

WALKING
IN THE
DARK



WALKING IN THE DARK

Jim Holyoak
Genevieve Robertson
Carol Wallace

This artist book explores carbon as a drawing material, a periodic element, a life-producing molecule and the substance that is so central to climate change. *Walking in the Dark* references the literal practice of walking to collect carbon-based materials, the process of locating oneself in an atmosphere obscured by forest fire smoke, and the darkness of ecological breakdown. All drawings featured in this book were produced with carbon, in the form of charcoal, coal, graphite and ink.

Dank forests, smokestacks, and the first crystal

Genevieve Robertson

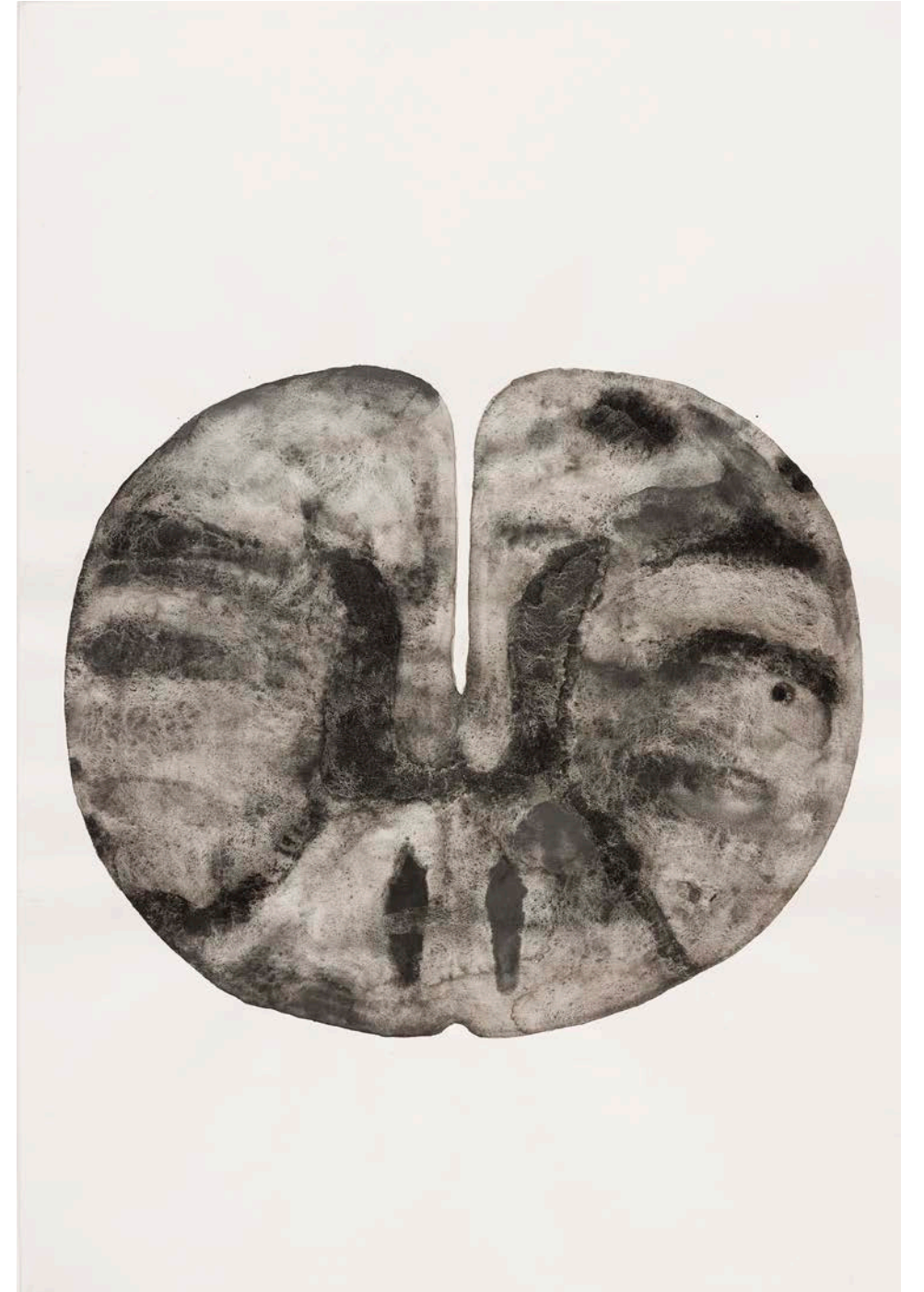
The first crystal formed inside exploding supernovas in the primordial universe. It was likely diamond, followed by graphite, which crystalized as the hot chaotic mess of dust and gas settled. Some of the synthesis of carbon molecules vital to life took place at the inception of the universe; the blueprint for inchoate life began inside exploding stars.

