard, Hermann Biow, F&D Cartier, Optics Division of the Metabolic Studio (Lauren Bon, Tristan Duke and Richard Nielsen), Oscar and Theodor Hofmeister, Susanne Kriemann, Honoré d'Albert de Luynes and Louis Vignes, Charles Nègre, Jürgen Friedrich Mahrt, Mary Mattingly, Madame d'Ora, Daphné Nan Le Sergent, Lisa

Rave, Hermann Reichling, Alison Rossiter, Robert Smithson, Simon Starling, Anaïs Tondeur, James Welling, Noa Yafe and Tobias Zielony. They have chosen to approach the theme of various forms of image production from in part very different perspectives – from peat cutting (Theodor and Oscar Hofmeister) to the filling in of a quarry with liquid asphalt (Robert Smithson) to a slaughterhouse series (Madame d'Ora).

The exhibition is curated by artist, author and curator Boaz Levin and by Dr Esther Ruelfs, Head of the Photography and New Media Collection at MK&G.

A joint venture between KUNST HAUS WIEN and the Museum für Kunst & Gewerbe Hamburg [Museum for Arts and Crafts Hamburg]
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Artist's texts

COPPER, GOLD, AND THE DAGUERREOTYPE

Hermann Biow and Alexander von Humboldt

Photographic pioneer Hermann Biow's clear, unfussy visual language quickly made him a sought-after portraitist in prominent circles. In 1850, his Deutsche Zeitgenossen (German Contemporaries) portfolio was published with copperplate engravings from his photographs ofartists, scientists, and politicians. In 1847, Biow had also photographed the famous naturalist Alexander von Humboldt in Berlin for the project.
Humboldt, whose goal it was to depict the entire physical world in one work, was employed as a mining official for the Prussian authorities before setting out in 1799 on his first major research trip through South, Central, and North America. He brought back from there samples of the metals that would be the key elements in Biow's daguerreotypes half a century later. The silver- and copper-bearing minerals that he collected give a sense of how these raw materials occur in nature and how, after the complex processing steps, their materiality is ultimately concealed by the finished photograph. Humboldt also recorded the way these precious metals circulated between the continents—a requirement for the industrial-scale production of daguerreotype plates—in a map in his Geographical and Physical Atlas of the Kingdom of New Spain, published in 1811. There is still some dispute, however, as to whether Humboldt was the first to warn of the dangers of anthropogenic climate change when, in 1843, he raised the question in his publication Central-Asien of the extent to which humans were influencing the climate "by felling the forests,

altering the arrangement of bodies of water, and developing large masses of steam and gas at the epicenters of industry."

Hermann Biow (b. 1804 in Breslau, d. 1850 in Dresden) was a portrait painter and lithographer and an important pioneer of photography in Germany. His documentation of the devastation of Hamburg after the fire of 1842 was the first photo reportage in history. The natural scientist Alexander von Humboldt (b. 1769 in Berlin, d. 1859 in Berlin) was an early fan of photography and saw it as "one of the most delightful and wondrous discoveries" of his time, even if he never operated a camera himself.

Daguerreotypes of the Californian Gold Rush

When, in 1848, it became known that gold had been discovered in the bed of the American River, people headed west to California in their hundreds of thousands to seek their fortune, together with traders, merchants, and photographers. Every gold prospector was also a potential customer wanting to send home a photo after a successful dig. The gold rush led to a boom in early photography and became the first event in US history to be comprehensively documented in photographs. Many daguerreotypists traveled straight to the mines as itinerant photographers. They portrayed gold diggers in threadbare clothing with tools and weapons, thereby presenting the Californian adventurers as the antithesis of the sophisticated denizens of the big cities. At the same time, they recorded the ongoing evolution of the techniques used in gold prospecting. The prospectors started out manually washing the precious metal from the river sediment using pans. But in the 1850s companies began extracting gold on an industrial scale. Watercourses were diverted so that gold could be retrieved from the drained riverbeds; "hydraulic" mining applied highpressure jets of water to detach gold-bearing sediments from hillsides and cliffs; and explosives and heavy equipment were used to dig veins of gold from underground. The gold rush daguerreotypes are thus the first documentation too of environmentally destructive mining practices. Here, it is easy to miss the fact that the images also record the mining of a material that was necessary for their own production: gold chloride had been in constant use as a fixative for daguerreotypes since 1841. Mercury represents another link between mining and photography. While photographers' use of it as a developing agent jeopardized their own health primarily, its accessory role in gold washing caused the contamination of entire rivers in the area around the mines.

