THE LAST BEAR SERIES
‘POWERFUL AND VULNERABLE’
Oil on canvas, 100x100 cm, 2018

THE BEAR AS A TARGET SERIES ‘POWERFUL AND VULNERABLE’
Oil on canvas, 100x100 cm,
2018

IN THE NORTHERN LIGHTS SERIES ‘POWERFUL AND VULNERABLE’
Oil on canvas, 100x100 cm,
2018

THE SAINT BEAR SERIES ‘POWERFUL AND VULNERABLE’
Oil on canvas, 80x80 cm, 2019

LONE BEAR SERIES ‘POWERFUL AND VULNERABLE’
Oil, wax on canvas, 100x100 cm, 2018

PREDATOR,
HUNT
SERIES
‘POWERFUL AND
VULNERABLE’
Oil on canvas,
100x100 cm, 2018

THE ARCTIC'S SUNNY BEACH SERIES 'POWERFUL AND VULNERABLE'
Oil on canvas, 100x100 cm, 2018

BROKEN SEA DEFENCES
HAPPISBURGH, NORFOLK
EAST COAST SURGE
Oil on canvas, 2017-2019, 80x150 cm
‘Homes fall into sea, waves rip at pier, wildlife struggles. Norfolk residents tell of evacuations, close shaves, a flooded nature reserve and seals with pups missing. Collapsed houses lie on the beach after a storm surge in Norfolk’ (The Guardian)

SADNESS AT HAPPISBURGH
Oil on hessian, 2018, 81x109 cm
Coastal erosion at Happisburgh is where recent coastal erosion has been most severe in Norfolk. Rising sea-level, due to global warming, is exacerbating the problems which the erodible coastline faces. Most of the erosion occurs during dramatic events associated with storms. The impact on the local community is great. These paintings where produced after a severe episode in 2013, when there was pronounced cliff collapse and damage to the timber sea defences. Predictions indicate more future sadness.

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SADNESS AT HAPPISBURGH
Oil on canvas, 2018, 109x81 cm

‘Poorly Peyto’, diptych

To produce this diptych, I have relied on my own field drawings and photographs, my memory, and very high-resolution stills and videos from drones operated by Global Water Futures’ scientists on that day. The meltwater was flowing in runnels and torrents across and through the ice, and parts of the glacier were dramatically colored, especially by the red of algae and the black of cryoconite (accumulations of ash and soot from wildfires, fungi, bacteria, as well as algae). At places at the margins of the Glacier, but especially below its receding snout, were deposits of yellow-tinged glacial silt. The whole scene taken together, including the bare moraines and sediment beyond the snout, summoned - in my mind - a sense of destruction.

In this diptych, the red hues signal scars which, I imagine, represent the bleeding and screaming of this ancient, moving, and ever-changing entity. Despite the vivid coloration, it represents a step closer to final death, decay, and darkness. I visualize the yellow tinges as the transformation of progressively deeper, bleeding scars to the pervasive dirty yellows which will be the remaining ice-free depositional landscape and which, for a short-time, will be desert-like in its absence of vegetation. Although Peyto must be doomed, a fate perhaps camouflaged by this transient brightness, in my future work I want to increasingly incorporate representations of potential solutions and coping strategies. In this way I want my paintings to stretch beyond the realms of awareness and engagement, and provide glimmers of hope and brightness that we have the imagination and determination to avoid the very worst consequences of climate change.

'The Requiem for the Peyto'
Oil on canvas, 100x80 cm

'Glacier Decline;
Emergence of Strange New Landscape'
Oil on canvas, 150x100 cm

'The Requiem for the Peyto'

I enjoy surreal painting. It helps me express my emotions; something which is important to me. I know that scientists also have emotional responses to what they are seeing and studying. But, in their public statements, they are careful to express themselves in objective terms, based on the rational methods and reporting of science. Because I am an artist, I am allowed to portray myself in a way which expresses some of my feelings.

Here I am below the current snout of the Peyto Glacier, amidst the new and barren landscape revealed by the glacier's rapid retreat. Modelling by the scientists shows that the glacier could have almost completely vanished by the end of the Century. Although barren, the newly-emerged post-glacial depositional landscape does show tiny specks of green – the first plants are already moving in. They are shown in my glass. Also in my glass is the beige-yellow glacial silt of the depositional landscape, and cryoconite. Cryoconite, the scientists explained to me, is a cocktail of materials which accumulates each year on the glacier's surface. It consists of ash and soot from vegetation fires, algae, bacteria, viruses, and seeds. It has been growing in abundance over the years, accelerating the glacier's decline, and is washed-off by the annual melt-water to form dark deposits below the snout. It aids the growth of seedlings and moss. It is an important part of the greening process, driven by the quickly-warming climate. At what point in the future will the blue-white icescape behind me be transformed to green?

I also audio-record the sound of the glacier. The ice-driven katabatic wind; the wind-driven snow particles in late winter; the torrents of meltwater in summer; the splitting and crashing of the collapsing glacier. The record-player is my surreal expression of this. It is also a way, for me, to emphasise the importance of the painstaking recording of scientific data on Peyto the glacier. Observations first started more than 120 years ago, making it the longest-studied glacier in North America, and are continuing with the sophisticated instrumental network of Global Water Futures. In another 120 years there will only be the record left.

Glacier Decline' drawings on paper

Perhaps ironically, my other paintings in the Virtual Water Gallery are amongst the most brightly-coloured I have produced in the Transitions project. One of the reasons is because on the occasion of my summer visit, in August, it was a brilliantly-clear blue sky day. My other visit was in the preceding April, on a cloudy cold grey day. The glacier was still mostly hidden beneath snow-cover. It was a miserable day; better fitting the emotions which I now feel about this departing feature of the dramatic mountain landscape. I have transposed my darker emotions into these drawings.

In the distance in the first slide top drawing the glacier is covered by snow. In the foreground are strange deposits of black cryoconite. The cryoconite accumulates on the ice surface and, each year, is washed off by the copious summer meltwater to form mini-mountain ranges, a metre or so high, beyond the glacier snout. Cryoconite comprises of ash and soot from wildfires, bacteria, fungi and algae. It has become more abundant in recent years. It darkens the glacier's surface, reducing its reflectivity, and exacerbating melt.

This slide drawing, fore-fronting the now-exposed strata which were once the side of the glacier valley are deposits of glacial silt which have accumulated below the glacier snout. I have shown how these silt deposits crack in summer heat.
John Pomeroy comments "I like this drawing because it gives the illusion of the glacier transforming into a river delta – it speaks to glacial hydrology and the loss of these glaciers and their replacement by terrestrial hydrological systems. And that sediment and cracking can also be dangerous – look at India recently"

'Glacier Decline'
Charcoal on paper, 180x100 cm

THE RED INVASION AT WOLF CREEK
Oil on canvas, 91x116 cm
The GWF observation station was established over bare ground with scarce low alpine vegetation in the 1990s. In the meantime, shrub has moved into the area and is now overwhelming the station. The red bushes are represented as flickering flames consuming the instrumentation, heating the surroundings. They carry black seeds of the continuing invasion. This painting is a good example of iterative collaboration between artist and scientists, who felt that early versions of the impression did not adequately represent the true scale of the invasion and disruption to the instrumentation. The station is no longer useful as a source of aerially-representative observations, but is retained to record the modifications caused by the vegetation close to the ground.

DRUNKEN TREES
Oil on canvas, 91x116 cm, 2019
When permafrost melts, which it is increasingly doing across northern Canada, the soil in which tree-roots are embedded starts to become more mobile and loses adherence to the sub-surface layers. On slopes, this means that trees and soil can just slide away down-slope. When the ground is flatter, the trees lean and topple over willy-nilly. Some trees can trees survive the stress and continue growing, with continuing growth being vertical. Others just collapse, or die from being water-logged.

TRANSITION
Oil on canvas, 81x116 cm, 2019
The retreating glacier, pock-marked by rock, mud and silt, overlooks the lake, which together, represent the transitions in the landscape and in the hydrological cycle: less ice, less snow, more water. The title also gestures to the transitions which local communities have to make in response to these changes; and to the transitions which all societies will have to make in order to mitigate the worst consequences of climate change, and to cope with the inevitable continuing changes.

THE GLACIER IS ROCK!
Oil on canvas, 90x150 cm, 2019
One of the more remarkable sights in Yukon are rock glaciers. These are left when the ice has mainly melted, or remains beneath the rocks in vestigial form. The rocks were once carried within, or on, the glacier, and have been added to by fall from the valley sides. They have ripples in the surface, remnant from the flow of the former glacier or a result of continuing slow movement. A rock-coloured glacier of rock, kilometres-long crawling tongue of rock, the rocks over which one can easily clamber to scale the ripples.

GHOST GLACIER
Oil on canvas, 91x116 cm, 2019
Inspired by the Rock Glacier in Kluane Park, Yukon, sitting in the distance above the ribbon of rock is the ghost of a glacier, shrouded in snow re-suspended by the wind from one of the north-facing sides of a mountain gully. In the foreground are the waters of Dezadeash Lake, which is still drip-fed by the waters flowing beneath the rock glacier, the rocky remains of what was once a glacier of ice.

THE DENIER AND THE BEAR
Mixed media on hessian, 175x135 cm, 2019

Despite overwhelming scientific evidence, there are still people who deny climate change and/or the role of humans. The consistent evidence comes from many sources, including GWF monitoring stations, such as the one represented here, at Trail Valley Creek in Northwest Territories, which has support and accommodation tents. The Polar Bear, which – to many – is iconic of the threat which climate changes poses for many animals, has supplemented his already impressive weaponry. He needs all the help he can get.

THE SLOW NUCLEAR EXPLOSION AT FORTRESS MOUNT
Oil on canvas, 90x70 cm, 2019
This painting was inspired by the words of the Chief of the Gwich'in Indigenous People, who said in April 2019, that climate change was "like watching a slow nuclear explosion". Although his People's land is further north, this seemed a good location to start developing representations of slow nuclear explosions as a metaphor for the impacts of human-induced climate change across Northwest Canada. This one is starting near the site of the GWF station, which has already been destroyed, on the edge of a cirque, which was once home to a glacier. Even Fortress Mountain can be stormed.

THE YUKON SUNRISE
Oil on canvas. 100x100 cm, 2019
The fore-mountains, near Haines Junction, beyond and above, which lay the St Elias Ice-field change their hue spectacularly through the day. This is how they respond to the rising of the Sun.

MARCHING TREES
Oil on canvas, 90x100 cm, 2019
As the climate change brings warmer temperatures, trees are moving northward and to higher elevations. To firm land was previously free of trees. First, one or two individuals establish themselves, followed by more until there are a large number of scattered individuals or, in favoured locations, small copses. As we travelled north through Yukon, especially where the terrain channelled the wind into favoured directions, and causing the trees to bend, it looks as though they were, slowly but inexorably, marching northwards.

IMPERMANENT FROST
Oil on canvas, 135x170 cm, 2019
Permafrost is defined as a subsurface layer of soil that remains frozen throughout the year, or permanent. There is an enormous area of permafrost across northern Canada. Because of climate change it is no longer permanent. Large swathes of the permafrost zone are melting. The consequences are dramatic. The surface layers slide down slopes, sometimes in slow viscous rivers of mud, carrying any vegetation, including trees, with them and leaving bare scars. When the permafrost is relatively water-rich, ice within the soil is clearly visible in the exposed scar, and during warm, day's water from the melting ice cascades out of the exposed surface. GWF scientists have examined layers in the permafrost, which are up to 15,000 years old to confirm that the melting is unprecedented on this scale. As the permafrost melts, vast quantities of carbon currently locked within it are released as carbon dioxide and methane, adding significantly to the concentration of global warming gases in the atmosphere. It may be such changes in the landscape, which prompted the Chief of the Gwich'in Indigenous People to proclaim that climate change **"was like watching a nuclear explosion in slow motion"**.

THE FORTRESS MOUNT NOW
Oil on canvas, 130x170 cm, 2019
Fortress Mountain is an iconic location in the Rockies in Alberta. Its dramatic countenance has appeared in many Hollywood films. It is an important site for one of the GWF observation stations which automatically records atmospheric and ground conditions. These observations are part of a network, which monitors changes over time and provided invaluable information to help develop predictive models; a necessity for successful modelling in such complex terrain.

THE DESERT ON THE LAKE
Oil on canvas, 90x150 cm, 2019
A trickle – which remains of the river whose glacial melt-water source was pirated by another valley because of glacier recession – makes its contorted way towards Kluane Lake. Where once was lake-water, there is now silty dust. The strong cold katabatic winds, which flow off what remains of the Kaskawulsh Glacier whip up dust storms. Melt from the thin snow cover on the distant mountains is not sufficient to maintain the lake at its pre-2016 level, when the act of piracy took place.

WILD BILL WOULDN'T RECOGNISE IT
Oil on canvas, 90x150 cm, 2019
The Peyto Glacier in Alberta is named after Wild Bill Peyto, who was born in England. On moving to Canada he became, from the 1890s onward: pioneer, railway labourer, trapper, prospector, horse outfitter, packer, legendary mountain guide, and eventually one of the first wardens of Banff National Park. One of many stories about Bill is when he released a lynx in a bar. The Peyto is one of the world's longest-studied glaciers. It has lost more than 70% of its volume since the beginning of the 20th Century with the most rapid loss being in the last decades. It is losing 3.5million cubic metres of water each year. Observation stations placed on the glacier in recent years have been lost because the ice is melting so rapidly. Where there was once ice, there are now banks of silt and mud. In the distance, perched on a bank of mud, is a form of transport Bill didn't have access to. The painting with the finer detail portrays ice remnants, discoloured by mud and silt.

DESTRUCTION BAY
Oil on canvas, 100x100 cm, 2019
The dark, drying mud in the foreground is bounded by the walls of the now redundant harbour once used for the fishing boats of the Indigenous People for whom fishing on Kluane Lake was such an important activity. The lake is still frozen – it is April, but the Background Mountains are already free of snow. The now useless harbour is on Destruction Bay: an apt name.