Carbon lies at the centre of life. It is ubiquitous and essential in the sinew of living molecules: leaf, bark, bone and brain alike. How did it get from the stars to the young Earth 4500 million years ago? Carbonaceous comets and meteorites hurled themselves through Earth's thin atmosphere, likely delivering the carbon that prepared this planet for life.

While carbon has existed on Earth since its inception, the zenith for carbon was during the Carboniferous period 330 million years ago. During this time, dank, silent, yet luscious swamps dominated the surface of the planet. Towering fern-like trees shaded early moss, lichen, fungi, and broad-leaved plants, while slow amphibians caught giant dragonflies and newly winged insects. Spore clouds lofted through shadowed understory. Over millennia these swamps decayed and were buried, succumbing to extreme heat and pressure. The deep deposits of black organic material from these vast swamplands produced the coal that fuelled the Industrial Revolution.

In the blazing furnaces of thousands of factories, solar energy that had been sealed away underground was released as carbon dioxide. Progress pressed forward through the exploitation of the sunlight that shone through ancient Carboniferous forests. This sunlight cannot be revived now except through the obliteration of the life it made possible. The reactivation of ancient life, through burning of carbon, has become the most dangerous practice of our time. The life-giving element is now transformed into the vaporous invisible gas that is likely to be the end of us.

Imagery in these pages arise from the processes and living beings that created carbon-based materials. The book also explores atmospheres of darkness and precarity. Produced at a time when much is obscure about our collective future on Earth, through carbon we are reminded that this sense of fumbling in the darkness is not new. Whether our vision is obscured by smoke, the nadir of pitch-black night, or the limits of our abilities to imagine, the feeling of walking in the dark may be written in our bones from a time when we were matter hurtling through space.



Previous pages:

