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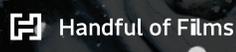


# Hunt

## for the oldest DNA

A lost world in a spoonful of dirt.

A HANDFUL OF FILMS AND HHMI TANGLED BANK STUDIOS PRODUCTION IN ASSOCIATION WITH GBH  
 WRITTEN & DIRECTED BY NIOBE THOMPSON CINEMATOGRAPHY ATHAN MERRICK & RYAN WILKES EDITED BY JAY MCMILLAN, JEN RANDALL, TIMOTHY SYKES  
 ART DIRECTION & ANIMATION BY BRUCE ALCOCK COMPOSER JONATHAN KAWCHUK PRODUCED BY RICHARD STONE, ALLY BARRY, SANDRA TOBER  
 EXECUTIVE PRODUCERS JOHN RUBIN, SEAN B. CARROLL, CHRIS SCHMIDT, JULIA CORT, NIOBE THOMPSON



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# Hunt

## for the oldest DNA

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**SEAN B. CARROLL**

**CHRIS SCHMIDT**

**JULIA CORT**

Science Producer

**RICHARD STONE**

Featuring

**ESKE WILLERSLEV**

**BETH SHAPIRO**

**NATALIA RYBCZYNSKI**

**MIKKEL WINTHER PEDERSEN**

**MAUREEN RAYMO**

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# LOGLINES

## #1

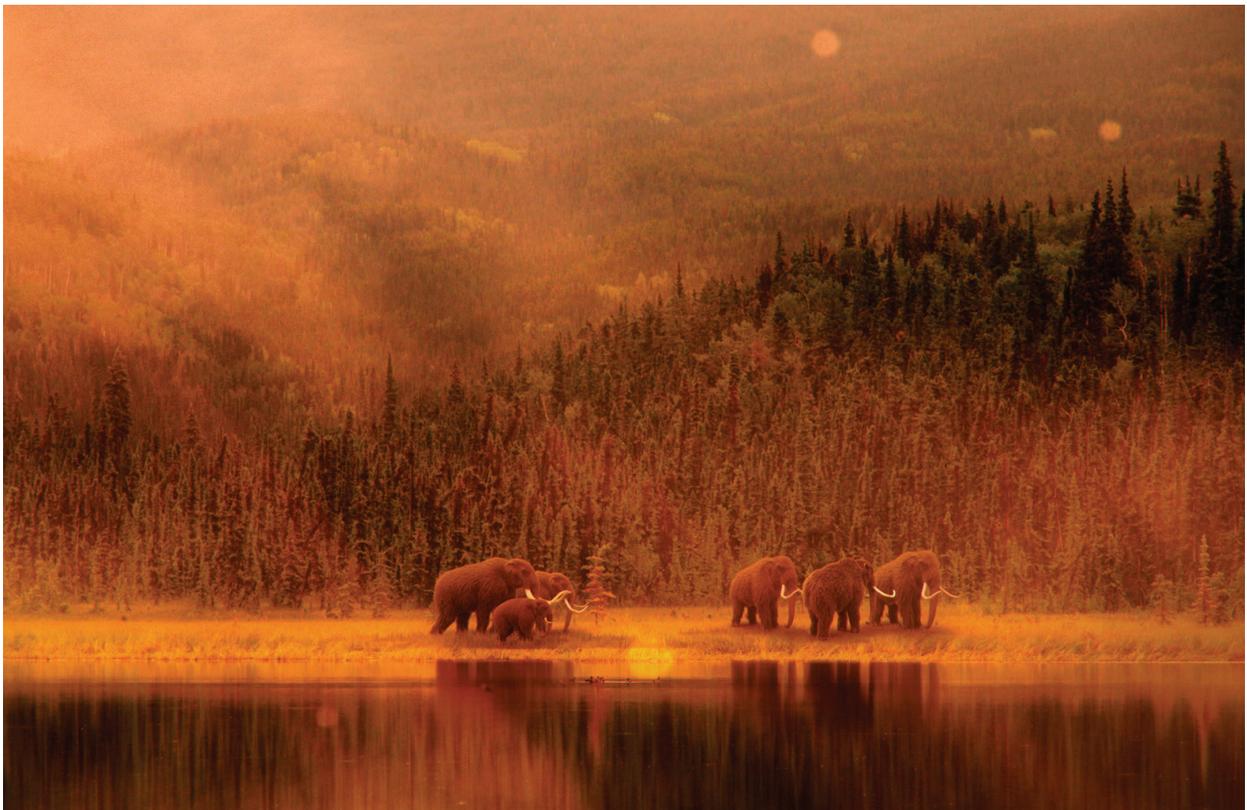
Follow the quest to recover DNA millions of years old, revealing a lost world from before the Ice Age.

## #2

For decades, scientists have tried to unlock the secrets of ancient DNA. Follow the dramatic quest to recover DNA millions of years old and reveal a lost world from before the last Ice Age.