BURN !
Oil on canvas, 100x100 cm, 2019
Early, and less, snowmelt combined with higher temperatures prime the vegetation for burns (fires), even in April, in northern and western Canada. The mountains behind the still-frozen lake fringed by its newly exposed silty desert are bereft of even their thin snow cover. A wisp of cloud resembles a glacier arm still clinging on. The burst of yellow and red on the mountains are ‘burn’!

AFTER A SHORT WINTER
Oil on canvas, 70x90 cm, 2020
Rivers in northern Canada and Russia are normally frozen for half the year or longer. However, earlier spring river ice break-up is occurring across Russia and Canada and leading to longer ice-free seasons, warmer water temperatures, and changes to the aquatic ecosystem, including the loss of fish species that rely on cold water. Earlier river ice break-up is being triggered by warmer winters and springs, and earlier snowmelt – another indicator of the loss of cold that cold regions are experiencing around the world. Ivanov's oil on canvas captures the essence of this visually-obvious phenomenon.

THE FORTRESS MOUNT NOW
Pastel on paper, 2019
Fortress Mountain is an iconic location in the Rockies in Alberta. Its dramatic countenance has appeared in many Hollywood films.

Ogilvie Mountains, Yukon.
The Field drawing, pastel on paper, 18x24 cm, April, 2019
Spring-time checking of Global Water Futures automatic monitoring equipment in the Ogilvie Mountains include density measurements of the snow cover-extremely patchy and thin this year.

PLUNDERED BY PIRACY

The field drawing, pastel on paper.30x42 cm, April 2019

Large areas of what was lakebed as recently as 2016 are now exposed, and it is possible to walk over to what was an island on the biggest lake in Yukon, Kluane Lake. Over the space of 4 days, the 150m wide Slims River, which fed the Lake all but, disappeared. The geomorphological process known as “river capture “or” river piracy caused this. As the Kuskawulsh Glacier - whose melt water fed the Slims River, retreated through climate change the melt water was diverted down a higher valley, depriving Kluane Lake of much of its water input. This is the first known example of human-induced river piracy. It was a dramatic event. The melt water, which fed a river basin, which drained to the Bering Sea in 2016, now feeds a river basin, which drains to the Pacific Ocean.

CHANGING PALETTE ON PEYTO 1&2
The field drawing, pastel on paper. 30x42 cm , April 2019
The Peyto Glacier, in the Rockies of Alberta, has receded dramatically, particularly in the last 50 years. This rapid recession has produced a changing palette of colours; more greys, browns, and sludges as the vanishing ice – which produces more blues, whites and silvers - leaves behind banks of mud. The helicopter landed on one such bank, sticky and cloying, not frozen, because of the exceptionally warm spring. The suction and additional weight on the helicopter skis required extra thrust for it to take off.

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CARIBOU CREEK THAW SLUMPS

The field painting, mud, gouache on paper. 30x42 cm, April 2019

According to researchers, as global temperatures rise, so too has the amount of permafrost melt contributing to massive ice landslides called retrogressive thaw slumps.

The Inuvialuit-Gwich'in guide has travelled much of the region and knows it well, but that familiar landscape is changing. "Slumping from the mud and permafrost melting underneath" is changing the riverbanks, he says. "Our land underneath us is melting as we speak. "Its climate change and it's not faring well for a lot of people up here."

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The field painting, mud, gouache on canvas board. 18x24 cm, April 2019

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THE YUKON SUNRISE 1 & 2
The field drawing, pastel on paper. 30x42 cm, April 2019
The fore-mountains, near Haines Junction, beyond and above, which lay the St Elias Ice-field change their hue spectacularly through the day. This is how they respond to the rising of the Sun.

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QUILL CREEK CRACKING
The field drawing, pastel on paper. 30x42 cm, April 2019
As with other creeks and rivers across Yukon and Northwest Territories, the recent pattern of very early ice break-up was occurring. Snow was hanging in on the north-facing sides of the mountain gullies, but most of the south-facing sides were bare.

YUKON RIVER.
FIVE FINGER RAPID.
The field drawing, pastel on paper. 30x42 cm, April 2019
The Klondike Stampede.
During the 1898 Klondike Gold Rush, thousands of prospectors navigated their homemade boats and rafts 1300 kilometers (800 miles) from Bennett Lake to Dawson City. Five Finger Rapid was a major obstacle along the route and more than a few stampeders ended up in the water after choosing the wrong channel.

THE YUKON SUNSET 1 & 2
The field drawings, pastel on paper. 30x42cm, April 2019
The mountains near Haines Junction are equally, but differently, attractive at sunset.

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WAITING TO MOVE

The field drawing, Dawson city. 30x42 cm, April 2019

The tripod sitting on the Yukon River ice at Dawson City is the indicator, when it moves, of the time of ice break-up. This event occurred a few days after this scene was painted: April 23 was the equal earliest date recorded.

STILL FROZEN, FOR NOW – 1&2
The field drawing, pastel on paper. 30x42 cm, April 2019
Atop the St. Elias Ice-field – the third-largest ice field in the world – after Antarctica and Greenland. The ancient ice-sculpted forms of distant mountains, including rise upwards almost 6,000 from the Pacific Ocean to Mount Logan, which provides a spectacular point of concern being pointed out by the figure of Prof Pomeroy. Despite having the greatest elevational range in the world. The St Elias mountain range has lost a quarter of its ice cover in the last 50 years. The ice-field still feeds the receding Kaskawulsh Glacier that used to support the now diminished Kluane Lake.

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THERE ARE STILL WOLVES

The field drawing, pastel on paper. 30x42 cm, April 2019

The ecosystem at Wolf Creek is in rapid change. Here are a number of scientific monitoring stations, which have observed the environmental change over the last 25 years. The vegetation is responding. Shrubs are growing more prolifically. Wolves still roam, but other predators, including lynx and coyote, are moving northwards. The ecosystem will continue to change.

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HAIL ON KATHLEEN LAKE

The field drawing, pastel on paper, with a contribution from a hailstorm. April 2019, 30x42 cm

Kathleen Lake, in Kluane National Park, is still ice covered. This scene was captured when the artist was on the lake, together with two Indigenous People who were fishing through a hole in the 80cm thick ice. An enormous hailstorm started, and the stippled appearance of the drawing is the result of hailstones falling on the paper. (Artist's note: so I feel that this painting truly captures something of - and from! - the atmosphere of this beautiful location). Kokanee salmon live in the lake; a landlocked version of Sockeye salmon, trapped by a surging glacier in a Glacial Age, which have adapted to living wholly in freshwater. The Kokanee population is now recovering from a crash with a low point in 2008. The reasons are not fully understood, but it may be related to an interaction between climate and the hydrological cycle (including hydro-chemistry); and example of the importance have having good scientific observations.

DESTRUCTION OF A WAY OF LIFE AT DESTRUCTION BAY 1&2
The field drawing, pastel on paper. 18x24 cm, April 2019
Kluane Lake is still ice covered. The piracy of water into the Slims River has caused the lake level to drop by almost 2m since 2016. This means that some fish cannot reach their natural spawning waters. It has also meant that the substantial harbours, which were constructed for the fishing boats of the local indigenous peoples, including the one at Destruction Bay, can no longer be used. They are stranded and useless.

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Woolf_creek_gouashe_on_paper_30x42cm, April 2019

THE RED INVASION
The field drawing, pastel on paper. 30x42 cm ,April 2019
In Tombstone Park, north of Dawson City, there was much less snow cover than there used to be, and the reddish hues in this painting reflect the increasing encroachment of shrubs - northwards and to higher elevations - because of climate change.

PINING AT THE EDGE OF PINE LAKE
The field drawing, pastel on paper. 18x24 cm, April 2019
The stooping trees in this northward facing perspective of Pine Lake appear to be bowing in sympathy for their cousins further north in permafrost regions where large swathes of the frozen sub-surface are melting, causing trees to slide down slopes, or drunkenly collapse on flatter terrain.

STILL FROZEN,STILL ICE CROSSING

The field drawing, pastel on paper. 35x24 cm, April 2019

The Mackenzie River Basin is a 1.8 million square kilometer basin in northwestern Canada. It drains 20 per cent of Canada's lend mass, including waters from Northwest Territories, The Yukon, British Columbia, Alberta and Saskatchewan. The basin includes two freshwater deltas-the Peace-Athabasca and the Slave River deltas. Many First Nations communities rely on the natural rhythms of high and low river flows in the deltas and the subsequent increase in biological productivity to sustain traditional livelihoods.

TRAIL VALLEY CREEK STATION

The field drawing, pastel on paper. 18x24 cm, April 2019

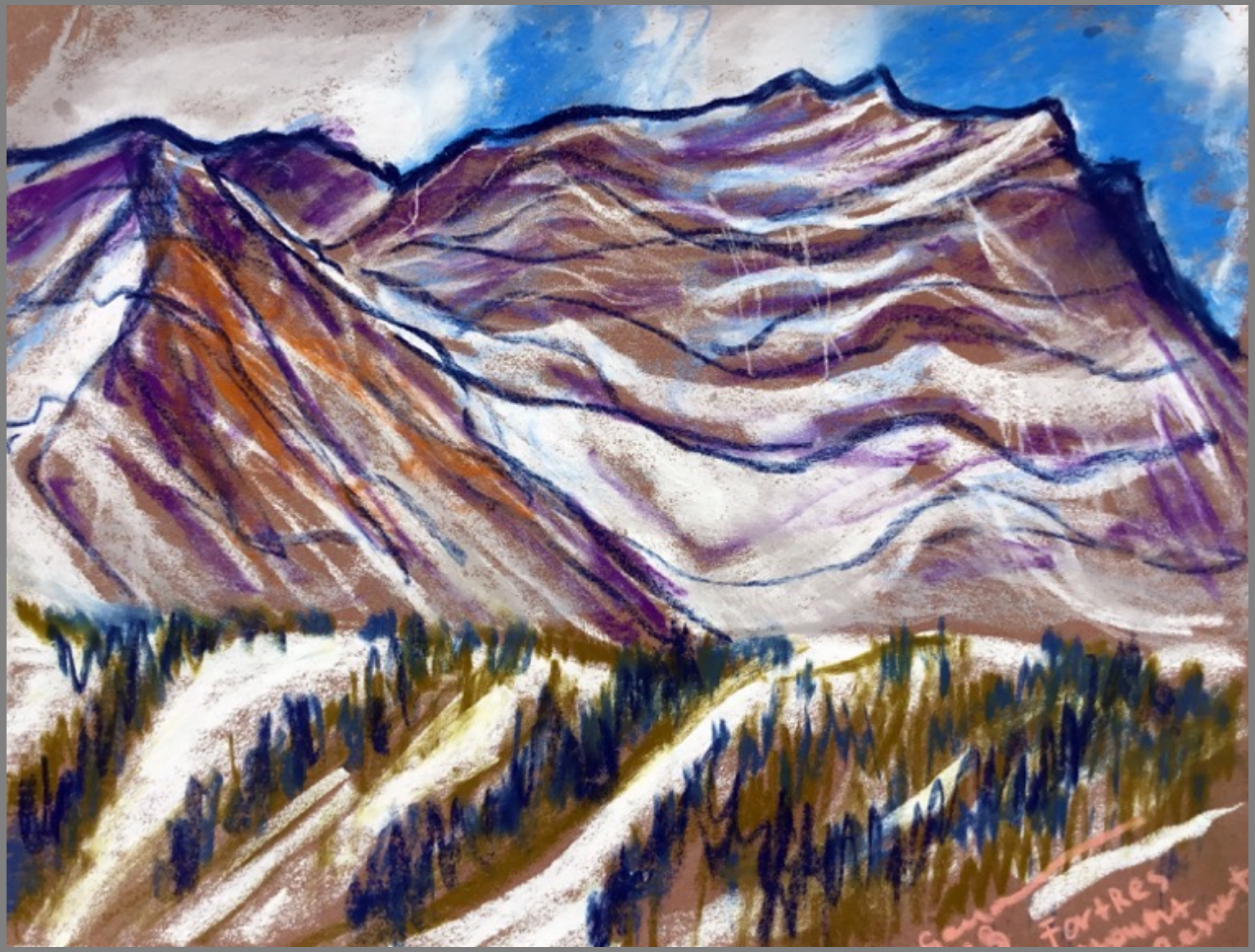
Trail Valley Creek Research Station, in Northwest Territories, was established in the early 1990s. It is has grown to be amongst the most instrumented, and well-studied, research basin in this part of Canada, with a number of organizations, particularly Wilfrid Laurier University, installing equipment. This major scientific effort requires significant support, including accommodation and sleeping tents, field laboratories and power supplied via wind turbines and solar cells.

WANING POWER

The field drawing, pastel on paper. 18x24 cm, April 2019.

The glacier above Lake Louise is an ever-diminishing shadow of even its recent former self, because of humans-induced climate change. On geological time-scales the former immensity of its power is evident from the deep U-shaped valley, which it scoured out. Its vestigial form may vanish by the end of the century.

NEAR FORTRESS MOUNTAIN
The field drawing, pastel on paper. 18x24 cm, April 2019
Accessing the GWF observation station beneath Fortress Mountain requires significant logistical support: snowmobiles, and so on. These pastels were painted as we awaited the arrival of the GWF support team of the logistics camp.



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PREDATOR
SERIES ‘POWERFUL AND VULNERABLE’
Oil on canvas, 120x90 cm, 2019

Ursus maritimus evolved as a powerful and efficient predator. They are hunters specialising in ice seals. They also eat plant material and land mammals, but they do not get sufficient calories from these terrestrial sources. Their sea-hunting depends on sea-ice, and there has been a plentiful supply of food during fall, winter and spring. This has been changing for some time: climate change means less extensive and shorter-lived sea ice. It is now quite common to see Polar Bears scavenging around human communities for garbage. The current population is estimated to be between 22-31,000, with 60-80% living in Canada. North-east Canada and northern Greenland are likely to be the two regions which retain a fringe of sea ice throughout the year. Predictions are that global Polar Bear populations will decline by around 30% over the next two decades.