Jim Holyoak
Peppered Moth, 2020

Carol Wallace
Graphite Landscape, 2020

Genevieve Robertson
Lopedidendron, 2019

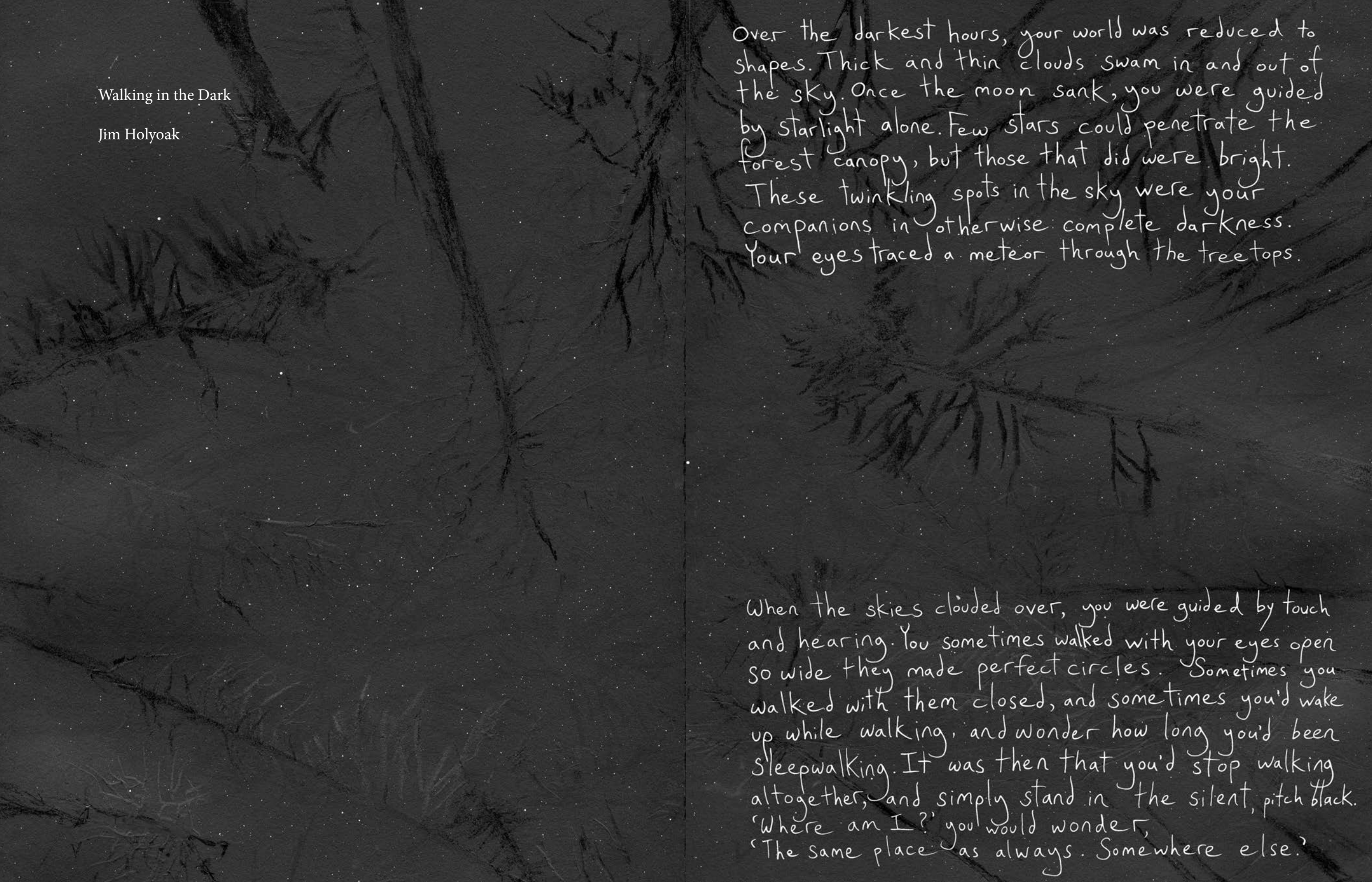
Following pages:

Genevieve Robertson
Protorthoptera, 2019

Jim Holyoak
Those Who Favor Fire, 2020







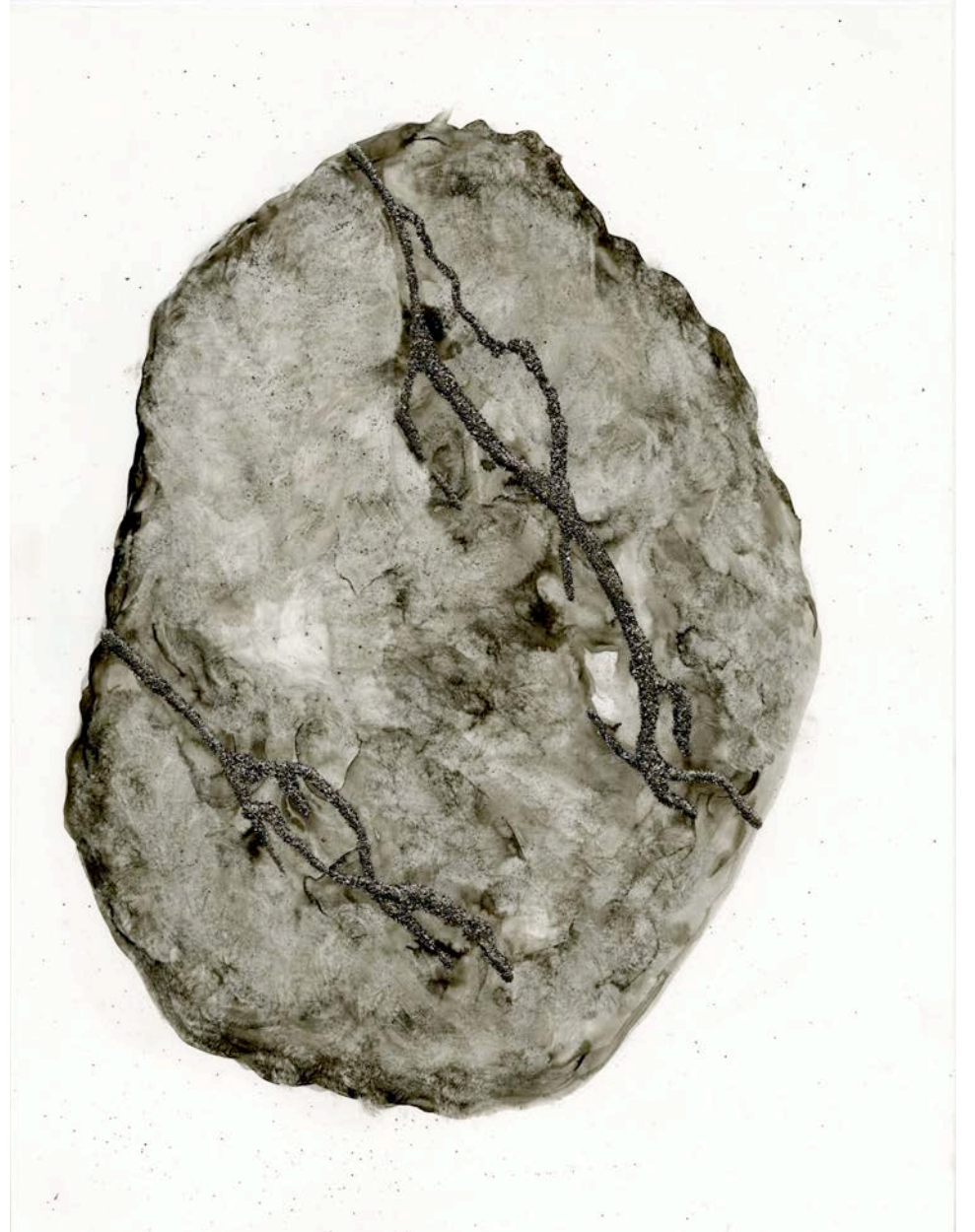
Walking in the Dark

Jim Holyoak

Over the darkest hours, your world was reduced to shapes. Thick and thin clouds swam in and out of the sky. Once the moon sank, you were guided by starlight alone. Few stars could penetrate the forest canopy, but those that did were bright. These twinkling spots in the sky were your companions in otherwise complete darkness. Your eyes traced a meteor through the tree tops.

When the skies clouded over, you were guided by touch and hearing. You sometimes walked with your eyes open so wide they made perfect circles. Sometimes you walked with them closed, and sometimes you'd wake up while walking, and wonder how long you'd been sleepwalking. It was then that you'd stop walking altogether, and simply stand in the silent, pitch black. 'Where am I?' you would wonder, 'The same place as always. Somewhere else.'