## #3

For decades, scientists have tried to unlock the secrets of ancient DNA. But life's genetic blueprint is incredibly fragile, and researchers have struggled to find DNA in fossils that could survive millions of years. Then, one maverick scientist had the controversial idea to look for DNA not in fossils or frozen ancient tissue – but in dirt. Join the hunt as scientists decipher the oldest DNA ever found and reveal for the first time the genes of long-extinct creatures that once thrived in a warm, lush Arctic.



## SHORT SYNOPSIS

**Hunt for the Oldest DNA** tells the story of a maverick gene hunter, whose single-minded pursuit of an improbable scientific vision would tease and torment him before ending with a stunning triumph: a lost world recovered from a spoonful of dirt.

Two decades ago, Eske Willerslev had a radical idea: Could DNA, the fragile chemical code of life, survive intact in frozen sediment for millennia? Fellow scientists called him crazy. But the Danish biologist set out to prove everybody wrong, and his perseverance paid off with a landmark breakthrough—with massive implications for how we understand the deep past.

After many years of failure, Willerslev recovered the genetic traces of a lush forest ecosystem from before the Ice Age, more than two million years ago. The species identified from their DNA lived during the last hot epoch on Earth. Signaling a new era in DNA research, scientists can now use DNA to travel back millions of years and piece together vanished ecosystems. Today, they are poised to harvest the genetic secrets of these ancient worlds to help us adapt to our own climate future.



# DOCUMENTARY OUTLINE

## HOW CAN WE TRAVEL BACK IN TIME? IS THERE A TIME MACHINE? YES. IT'S DNA. IT'S ANCIENT DNA.

– *Eske Willerslev*

Two decades ago, in an arctic desert in northern Greenland, Danish biologist Eske Willerslev found perfectly preserved pieces of trees from a forest that flourished 2.5 million years ago – before the Ice Age began. “This gave me an idea. A naughty idea!” he recalls. What if he could dig in the layers of dirt there and recover genetic traces of that lost world? No one believed DNA could survive for millions of years, and even Willerslev had his doubts. But his radical idea was the start of an epic scientific quest.

**Hunt for the Oldest DNA** tells the inside story of a maverick gene hunter, whose single-minded pursuit of a scientific white whale would tease and torment him for 15 years. Setbacks along the way even ended scientific careers in his lab. But his tortuous path culminated in a stunning triumph: the discovery of an ancient lost world and the surprising plants and animals that inhabited it.

Willerslev’s remarkable journey began in the 1990s, when the intoxicating promise that we could recover dinosaur DNA – the idea that inspired Jurassic Park – went up in flames. Ancient DNA, scientists conceded, had a shelf life far, far shorter: thousands, not millions, of years. The genetic signals they believed dated to the age of dinosaurs, more than 66 million years ago, were in fact contamination: modern DNA mixed with their ancient samples.

At the height of this scientific fiasco, Willerslev was pursuing his first passion: working as a fur trapper in Siberia. That hard life nearly broke him. He returned to Copenhagen to enroll in biology classes, but tormented by a sense of personal failure, he spiraled into a deep despair. Then, a chance encounter with the wonders of evolution inspired a new fascination: the possibility of cracking nature’s mysteries with ancient DNA. A rebel from the beginning, he was prepared to question scientific assumptions – and keen to attempt the impossible. Still a student, he set out to test the limits of DNA survival.

But first, he had a more immediate problem to solve. At the time, scientists were recovering ancient DNA from fossilized bones and teeth – but these fossils are rare. As Willerslev recalls, “I wasn’t famous, so nobody wanted to give me fossils.”

It was then that he had an epiphany: Willerslev would look for ancient DNA outside of fossils. His inspiration: dog poop. Watching a dog walker one rainy day in Copenhagen, he wondered whether DNA in the pup’s poop would remain intact in the environment. Could there be DNA from millennia ago in the dirt under our feet? When he asked the question in the laboratory lunchroom, the professors laughed at him. Everyone knew that DNA – the chemical code of life – is an unstable molecule, quickly disintegrating outside a living body. DNA surviving in the dirt for eons was a crazy idea!

Where others saw an impassable barrier, Willerslev saw an opportunity. First, he recovered the DNA of

ancient bacteria from Greenland ice cores. Then he returned to Siberia, this time to sample permafrost laid down during the Ice Age. In the frozen dirt, he discovered the genomes of now-extinct creatures, from mammoths to giant bison, that lived up to 400,000 years ago. In one swoop, he set a record for the oldest DNA ever recovered and founded a new field of science: ancient environmental DNA. And that is when his ambitions truly took flight.

## WHILE EVERYONE ELSE WAS LOOKING FOR DNA IN FOSSILS, AND DISCOVERING ONE SPECIES AT A TIME... I WAS LOOKING IN THE DIRT FOR EVERYTHING!