Cartes de visite of pit brow women

The photographs show the women who, from the early 17th century on, worked unseen in Britain's coal mines, first below ground, and later, following the passage of the Mines and Collieries Act (1842), carrying out the lower-paid jobs on the surface. As mine workers, they moved lumps of coal with shovels and carts and separated them from the gangue using large

sieve pans. Their work was a major economic contributor to Britain's industrial success. Coal was a key element underpinning many production sectors, and it was crucial for the processing of copper, which was used in manufacturing daguerreotype plates. The British poet Arthur J. Munby collected photographs of working-class women, which catered to his interest in sociology. He bought photographs of women workers distributed as cartes de visite and also had studio photographs taken that depicted the women in their work clothes and pit gear. Unlike the Californian prospectors, who presented themselves in daguerreotypes as gold rush entrepreneurs and adventurers, the women seen in these images had little in common with the classical notions of the Victorian era. The view they showed of women in dirty work clothes (including trousers) turned the pictures into collectible motifs. We see the women sitting with legs apart and hands on hips—self-reliant poses with strong male connotations— photographed in a studio setting, where the furnishings were at odds with their class affinities

Ignacio Acosta

Created for the exhibition, Ignacio Acosta's multimedia installation centers on forty photographs arranged in a four-row grid structure. They combine three motifs linked together in a visually associative network, straddling copper production and water consumption. In the topmost rank, we see a smokestack belonging to the Hamburg copper producer Aurubis AG rising aloft, paralleled by the sculpture of Hygieia, which is mounted on a fountain with her back turned on Hamburg's city hall, looking towards the Chamber of Commerce. Acosta makes a connection between the resource-intensive and, above all, waterintensive industry—a major source of pollution for the Elbe River—andthe politically charged sculpture commemorating the dreadful cholera epidemic of 1892, which was caused by contaminated water. In the rows below, close-up views of the fountain are interlaced with stained rubber suits worn by Aurubis AG's workers to protect themselves from sulfuric acid. Visual and material analogies arise, linking the copper parts of the bronze sculpture, which have been oxidized to a green patina, with the tokens of "dirty" work in the copper plant—a thematic examination of the relationships between industry, politics, and society in terms of water and resource consumption. Acosta delves deeper into these themes in a video interview with Klaus Baumgardt from the Hamburg-based environmental protection initiative "Save the Elbe." This new installation thus expands on his work Copper Geographies, an investigation into the global mobility of mined copper that he began in 2010.

FOSSIL FUELS, COAL, AND BITUMEN

Theodor and Oscar Hofmeister

The Hofmeister brothers present the moorlands around Hamburg as an area imbued with longing. The white blooms of the cottongrass accentuate the charming, painterly qualities of the idealized landscape, which is rendered in vertical format in the style of Japanese woodblock

prints. The Hofmeisters do not show the furrowed ground, marked by the incipient signs of systematic peat extraction, or the geometrical lines of the drainage ditches. Instead, our eye is drawn in by a walkway projecting into the picture at an angle. The technique of multicolor gum bichromate printing, which came into vogue in the 1890s, uses pigments to render the photographic masters as prints that are made more durable by the admixture of soot.

Jürgen Friedrich Mahrt and Hermann Reichling

Moorlands contain the organic commodity peat. Once it has been drained, dug, and dried, it can be burned as a source of energy. This usage has a long history and was of great importance until the emergence of the coal industry. As naturalists, Jürgen Friedrich Mahrt and Hermann Reichling recorded how peat cutting infringed on nature and documented the massive impact it had. While Mahrt's handcolored photographs are illustrative of the arduous manual labor involved, Reichling's work gives a palpable sense of the industrial scale of this undertaking. He often seeks out compositions that set up a contrast between the supposedly pristine moor—which represents such an important habitat—and the drastic impact of human agency. In this way, he clearly shows how the natural vegetation is inscribed with an industrial grid of furrows, which gives structure to the photographs' pictorial space as a graphical raster. It becomes evident here how nature is turned into a commodity, how with every cut that is dug, whether with a spade or an excavator, sods of peat are removed from the earth as a monetizable product. The shots showing the edges of the peat in cross section—as documented by both photographers— also allude to the temporal dimension of the resource: in the right conditions, it takes a thousand years to produce 1 meter of peat from organic material. However, the climate is being damaged not only by the commercial exploitation of the moorlands but also by the process of draining them, which releases huge amounts of CO2.