Pencil lead, diamonds and energy stores

Carol Wallace

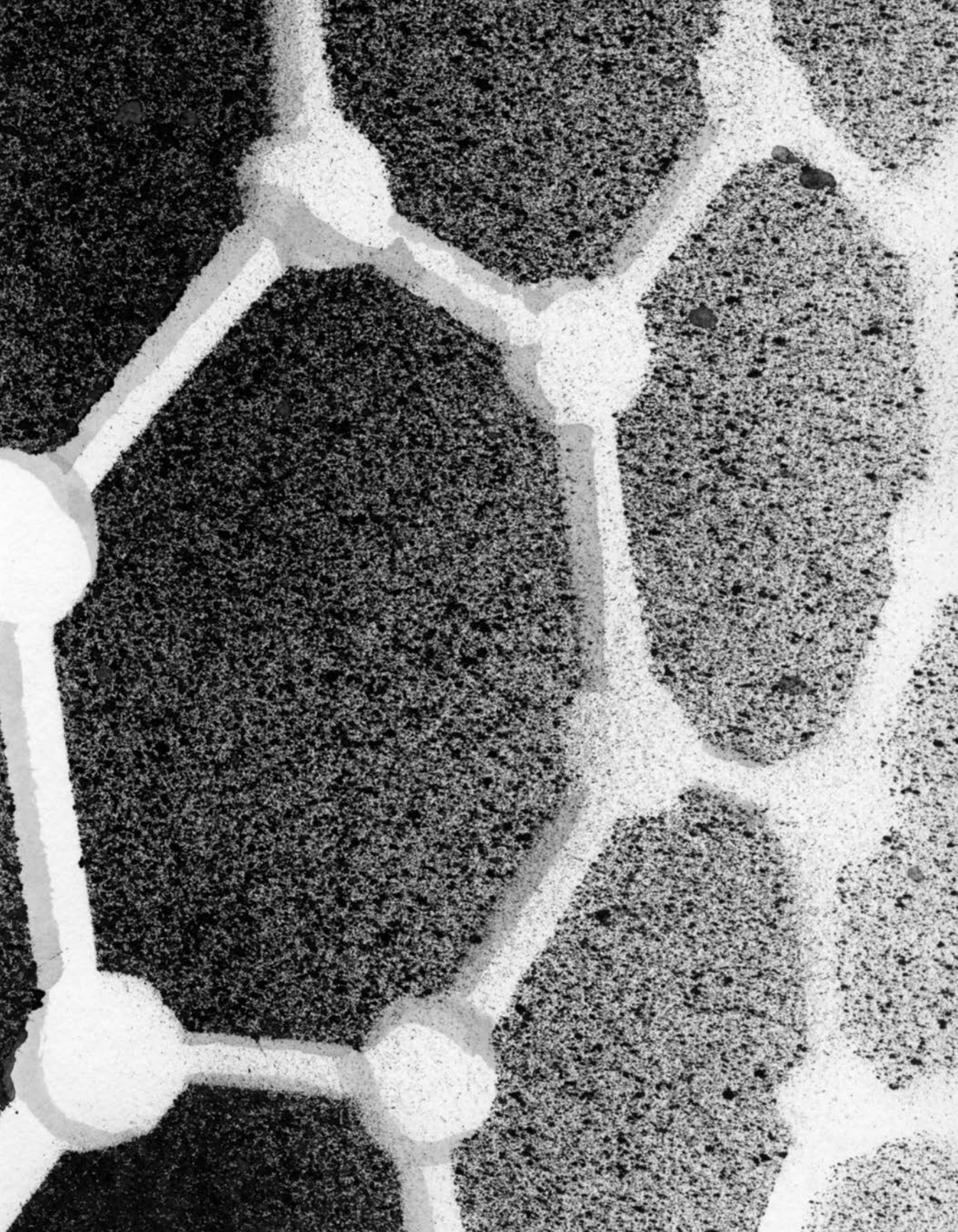
The most stable form of carbon is graphite. You know it as pencil lead. At first glance you may think it's not much compared to its dazzling cousin the diamond; a mineral of the exact same composition. The only difference between graphite and diamond is how the atoms are arranged. The result is that one is opaque, the other sparkly; one is jewellery, the other industrial. The graphite form of carbon is so soft it can be scratched with a fingernail. A diamond is so hard that no other material can scratch it. Diamond only fractures where bonds are weak.