*–Eske Willerslev*

Now a scientific star, Willerslev encountered his personal white whale. On a research expedition to one of the most remote and forbidding corners of the planet – Cape Copenhagen, at the northern tip of Greenland – he collected frozen dirt samples dating to the onset of the Ice Age, 2.5 million years ago. At that time, the theoretical outer limit for DNA survival was one million years, although no one had ever recovered DNA even half that age. Hunting for DNA in the Cape Copenhagen samples was truly “a naughty idea.” But reaching well beyond his grasp was Willerslev’s trademark, reflecting his drive to succeed at any cost. “I always had this need for winning. By winning, I’m keeping away my demons.”

Amazingly, the Greenland samples did contain ancient DNA. But no one in his lab could decipher the heavily degraded fragments. Willerslev recalls, “Those early researchers on my team, they all left. They basically quit science.” It became known as the “Curse of Cape Copenhagen.”

But after fifteen years of failure – a stunning breakthrough. Willerslev and one of his students paired an emerging technology called shotgun sequencing with massive computing power, and they broke the curse. Shattering the record for the oldest DNA ever recovered, they unveiled in a landmark scientific paper the genetic traces of a lush forest ecosystem that flourished well over two million years ago on Greenland’s northern coast. They deciphered the DNA of nine animals, from fleas and lemmings to horseshoe crabs and caribou. They identified over one hundred plants, from mosses to cedar trees, and some 2000 other organisms, including bacteria and plankton. Willerslev’s team even discovered the genetic fingerprints of mastodons, an extinct cousin of elephants that no one dreamed lived so far north. It truly was a lost world in a spoonful of dirt.

Years in the making, and with exclusive access to Willerslev’s team, **Hunt for the Oldest DNA** brings viewers inside a breakthrough with massive implications for how we understand the deep past, signaling a new era in DNA science. For the first time, scientists can use DNA to travel back millions of years and piece together now-vanished ecosystems. Using exquisite animations, the film presents an unprecedented reconstruction of a weird forest world in the High Arctic from before the Ice Age, where the ancestors of bears, camels, beavers, and horses endured months of unbroken winter darkness.

But Willerslev's discovery comes with an alarming twist. These species lived in the Pliocene: the last hot epoch on Earth, when average Arctic temperatures were 20 degrees Celsius warmer than today. The strange and distant Pliocene, it turns out, aligns with our present: this was the last time atmospheric carbon reached the levels in our atmosphere today. Willerslev's ancient DNA is giving us a glimpse of a time that presages our climate future.

Now, he and his colleagues are poised to harvest the genes of ancient organisms, in a kind of Hail Mary attempt to prepare our living world for rapid warming. Could genetic secrets from the Pliocene give us the tools to survive what is to come?



## FILMMAKER'S NOTES by Niobe Thompson

I first encountered the incomparable Eske Willerslev at the turn of the century, when I was studying Siberian cultures with his identical twin brother Rane at the University of Cambridge. Even then, Eske's obsession with ancient DNA was evident – he was our “friend without small talk”. All three of us had an unusual passion for taking long trips to the tundra, but where Rane and I were living with Chukchi and Yukaghir nomads, Eske was drilling into the permafrost. In the summer of 2005, on the way up the Main River to a remote Russian-Chukchi village called Vayegi, I encountered Rane's gene-hunting brother covered in mud from his boots to his hair, living in a tent camp harassed by grizzly bears, and coring the exposed frozen riverbank with a hammer drill.

At that time, I was pursuing a human-scale story in the Russian North going back at most a century. With ancient DNA, Eske was chasing a history stretching into to the Ice Age, 400,000 years back in time. In the decades since, he set record after record, reaching further back than any of his fellow scientists thought possible. His most spectacular breakthrough so far – the recovery of the DNA of an entire living world that existed in the Arctic millions of years ago, before the Ice Age – is at the heart of this film.

Ancient DNA science is very young. The spectacular promise of finding dinosaur DNA that inspired Steven Spielberg's Jurassic Park in 1993 turned out to be hollow – DNA is far too fragile to endure over tens of millions of years. But more modest breakthroughs, it turned out, were possible. Around the turn of the century, a tiny group of determined molecular biologists picked up the pieces and began the painstaking work of recovering DNA from fossils and reconstructing ancient genomes. Eske Willerslev was one of them.

I have always dreamed of telling this story in film. So, when Eske called me with the news of his incredible breakthrough, I knew we had an event around which to build a larger narrative. **Hunt for the Oldest DNA** is the story of a scientific revolution, embodied in one scientist's bloody-minded struggle to achieve the impossible, to recover DNA older than anyone thought could survive.

I have never met anyone like Eske – he is obsessive, relentlessly curious, completely candid, and paradoxically full of confidence while haunted by a fear of failure – and he offered our cameras an open door to his life. For my part, I was determined that Eske's quest for knowledge be the narrative spine of the film. This is a classic hero's journey, from his origins as a trapper in Siberia, onwards through moments of profound self-doubt and suicidal ideation, and leading to incredible renown and professional success. This is also a messy journey – some of those grasping the tail of Eske's star have become its victims. Some have become stars in their own right. As many of his ideas have ended in failure as success.