The_boy_and_the_little_Polar_bear_Transitions_project_oil_on_canvas_100x100cm_2018

The_arctic_Ice_hummocks_
Polar_bears conflicting with Black bears ???
oil_on_canvas_100x160cm__2019

The Dreams I
now have 1
Oil on canvas,
100x100 cm,
2014-2019

Metamorphosis

The Dreams I now have 2
Oil on canvas,
100x100 cm,
2014-2019

Metamorphosis

MELTING POLAR BEAR
Mixed media on canvas, 152x102 cm, 2019
Ursus maritimus evolved as a powerful and efficient predator. They are hunters specialising in ice seals. They also eat plant material and land mammals, but they do not get sufficient calories from these terrestrial sources. Their sea-hunting depends on sea-ice, and there has been a plentiful supply of food during fall, winter and spring. This has been changing for some time: climate change means less extensive and shorter-lived sea ice. It is now quite common to see Polar Bears scavenging around human communities for garbage. The current population is estimated to be between 22-31,000, with 60-80% living in Canada. North-east Canada and northern Greenland are likely to be the two regions which retain a fringe of sea ice throughout the year. Predictions are that global Polar Bear populations will decline by around 30% over the next two decades.

Peyto_Crevasses_91x116_cm_oil_on_canvas 2019

Peyto_Crevasses_91x116_cm_oil_on_canvas, 2019

Kananaskis_country_20x20_cm_oil_on_canvas, 2019

Marmot_creek
_20x20_cm_o
il_on_canvas
2019

Five_finger_rapids_40x40_cm_oil_on_canvas
2019

Three_sisters
_mointains_2
0x20_cm_oil
_on_canvas_
2019

Vermillion_pass_forest_fire_30x30_cm_oil_on_canvas_2019

Athabasca_heat_20x20_cm_oil_on_canvas- 2019

The_Athabasca_glacier_30x30_cm_oil_on_canvas 2019

The_Pine_lake_30x30_cm_oil_on_canvas 2019

Richardson_mountains_digital_drawing_30x42cm_2019

Three_Sisters_Mountains_Alberta_30x30_cm_oil_on_canvas 2019

The_Athabasca_Mountain_30x30_cm_oil_on_canvas 2019

The_Fortress_Mountain_46x25_cm_oil_on_canvas 2019

The_Fortress_mountain_30x30_cm_oil_on_canvas 2019

Autumn_on_the_
Piramid
lake_40x50_cm_
oil_on_canvas
2019

THE TASTE OF FIRE
Oil on canvas, 83x113 cm, 2019
Here the artist has used separate elements of fire, disaggregated to mirror the lattice structure of a Global Water Futures tower for observing carbon and water fluxes. He has included water, snow and ice elements. There is also the head of a bird. The raven is important for many indigenous Canadian peoples, although the symbolism is complex. When it talks it can represent prophecy and insight, but also deceit and trickery.
“I think of the scientists pursuing truth, and those who seek to deny it.” (Gennadiy Ivanov).

Fire- global warming's shockwave
Oil on canvas, 90x90 cm, 2019

Fire has been a recurring theme of the Transition's team experience and represents the shockwave of global warming: more frequent, more intense and larger wildfires burning forests, grasslands, tundra, homes, and communities. Wildfires can spread faster than a human can run and the accounts of fires from the oil train derailments in Saskatchewan and Quebec and the partial burning of the City of Fort McMurray by wildfire in 2016, the most expensive natural disaster in Canadian history, haunted the team.
Wildfires are an important part of natural ecosystem renewal and small wildfires were part of how Indigenous peoples managed forests and grasslands and prevented larger wildfires. Modern global warming-driven wildfires are large, intense and dangerous and can also cause increased flooding after fires have burned soils and vegetation and so reduce the natural ability of river basins to retain and evaporate water from snowmelt and rainfall. "This painting is based on a bonfire I saw near Saskatoon, set during a wet period in a rural area that had almost burned down in the previous record-dry spring due to a grass wildfire. It is menacing and foreshadows the greater destructions that wildfire can cause." (Gennadiy Ivanov)

DENIERS' STATION
Oil on canvas, 95x90 cm, 2019

Ivanov's inspiration for this painting was the cold regions field research stations of the Global Water Futures programme. The instruments record meteorological variables including water vapour flux and carbon dioxide exchange. Ivanov has inverted the instruments since, to him, it represents the way in which climate deniers turn logic upside-down.

CRYCONITE SEDIMENT I
Oil on canvas, 80x60 cm, 2019

"One of the most fascinating outcomes of conversations with scientists has been my growing realisation of how interconnected the world is and how something that is very small can affect the whole planet." (Gennadiy Ivanov).

CRYCONITE SEDIMENT II
Oil on canvas, 80x60 cm, 2019

"One of the most fascinating outcomes of conversations with scientists has been my growing realisation of how interconnected the world is and how something that is very small can affect the whole planet." (Gennadiy Ivanov).

THE NORTHERN APPLE
Oil on canvas, 200x150 cm, 2019

This painting expresses some of my emotions when talking in a light-hearted way of apple orchards in Northwest Territories. Here the apple is growing on an automatic weather station. The animals will have to adapt, or not, to major climate shifts. The scientists do their best to explain". (Gennadiy Ivanov).

LAST CHANCE
Oil on canvas, 120x150 cm, 2019

Rosedeer, in the Alberta Badlands, was once a thriving coal-mining town. Now, few people live here. The name of the saloon at the hotel seemed apposite. Time is running out to make the necessary sharp reductions in carbon emissions to avoid the very worst consequences of climate change. On the other side of the disused railway track from the Last Chance Saloon was a dead tree festooned with dolls and toys. “Somehow, to me, this summed up the starkness of the choices facing us; or rather, to which we have to face up”. (Gennadiy Ivanov).

KLUANE LAKE
Pastel on paper, 38x58 cm, 2019

SUMMER AT THE ATHABASCA GLACIER
Pastel on paper, 38x58 cm, 2019

ATHABASCA GLACIER
Pastel on paper, 38x58 cm, 2019

AND FIRE IN HIS EYES
Oil on canvas,
100x100 cm, 2019

“One thing which has really struck me about the scientists is how enthusiastic – indeed, passionate – they are about their research. They are fired-up about their work." (Gennadiy Ivanov). This painting shows John Pomeroy, who is discussing some important detail of the science, with Trevor Davies. Davies is the reflection; standing next to an automatic weather station on the Athabasca Glacier.

Vermillion Pass Forest Fire
Oil on canvas, 80x80 cm,
2019

Vermilion Pass gets its name from the colouration which originates in mineral springs of iron oxide. These ochre springs are important for the indigenous people, and are known as the paint pots. Scientifically, it is an interesting location because of the pronounced influence of groundwater chemistry on surface waters. “This felt a special – and elemental – place to me. The paint pots and the stream-water downstream were amongst the most vivid colourations I have seen in nature”. (Gennadiy Ivanov).

SENTINELS FROM ANCIENT SEAS
Oil on canvas, 120x150 cm, 2019
Hoodoos – these strange formations – have become a symbol of Alberta's Badlands. They are composed of erodible sand and clay deposited during the Cretaceous which, originally, was covered by a harder, more resistant layer. The sedimentary layers became exposed following the catastrophic flooding that accompanied deglaciation in the Prairies. As erosion from snowmelt and rainfall proceeded, the harder rock provided some protection to the softer underlying layers. The harder capstones remain today in this strange landscape of rock mushrooms. These sentinels are eroding rapidly today, on watch over the landscape which contained, and still contains, so much fossil carbon. Wear and tear from tourists, which flock to see them, have caused additional erosion to many of the finest specimens. Visitor access to some of the sentinels is now restricted, but erosion is proceeding apace due to heavier and more frequent summer rainfalls due to climate change.

RECEDING GLACIER
Oil on wooden panel, 60x80 cm, 2019
An impressionistic painting inspired by spectacular views seen of the Athabasca, Peyto, and Stanley Glaciers.

THE DINOSAUR'S DAMNATION
Oil on canvas, 120x150 cm, 2019
The artist has taken the opportunity to juxtapose a dinosaur, the fossil- and coal-bearing strata, and a modern Alberta oil extraction facility. Many indigenous peoples in North America have a mythology about a horned serpent, with the mystical beast associated with extreme events – rain, water, thunder, lightning. "Many of the fabulous fossils in the Tyrell Museum just outside Drumheller evoked a horned serpent in my mind", (Gennadiy Ivanov). The dinosaur is watching, atop the beds overlaying the fossil-rich strata, as humankind is instigating a global environmental change which may well appear in Earth's future geological record- and already dubbed the Anthropocene.

The_Stanley_Glacier_30x30_cm_oil_on_canvas
2019

Peyto crevasses
Oil on canvas, 91x116 cm, 2019

DEEP WATER, ATHABASCA GLACIER
Oil on canvas, 108x150 cm, 2019

WORLDS WITHIN WORLDS
Oil on round canvas, 20 cm diameter, 2019

"One of the most fascinating outcomes of conversations with scientists has been my growing realisation of how interconnected the world is and how something that is very small can affect the whole planet." (Gennadiy Ivanov).
The connection between the rate of melting of the ice and the “brightness” (the albedo, in scientific terms) of the ice surface. Clean ice is very bright and melts slowly and dark ice absorbs solar energy and melts more quickly. Rapid ice melt leads to sea level rise and deglaciation. This dark material is known as cryoconite, and is teaming with life, including pollen and living organisms such as algae and bacteria. Cryoconite accelerates glacier melt. It can be studied through the technique of scanning electron microscopy (SEM), which produces images at, typically, around 10,000 magnification. These World Within World paintings are based on SEM images of cryoconite samples from the Peyto Glacier – collected and analysed by Global Water Futures scientists. This normally unseen “microworld” has profound impacts on our Earth - the accelerated glacier melt caused by these microorganisms even contributes to the sea level rise that low-lying coastal regions such as East Anglia in the UK are experiencing.

WORLDS WITHIN WORLDS
Oil on round canvas, 20 cm diameter

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WORLDS WITHIN WORLDS
Oil on round canvas, 20 cm diameter

"One of the most fascinating outcomes of conversations with scientists has been my growing realisation of how interconnected the world is and how something that is very small can affect the whole planet."
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The connection between the rate of melting of the ice and the “brightness” (the albedo, in scientific terms) of the ice surface. Clean ice is very bright and melts slowly and dark ice absorbs solar energy and melts more quickly. Rapid ice melt leads to sea level rise and deglaciation. This dark material is known as cryoconite, and is teaming with life, including pollen and living organisms such as algae and bacteria. Cryoconite accelerates glacier melt. It can be studied through the technique of scanning electron microscopy (SEM), which produces images at, typically, around 10,000 magnification. These World Within World paintings are based on SEM images of cryoconite samples from the Peyto Glacier – collected and analysed by Global Water Futures scientists. This normally unseen “microworld” has profound impacts on our Earth - the accelerated glacier melt caused by these microorganisms even contributes to the sea level rise that low-lying coastal regions such as East Anglia in the UK are experiencing.

WORLDS WITHIN WORLDS
Oil on round canvas, 50 cm diameter

"One of the most fascinating outcomes of conversations with scientists has been my growing realisation of how interconnected the world is and how something that is very small can affect the whole planet." (Gennadiy Ivanov).
The connection between the rate of melting of the ice and the “brightness” (the albedo, in scientific terms) of the ice surface. Clean ice is very bright and melts slowly and dark ice absorbs solar energy and melts more quickly. Rapid ice melt leads to sea level rise and deglaciation. This dark material is known as cryoconite, and is teaming with life, including pollen and living organisms such as algae and bacteria. Cryoconite accelerates glacier melt. It can be studied through the technique of scanning electron microscopy (SEM), which produces images at, typically, around 10,000 magnification. These World Within World paintings are based on SEM images of cryoconite samples from the Peyto Glacier – collected and analysed by Global Water Futures scientists. This normally unseen “microworld” has profound impacts on our Earth - the accelerated glacier melt caused by these microorganisms even contributes to the sea level rise that low-lying coastal regions such as East Anglia in the UK are experiencing.

WORLDS WITHIN WORLDS
Oil on oval canvas, 2019

"One of the most fascinating outcomes of conversations with scientists has been my growing realisation of how interconnected the world is and how something that is very small can affect the whole planet." (Gennadiy Ivanov).
The connection between the rate of melting of the ice and the “brightness” (the albedo, in scientific terms) of the ice surface. Clean ice is very bright and melts slowly and dark ice absorbs solar energy and melts more quickly. Rapid ice melt leads to sea level rise and deglaciation. This dark material is known as cryoconite, and is teaming with life, including pollen and living organisms such as algae and bacteria. Cryoconite accelerates glacier melt. It can be studied through the technique of scanning electron microscopy (SEM), which produces images at, typically, around 10,000 magnification. These World Within World paintings are based on SEM images of cryoconite samples from the Peyto Glacier – collected and analysed by Global Water Futures scientists. This normally unseen “microworld” has profound impacts on our Earth - the accelerated glacier melt caused by these microorganisms even contributes to the sea level rise that low-lying coastal regions such as East Anglia in the UK are experiencing.

THE SALT LAKE
Oil on canvas, 80x80 cm, 2019

Near Clavet Research Farm the changing patterns of flood, salinization and drought have led to the evaporation of a shallow lake, leaving salt deposits. In the distance are hay bales and a traditional grain elevator. “I have used this scene to produce another expressionistic painting. I have supplemented the hay bales with stacks of oil pipe sections, which are a common sight across the Prairies. I have also introduced a coal power station. Around one-third of Saskatchewan’s power comes from coal-burning.” (Gennadiy Ivanov).