Yet, due to its growing set of new technological applications, notably energy storage, pencil lead may soon be more valuable, and certainly more useful than the dazzling version of carbon. Graphite is a mineral of extremes: it cleaves with very little pressure, it is highly heat resistant and conductive, and it possesses a low specific gravity, allowing graphite flakes to float in water.

Carbon is found in all things living. Fossilized, it turns to coal; burned, it turns to charcoal. Heated up to over 750 degrees Celsius, and under pressure deep in Earth's crust, it turns to graphite. Imagine coral reefs and layers of sediment full of microscopic life on the ocean floor, buried deep within the continent. There, atoms in minerals reorganize themselves in a transformation from their original identity; all evidence of the previous form is obliterated. Metamorphism. Life turned into pencil lead.

While carbon emissions contribute to the uncertainty of our future, the carbon atom arrangement known as graphite may lead to the technology necessary to steer us away from fossil fuel dependency. Graphene, which is an isolated form of graphite only one atom of carbon thick, is considered a 'wonder material' with a growing set of new applications due to its incredible strength and electrical conductivity. Batteries, coatings, sensors, electronics; graphene has the potential to revolutionize entire industries. Although its potential uses are vast, its energy storage capabilities are the most promising, allowing a reliable solar/wind energy infrastructure to replace our current limited one.

Perhaps by utilizing this ubiquitous carbon atom in the form of graphite, technology will lead us toward our own cultural metamorphism, with a promising future. That's optimistic. More likely, we will follow the laws of thermodynamics, waiting for the heat to rise and the pressure to build, before we will be ready to reorganize ourselves, back to a stable form of carbon.



Previous pages:

Jim Holyoak
Sikkim Skyline, 2016

Genevieve Robertson
Pod 1, 2019

Carol Wallace
Graphite Veins, 2019

Carol Wallace
Wrinkled Graphine, 2019

Carol Wallace
Carbon Atoms, 2019

Following Pages:

Genevieve Robertson
Scapula, 2019

Jim Holyoak
Melanic Soot Moth, 2020



A Carbonic Glossary:

Ash: is the solid remnants of fire. Specifically, ash refers to all non-liquid, non-gas residues that remain after something has completely burned. The main chemical component of ash is carbon. Other elements include calcium, magnesium, potassium and phosphorous. All may remain after fuel has been incinerated. The darker the wood ashes, the higher the content of remaining charcoal from incomplete combustion. Some ashes contain compounds that make soil fertile. Others contain chemical compounds that can be toxic but may eventually degrade due to the activity of microorganisms. Note of interest: 'Ashes to ashes' derives from the English Burial Service. The text of that service is adapted from the Biblical book of Genesis, 3:19: 'In the sweat of thy face shalt thou eat bread, till thou return unto the ground; for out of it wast thou taken: for dust thou art, and unto dust shalt thou return.'

Calcium carbonate (CaCO₃): is the main chemical component in pearls and the shells of marine organisms, snails and eggs. It is a common substance found in rocks, most notably limestone. **Limestone** is a carbonate sedimentary rock that is often composed of the skeletal fragments of marine organisms such as coral, plankton, mollusks and bivalves who use carbon from the ocean to make their shells. Limestone sediment is found in warm, shallow marine environments where there is an abundance of life. Calcium Carbonate (and limestone) is a carbon sink (see carbon sink).

Carbon (C): is the 6th element on the periodic table, and also happens to be the 6th most abundant element in the universe. Carbon is unique because of its four valence electrons which make it highly versatile and allow it to bond with many other elements including itself, thus it has been called 'the building block of life'. There are over 10 million known compounds containing carbon.

Carboniferous (The Coal Age, The Age of Amphibians): The Carboniferous Period lasted from about 359 to 299 million years ago during the late Paleozoic Era. The term 'Carboniferous' comes from England, in reference to the rich deposits of coal that occur there and throughout northern Europe, Asia, and midwestern and eastern North America. The name Carboniferous means 'coal-bearing' and derives from the Latin words *carbō* ('coal') and *ferō* ('I bear, I carry').