Eske tells our cameras that he is haunted: “I have a demon on my shoulder – I have this need... of winning. By winning, I keep away my demons.” This is not an admission you hear from high-achieving characters, and especially not from scientists. But science is populated by emotional, committed, obsessive human beings, and in **Hunt for the Oldest DNA**, Eske gave me the rare gift of sharing this reality with our cameras.

Making **Hunt for the Oldest DNA** has been a thrilling privilege: wonderful creative partners at Tangled Bank Studios and PBS NOVA, exclusive access to a remarkable discovery, the complete trust of a fascinating and unique main character, and the tools to bring a lost world to life in animation and pictures. But more than all that, I am privileged to be telling a story about how science changes our world, about how breakthroughs happen, and about how the scientists behind them are, like anyone, colourful, fallible, and unique people.

## NOTES ON MUSIC

“When we say we watch a film, we’re actually listening just as intently as we’re watching. The listening part should be just as multi-layered and informationally dense as the watching part. But that half of the experience happens in your subconscious.” – Writer & Director Niobe Thompson.

To create the original music for **Hunt for the Oldest DNA**, Thompson renewed his long-time collaboration with the Canadian experimental musician and composer **Jonathan Kawchuk**, who scored his previous two feature documentaries, the transplant science feature *Memento Mori* (2016) and *Carbon – The Unauthorised Biography* (2022). “With **Hunt for the Oldest DNA**,” says Thompson, “I asked Jon for the sounds of a lost world, of evolution, of life itself – it was an enormous brief.”

Kawchuk joined the project early in production, following the evolving story as it was filmed and providing musical explorations – “draft cues” – as it moved into the edit suite. By incredible coincidence, he is also amateur paleontologist who volunteers every summer at excavations in layers that date to the KT Boundary – the moment 64 million years ago that an asteroid struck Earth and triggered the extinction of the dinosaurs - in the Alberta Badlands. Kawchuk was naturally delighted to explore the sounds of distant geological epochs and their strange creatures.

He began building a bespoke sample library for the project, bowing tuned wood plates (an instrument called a Daxophone), creating wind instruments from dried bull kelp, collecting the invented “best guess” sounds of mastodons and other extinct animals, and working with his network of solo vocalists and strings players (performing in their bedroom studios across Canada). By summer 2023, when Kawchuk began formally composing what would become over 83 minutes of film music, he was already drawing on an impressive catalogue of samples and themes.

Working from his base in the remote British Columbia mountain town of Nelson, Kawchuk gathered a team of arrangers, assistants and sample musicians to compose his score over three months. At the end of October, they gathered at one of Canada’s premiere recording spaces – Bryan Adams’ Warehouse Studios in Vancouver – for four days of sessions with the Vancouver Film Orchestra, a brass quartet, and soloists ranging from flute to harp to operatic voice. Most of the tracks passed through the Rupert Neve-designed console that George Martin used to record the Beatles’ first multitrack albums, now housed at the Warehouse.

“I’m always nervous asking a composer to find ‘the sound of curiosity’ or ‘the ecstasy of a scientific breakthrough’... but Jon’s not bothered. He’s like, ‘we’ll just bring some aspirated flute, a harp, some brappy tubas, and a Georgian choir, and it’ll be great.’ Most times, he’s right!” - Niobe Thompson.

WATCH A SHORT BEHIND-THE-SCENES VIDEO ON THE MUSIC OF  
**HUNT FOR THE OLDEST DNA**

[MUSIC](#)

# NOTES ON ANIMATION

“How can we travel back in time? Is there a time machine? Yes, it’s DNA. It’s ancient DNA.” – Eske Willerslev, main character in **Hunt for the Oldest DNA**.

From the moment Willerslev utters these words in the opening minute, a rich diversity of animations delivers on his promise of time travel: back to the early years of DNA science, to Willerslev’s origins as a young trapper in Siberia, through decades of struggle to recover DNA from before the Ice Age, and ultimately, millions of years back in time to the lost world of the Pliocene Arctic.

To fulfill his promise, writer and director Niobe Thompson turned to the Vancouver animation studio Global Mechanic and its artistic director, **Bruce Alcock**. After bringing the cosmic and atomic journeys of the element carbon to life in delightful animations for his previous film *Carbon – The Unauthorised Biography*, Thompson returned to Global Mechanic for an even bigger animation challenge with **Hunt for the Oldest DNA**. Eventually, Alcock and his team created 291 discrete animations, with their work appearing on roughly one third of the frames of the finished film.

“Bruce and his team are phenomenally creative, as we knew from past collaborations. So, we built animation-supported storytelling into every piece of the narrative... and we even attempted some things Bruce had never tried before.” - Niobe Thompson.

The film crew travelled to locations around the world – Copenhagen, Iceland, Greenland, Northern Canada – to film tundra and boreal forest landscapes and collect hundreds of sample images: rocks, trees, bushes, distant mountain ranges, towering waterfalls, and even displays of aurora borealis. This footage became a vast library of settings into which Global Mechanic built the Pliocene and its creatures: hand-drawn 3D camels, reindeer, geese, rabbits, bears, and mastodons.