Eduard Arning

If you look closely at Eduard Arning's large-format gum bichromate print of an iron and steel works, it has a leathery look that resembles skin. The print's surface structure contains the pigments that give it ist murkily indistinct visual effect. This is produced in large part by a blueblack color produced when larger amounts of soot were mixed into the pigments. The surface of the paper, which has been treated with pigments and a binding agent, is exposed: these areas become fixed, while less exposed parts are rinsed away and remain lighter. In this case, the result is a nocturnal view of an iron and steel works, whose chimneys spout fire and belch smoke. The leaping flames and brightly lit windows were added after the fact by Arning and convey a Romantic idea of industrial production at the turn of the 20th century. To the right of the picture, a shadowy heap of ore looms large in the foreground, while on the left a somewhat brighter swath leads the eye into the depths of the picture and the glowing entrance to the factory. Towering next to it is the monumental chimney from which soot rises—a symbol

of industrial progress. This returns in material form as blue-black pigment, extending right to the frontmost plane of the picture and giving the dark pile of ore its shape.

Anaïs Tondeur

Anaïs Tondeur's work Carbon Black sees her delving into soot particles, which were an essential component used in photographic methods at the turn of the 20th century. A product of industrial combustion processes, consisting almost exclusively of carbon, soot is carried by wind and air currents and does not usually fall to the ground until it is hundreds of kilometers from the site of emission. The black particles of carbon absorb the sun's rays, warming the atmosphere and thus contributing to the melting of the ice caps. Soot enters the human body through the lungs as a fine dust measuring less than 2.5 micrometers—breathed into the alveoli, it is transported into the bloodstream and finds its way into the internal organs. Working together with two climate researchers, the artist set out on a fifteen-day expedition traversing the UK. Using airflow analyses, the team determined the trajectory of soot particles, a trail that led from Fair Isle in Scotland to the port of Folkestone in the south of England. At each stop on their journey, they took photographs of the horizon using a helmet camera, measured the concentration of particulate matter, and recovered soot particles from the air. Inserted into printer cartridges as pigment, these particles were then used to produce a landscape photograph whose color characteristics are specific to the site where the picture was taken. The severity of the air pollution is thus given expression in the dramatic gray and black tones of the cloud constellations depicted.

Susanne Kriemann

The artist works with heliogravure, a manual printing technique that is now no longer used in practice: the copper plate is dusted with asphalt powder and printed using a highly pigmented paint mixed with soot. In 2017, Susanne Kriemann began accompanying scientists from the University of Jena on their research trips to investigate the renaturation of the uranium mining area formerly operated by SDAG Wismut in the Ore Mountains (Erzgebirge). Uranium ore, a highly radioactive substance, was mined there between 1949 and 1990. Today, its soil is severely contaminated with heavy metals. Kriemann uses photography for her artistic research on the project—her logging of contaminated plants stretches the medium to the very limits of what it can depict, as the radiation measured by the researchers cannot be seen in the photograph. Notwithstanding, Kriemann has devised a method that allows her to inscribe the radioactivity in the image: she harvests individual plants that she has previously photographed and processes them to produce different-colored pigments, which she mixes with soot and uses to print her heliogravures. This technique allows her to include the plants directly in the work she creates. In this way, the radioactivity becomes a physical element in her images.

Robert Smithson

In his 1969 work Asphalt Rundown, Robert Smithson abandoned the gallery space completely to realize his first outdoor earthwork. In a stone quarry south of Rome, he had a truckload of hot, liquid asphalt tipped down an eroding slope. In choosing the quarry, he opted for a landscape that bore the marks of human intervention, the first link in a variety of industrial supply chains. Smithson's Asphalt Lump from 1968 had already demonstrated his interest in industrial composites and nature as shaped by humanity: it was at this point that he was invited by the Konrad Fischer Galerie to conduct research on the slag heaps in the Ruhr, together with the photographer couple Bernd and Hilla Becher. In the work in Rome, the inky black mass covers the barren earth in next to no time, causing the ground to disappear beneath it as it pushes its way down the slope like a natural river, cooling and congealing. Smithson conceived the sculpture as a symbol of frozen time. In his view, time does not simply pass—rather, it is deposited in an ongoing process like layers of sediment in the soil. As a language construct, Asphalt Rundown links into the idea of photographic images as frozen moments. On the material level, meanwhile, Smithson's use of asphalt also alludes to Nicéphore Niépce's heliographic experiments, where the hardening of asphalt on a tin plate under the action of light was used to record fleeting images and was thus a means to freeze time. The natural asphalt used by Niépce can be found as bitumen judaicum in the area around the Dead Sea, where the visual scenery bears a striking resemblance to Smithson's artificially created volcanic landscape.