DRUMHELLER CANYON AND COLOURFUL EARTH LAYERS
THESE ARE THE BADLANDS OF ALBERTA
Pastel drawing , 45x65 cm, 2019

The Prairies east of Calgary in summer are vast rolling fields of canola and wheat. The vast underlying oil and gas reserves are evidenced by storage tanks dotted across the landscape, looking like shiny buttons in the vast landscape. Occasionally, long trains transporting the fossil fuel traverse the landscape. This is also old coal country; settlements – with names like Carbon - whose original purpose was coal-mining; but no more. And then, on the sedate journey eastwards – a dramatic 130m deep scar cutting through the rolling landscape. The canyon was cut by the Red Deer River during the catastrophic flooding that accompanied deglaciation around 10,000 years ago. The river cut a deep channel into the layers of ancient ocean and swamp sediments deposited along with carbon - which later formed into coal - during the Cretaceous Period around 70-75 million years ago. The horizontal rock bands are of distinctly contrasting colours of textures. Some of these layers have provided one of the richest sources of dinosaur fossils in the world. The town which sits on the floor of the canyon – Drumheller, originally a coal mining town – is justifiably proud of its moniker: Dinosaur Capital of the World.

Peyto Crevasses
Pastel on paper, 45x65 cm
2019

SASKATCHEWAN PRAIRIES
Pastel drawing, 45x64 cm, 2019
As the Transitions team travelled eastwards from Drumheller, over the Alberta – Saskatchewan border, on the way to Saskatoon where the Global Water Futures research programme has its headquarters at the University of Saskatchewan, the railways became an increasingly obvious feature in the landscape. They are used to transport Prairie wheat, oilseeds, pulse crops, potash and oil. Saskatchewan has the world's largest potash reserves, with many of the mines near Saskatoon. The resource formed when a large inland sea evaporated around 400 million years ago. The oil and gas industry is smaller than in Alberta but is still substantial: Saskatchewan is Canada's second largest producer of oil. Saskatchewan has one of the highest greenhouse gas emission rates per person in the world. The traditional, tall, grain elevators by the rail-side are noticeable features, often greatly-valued as heritage by the settlements near where they are located. The STOP sign in this expressionistic painting signals humanity's need to stop just carrying on as "normal".

THE ICE AND FIRE
Oil on canvas, 116x91 cm. 2019

Here the artist expresses some of his memories of the Transitions trip to the Rockies and the Prairies. One is the seemingly endless trains which transport Canadian resources for export, and carry manufactured goods from around the globe – a symbol of the nature of human activity which is driving climate change. Also included is a Global Water Futures' observation station which monitors the changing weather due to climate change, and the changing state of glaciers and snow-packs. A scientist reflects on the challenges global society faces in de-coupling our necessary activities from continuing increases in greenhouse gas emissions. We need to open the window to adopting, and identifying, new solutions.

THE AUTUMN FEELINGS, SOUTH SASKATCHEWAN RIVER

Oil on canvas, 80x80 cm

Hundreds of miles to the east, some of the meltwater from the Canadian Rockies flows through the Canadian Prairies in the South Saskatchewan River. The streamflow regimes in the Canadian Prairies are also changing because of climate change and human use for irrigation and hydroelectric power. Pronounced floods and droughts (which are leading to earlier and more frequent vegetation fires) are increasing in frequency and intensity, with implications for agriculture, infrastructure and transport. The worst floods and droughts since colonisation of the region in the late 1800s have occurred in the last two decades. The South Saskatchewan River flows through the city of Saskatoon, the home of the University of Saskatchewan and the headquarters of the Global Water Futures research programme. The slumping banks of the river, and the changing pattern of sand bars, show evidence of shifting patterns of erosion and deposition in response to recent hydrological changes. The best way of seeing this evidence is from a canoe, and this series of pastels illustrates the changing views – very different from the sculpted landscapes of the Rockies – painted on a 12km sojourn on the river, downstream towards Saskatoon, under the paddle power of the scientists!

Peyto glacier
Glacier Ice and Water

80x80 cm, oil_on_canvas 2019

Distributed amongst the terminal moraines, just below the glacier snout, are the strange black accumulations of cryoconite, some of which resemble mountain ranges in miniature form, 1-2m in height.
The view down the glaciated U-shaped valley, from a point beneath the present glacier snout, gives a very clear impression of the scale of Peyto in recent decades.

The_Fortress_mountain_end_of_summer_45x65_cm_
pastel_on_paper 2019

Athabasca_glacier_runoff_91x116_cm_oil_on_canvas 2019

BREAKFAST WITH SCIENTISTS
Oil on canvas, 150x120 cm, 2019

A vital part of the Transitions climate-art project is discussion with the scientists, not only in the field but also in reflection. This conceptualisation of a breakfast conversation with Professor John Pomeroy (left) and Professor Trevor Davies occurred the morning after our exhausting day on the Peyto Glacier in August 2019. On the table is an accumulation of cryoconite; a strange material which consists of ash and soot from wildfires and air pollution, dust, bacteria, fungi, algae and other organisms. It collects on the surface of the glacier, and has been increasing over the years as greater more frequent and more extensive wildfires deposit more soot which feeds the algae and microbes, darkens the glacier and contributes to increasing melt rates. Summer melt washes some of it off the glacier surface, and it accumulates in weird formations below the snout of the glacier. Scientists from Global Water Futures are examining its composition by various techniques, including scanning electron microscopy and DNA sequencing and showing how it is accelerating glacier melt and ultimately sea level rise.

THE END OF THE ENDLESS OIL TRAIN
Oil on canvas, 90x90 cm, 2019

The oil trains traversing the Canadian Prairies seemed endless. Eventually they did end. Is this painting prophetic? Transporting oil this way presents risks from spills and contamination. Two recent derailments in two months near Guernsey, 115 km south-east of Saskatoon, led to spills of 1.5 and 1.6 million litres of oil. These incidents can be catastrophic; the derailment of a train carrying oil from Saskatchewan in 2013 caused an explosion and the deaths of 47 people in Lac Mégantic, Québec.

BIRTH OF THE RIVER, DEATH OF THE GLACIER
Oil on canvas, 91x116 cm, 2019

The rapidly retreating Peyto Glacier reveals a former sub-glacial channel that is emerging as a large stream beside the glacier. The stream is fed from melting ice and snow and is choked with ice that has collapsed from tunnel walls within the glacier and now will flow with the river to melt downstream. The cold water from these streams provides ideal conditions for native trout in the Canadian Rockies. This cold water has become even more important as recent hot summers have warmed river temperatures above the cool conditions that trout require. Glacial meltwater can also be an important water supply to support river flows to the Canadian Prairies and British Columbia in years of drought.

Title: *Former Peyto Glacier*
Media used: pastel on paper, 2019.
Dimensions: 45x65cm
Caption: Here I attempt to capture the criss-cross patterns of crevasses and melt channels on the glacier; to give a sense of the collapse of the ice mass. So much of the foreground detail in this painting was hidden on my first visit to Peyton in April 2019. We walked over this landscape, but it was mainly snowcovered and frozen. In August the deposits of glacial silt and black cryoconite accumulations - surrounded by, and saturated with, water – are next-to-impossible to walkover. They give way and suck you down up to your knees; they want to drag you down. Although, again, a colorful painting, when I look at my own painting as a spectator the bare moraines and sediments left by the retreating ice giveve me a sense of destruction, darkness and decay borne in rapid deglaciation initiated by human-caused climate change. It is a disturbing task to task to try to represent the sense of decay during an azure day which produced vivid contrasts and colorations.

Vermillion Pass
Forest Fire. Stanley
Creek

Pastel drawing

65x45 cm

Athabasca_glacier_station_II_47x62_cm_pastel_on_paper 2019

Athabasca_glacier_station_I_47x62_cm_pastel_on_paper 2019

NORTH EAST SWALE
Pastel on paper drawing, 18x24 cm, 2019
North East Swale is on the edge of Saskatoon. It is regarded as a unique environment, which has natural and cultural connections to Saskatchewan's past. It is a habitat for more than 200 plants species, more than 100 birds, and many mammals, reptiles, insects and amphibians. It harbours some of the last Plains Rough Fescue in the world. Its wetlands store runoff from the rapidly growing immediately-adjacent urban neighbourhood. Consequently, its successful management is challenging. It is an important field training attribute for students at the University of Saskatchewan. Here they start to understand the rigorous science methods which are required to understand the complex human-environment linkages which are needed for successful management of valuable environmental resources. This field pastel shows new housing development in the distance; and behind it an approaching storm. There are dead patches in the vegetation cover – a consequence of pronounced fluctuations in water levels due to recent drought and previous flooding-extremes that are magnified because of climate change.

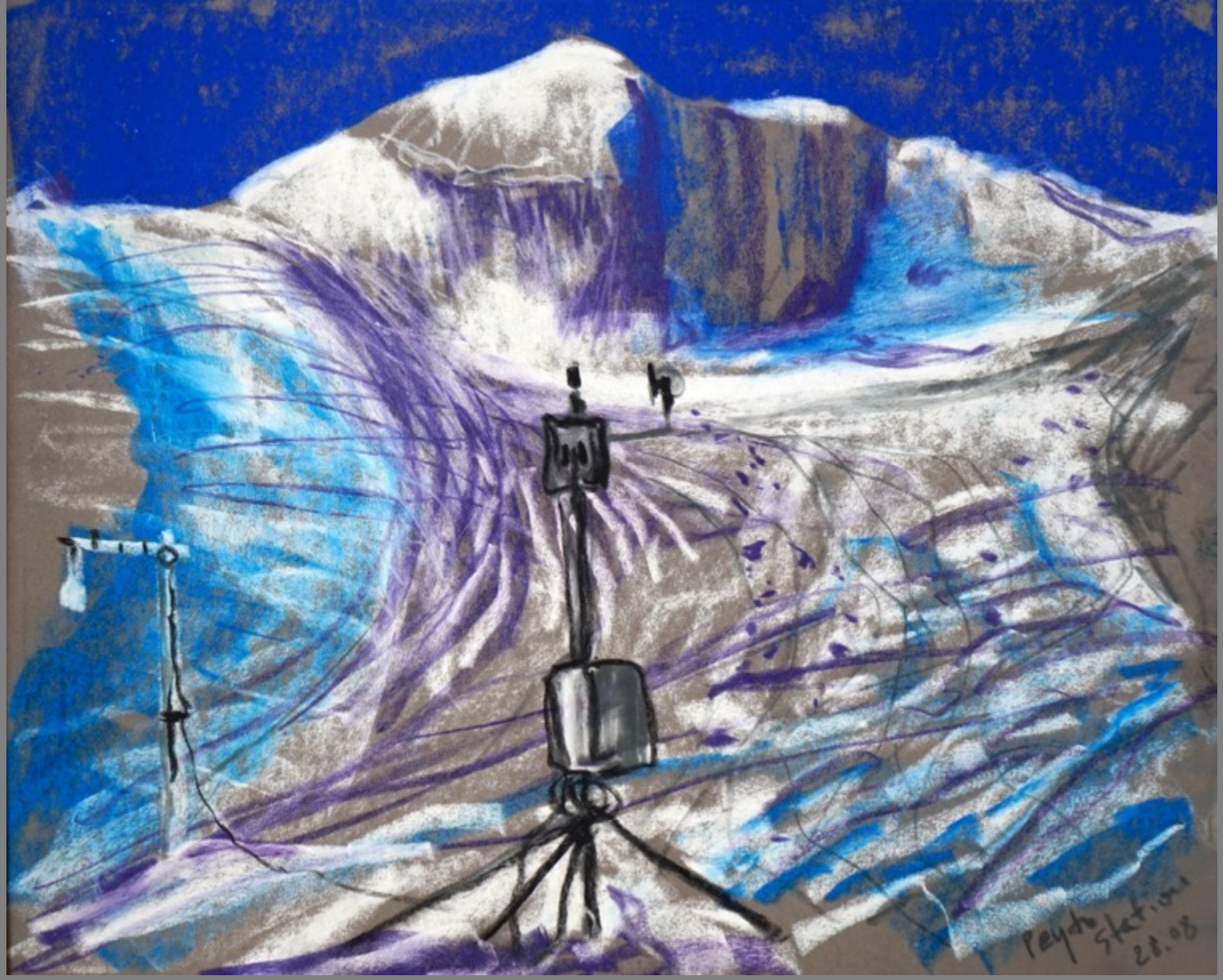
Peyto Glacier, pastel drawing on paper, 18x24 cm, 2019

Peyto Glacier, pastel drawing on paper, 18x24 cm, 2019

Peyto Glacier, pastel drawing on paper, 18x24 cm, 2019

Peyto Glacier, pastel drawing on paper, 18x24 cm, 2019

Peyto Glacier, pastel drawing on paper, 33x45 cm, 2019



Peyto Glacier, pastel drawing on paper, 18x24 cm, 2019

Peyto Glacier, pastel drawing on paper, 18x24 cm, 2019

Athabasca Glacier, pastel drawing on paper, 33x45 cm, 2019

Stanley Glacier, pastel drawing on paper, 33x45 cm, 2019
Stanley Glacier is in Kootenay National Park in British Columbia, just over the provincial border with Alberta and in the headwater of the Columbia River which supplies water for ecosystems, food and energy in vast areas of British Columbia and the US Pacific Northwest. Although not as intensively monitored as glaciers like Peyto of Athabasca it, too, is receding rapidly. On the trek up to a convenient vantage point to paint, there is still much remaining evidence of the Vermilion Pass forest fire which destroyed 2,500 hectares over 18 days in 1968 and subsequent fires in 2003 and 2018. Forests in these locations take a long time to recover. The ground squirrels were inquisitive.

Near_Stenley_glacier_24x30_cm_pastel_on_paper, 2019

Near_Stanley_glacier_
24x30_cm_pastel_on_
paper 2019

Near_Stenley_glacier_24x30_cm_pastel_on_paper, 2019

JOHNSON LAKE
Pastel field drawing, 24x30 cm, 2019
Johnson Lake is a 20 ha reservoir, at an elevation of 1,426m, near Banff in Alberta.
"I made a small field painting of this lake because I was struck, and depressed by the fact, that although - to my eyes – it looked pristine, there were recent notices warning that the lake's trout were suffering from an out-break of whirling disease." (Gennadiy Ivanov).
Whirling disease is caused by a myxosporean parasite which induces the fish to swim with a whirling motion. It was first observed in the USA, and has spread across international and provincial borders through recreational activities. Although not related to climate change, it was an example of the multitude of stresses which human activity can place on aquatic environments.