Meanwhile, to support the very personal narrative of the main character – maverick trapper-turned-gene hunter Eske Willerslev – the crew filmed him re-enacting episodes from his past in locations including Danish lakes, hunting cabins, DNA laboratories, and Greenland’s Icefjord. Using classic rotoscoping techniques – painting each live-action frame to become an animated plate – Global Mechanic brought Willerslev’s past to life in a stunning range of colours and with startling verisimilitude.

“A central challenge for science filmmakers is to transform a scientific discovery from the pages of a dry scientific journal into a vibrant and fascinating story that still preserves the essence of fact. That is an almost impossible task without the help of talented animators.” – Niobe Thompson

WATCH A SHORT BEHIND-THE-SCENES VIDEO ON THE ANIMATIONS OF  
**HUNT FOR THE OLDEST DNA**

**ANIMATION**

# NOTES ON CINEMATOGRAPHY

The art of documentary cinematography typically leans toward actuality – capturing the genuine moment and giving the viewer the precious sense of witnessing a story unfold. **Hunt for the Oldest DNA** is, in part, a fly-on-the-wall observational account of a long and twisted scientific journey, culminating in a true-to-life breakthrough. But viewers also travel far back beyond the 2-year window of filming. This presented cinematographers **Athan Merrick** and **Ryan Wilkes** with a unique challenge: collecting the raw material with which to build imagined, animated worlds over a span of millions of years.

First, the actuality. Even before formal production began, the crew followed the work of Eske Willerslev and an international team of scientists as they cored the bottoms of frozen lakes in the middle of an Icelandic winter. They tracked down the pioneers of the ancient DNA revolution, from Beth Shapiro in Santa Cruz, to Hendrik Poinar in Hamilton, to Ross MacPhee in New York, to Tom Gilbert and Eske Willerslev in Copenhagen. They travelled with Willerslev on an expedition to Greenland in the summer of 2022, and back to Iceland later that summer. Finally, they captured the work of a large, international science team in labs in Cambridge and Copenhagen, as Willerslev and a team of 37 other authors endured a gruelling year of peer review, culminating in a triumphant London press conference on December 6<sup>th</sup>, 2022, when they announced the breakthrough discovery of 2-million-year-old DNA from Greenland.

But then, the make-believe. The cinematographers were the long arm of the animation team at Global Mechanic in Vancouver, travelling with thick stacks of storyboard to locations around the world, tasked with filming “live action plates” for animation. Many of these shoots were with Eske Willerslev, as he re-enacted episodes in his early life: cleaning a moldy lab in a Copenhagen basement with industrial bleach, paddling down Siberian rivers in a canoe, coring Siberian permafrost in search of Ice Age DNA, even watching a dog drop DNA-laden poop on a wet winter day in Copenhagen.

For cinematographer Athan Merrick, “Shooting the plates ran against every conventional rule of filming: deep depth of field, high shutter speed, no foreground elements, very wide framing. So, it forced us to switch our brains between “real scenes” and “animation scenes”, often within the same hour. For trained cinematographers, it felt deeply unnatural, but when we saw what the animators could do with our material, it all made sense.”

Merrick and Wilkes flew drones above glaciers and along calving glacier tongues, filmed from fishing boats amidst icebergs in western Greenland, and from mountain ridges in the remote interiors of Iceland and British Columbia. But the strangest shoot of all was over a summer week in a pristine boreal-forest valley in northern Canada. There, they created the other-worldly look of a hot 3-million-year-old Pliocene forest with Hessyl hazing machines and an arsenal of stabilized cameras, from drones to the extraordinary DJI 4D.

For Merrick, “The DJI Ronin 4D is a completely new and revolutionary tool for high-end documentary filmmaking. You can have it out of a backpack and up and running in twenty seconds, delivering the most stable moving footage possible. The results exceed what a 20-year veteran Steadicam operator can offer – with the four axes of stabilization, the ease of use and smoothness goes far beyond what we get from the standard 3-axis gimbals.”

WATCH A SHORT BEHIND-THE-SCENES VIDEO ON THE CINEMATOGRAPHY OF  
**HUNT FOR THE OLDEST DNA**

CINEMATOGRAPHY

# THE PROTAGONISTS



## **ESKE WILLERSLEV**

Renowned Danish evolutionary biologist Eske Willerslev led the effort to sequence the first ancient human genome, pioneered the field of ancient environmental DNA, and has repeatedly broken the record for the oldest sequenced DNA. He spearheaded the recovery of genetic material from a revelatory forest ecosystem in northern Greenland that was at least two million years old – a discovery cited as one of *Science* magazine’s “Breakthroughs of the Year” in 2022 and featured on the cover of the journal *Nature* that December. He has made major contributions to our understanding of early human migrations, including the peopling of the Americas, the genetic origins of modern Europeans, the domestication of the horse, the earliest settlement of Australia, and the Polynesian expansions in the South Pacific.