Honoré d'Albert de Luynes, Louis Vignes, Charles Nègre

The atlas Voyage d'exploration à la mer Morte is a documentary account of the 1864 scientific, archaeological, and artistic expedition to the Dead Sea basin and the interior of Jordan. Financed by Honoré d'Albert, duc de Luynes, an archaeologist, scientist, and art connoisseur, the expedition was accompanied by, among others, the geologist Louis Lartet and the photographer Louis Vignes. D'Albert subsequently commissioned Charles Nègre—who was one of France's best-known photographers and had developed a photomechanical reproduction process—to translate Vignes's photographs into an official report on the expedition using photogravure plates. The publication that came out of this process can still be termed a handmade book. Nègre was not merely an accomplished technician, he also had the eye of an art photographer and created intermediate tonalities and shadows for Vignes's images, which turned out to have too much contrast. His prints, which are rich in detail and the play of light and shadow, were on occasion composed of several negatives, and, in some cases, the clouds were superimposed. The atlas shows, among other things, the sites where the natural deposits of bitumen were found: this was the basis, in turn, for the gravure printing process that Nègre refined.

Honoré Théodoric Paul Joseph d'Albert de Luynes (b. 1802 in Paris, d.1867 in Rome) was a numismatist, archaeologist, collector, scholar, and art lover. Born into an aristocratic family, he was endowed with a considerable fortune and financed the research trip to Jordan, in which he also took part. Louis Vignes (b. 1831 in Bordeaux, d. 1896 in Paris) was an admiral in the French navy and an amateur photographer. Charles Nègre (b. 1820 in Grasse, d. 1880 in Grasse) was a painter and photographer as well as a technician and inventor of his own photogravure method.

Noa Yafe

At first glance, we see a two-dimensional image, and it is only when we get closer to what is apparently a photograph mounted in the exhibition space that we register the three-dimensional sculpture let into the wall surface, which opens up like a diorama into the space behind it. Noa Yafe's sculptures are based on photographs: these are used as templates. It is often scientific images that capture her imagination. The artist deals with the verity of photography and the moment of illusion; at the same time, by turning photographs into objects, she also addresses materiality in an age in which images have become immaterial. The master for the work she made for the exhibition is the black-and-white photograph Vue Prise au dessus de Mar Saba (View over Mar Saba) of the Jordanian hillscape around the Dead Sea. The picture was taken by Louis Vignes and reproduced by Charles Nègre using the photogravure technique: it appeared in the atlas Voyage d'exploration à la mer Morte (Expedition to the Dead Sea, 1868–1874). The artist uses real materials for the "photograph" she constructs.

PAPER AND IST COATING

Gevaert Photographic Paper

The 1964 merger of the German corporation Agfa AG and the Belgian company Gevaert Photo-Producten NV led to the creation of the Agfa-Gevaert Group. These two enterprises, each with a long tradition, combined to form one of the world's leading producers of photographic goods, whose line extended from cameras to X-ray film. If we take, for example, black-and-white gelatin silver paper—one of Agfa-Gevaert's core products and a staple of the photographic industry in general—it is still manufactured according to the same principles today. The paper substrate is coated with a layer of barium sulfate (also known as baryte), which covers the paper fibers and ensures that the emulsion of gelatin and light-sensitive silver halide grains applied at the end adheres to the base. The pictures from the Agfa archive offer an insight into this process. Although the layers were always built up in the same way, there was considerable variety in the photographic paper that was produced. The possible surfaces might be white or cream colored, glossy or matte, smooth or textured and were available in up to six variants to allow the motif to be rendered with different degrees of contrast, from extra soft to ultra hard. Systematic research into photographic papers and their material properties did not start until a

few years ago. One such example is the documentation of Gevaert papers by the FOMU Photo Museum in Antwerp, which should provide a better understanding of these products and facilitate their processing in both artistic and technical terms. A study of the packaging reveals that successful product lines were offered over a period of decades, even if their outer form changed with the times in line with contemporary tastes.