Athabasca Glacier, pastel drawing on paper, 33x45 cm, 2019

THE STATION OF FORTRESS MOUNTAIN RESEARCH BASIN. **END OF SUMMER BY FORTRESS MOUNTAIN**

pastel drawing on paper, 33x45 cm, 2019

Fortress Mountain Research Basin is where GWF scientists are discovering the fundamental processes that govern the interaction between climate, high mountains, snow, ecosystems and streamflow generation. It shows that mountain hydrology can be sensitive to climate change and that ecosystem processes mediate this response to cause a very different future ability of mountain catchments to generate source waters.
“The paintings I produced of the Fortress Mountain Research Basin, during and after the Transitions visit in March-April, when snow blanketed the flatter surfaces and an icy gale was blowing, were – viewers told me – amongst the most dramatic of my paintings. The landscape is dramatic. I wanted to capture its very different demeanour in summer. To my astonishment, rather than wind-hardened snow, the land around the automatic weather station closest to the dramatic peak had a green alpine meadow appearance. Just a kilometre away, and a little lower, another weather station was surrounded by shrubs and small trees. I painted Fortress Mountain at the end of summer but. Already, I could sense its return to its icy winter wilderness”.

Near_Fortress_mountain_20x20_cm_pastel_on_paper 2019

COUGAR CREEK DEBRIS NET
Pastel on paper field drawing, 33x45 cm, 2019
On June 20 2013, the town of Canmore, Alberta and much of the surrounding region experienced a devastating flood that was the most expensive natural disaster in Canadian history at that time. The torrent formed a debris flow that tore down Cougar Creek destroying homes, railways and roads, causing substantial damage and isolating the region for several days. The flood was caused by three days of heavy rainfall forming runoff over still frozen alpine soils and enhanced by melt of a late lying alpine snowpack. It was exceptional event in modern Canmore, but similar events were noted in the late 19th and early 20th C. In anticipation of the increased frequency and magnitude that is likely for future extreme rainfalls, a temporary debris net was constructed above the town after the 2013 flood to retain boulders and trees within the torrent. A retaining dam is planned for future. The University of Saskatchewan's Coldwater Laboratory is based in Canmore, researching climate and hydrological regime changes and has developed predictive models for events such as this.

OCHRE RIVER
Pastel field drawing, 24x30 cm, 2019

Vermilion Pass gets its name from the colouration which originates in mineral springs of iron oxide. These ochre springs are important for the indigenous people, and are known as the paint pots. Scientifically, it is an interesting location because of the pronounced influence of groundwater chemistry on surface waters. “This felt a special – and elemental – place to me. The paint pots and the stream-water downstream were amongst the most vivid colourations I have seen in nature”. (Gennadiy Ivanov).

SHORT SOJOURN ON SOUTH SASKATCHEVAN
The field pastel drawing, 24x30 cm, 2019

Hundreds of miles to the east, some of the meltwater from the Canadian Rockies flows through the Canadian Prairies in the South Saskatchewan River. The streamflow regimes in the Canadian Prairies are also changing because of climate change and human use for irrigation and hydroelectric power. Pronounced floods and droughts (which are leading to earlier and more frequent vegetation fires) are increasing in frequency and intensity, with implications for agriculture, infrastructure and transport. The worst floods and droughts since colonisation of the region in the late 1800s have occurred in the last two decades. The South Saskatchewan River flows through the city of Saskatoon, the home of the University of Saskatchewan and the headquarters of the Global Water Futures research programme. The slumping banks of the river, and the changing pattern of sand bars, show evidence of shifting patterns of erosion and deposition in response to recent hydrological changes. The best way of seeing this evidence is from a canoe, and this series of pastels illustrates the changing views – very different from the sculpted landscapes of the Rockies – painted on a 12km sojourn on the river, downstream towards Saskatoon, under the paddle power of the scientists!








SHORT SOJOURN ON SOUTH SASKATCHEVAN
The field watercolours, 10x15 cm, 2019

CLAVET RESEARCH FARM, SASKATCHEWAN
The pastel field drawing, 24x30 cm, 2019

Just outside Saskatoon is a Global Water Futures experimental set-up at the Clavet Research Farm-part of a livestock and forage research centre. Ground-based instrumentation and drone-borne sensors help scientists understand, and model, hydrological processes. Besides contributing to more effective agricultural practices – important as climate change leads to changing weather patterns – the data are important for modelling exchanges between crops and atmosphere.

SPRING COMES EARLIER AFTER ARCTIC STORMS
Oil on canvas, 80x100 cm, 2019
The Richardson Mountains form the continental divide between Yukon and Northwest territories above the Arctic Circle. They are known for their howling winds and intense blizzards that trap travelers on the Dempster Highway for days. Here, after many days of wind storms that scoured the snow from ridgetops and left deep snowdrifts on the valleys, a hint of spring comes unnaturally early.

WATERMELON SNOW
Mixed media on canvas, 80x100 cm, 2019
Snow cover turning pink or reddish during spring and summer has been a long-observed phenomenon. In recent years it has been commonly called watermelon snow. Blooms of algae cause it with a red pigmentation for protection against high-levels of ultraviolet radiation. The blooms appear when there is melt-water present in the snow-cover. The red colouration makes the snow-cover less reflective (typically around 15%) to radiation from the Sun, causing even more melting. Increasing temperatures due to global warming has produced earlier and more melt-water in the snow-cover, and the resultant greater red algae growth, in turn, results in more melt-water in the snow-pack - a positive feedback.

THE SORCERER'S SNOWSCAPE
Oil on canvas, 100x82cm, 2019
This painting was produced by 'magic' overnight. I was working on a painting from my re-collected memories, which I left to dry overnight. The paint in the upper half of the canvas 'ran' serendipitously producing an image redolent of the textures in many mountainous landscapes.

Icefall
Oil on hessian
161x95 cm, 2019

FOX LAKE BURN
Mixed media on canvas, 90x120 cm, 2019
Between Whitehorse and Dawson City, in Yukon, there is a vast area (more than 45,000 hectares) of burnt forest, destroyed in fire – which was human-initiated – which raged in July 1998, and smouldered well into the following spring. The burn is still a scar, but small trees are now re-appearing. ‘Burns’ are becoming more frequent with climate change.

IMPERMANENT FROST
TRIPTYCH, OIL ON 3 WOODEN BOARDS, 240X80 CM, 2019

Because of climate change it is no longer permanent. Large swathes of the permafrost zone are thawing. The consequences are dramatic. The surface layers slide down slopes, sometimes in slow viscous rivers of mud, carrying any vegetation, including trees, with them and leaving bare scars. When the permafrost is relatively water-rich, ice within the soil is clearly visible in the exposed scar, and during warm days, water cascades out of the exposed surface. GWF scientists have examined layers in the permafrost, which are up to 15,000 years old to confirm that the thawing is unprecedented on this scale. As the permafrost thaws, vast quantities of carbon currently locked within it are released as carbon dioxide and methane, adding significantly to the concentration of global warming gases in the atmosphere. It may be such changes in the landscape, which prompted the Chief of the Gwich'in Indigenous People in Canada to proclaim that climate change "was like watching a nuclear explosion in slow motion".

SNOWLIGHT
Oil on canvas, 80x80 cm, 2019

This painting is inspired by the special light in this dramatic landscape, when passing dark clouds bring gusty winds and small snow flurries; but most of the snow in the atmosphere near the ground is re-suspended by the strong wind from small patches of snow cover in shadowed mountain gullies. The shafts of sunlight squeezing through breaks in the cloud, shining on this blowing snow, produces a special light.

SNOWLIGHT 2
Oil on canvas,
80x80 cm, 2019

LANDSCAPES FROM MY MEMORY

Oil, on canvas, 116x81 cm, 2019

Painting based on my trip through dramatic Canadian landscapes, some draped in snow and ice, made a deep impression. What I saw is locked in my memory. These paintings are based on my re-collection of those memories.

MELTING GLACIER
Mixed media on canvas, 100x150 cm, 2019
“The key is a symbol for our need to adopt existing, and identify new, solutions to climate change”

LANDSCAPES FROM MY MEMORY
Oil, on canvas, 116x81 cm, 2019

The melting glacier series
Mixed media on canvas,
100x100 cm
2019

The melting glacier series
Mixed media on canvas,
100x100 cm
2019

The melting glacier series
Mixed media on canvas,
100x100 cm
2019

The melting glacier series
Mixed media on canvas,
100x100 cm
2019

The melting glacier series
Mixed media on canvas,
100x100 cm
2019

The melting glacier series
Mixed media on canvas,
100x100 cm
2019

FAMILY
SERIES ‘POWERFUL AND VULNERABLE’
Oil, ink, charcoal on canvas, 120x90 cm, 2019

The Frozen city, oil on canvas, 90x120 cm

LANDSCAPES FROM MY MEMORY
Mixed media on canvas, 150x40 cm, 2019

Peyto_glacier_18x24_cm_oil on canvas, 2019

Peyto_glacier_18x24_cm_oil on canvas, 2019

Peyto_glacier_18x24_cm_oil on canvas, 2019

Athabasca_glacier_18x24_cm_oil on canvas, 2019

Spring_in_Yukon_20 x20_cm_oil on canvas, 2019

Spring_in_Yukon_Tombstone_park_20x20_cm_oil on canvas, 2019

Kathelen_lake_18x24_cm_oil on canvas, 2019

Peyto_glacier_13x18_cm_oil on canvas, 2019

Distraction_bay_20x20_cm
_oil on canvas, 2019

LISTEN TO THE SCIENTISTS
Oil on canvas, 200x140 cm, 2020

Prof John Pomeroy explaining some of Global Water Futures research on the Athabasca Glacier to Greta Thunberg in autumn 2019.
A message Ms Thunberg often gives is: listen to the scientists.

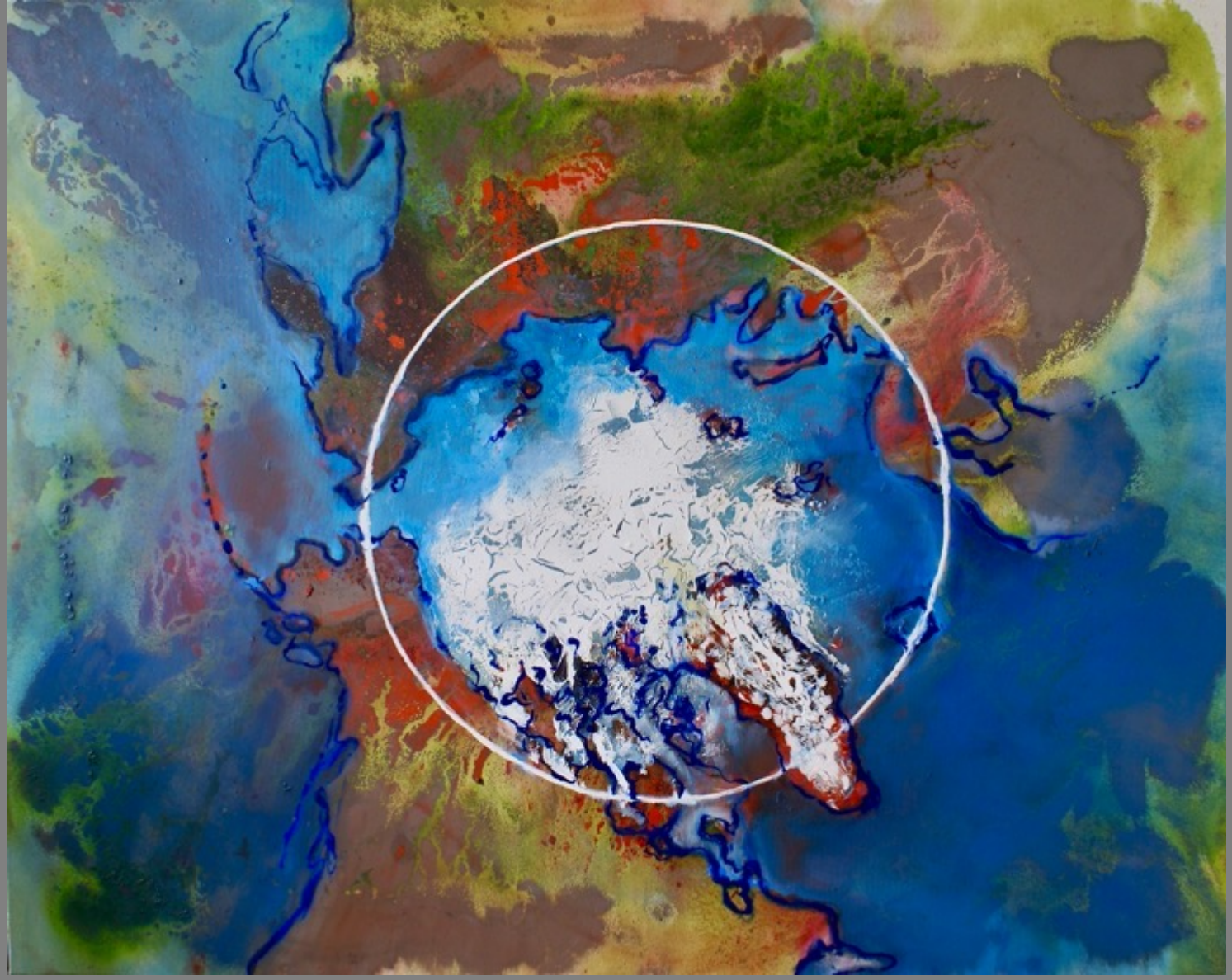
The mountains and glacier series, oil on linen, 70x30 cm 2020

Blue Mountain
Oil on linen, 40x40 cm
2020

PERMAFROST THAWING REUNITED DISTANT COUSINS
Oil on canvas, 200x150 cm, 2020
Thawing permafrost has led to more and more discoveries of woolly mammoths, especially in Siberia; some of the specimens are remarkably well-preserved. Most died out at the end of the last Ice Age, about 10,500 years ago, but some persisted on Wrangel Island in the Russian Artic until about 4,000 years ago. Their demise was a result of climate and environmental change, but hunting by humans was also a factor.
Finds of well-preserved Cave Bears are much rarer, but a well-preserved specimen was discovered recently in the Russian Arctic Lyakhovsky Islands, dating from 22,000-39,500 years ago. Cave Bears were enormous, the largest weighing as much as 1,000kg - bigger than Polar Bear - and became extinct about 15,000 years ago. The Cave Bear lineage split from the Brown Bear lineage before the Brown Bear and Polar Bear lineages split.
There are still 22-31,000 Polar Bears in the Northern Cold Regions but, with predictions of around 30% decline over the next two decades, to many, the Polar Bear has become the icon of the threat which human-induced global warming poses for many animals.
Ivanov has brought these animals together with impressions of: meltwater cascading from water-rich permafrost in an exposed bank; a water-runnelled glacier; and the trunks of dying trees slumping as the soil becomes mobile though permafrost thawing. In the background is the Aurora Borealis.
Ivanov's juxtaposition of extinct and threatened animals acknowledges the role of climate change over tens of millennia, but the changes in recent decades are primarily related to human activity, are exceptionally rapid, and - unless we take strong and quick action - will be one-way.