Carbon dioxide (CO₂): consists of a carbon atom double bonded with two oxygen atoms. The current concentration of CO₂ in Earth's atmosphere is 415 parts per million, having risen from pre-industrial levels of 280 parts per million. Carbon dioxide is colourless and odorless at normally encountered concentrations, but at high concentrations, it has a sharp and acidic odor. Naturally occurring atmospheric CO₂ is the primary carbon source for all lifeforms on Earth. The concentration of CO₂ in Earth's pre-industrial atmosphere was

regulated by photosynthesis. Plants, algae and cyanobacteria use light energy to photosynthesize carbohydrates from carbon dioxide and water, with oxygen as a waste product. Carbon dioxide is produced by animals during respiration, and during processes of decay and fermentation of organic materials. It is also produced by combustion of fossil fuels such as coal, peat, petroleum and natural gas, as well as by the burning of organic materials, especially forests. Since the Industrial Revolution, anthropogenic emissions – primarily from deforestation and the use of fossil fuels – have rapidly increased CO₂ concentration in the atmosphere, leading to global warming. Because carbon dioxide dissolves in water, creating carbonic acid, it also causes ocean acidification.

Carbon Cycle, The: the biogeochemical cycle by which carbon is exchanged among the biosphere, pedosphere, geosphere, hydrosphere, and atmosphere of Earth. Along with the nitrogen cycle and water cycle, the carbon cycle comprises a sequence of events that are key in making Earth capable of sustaining life. It describes the movement of carbon as it is recycled and reused throughout the biosphere, as well as long-term processes of sequestration and release of carbon from carbon sinks.

Carbon Sink: is any reservoir, natural or otherwise, that absorbs and stores more carbon than it releases, and thereby lowers the concentration of CO₂ from the atmosphere. Globally, the two most important carbon sinks are vegetation and the ocean. Others include unmined coal, oil, natural gases, and limestone.

Charcoal: a porous black solid, consisting of an amorphous form of carbon, obtained as a residue when wood, bone, or other organic matter is heated, especially in the absence of air. In the Carboniferous, heady oxygenated air produced huge and violent forest fires; there is ancient charcoal from these fires. In recent years forest fires have increased in frequency and destructiveness globally. Intensifying seasonal fires are the result of poor forestry practices and climate change. Industrially produced charcoal is used as fuel and in medicine, cosmetics, horticulture, filtration, and as a drawing implement.

Coal (Black Diamond Dust, Devildriver, Black Lung): a combustible black or dark brown rock consisting mainly of carbonized plant matter, found mainly in underground deposits and widely used as fuel. Coal is derived from ancient forests that were preserved in low oxygen environments such as bogs and swamps for hundreds of millions of years. The legacy of coal burning has blighted forests, blackened landscapes and sterilized lakes as a result of sulphuric acid rain. The manufacturing industries built on coal during the Industrial Revolution paved the way (no pun intended) for roads, steel, bridges, steamships, plastics, synthetic dye, explosives and industrially produced cloth. Historically, coal mining was difficult and dangerous and catalysed the creation of early worker's unions. Coal-fired power plants remain the most commonly used energy source for electricity worldwide and are

currently the largest contributor to atmospheric CO₂. Common byproducts are coke, coal tar, and coal gas. Untouched, coal is a carbon sink.

Diamond (Ice, Rock, Bling): a clear and colorless crystalline form of pure carbon that is the hardest naturally occurring substance on Earth. When transparent and free from flaws, diamond is highly valued as a precious stone, and is also used industrially, especially as an abrasive. Diamonds are formed hundreds of kilometres below Earth's crust from carbon dioxide-rich magma. Rare volcanic eruptions called kimberlites occur at rocket speed bringing to surface the sought-after mineral.