Alison Rossiter

Alison Rossiter's photographic work is created without a camera or a lens, using expired photographic paper. Since 2007, the artist has collected approximately fifteen hundred packages of old photographic paper, starting from the late 19th century and representing every decade of the 20th. Rossiter mines what she describes as a "cross section of the history of photographic print materials" for their latent images—created by the effect on the paper over time of oxidation, light leaks, pollutants, or physical damage and then developed by the artist in the darkroom to reveal "found photograms." At times, the artist marks the surface intentionally by pouring or pooling photographic developer directly onto the paper, or else limiting its contact with it, deftly combining chance and skill. The results are abstract images, fields of texture, spilled marks, and monochromes, in a subtle array of blacks, grays, and whites reminiscent of mid-century modernist painting. Each work's title contains three facts: the manufacturer and type of paper, its expiration date as stated on its package, and the date that Rossiter processed the material. As indicated by its title, a work consisting of six prints included in the exhibition was produced using Gevaert Gevaluxe Velours paper, but their exact expiration date is unknown. First produced by Gevaert in 1933, Gevaluxe Velours was advertised by the company as the "most beautiful paper ever made" and is considered to this day to have been one the best commercially available papers due to its matte surface and intensely deep black shadows. A second work comprises of two images printed using an unnamed photographic paper produced by The Haloid Company, Rochester, for the US military. The abstract geometrical compositions' material provenance reveals their connection to what could be called the military-photo-industrial-complex, but also hints at the origins of digital technologies within the photographic industries: in 1961 Haloid changed its name to Xerox Corporation, and would go on to invent some of the key technologies in personal computing.

F & D Cartier, Wait and See – The Never Taken Images

In 1998, F & D Cartier began investigating the materiality of photographic paper in a work group entitled Wait and See. For them, the work is an exploration of the rudiments of the medium and a way of engaging with the flood of photographic images produced in the digital age. In their installations, the artists use expired photographic papers dating from the years 1890 to 2000, which have lost some of their sensitivity but still respond to light. Their exposure in the exhibition space triggers an ongoing process of slow change as their appearance constantly

alters. Without any recourse to a camera or photochemistry, the duo thus brings to life images that were never taken and examines their potential. At the same time, their radically simplified experiment, designed to record light and time, connects back to the early days of the medium, when developing photographic paper was still unusual and daylight exposure was the principal means of blackening the silver salts. The surprising colors produced by the undeveloped gelatin silver emulsions reveal another invisible aspect of analog photography: in this way, F & D Cartier's experiment conveys a profound sense of the complexity of a material that was ubiquitous in the 20th century.

James Welling

Throughout his career, James Welling has reflected on photography's history and nature by examining the medium's materiality through the lens of its most common components. Used as a binding layer for gelatin silver prints, gelatin's prevalence in photographic images normally remains invisible to the naked eye. In this series, produced in 1984, Welling chose to portray the substance in a style reminiscent of product photography. Infused with black ink and then cooled, the sculpted chunks of gelatin were placed against a seamless white background, creating semi-abstract compositions with the appearance of shining coal or black glass. Welling's work highlights photography's artifice: reflecting on the way it is consciously and explicitly staged, ist choice of subject, and its referential indeterminacy. This is accentuated by the fact that it is difficult at first to tell what exactly it is we are looking at. In his work, Welling often creates a delay between the moment an image is seen and the time viewers understand what it
depicts. Here, what the image is of is exactly what it is made of: as if by sleight of hand, Welling reveals image and substrate to be one and the same, reflecting on all that is normally left out of the frame or taken for granted—or all that is hidden by it—when we normally think of what photography is, and what it does to the world.

Madame d'Ora

Between 1949 and 1953, Madame d'Ora produced an unsparing photographic study of two Parisian slaughterhouses, which she would go on to describe as her "great final work." Built during the 19th century under Napoleonic decree and in keeping with Baron Haussmann's vision, slaughterhouses such as the Abattoir Ivry Les Halles and Abattoir de Vaugirard signaled the emergence in France of industrialized meat production governed by capitalist imperatives.9 It was in such abattoirs that the repetitive, procedural, and rationalized mode of the factory was first introduced into the realm of animalslaughter, a practice that was later perfected in the US with the introduction of the assembly line. Enabled by such developments, the exponential growth of the cattle industry during the 19th century contributed to the dramatic acceleration in carbon emissions that began in those years. To this day, cattle are considered the number one