GLACIER DECLINE; EMERGENCE OF STRANGE NEW LANDSCAPE
Oil on canvas, 150x100 cm, 2020

The Peyto Glacier in Alberta, Canada, is one of the world's longest-studied glaciers. It is rapidly receding because of climate change, having lost more than 70% of its volume since the beginning of the 20th Century. In this impression by Ivanov, the remaining ice is seen in the distance, behind strange deposits of black cryoconite, and glacial silt in the foreground. The cryoconite accumulated on the ice surface and is then washed off by the copious summer meltwater; it consists of ash and soot from wildfires, bacteria, fungi and algae. Each year it darkens the glacier's surface, reducing its reflectivity, and exacerbating melt. The deposits of glacial silt are cracking in the summer heat.



COLD REGIONS WARMING
Oil on canvas, 100x150 cm, 2020

The vast cold regions of Russia, especially, and Canada extend far southwards of the Arctic Circle. This summer in the Northern Hemisphere has been the hottest on record. The Arctic sea-ice is thinning and contracting. The Greenland ice-sheet is melting at unprecedented rates. Vast tracts of the permafrost zones in Russia and Canada are collapsing. Vegetation and peat fires are now extensive. The red hues in this painting of the circumpolar regions by Gennadiy Ivanov are an artistic metaphor for these dramatic changes.

THERE WAS A GREEN FOREST
Oil on canvas, 200x150 cm, 2020

The Boreal Forest, or Taiga, is also known as the snow forest. It is the world's largest biome and, territorially, Siberia and Canada dominate its distribution. Increasing temperatures lead to slumping and death of trees in permafrost-rich zones. Sometimes strange landscapes of "drunken trees" are created because of the collapsing ground. Higher temperatures are also leading to a greater frequency of forest fires razing vast tracts of forest which take a long time to regenerate. Ivanov's impression captures the elements of permafrost, dying trees and fire. Burning trees emit global warming carbon dioxide into the atmosphere. Permafrost-rich zones contain large quantities of organic carbon which did not decompose because of the low temperatures. Thawing of the permafrost, and increasing temperatures – exacerbated where the shade-providing trees have been burned - allows bacteria to decompose the stored organic matter emitting carbon dioxide and the very powerful global warming gas methane into the atmosphere. Besides the destruction of landscapes, human-induced global warming leads to powerful reinforcing "positive feedbacks" such as those described here.

NUCLEAR EXPLOSION IN SLOW MOTION
Oil on canvas, 150x100 cm, 2020

For many scientists in the Global Water Futures research programme, this location is iconic – because of the dramatic scenery, and the importance of this automatic observation station, and others in the near-vicinity. The location is Fortress Mountain in the Canadian Rockies. The observation network has been built to improve understanding of rapid climate and environmental changes which have occurred in recent decades and to further develop predictive models of the effect of future climate change on the local hydrology – a particular challenge is such complex terrain.
Ivanov has produced a number of paintings of the nuclear explosion in slow motion (a phrase attributed to a Gwich'in Chief when describing what it is like to witness the profound changes caused by climate change of the landscape of his people in Northwest Territories. The cauldron where once a valley glacier flourished is the seat of Ivanov's slow nuclear explosion.

ANGELS & DEVILS I
Oil on canvas, 90x60 cm, 2020

For many scientists in the Global Water Futures research programme, this location is iconic – because of the dramatic scenery, and the importance of this automatic observation station, and others in the near-vicinity. The location is Fortress Mountain in the Canadian Rockies. The observation network has been built to improve understanding of rapid climate and environmental changes which have occurred in recent decades and to further develop predictive models of the effect of future climate change on the local hydrology – a particular challenge is such complex terrain. Ivanov has produced a number of paintings of the nuclear explosion in slow motion (a phrase attributed to a Gwich'in Chief when describing what it is like to witness the profound changes caused by climate change of the landscape of his people in Northwest Territories. The cauldron where once a valley glacier flourished is the seat of Ivanov's slow nuclear explosion.

ANGELS & DEVILS II
Oil on canvas, 90x70 cm, 2020

For many scientists in the Global Water Futures research programme, this location is iconic – because of the dramatic scenery, and the importance of this automatic observation station, and others in the near-vicinity. The location is Fortress Mountain in the Canadian Rockies. The observation network has been built to improve understanding of rapid climate and environmental changes which have occurred in recent decades and to further develop predictive models of the effect of future climate change on the local hydrology – a particular challenge is such complex terrain. Ivanov has produced a number of paintings of the nuclear explosion in slow motion (a phrase attributed to a Gwich'in Chief when describing what it is like to witness the profound changes caused by climate change of the landscape of his people in Northwest Territories. The cauldron where once a valley glacier flourished is the seat of Ivanov's slow nuclear explosion.

MOUNTAIN TINDERBOX AND ASHES
Oil on canvas, 90x70 cm, 2020

A major reason for the increase in forest fires across the cold regions is the growing areas of dead and dying trees, representing a tinderbox primed for the ravages of fire. Amongst the most serious of pests are bark beetles attacking pine trees. Rising temperatures reduce the widespread winter die-off of beetle larvae. The beetles also hatch earlier and reproduce more frequently. Some entomologist call beetles “first responders” because they are so sensitive to climate and environmental change.In this painting Ivanov portrays swathes of dead and burnt trees; although an impressionistic painting, many photographs of forested landscapes affected by pests and ravaged by fire would give a similar impression.

FIRE ACROSS THE ICE
Oil on canvas, 80x80 cm, 2020
The Arctic Ocean has undergone a massive warming in the last 40 years, with the loss of over half of its multi-year sea ice. This ocean is surrounded by the Arctic lands of Russia, Canada, Greenland and Scandinavia – much of which are warming three times faster than the rest of the world – and receives the warmer and increasing freshwater flows from the major northward flowing rivers of Russia and Canada such as the Ob, Yenisei, Mackenzie, Lena etc. as well as freshwater from melting glaciers and ice sheets. Here, the view from the Arctic coast of Canada looks across the remaining ice to Russia, a view that foretells the increasing temperatures, permafrost thaw, greenhouse gas emissions, wildfires, floods and streamflow volumes that span the circumpolar North. The bubbles in the ice remind us of methane emissions from permafrost through lake ice that are ubiquitous in northern peatlands.

PERMAFROST THAWING RELEASES FOSSIL FUEL
Oil on canvas, 70x90 cm, 2020
The extraction and use of fossil fuel world-wide has led to a catastrophic thawing of permafrost. It is ironic that permafrost thaw can lead to the release of contained fossil fuel into the environment. This painting is based on satellite imagery of a major pollution incident at Norilsk in Siberia, starting on 29 May 2020. Around 17,500 tonnes of diesel stored at a power plant leaked into the local waterways turning them red. President Putin declared a state of emergency. A major cause was permafrost thawing which caused the collapse of the storage tank. On 4 June, booms on the Ambarnaya River, which has been installed to contain the spill, were broken by large amounts of drifting ice. After the incident, which followed weeks of abnormally warm weather, the Russian authorities ordered urgent safety checks on all potentially hazardous installations built on Arctic permafrost.
The tundra polygon cracks visible in this painting portray the shifting ice-laden soils of Arctic permafrost which have become more dynamic and unstable as deeper and deeper thaw sets in. This puts at risk not only Arctic rivers but the massive infrastructure in the North such as mines, pipelines, roads, railways and communities and the disaster at Norilsk illustrates a common problem that Russia and Canada have in sustaining northern economies and environmental protection during the climate crisis.

Transitions_Project_Melting_glacier_24x30_cm_oil_
on_canvas, 2020

Transitions_Project_Melting_glacier_24x30_cm_oil_
on_canvas, 2020

Transitions_Project_Melting_glacier_24x30_cm_oil_
on_canvas, 2020

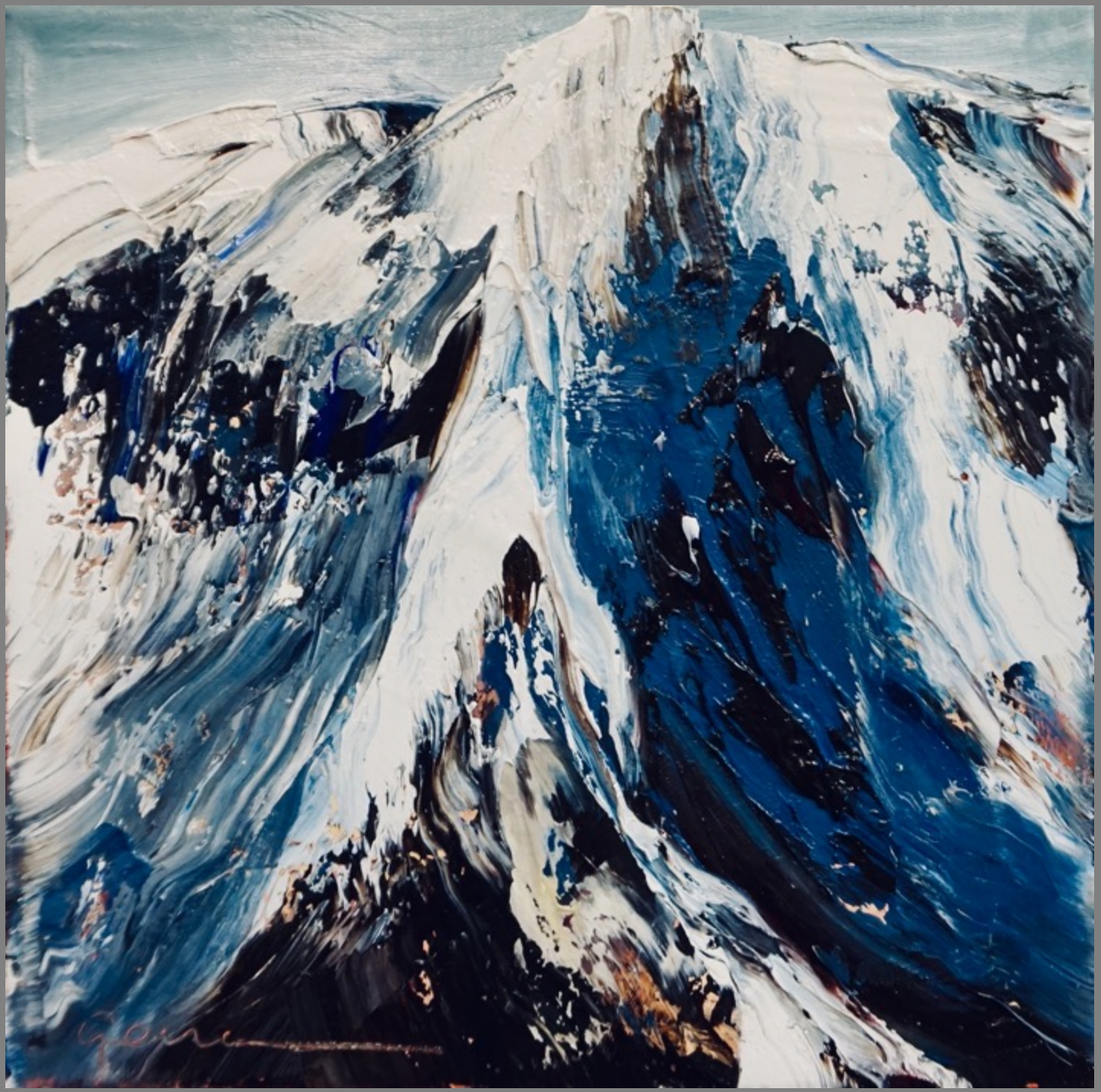
Impression_of_glacier_100x40_cm_oil_on_canvas, 2020

_Summer_Glacier_80x30_cm_oil_on_canvas_2020

The_Mountains_and_glaciers_30x30_cm_oil_on_canvas 2020

The_Mountains_and
_glaciers_30x30_cm
_oil_on_canvas 2020

The_Mountains_and_glaciers_30x30_cm_oil_on_canvas
2020



The_Mountains_and_glaciers_30x30_cm_oil_on_canvas, 2020

SNOWY MOUNTAINS
Oil on canvas, 76x50 cm, 2020

“The substantial change that loss of snow-packs and glaciers is having on the planet is something the international scientific and policy community needs to address quite urgently. These changes have led to, and will continue to cause, serious unsustainability of freshwater as a result of the impact of climate change”. (John Pomeroy, World Meteorological Organization’s High Mountain Summit, Geneva, October 2019).