## **BETH SHAPIRO**

A leading expert in the field of ancient DNA, Beth Shapiro specializes in the genetics of Ice Age animals and plants. As Professor of Evolutionary Biology at UC Santa Cruz, Shapiro is at the forefront of recovering ancient DNA from fossil remains and the environment to study evolution and the impact of human activities on this process. She has studied organisms ranging from the influenza virus to woolly mammoths, asking questions about extinctions, domestication, speciation, and pathogen evolution. In the 1990s, Shapiro began her career in ancient DNA at the University of Oxford, working alongside fellow researcher Eske Willerslev.



## **HENDRIK POINAR**

Molecular evolutionary geneticist Henrik Poinar is the son of noted entomologist George Poinar and, as a student, was an author of research in the 1990s claiming to have recovered DNA from the age of dinosaurs. After these findings were invalidated, he emerged as one of the pioneers of the field of ancient DNA, training with future Nobel Laureate Svante Paabo in Germany before founding an ancient genomics lab at McMaster University. He has focused most of his career on the evolution of the immunology of plagues and the sequencing of ancient animal genomes.



## **ASTRID SCHMIDT**

Biologist Astrid Schmidt was one of the earliest graduate students in the laboratory of Eske Willerslev, and she made some of the first attempts to recover DNA from Pliocene sediments sampled in northeast Greenland. When her efforts failed to yield results, she turned her back on research and devoted herself to science education, currently working as a lecturer in Citizen Science and Biodiversity for the teaching institute DIS Copenhagen.



### **MIKKEL WINTHER PEDERSEN**

A close collaborator of Eske Willerslev, Pedersen was a PhD student when he was invited to attempt work on the “cursed” sediment samples from northeast Greenland. Unlike numerous researchers before him, he was able to harness new technologies to recover and sequence DNA at least two million years old, leading to the December 2022 breakthrough discovery of an entire ancient ecosystem in northern Greenland, published on the cover of *Nature* magazine. He is now leading research to reconstruct past environments in Colombia, Congo, Denmark, Mexico, North America, Scotland, Tanzania, United Kingdom, and China.



### **MAUREEN RAYMO**

One of the world’s leading paleoclimatologists, she is a founder of the Columbia Climate School and the past Director of the Lamont-Doherty Earth Observatory. She studies the history and causes of climate change in Earth’s past and has done pioneering work on the ice ages, geologic temperature records, and the causes of cooling and warming transitions in Earth’s past.



# THE FILMMAKERS



## NIOBE THOMPSON

Writer, Director, Executive Producer

Anthropologist and filmmaker Niobe Thompson's documentaries reach back to our human origins, explore the mysteries of evolution, and tackle the environmental dilemmas of the Anthropocene. After co-directing the 2022 feature doc *Carbon - The Unauthorised Biography*, his 2024 film **Hunt for the Oldest DNA** premieres at CPH:DOX. He is a three-time winner of Canada's most prestigious award for science and nature documentaries: the Rob Stewart Award for "Best Science and Nature Program". His films have been nominated for two Emmy Awards, and he produced the Sundance-winning short film *Fast Horse*. Niobe is the founding producer of British-Columbia based Handful of Films.



## JOHN RUBIN

Executive Producer

John Rubin is executive producer at HHMI Tangled Bank Studios. Winner of a Peabody and four Emmys, Rubin turned to documentaries after earning his doctorate in cognitive science at MIT. He has produced, written, and directed films for the flagship PBS series *Nature*, *American Experience*, and *NOVA*. Rubin's films often explore the intersection of natural history and science. At Tangled Bank, Rubin executive-produced *The Farthest*, *Rise of the Mammals*, *The Gene Doctors*, and the digital series *I Contain Multitudes*. *The Farthest* won an Emmy for Outstanding Science and Technology documentary, the National Academies' Keck Communication Award, and the AAAS Kavli Science Journalism award.



## SEAN B. CARROLL

Executive Producer

Sean B. Carroll is an internationally recognized biologist, award-winning author, and Emmy-winning executive producer. Carroll was the architect of HHMI's filmmaking initiative, Tangled Bank Studios, to bring great stories about science and scientists to broad audiences. A frequent public speaker and prominent storyteller in print, in film, and on radio, Carroll has served as executive producer of more than 40 documentary, IMAX, and short films, including the Emmy-winning *The Farthest* and *The Serengeti Rules* and the BAFTA- and Oscar-nominated *All That Breathes*.



### **ATHAN MERRICK**

Director Of Cinematography

Athan Merrick is a western Canadian cinematographer with a background in lighting on big Hollywood productions and shooting adventure ski films. He made the transition from massive studio sets to chasing professional athletes with a 50-pound pack on his back in -20 Celsius weather in some of the most remote spots on Earth. He was raised among the desert vistas of New Mexico by artist parents and settled in the ocean and mountain wonderland of Vancouver Island, Canada. Merrick's career highlights include a Canadian Society of Cinematographers award for his work on the art installation, *Uninterrupted*, as well as a Leo Award in 2018 (BC Film Awards) for his ski film, *Numinous*.