agricultural source of greenhouse gases worldwide (responsible for about 14 percent of total human-induced emissions). Madame d'Ora's images seem to dissect her subjects, portraying them with a sense of tactility and precision and, at times, of the absurd. In some images, skin is stretched across the picture plane, resulting in near abstraction, while, in others, pools of blood and rows of clipped and flayed corpses fill the frame to capacity, creating a mood of excess and serialized death. Evoking a mixture of detachment and brutality, distance and cruelty, reminiscent of the horrors of the 20th century, the series has often been read as an implicit response to the Holocaust, during which many of d'Ora's family members, including her sister Anna, were killed. By documenting the unpleasant reality behind industrial meat production, an essential component in many everyday commodities— including the gelatin-silver paper used for these prints—d'Ora sheds light on a dark and often ignored aspect of modernity.
Madame d'Ora (née Dora Philippine Kallmus, b. 1881 in Vienna, d. 1963 in Frohnleiten, Austria) was an Austrian Jewish photographer and one of the most acclaimed portraitists of fin-de-siècle Vienna. After the war, d'Ora was commissioned to produce a series representing refugees and displaced persons by the United Nations. It was at that time too that she started working on her slaughterhouse series.

Tobias Zielony

For Blackbox Wolfen, Tobias Zielony has created a fictional archive of the AGFA-ORWO film factory in Wolfen, combining still images and interviews with former employees who worked in the factory's darkrooms. Predominantly women, the workers had to perform their tasks in near pitch darkness, in extreme cold or heat, exposed to various toxic chemicals. For the GDR, filmstock represented a valuable commodity that could be traded with the Soviet Union in exchange for silver, oil, and gas. ORWO also supplied cinematographic material to other socialist countries, as well as non-socialist economies such as Egypt and Brazil. One of the biggest export markets for ORWO film was India, which needed stock for its burgeoning movie industry and provided sun-bleached cow bones, used for high-quality film gelatin, in exchange. Today, only a single small company exists in Wolfen, primarily producing a highly specialized black-and-white archival film. Used by the German Federal Archive, the film is said to survive for up to a thousand years once exposed if it is stored in dark and cold environments, such as Germany's National archive, which is located deep underground in the decommissioned silver mine of Barbarastollen. Using this film for his fictional archive, Zielony asks what will remain of this history in a thousand years? Who might then discover and read this archive: the survivors of the coming catastrophes, aliens, or machines? What might they be looking for on earth? Manpower, raw materials, technical know-how, or something else entirely?

SILVER

Simon Starling

In his sculptural work, Starling zooms in on the materiality of the photograph, using an electron microscope to single out two silver particles in the emulsion of a historical photo and then rendering them, with the help of a computer program, at a magnification of 1:1,000,000. This rendering is converted into a stainless-steel three-dimensional sculpture that is larger than a person, its seemingly fluid polished surface creating a virtual effect. Starling has described the photograph as a "deposit of matter", an image produced by an agglomeration of silver particles. His rendering has its origins in the materiality and documentary function of a stereophotograph showing Chinese migrant workers who had been brought to Massachusetts in 1870 to break a strike in a shoe factory. Made in China because of lower production costs, the sculptures reverse the trajectory in this story of labor migration. The Nanjing Particles can also be regarded, therefore, as a work about the development of systems of global production. Starling treats photographs as material objects that need to be produced and preserved. In the process, photographs activate memory and knowledge, at times revealing stories that have been suppressed.

Optics Division of the Metabolic Studio (Lauren Bon, Tristan Duke, and Richard Nielsen)

The dry expanse of Owens Lake in the California desert is not only the subject of the work by the artists' collective, it also supplies the material for it. Liminal Prints Buried in Owens Lake shows two largeformat photographs buried in the mud of the lake, where they are being "developed." These images are on show in the exhibition along with the utensils used for the purpose. The silver nugget on display is the silver from two years of photographic work—including the exposures from the AgH2O series—that has been recovered from the fixer by a process of electrolysis. The group of works originated with the artists' attempt to produce their own photographic materials. The members of Metabolic Studio collected silver from the disused Cerro Gordo mine, harvested halide salts from the bottom of the lake, and processed gelatin from cattle from the region. The darkroom was replaced by the nighttime darkness, and the chemicals by brine from the lakebed, which contains large quantities of sodium thiosulfate, a fixing agent employed since the invention of photography. This rarely occurring element is produced by the microorganisms present there—archaea—which metabolize sulfur. The lakebed develops the images and fixes them at the same time. To create the photographs in the AgH2O series, the collective used ist "Liminal Camera," a shipping container that has been converted into a large-format camera. The container symbolizes the global trade in silver and water and the overexploitation of these resources: the silver from the Owens Valley was mostly used by Eastman Kodak to produce film (the company also supplied Hollywood), while, from 1913 on, the

water slaked the increasing thirst of Los Angeles's expanding metropolis. By 1924, the lake was all but dry. The landscape in the photographs is itself a quotation: we are familiar with the steppe valley from Hollywood westerns and Ansel Adams's landscape images.