Title: *Glacier Decline*
Media used: Charcoal, ink on paper drawings, 2021.
Dimensions: 170x100cm each.
Caption:
Perhaps ironically, my other paintings in the Virtual Water Gallery are amongst the most brightly-coloured I have produced in the Transitions project. One of the reasons is because on the occasion of my summer visit, in August, it was a brilliantly-clear blue sky day. My other visit was in the preceding April, on a cloudy cold grey day. The glacier was still mostly hidden beneath snow-cover. It was a miserable day; better fitting the emotions which I now feel about this departing feature of the dramatic mountain landscape. I have transposed my darker emotions into these drawings.

In the distance in the top drawing the glacier is covered by snow. In the foreground are strange deposits of black cryoconite. The cryoconite accumulates on the ice surface and, each year, is washed off by the copious summer meltwater to form mini-mountain ranges, a metre or so high, beyond the glacier snout. Cryoconite comprises s of ash and soot from wildfires, bacteria, fungi and algae. It has become more abundant in recent years. It darkens s the glacier's surface, reducing its reflectivity, and exacerbating melt.

The lower drawing, fore-fronting the now-exposed strata which were once the side of the glacier valley are deposits of glacial silt which have accumulated below the glacier snout. I have shown how these silt deposits crack in summer heat.
John Pomeroy comments "I like this drawing because it gives the illusion of the glacier transforming into a river delta – it speaks to glacial hydrology and the loss of these glaciers and their replacement by terrestrial hydrological systems. And that sediment and cracking can also be dangerous – look at India recently"

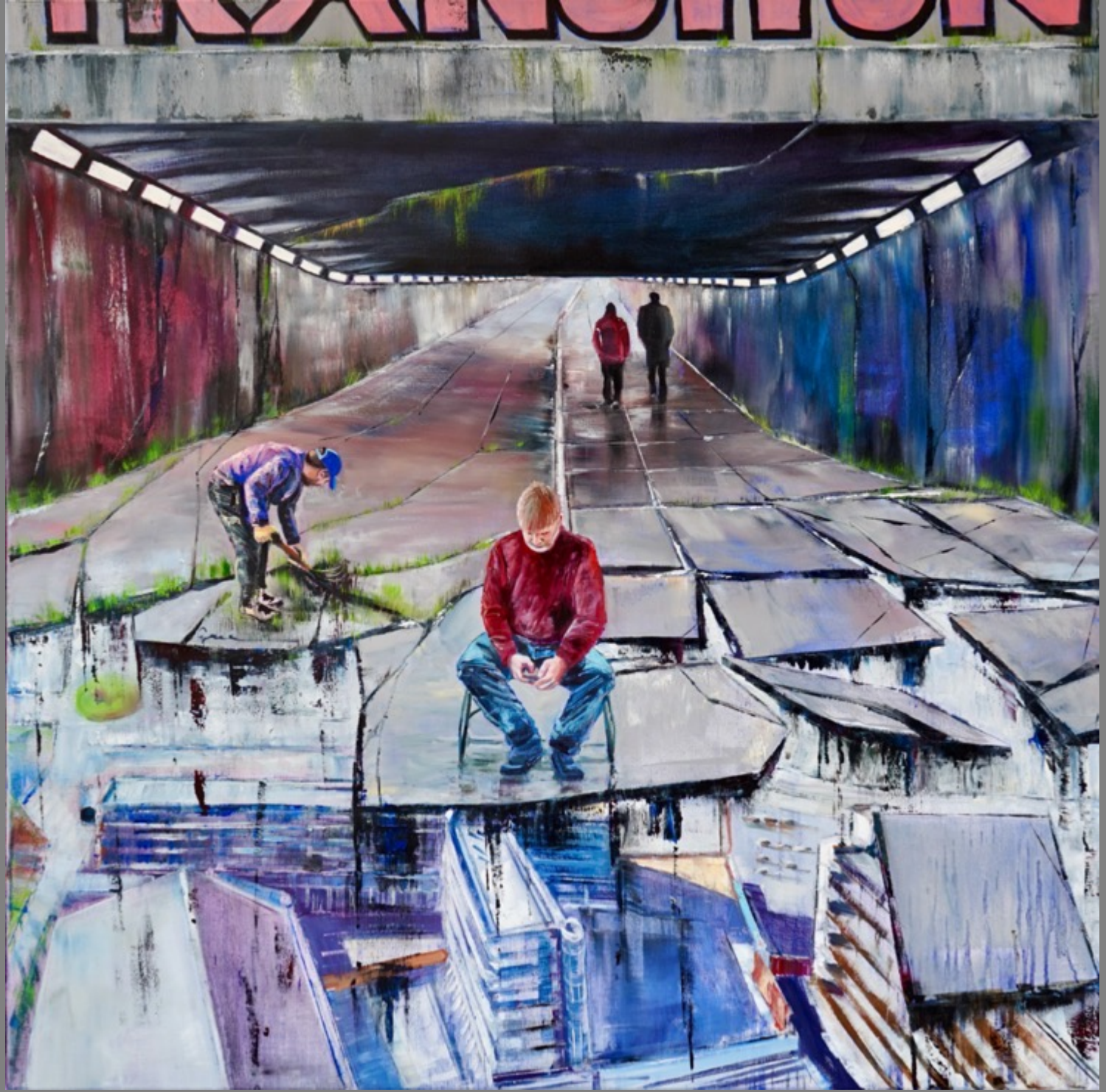
IMPERMANENT FROST
OIL ON CANVAS, 120X100 CM, 2021
Because of climate change it is no longer permanent. Large swathes of the permafrost zone are thawing. The consequences are dramatic. The surface layers slide down slopes, sometimes in slow viscous rivers of mud, carrying any vegetation, including trees, with them and leaving bare scars. When the permafrost is relatively water-rich, ice within the soil is clearly visible in the exposed scar, and during warm days, water cascades out of the exposed surface. GWF scientists have examined layers in the permafrost, which are up to 15,000 years old to confirm that the thawing is unprecedented on this scale. As the permafrost thaws, vast quantities of carbon currently locked within it are released as carbon dioxide and methane, adding significantly to the concentration of global warming gases in the atmosphere. It may be such changes in the landscape, which prompted the Chief of the Gwich'in Indigenous People in Canada to proclaim that climate change "was like watching a nuclear explosion in slow motion".

Code Red for Peyto Glacier_150x100cm_oil_on_linen, 2021

“Code Red for Peyto Glacier”
This plays on the quote from the UN Sec General that climate change was code red for humanity.

Code Red for Peyto Glacier
As UN Secretary General António Guterres said a recent report summarizing the science of climate change "is a code red for humanity". Climate scientists have said a catastrophe can be avoided if the world acts fast, and they predict that deep cuts in emissions of greenhouse gases can limit rising temperatures. However, the modest reductions in emissions promised at the COP26 Climate Summit in Glasgow were inadequate to limit climate change sufficiently to permit the survival of mountain glaciers like Peyto Glacier. This painting shows a conceptual, blood red, lava-like flow replacing the glacier and its meltwater and the rapid, catastrophic melt of the remaining ice. Such rapid melt occurred in the record hot summer of 2021 when Peyto Glacier retreated 200 m, roughly ten times its recent rate. The valley is flooded, as were many mountain rivers draining glaciers in Western Canada during the 2021 heatwave.

Welcome_to_Old_Crow, oil on canvas, 80x100cm, 2021



Norwich_city
and_the_world
can_wait,
oil_on_canvas
100x100_cm,
2021

The Green Professor
Oil on canvas, 100x80 cm
2021

Premonition of the spring
Oil on canvas, 100x80 cm
2021

Title: *The Requiem for the Peyto*
Media used: Oil on canvases, 2021.
Dimensions: 100x80cm
Caption:
I enjoy surreal painting. It helps me express my emotions; something which is important to me. I know that scientists also have emotional responses to what they are seeing and studying. But, in their public statements, they are careful to express themselves in objective terms, based on the rational methods and reporting of science. Because I am an artist, I am allowed to portray myself in a way which expresses some of my feelings.

Here I am below the current snout of the Peyto Glacier, amidst the new and barren landscape revealed by the glacier's rapid retreat. Modelling by the scientists shows that the glacier could have almost completely vanished by the end of the Century. Although barren, the newly-emerged post-glacial depositional landscape does show tiny specks of green – the first plants are already moving in. They are shown in my glass. Also in my glass is the beige-yellow glacial silt of the depositional landscape, and cryoconite. Cryoconite, the scientists explained to me, is a cocktail of materials which accumulates each year on the glacier's surface. It consists of ash and soot from vegetation fires, algae, bacteria, viruses, and seeds. It has been growing in abundance over the years, accelerating the glacier's decline, and is washed-off by the annual melt-water to form dark deposits below the snout. It aids the growth of seedlings and moss. It is an important part of the greening process, driven by the quickly-warming climate. At what point in the future will the blue-white icescape behind me be transformed to green?

I also audio-record the sound of the glacier. The ice-driven katabatic wind; the wind-driven snow particles in late winter; the torrents of meltwater in summer; the splitting and crashing of the collapsing glacier. The record-player is my surreal expression of this. It is also a way, for me, to emphasise the importance of the painstaking recording of scientific data on Peyto the glacier. Observations first started more than 120 years ago, making it the longest-studied glacier in North America, and are continuing with the sophisticated instrumental network of Global Water Futures. In another 120 years there will only be the record left.

“Code Red for Peyto Glacier”, 2021
Oil on canvas, 91x116 cm
This plays on the quote from the UN Sec General that climate change was code red for humanity.

Code Red for Peyto Glacier

As UN Secretary General António Guterres said a recent report summarizing the science of climate change "is a code red for humanity". Climate scientists have said a catastrophe can be avoided if the world acts fast, and they predict that deep cuts in emissions of greenhouse gases can limit rising temperatures. However, the modest reductions in emissions promised at the COP26 Climate Summit in Glasgow were inadequate to limit climate change sufficiently to permit the survival of mountain glaciers like Peyto Glacier. This painting shows a conceptual, blood red, lava-like flow replacing the glacier and its meltwater and the rapid, catastrophic melt of the remaining ice. Such rapid melt occurred in the record hot summer of 2021 when Peyto Glacier retreated 200 m, roughly ten times its recent rate. The valley is flooded, as were many mountain rivers draining glaciers in Western Canada during the 2021 heatwave.

The_sky_river_oil_on_canvas_130x170cm, 2021

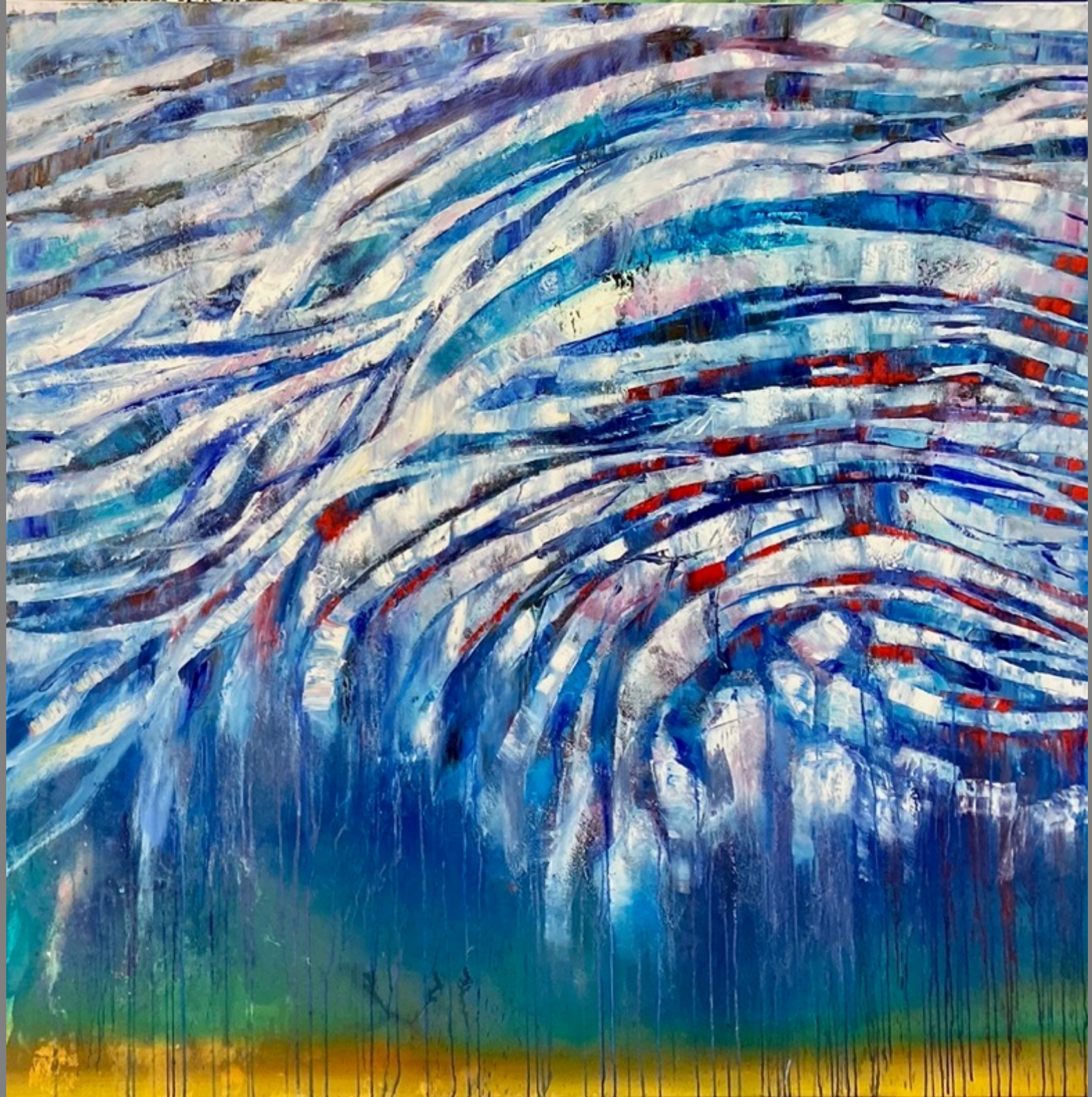
Spring_is_come_in_but_we_are_expecting_floods_and_fires_oil_on_canvas_160x160cm, 2021

Mount_Logan
_oil_on_canva
s_100x100cm
, 2021

Fortress_mountain_station_oil_on_aluminium_80x120cm, 2021

Stanley_Glacier_oil_on_canvas_100x100cm, 2021

Poorly_Peyto_Virtual_Water_Gallery_Project_oil_on_canvas_160x160cm, 2021



Bleeding_Peyto_Glacier_Virtual_Water_Gallery_Project_oil_on_canvas_160x160cm, 2021

Dippy Drops in for a Pint
Oil on canvas. 80x80 cm, 2021

“This is the way I see it guys …. dinosaurs were grooving for 165 million years, and then it took a massive asteroid to knock us out; looks like you lot are on the verge of knocking yourselves out after only a couple of hundred thousand years on the planet”.