### **RYAN WILKES**

Cinematographer

Ryan Wilkes is a multi-talented storyteller whose passion for science, adventure and conservation is reflected in his work as a cinematographer and photographer. His diverse background, which includes a PhD in Bioengineering and experience as a materials scientist, gives him a unique perspective when it comes to communicating complex scientific topics in an accessible and engaging way. Ryan has shot on all seven continents and his cinematography can be seen in multiple documentaries currently in production with major networks including CBC, PBS and ARTE. He has received several awards for his independent short documentaries and is an alumnus of the Jackson Wild Media Lab and the Being Black in Canada filmmaking program.



### **BRUCE ALCOCK**

Animation And Art Director – Global Mechanic

As a director and creative director for over three decades, Bruce Alcock's award-winning films, television series, interactive projects, and hundreds of international commercials have earned him accolades worldwide. His varied work includes films such as *Impromptu*, *54 Hours*, and *At the Quinte Hotel*, as well as *Jam Van*, a preschool music series for YouTube Originals; *Scribbles & Ink*, a PBS hybrid narrative drawing app; and *Far Away from Far Away*, a National Film Board of Canada interactive project. Alcock co-founded three animation studios: Cuppa Coffee (Toronto), Tricky Pictures (Chicago), and Global Mechanic (Vancouver). Working in a mix of physical and digital techniques, Alcock is, above all, an experimental artist. He loves to blend commercial and artistic streams of production, combining professional rigor and creative abandon to make truly original work.



**JONATHAN KAWCHUK**

Composer

Jonathan Kawchuk is a Canadian composer and sound artist, notably having scored *Carbon: The Unauthorized Biography* and episodes of David Suzuki’s “The Nature of Things.” His work spans theatre, film, and sound installations. He has worked on albums for Nico Muhly and Ben Frost, and has studied field recording under Chris Watson. An alumnus of several music residencies, he is a Grammy voting member, recording artist on Paper Bag Records, and the Canadian representative for acoustic conservation non-profit Quiet Parks International. His upcoming work includes the scores for *Send Kelp!* (2023) and *Before the Ice* (2024).



**JAY MCMILLAN, JEN RANDALL, TIMOTHY SYMES**

Editors – Halcyon Post

Halcyon Post is a film editing collective owned and operated in Squamish, BC by founders Jay Macmillan, Tim Symes and Jen Randall. They are known for creating meaningful documentaries, branded films, and commercial content with narrative clarity, cinematic quality and creative soul. Halcyon Post collaborates with studios, brands, agencies and directors to create raw and authentic films. Their award-winning team of editors empower clients to share stories with a bold voice, offering audiences entertainment with emotion.

## VIDEOS

TRAILER

MUSIC

ANIMATION

CINEMATOGRAPHY

## PRESS ASSETS

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Executive Producers  
**JOHN RUBIN**  
**NIOBE THOMPSON**  
**SEAN B. CARROLL**  
**CHRIS SCHMIDT**  
**JULIA CORT**

Producer and Science Editor  
**RICHARD STONE**

Producers  
**ALLY BARRY**  
**SANDRA TOBER**

Director of Photography  
**ATHAN MERRICK**

Cinematographer  
**RYAN WILKES**

Edited By  
**JAY MACMILLAN**  
**JEN RANDALL**  
**TIM SYKES**

Art Director  
**BRUCE ALCOCK**

Music Composed by  
**JONATHAN KAWCHUK**

Sound Design & Mix Engineer  
**DAVID PARFIT**

Production Coordinator  
**LINDA ROSENSTRØM CHAN**

Featuring

**ESKE WILLERSLEV  
MIKKEL WINTHER PEDERSEN  
HENDRIK POINAR  
TOM GILBERT  
ED GREEN  
JOAN FORNOS**

**BETH SHAPIRO  
NATALIA RYBCZYNSKI  
ASTRID SCHMIDT  
ALEXANDRA ROUILLARD  
MAUREEN RAYMO**

Scientific Advisors

**ANDREW J. CHRIST  
ALEXANDRA VAN DER GREER  
BENJAMIN VERNOT**

Researcher

**JUDE COLEMAN**

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**ANIMATION BY GLOBAL MECHANIC MEDIA**

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Director

**BRUCE ALCOCK**

Producer

**TINA OUELLETTE**

Assistant Director

**RACHEL STOLBERG**

Director of Visual Effects

**RYAN KANE**

Designer

**KEVIN LANGDALE**

Line Producer

**CHRIS BRODIE**

Editor

**KYLE D'ODORICA**

Animators/Revisionists

**DEBORA LEAO  
MADELINE PERIUT**

Animators

**CHEZ BATTISTA  
LAUREL THOMSON  
GRACE YOO**

Compositors

**RAAD ARIYA  
DARYL-LYNN NEILSEN  
ZACH ACHERMAN**

Production Coordinator

**VICKY VAN**

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## ORIGINAL SCORE

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Music Composed By  
**JONATHAN KAWCHUK**