Daphné Le Sergent

The film L'image extractive (The Extractive Image) intercuts macro photography of a silver surface with black-and-white landscape shots showing silver and gold mining in the Americas. This takes us on a journey to Mexico's mining regions. The video essay weaves together fact and fiction. It tells the story of how photography was invented: the artist does not begin her account in 1839 but rather starts with the discovery and mining of silver in South America. The film tells of the legendary El Dorado and recounts an alternative story of the medium's invention set in Brazil, where photographic pioneer Hercule Florence secretly discovered a gold-based process at the same time as French inventors Daguerre and Arago made their own discoveries. This is followed by images of die stamping, of silver's stock price, and of miners. On the soundtrack, the artist speaks of the photographic industry's late 19th-century boom, which she associates with the introduction of the gold standard around 1870 and the devaluation of silver. She recalls how the vertiginous rise in the price of silver led to the invention of digital photography in 1985. She also suggests a linkbetween the P. G. Morgan company's interests in silver speculation and its promotional work in the field of art photography. Her narrative arc ranges from the gold rush to data mining. She uses haunting music to underscore the repetitive loop of images showing gold and silver prospecting and the landscape being scoured in search of gold nuggets. The textual layer of the film uses a staccato verse sequence to tell a hypothetical and speculative story, drawing on a plethora of historical facts from Le Sergent's artistic research.

RARE EARTHS, METALS, ENERGY, AND WASTE

Lisa Rave

Structured like a nautilus shell, with layers of narrative gradually unfolding and echoing each other in the process, Lisa Rave's Europium makes visible connections between Papua New Guinea's colonial past and the planned excavation of the rare earth element Europium from the Bismarck Sea. Using a combination of historical found footage, interviews, and performative sequences, the essay film revolves around the rare earth Europium, whose fluorescent qualities are used to validate European banknotes and to ensure the brilliance of colors on flat-screen surfaces. Pointing to the human and ecological violence inherent in the extraction of so-called resources and their transformation into monetary value, Rave directs her anthropological gaze back toward our own society, exposing the ghosts of the past as they appear in the technologies and screens that surround us.

Mary Mattingly

Combining chalk-drawn maps of global supply chains, satellite imagery, staged photographs of sculptural assemblages, and documentary images, Mary Mattingly's series Cobalt—a selection of which is shown in the exhibition—is an attempt to comprehend a system of immense scale, scope, and complexity that remains hidden in plain sight. Over 60 percent of the world cobalt extraction, the "blood diamond of batteries," takes place in the Democratic Republic of Congo in dangerously precarious conditions. The extracted metal, mined predominantly as a by-product of copper or nickel, is purchased by Chinese manufacturers, who process and then retail it to clients in the consumer market. Cobalt is then used in our phone's sensor components and lithium-ion batteries of all kinds (from laptops to vacuum cleaners to electric cars). Capable of withstanding extreme heat, the mineral is also used in weapons and alloyed steel and has been classified as a "strategic mineral" by the US, in an attempt to encourage its local mining and production. In Mattingly's work, we can see different stages in cobalt's life cycle: mineral seepage visible in an exposed cliff face; a recently opened mine in Michigan, whose manmade structures protrude from the natural landscape; an ore transportation station. Weaving them all together is an elaborate map, tracing its supply chain across its different stages. Mattingly's work seeks to address the ways in which we are inevitably entangled in the violent and extractive logic of neoliberalism and its ecological toll. Through her attentive mapping, we see how even forms of critical representation are dialectically bound to a mode of production wrought by ecological devastation and radical inequality. It is only by recognizing these conditions, Mattingly suggests, that we can begin to work toward changing them.

Lisa Barnard

In the "The Fox and the Rooster" section of her extensive project The Canary and the Hammer, Lisa Barnard uses documentary photography to examine the economy of waste surrounding the precious metal gold. One of the most expensive materials on earth, gold is used in making our smartphones, cameras, and televisions, turning worn-out devices into a precious commodity. However, e-waste contains not only precious substances but also some that are extremely poisonous— metals such as lead, mercury, and cadmium, which are highly toxic for both humans and the environment. China, which is responsible for 10 million tons of toxic substances every year, is one of the world's largest sources of e-waste as well as its biggest importer. In her research, the artist looks at China's trade in illegal e-waste, in which gold is extracted from old devices using aqua regia, a highly explosive mixture of hydrochloric acid and nitric acid, whose name is derived from its ability to dissolve the precious metals gold and platinum. An illustration of this reaction can be found in alchemist Basilius Valentinus's treatise "The Twelve Keys," which was published in 1599. The work contains a woodcut showing a rooster (symbolizing gold) eating a fox, which in turn is eating a rooster. The gold is dissolved not by the acid itself but rather by the products it creates when it reacts with the precious metal. Barnard's

choice of title thus makes reference to the potential dangers involved in recovering gold as well as to the mysterious aura that still surrounds it, even in the recycling loop that is a feature of the modern tech economy.