Dippy joins scientists and artist for a pint in the Adam and Eve. The conversation around the table has ranged from: the melting of glaciers and ice caps; the heaving of landscapes because of permafrost thawing; scientific fieldwork in the warming cold regions; reminiscences about an old colleague; the need to stop the emissions of global warming gases; and the location of Dippy’s discovery and what he might say.

Addiction
Oil on canvas. 91x65 cm, 2021
For the sake of this painting, Ivanov has volunteered to shoulder the burden of human's addition to fossil fuel. Dippy doesn't understand.

A Warm Welcome to Norwich
Oil on canvas, 180x180 cm, 2021

One of the Norwich City Hall lions – which bears a passing resemblance to an Ice Age sabre tooth tiger – roars his welcome. The lion is partially immersed in the torrents of flood water from melting ice sheets. This highlights that the global climate has changed on geological timescales.

In modern times we are approaching potentially catastrophic (for humans and many present-day species) climate change because of emissions of global warming gases – most noticeably carbon dioxide – through human activity. Yet carbon dioxide, and global temperatures, have been much higher in the past. The shift from red to blue, from left to right, in the upper half of the painting represents this in a broad impressionistic way.

More precisely, the graph shows reconstructed levels of carbon dioxide in the atmosphere from 600 million years ago to the present. These changing levels were a function of variations in the global carbon cycle. This was the result of biological and chemical interactions between, for example, volcanoes, vegetation, the weathering of rocks and the deposition of sediments in the oceans. Humans have, in only a hundred years or so, become a crucial part of the global carbon cycle. The Carboniferous Period (360-300 million years ago) was a period when many of the world's coal deposits were laid down as vast swamp forests removed carbon dioxide from the atmosphere and the carbon from dead vegetation became trapped in sediments.

Because of the geological time scale of the graph, it does not represent recent changes very well, but the concentration of atmospheric carbon dioxide in 2021 is around 420ppm, and by 2100 it could be 1000ppm if humans do not cut back emissions strongly (shown on an expanded horizontal scale on the graph). That concentration would still be lower than Dippy experienced – he lived about 150 million years ago – but it would be calamitous for the present global ecosystem, including humans.

If we carry on behaving as we are now for longer, we could burn all the world's currently-known fossil fuels (coal, oil, gas) in the next 200 years or so. That could push global atmospheric concentrations up to 5000 ppm. Have a look at the graph again. This will give an idea of just what an overwhelming new force humankind has become in the global carbon balance; and, consequently, in the global climate system.

On the right of the painting is one of the forms of clean energy we must increasingly rely on if we are to avoid calamity; the wind farms in the sea off the Norfolk coast are nationally important sources of energy.

Dippy Has Quite a Tale to Tell
Oil on canvas. 141x117 cm, 2021

On Dippy's tail are modern-day dinosaurs which inhabit the area in which he was discovered "nodding donkeys" pumping out the fossil fuel oil. Behind his head are dinosaurs which now stagger short distances in the locale he once roamed; giant machines which dig out coal from vast open-cast mines. Wyoming produces 40% of the United States' coal. It also has very large reserves of oil and gas. Wyoming's first oil town, Carbon, was founded in 1868. Dippy was discovered not very far away.
To the upper right of Dippy's tail are the exposures of the type of rock formations in which he was found. He was found in the Talking Rock Facies of the Morrison Formation. The Morrison Basin stretched from New Mexico to Saskatchewan and Alberta in Canada. It was formed when the Rockies started pushing up to the west. Streams and rivers swept sediments down from the heights, where they were deposited in swampy lowlands, lakes, river channels and floodplains. This became the Morrison Formation, composed of mudstone, sandstone, siltstone and limestone. Most fossils occur in green siltstone and lower sandstone beds.
Drumheller in Alberta, Canada, is also a site of fabulous dinosaur fossil finds. Athough the ages of the main dinosaur finds in Wyoming and Alberta are different, there is the geological link of the Morrison Basin between them. In this Dippy exhibition are prints of paintings of Drumheller, which are currently on tour in Canada. Close to Drumheller is also a town called Carbon. One of the reasons it is so appropriate to tell a story of Dippy, environmental change, carbon emissions from the burning of fossil fuel, and very rapid modern climate change through paintings is because of these close geographical juxtapositions.
The man who made the discovery of the first part of Dippy in 1899 was an employee of the Union Pacific Railroad, laid in this part of Wyoming to ship coal. So, without coal extraction Dippy fossil may have not been discovered. Railroads also, of course, accelerated the loss of Indigenous people's territory and a weakening of their culture in the 1800s.
In front of Ivanov is a map of what the major land masses of the world may have looked like in Dippy's time. The ancient super-continent Pangea was continuing its break-up towards the landmass distribution we know today. Today's locations were not where we know them today. Geography and climates were different. Future large-scale geography on a geological time scale will be different. Future geology will also be different; plastic may be a trace in a stratum which defined an interesting species – knowingly self-destructive - which had a rapid and devastating effect on the Planet.
Why is Ivanov eating an egg?
Is Dippy whispering something about an asteroid in Ivanov's ear?

The Star-Spangled Dinosaur?
Oil on canvas. 200x150 cm, 2021

Dippy's fossil was discovered in Wyoming in the United States on July 4 – American Independence Day – 1899. Because of this, and the fact that it was a very fine specimen, it became known as the Star-Spangled Dinosaur, and an international celebrity. The man who financed the excavation, Andrew Carnegie (Dippy's full name is Diplodocus Carnegie), had a number of plaster casts made. One was presented to King Edward VII, and it is this cast which is now in Norwich Cathedral.

Knowledge of fossils in America, though, substantially pre-dated the Stars and Stripes which are shown draped around Dippy; and look at the fireworks and the cloth showing modern America. The Lakota Sioux Indians, who lived in the area of Dippy's excavation, knew a lot about fossils. They observed, collected, and attempted to explain them. They had place names like – translated into English from their language - *Animal Bones Brutally Scattered About* for a hill in Nebraska; this place was re-named Carnegie Hill. The particular rock layers from which the Dippy fossil was excavated are now called the Talking Rock Facies. The upper right of the painting shows the talking rocks and animal bones scattered brutally about. In the forefront are also scattered animal bones.

The Indigenous people incorporated their knowledge of fossils, in a then quite rational way, into their belief systems. They updated their beliefs as their knowledge grew. Although their understanding of fossils was not scientifically methodical in our modern sense, to them it offered a coherent way of interpreting Earth's history at a time when Europeans were questioning their own explanations of Earth's history were just beginning to develop the formal disciplines of geology and palaeontology. Many Indigenous approaches to the fossil record were based on careful and repeated observation of evidence and on rational explanation - compatible with scientific inquiry. They became part of traditional knowledge and traditions were often verified and revised over time - the impulse to "get it right" – the same impulse which led to creation of the scientific method.

The Lakota Sioux visualised fossils as Giant Lizards and Water Monsters – who fought with Thunderbirds. In the end the Thunderbirds destroyed them except for small species like present-day snakes and reptiles. In the mid-right of the painting is a representation of a Thunderbird inspired by ancient Indigenous rock paintings. Some believe that Thunderbirds may have originated from finds of Pterosaur fossils: Pterosaurs are also shown in the painting.

Many great figures in early modern scientific history - Georges Cuvier (the "father of palaeontology"), Alexander von Humboldt, Benjamin Franklin, Thomas Jefferson – were keen avid investigators of indigenous American fossil lore.

So – the Star-Spangled Dinosaur could equally well be wearing a Sioux head-dress.

In the painting are also asteroids, deluges, vegetation which may be representative of the Carboniferous Period, and a sea of plastic waste – an ingredient in future geological strata.

Athabasca_river_pastel_on_paper_30x24cm, 2022

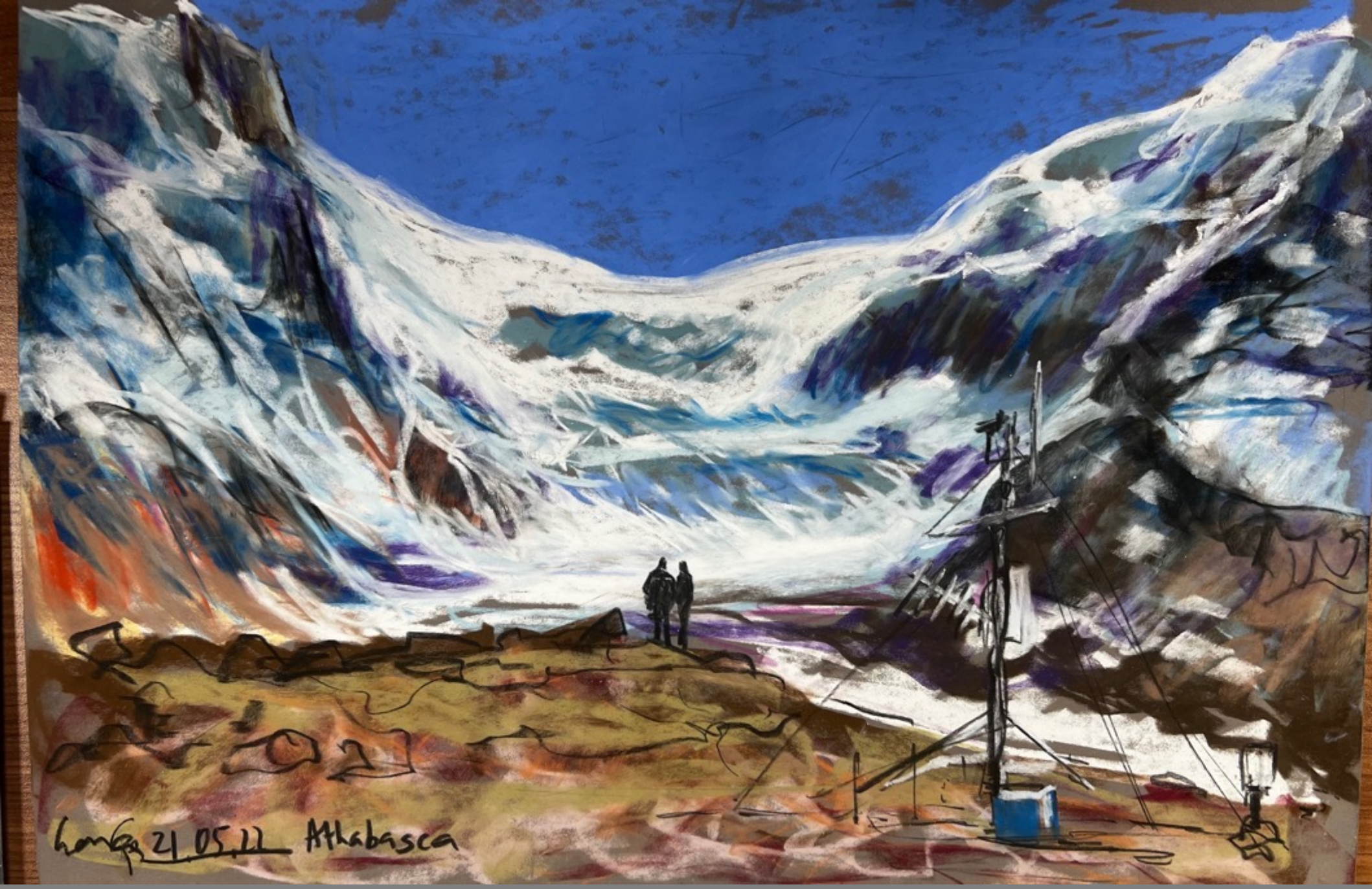
Upper_Kananaskis_lake_pastel_on_paper_30x24cm, 2022

Brule_lake_pastel_on_paper_30x24cm, 2022

Maligne_lake_pastel_on_paper_30x24cm, 2022

Maligne_lake_pastel_on_paper_45x33cm, 2022

Medicine_lake_pastel_on_paper_45x33cm, 2022



Athabasca_glacier_pastel_on_paper_45x33cm, 2022

Mount_Robson_pastel_on_paper_45x33cm, 2022

Kinbasket_lake_pastel_on_paper_45x33cm, 2022

Lower_Kananaskis_lake_pastel_on_paper_45x33cm, 2022

Sibbald_peatland_pastel_on_paper_30x24cm, 2022

Sibbald_peatland_pastel_on_paper_30x24cm, 2022

Fortress_mount_hanging_tree_pastel_on_paper_30x24cm, 2022

The station with the hanging tree is Tower Ridge Station, Fortress Mountain Research Basin, and you can call the tree the ‘hanging tree’ because everyone does. Formally it is a cut, suspended, weighed fir tree to measure interception of snowfall and rainfall and the storage of intercepted snow and rain in the subalpine canopy.

Maligne_falls_pastel_on_paper_33x45cm, 2022

Upper_Kanaskis_lake_pastel_on_paper_33x45cm, 2022

Transition_Samauma_sacred_tree_150x150cm, 2021

Happisburgh_broken_defences_oil_on_canvas_120x150cm, 2022

Northern_frost_Inspired_by_North_Canada_Russia_cold_oil_on_canvas_91x120cm, 2022