Additional Violin & Viola  
**DREW JUREKA**

Music Project Manager  
**TORSTEN GRAN-RUAZ**

Additional Instruments  
**DANIEL LAPP**

Mixing Engineer  
**JAMES CLEMENS-SEEELY**

Additional Bass  
**JILL MCKENNA**

Additional Music, Music Editing  
**KATYA SEMYONOVA**  
**TORSTEN GRAN-RUAZ**  
**FABIAN GALEANA**  
**WALKER GRIMSHAW**

Additional Cello  
**RAPHAEL WEINROTH-BROWNE**

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## SESSIONS

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Flutes  
**PAOLO BORTOLUSSI**

Cello  
**ZOLTAN ROZSNYAI**

Brass Quartet  
**ANDREW POIRER**  
**JAMES HOPSON**  
**ANDREW BROUGHTON**  
**PEDER MCLELLAN**

Voice  
**RED JANES**

Violin & Viola  
**REBECCA RUTHVEN**

Sesions Recorded at  
**MONARCH STUDIOS,**  
**VANCOUVER, BC**

Harp  
**ALBERTINA CHAN**

Recording Engineers  
**TOM DOBRZANSKI**  
**ALEX PENNEY**

Piano  
**COREY HAMM**

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## SYMPHONY RECORDINGS

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Score Performed by  
**VANCOUVER FILM ORCHESTRA**

Conductor and Music Director  
**HAL BECKETT**

Scoring Mixer  
**ROGER MONK, CAS**

Orchestrations by  
**HAL BECKETT**  
**DEVIN ROTH**

Score Recordist  
**VINCE RENAUD**

Music Preparation  
**REUBEN AVERY**  
**SHAYLA SWANSON**

Concertmaster  
**NANCY DIHOVO**

Assistant Engineer  
**ANDREW DOWNTON**

Score Copyist  
**GREG HAMILTON**

Music Recorded at  
**THE WAREHOUSE STUDIOS**  
**VANCOUVER, BC**

---

## LOCATION SOUND RECORDING

---

**AUGUST DRENK**  
**LOVE HOBBS**  
**STEPHEN LORNE**  
**BEN MESTERS**

**JON LEBRUN**  
**NIXON SANCHEZ**  
**MICHAEL JONES**  
**AGGI FRIDBERTSSON**

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**TOM MALENICA**  
**DARIAN LUNG**

DI Producer  
**MELISSA ZIELFFIE**

Iceland Fixer  
**RAFNAR HERMANNSSON**

Trailer Editor  
**TERENCE RACE**

Stills Photographer  
**RYAN WILKES**

Graphic Designer  
**TRISHA WHITE**

Camera Operator (*Behind the Scenes*)  
**JILLIAN MILLER**

Production Accountant  
**RICK MINHAS**

Legal  
**ALTMAN & YOUNG**

Production Bookkeeper  
**JEN CHILDS**

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## MUSIC

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“Kuud Kuulama” and “Une Meeles” by Maarja Nuut and Ruum appear courtesy of Fat Cat Records

“Kuud Kuulama”

Written by Maarja Nuut

Published by Rough Trade Publishing

By Arrangement with Bank Robber Music

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## ARCHIVAL MATERIAL

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“Saqqaq Man” © Konrad Nuka/VISDA Copenhagen/CARCC Ottawa 2023.

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Handful of Films

Eske Willerslev

Nicolaj Krog Larsen

SketchFab

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Communications Manager  
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Director of Operations  
**LORI BEANE**

Post Production Manager  
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Senior Producer  
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**MADS KROGSGAARD THOMSEN**

Project Manager, Education & Outreach

**CLARISSA LOKKEGAARD ENGLEHOM**

Senior Grant Lead

**CHARLOTTE DRUSEBJERG**

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**FOR DANMARKS RADIO**

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Commissioning Editor

**ANDERS BRUUS**

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**FILMED ON LOCATION**

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St. Johns College, University of Cambridge  
University of California, Santa Cruz  
Globe Institute, University of Copenhagen  
McMaster University  
University of Iceland  
American Museum of Natural History  
Arta Caves, Mallorca  
University of Bremen, Germany  
Jesus College, University of Cambridge

Canadian Museum of Nature  
The Culture House, Reykjavik  
Muskwa-Kechika Management Area, British  
Columbia  
Columbia University – Lamont Doherty  
Springer Nature Campus, London, UK  
Lamont Doherty Core Repository  
Ilulissat Icefjord, UNESCO  
Carlsberg Research Laboratory

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Mamba Studios  
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Heather Rodgers  
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Julius Csotonyi  
Alica Henschley  
Nicolaj Krog Larsen  
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The Angus Family  
Air Greenland  
The Jaren Family  
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Andrew, Alby & Anja Barry

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