Mari Lebanidze, Cleo Miao, Leon Schweer, Marco Wesche with the mentoring of Prof. Christoph Knoth and Prof. Konrad Renner of the University of Fine Arts (HFBK) Hamburg – Digital Graphics class

Using the same sort of facial recognition technologies employed by tech companies to mine behavioral data for speculative value, Terraformed Self tracks exhibition visitors' behavior. Having identified people using their smartphone, the interactive installation informs visitors about their own contribution to the ecological footprint of digital image production using a playful game-like animation. How many selfies have been taken in front of this screen? How much carbon dioxide are they responsible for? What is the equivalent of a minute of scrolling on Instagram? While the work seems to invite visitors to take the obligatory exhibition selfie in front of the large, mirrored structure, it offers a sobering reflection on how our daily smartphone habits are implicated in a planetary system of resource extraction. The work is accompanied by an Instagram face filter—using the platform to reflect on its own footprint.

Digital Graphics class

Against the backdrop of omnipresent digital forms that mingle with artifacts from the past, the class, led by Prof. Christoph Knoth and Prof. Konrad Renner of the University of Fine Arts (HFBK) Hamburg, explores the integrity of modern technologies and conceives visual models in the context of culture and digital possibilities.

EXHIBITION DETAILS

Exhibition venue	KUNST HAUS WIEN Untere Weissgerberstrasse 13 A-1030 Vienna, Austria
Exhibition run	9.3.23–29.5.23
Press tour	WED 8.3.23, 10 am
Opening	WED 8.3.23, 7 pm, doors open 6.30 pm, admission free
Curators	Esther Ruelfs / Boaz Levin
Exhibition production	Sophie Haslinger / Stephan Kuss / Rebecca Schmidt

Exhibition catalogue

The catalogue *Mining Photography. The Ecological Footprint of Image Production* is published to coincide with the exhibition: EUR 36.–, in German and English, Spector Verlag, Leipzig together with MK&G. The catalogue is available on site at the Museum and from the Online Shop.

ACCOMPANYING PROGRAMME

Public guided tours	SUN 12.3.23, 11 am SUN 26.3.23, 11 am SUN 16.4.23, 11 am SUN 30.4.23, 11 am SUN 14.5.23, 11 am SUN 29.5.23, 11 am
Dialogue tour with the artists and the curator Esther Ruelfs and with Boaz Levin	THU, 9.3.23 5 pm in German 6.30 pm in English
ARTIST's LECTURE with Mary Mattingly	WED 29.3.23, 7 pm
FUTURE TALK Raw materials, digitality, and the repercussions	WED 19.4.23, 6 pm
KUNST MELANGE Guided tour & coffee break	SAT 18.3.23, 3 pm SAT 22.4.23, 3 pm SAT 20.5.23, 3 pm
PHOTO WALK: Analogue	FRI 31.3.2023, 3 pm to 6 pm FRI 28.4.2023, 3 pm to 6 pm

WORKSHOP	FRI 21.4.2023, 3 pm to 5.30 pm
Cyanotype & Phytogram	FRI 12.5.2023, 3 pm to 5.30 pm
CHILDREN'S WORKSHOP	SAT 18.3.2023, 11.30 am to 1.30 pm
Upcycling Camera!	SAT 22.4.2023, 11.30 am to 1.30 pm
	SAT 20.5.2023, 11.30 am to 1.30 pm

Full details of the accompanying programme for the exhibition *MINING PHOTOGRAPHY. The Ecological Footprint of Image Production* can be found on our website: www.kunsthauswien.com.
Generally speaking, the participation conditions are in line with current Covid-19 protection measures.

Admissions	Hundertwasser Museum: EUR 11
	Temporary exhibition: EUR 9
	Combined ticket: EUR 12
	Annual ticket: EUR 22
	Annual ticket for two: EUR 42
	Adolescents to 18, students & apprentices up to age 26: EUR 5
	Free for children under 10

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Press photos are available for download at https://www.kunsthauswien.com/de/presse/

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