Graphite: a soft, black, lustrous material that is the most stable form of carbon under standard conditions. Graphite has a different molecular structure than diamonds, but is chemically identical. Most graphite was formed where organic-rich shales and limestone were under extreme heat and pressure, common near converging tectonic plate boundaries.

Hydrocarbon: an organic chemical compound composed exclusively of hydrogen and carbon atoms. Hydrocarbons are products of decomposition of organic matter and form the basis of crude oil, natural gas, coal, and other combustible fuel sources. Examples of processed hydrocarbons include gasoline, naphtha, jet fuel, white gas, methane, butane, and propane.

Ink: Chinese, Indian and Japanese ink is composed of black pigment, combined with water, and sometimes perfume and a binder (glue). **Carbon black**, the name of a common black pigment in inks, was traditionally produced from charring organic materials such as bone or wood (often pine), and which is then ground down into soot. It appears black because it reflects very little light in the visible part of the colour spectrum. It is known by a variety of names, each reflecting a traditional method for producing carbon black: **Ivory black** was traditionally produced by charring ivory or bones, **Vine black** was traditionally produced by charring desiccated grape vines and stems, **Lamp black** was traditionally produced by collecting soot from oil lamps.

Soot: is a mass of impure carbon particles resulting from the incomplete combustion of hydrocarbons.

Soot Moth (Biston betularia f. carbonaria): the peppered moth (*Biston betularia*) is a temperate species of night-flying moth. The peppered moth is an evolutionary example of directional colour change in the moth population as a consequence of air pollution during the Industrial Revolution. During that time, darker toned moths were better able to camouflage on polluted trees, so the frequency of dark-coloured moths increased. Soot moths are an example of industrial melanism.

Artist Bios:

Jim Holyoak's art practice is comprised of drawing and ink-painting, artists' books and room-sized drawing installations. Throughout his life, drawing has been a way of contemplating animals and monsters, the real and unreal, metamorphosis and parallel worlds. He received a BFA from the University of Victoria, an MFA from Concordia University, and studied as an apprentice to master ink-painter Shen Ling Xiang, in Yangshuo, China. Holyoak has attended artist-residencies in New York, Mumbai, Banff, The Netherlands, Finland, Sweden, Iceland, England and throughout Norway. His work has circulated widely in Europe and North America, including at the Musée d'art contemporain de Montréal, the Midlands Arts Centre in Birmingham, the GEM Museum in The Hague, the Drawing Association in Oslo, the Carnegie Mellon International Drawing Symposium in Pittsburgh and the Museum of Drawings in Sweden. Holyoak is presently teaching Illustration at Emily Carr University of Art + Design.

Genevieve Robertson is an interdisciplinary artist with a background in environmental studies. Her practice encompasses drawing, painting, video and writing and is often place-based and collaborative in nature. Genevieve's recent drawings are composed of fossil, mineral and plant-based pigments collected regionally and map a visceral and long-term engagement with materiality, alterity, and the politics of place. Her work is informed by a personal and intergenerational history of resource labor in remote forestry camps on the West Coast of British Columbia. She holds a BFA from NSCAD University and an MFA from Emily Carr University and has attended artist residencies and exhibited artwork internationally. Her work has been published with the Centre for Alterity Studies, Capilano Review, The Society for the Diffusion of Useful Knowledge, and featured in the recent compilations *Outdoor School*, *Fire Season*, and *Ecocene*.

Carol Wallace's current work explores ideas and imagery informed by her former work as a geologist. Her art training started as a summer field geology student in 1988. Field notes were filled with drawn landscapes from ridgetops in the mountains of Northern BC, the Yukon and Ellesmere Island in the Canadian Arctic. In the office, back when maps were made by hand, Carol continued her drawing training creating and finalizing geologic maps, later published by various government agencies. After earning her geology degree at the University of Calgary, Carol settled in Nelson, BC starting a consulting company providing services in geomorphology in the Columbia Basin. Drawing and map-making continued in this work, until 2014, when she decided it was time to work full time in her studio as a visual artist.

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