The Tale of Sleeping DOM

This newly mobilized old matter released by thawing permafrost.

By Aude Flamand

This book attempts to turn a master's research project into an engaging children's book, with the goal of making science more accessible and breaking down knowledge barriers.

My name is Aude Flamand, I completed my masters in oceanography at the Institut des Sciences de la Mer de l'Université du Québec à Rimouski (ISMER-UQAR), under the supervision of Gwénaëlle Chaillou, professor of marine chemistry at ISMER-UQAR, and Jean-François Lapierre, professor of biology at the University of Montreal. This research project focused on the matter released by thawing permafrost, a soil which had been frozen for more than two- years. This project was funded by NSERC and the ArcticNet network.

During my sampling campaign, in the summer 2021, I had the incredible opportunity to spend over two-months in the Inuvialuit community of Tuktoyaktuk. As I was talking to community members, I came to notice a certain frustration towards scientists. They felt left out, as the research happening on their land was rarely communicated to them. That is why, at the end of my master's degree, it was dear to my heart to share my results in a way it could be more easily understood and accessible to everyone. In the summer of 2022, I had the privilege of returning to Tuktoyaktuk and presenting this book to the community members. Their valuable input and feedback helped me further improve its content and message.

The Tale of Sleeping DOM

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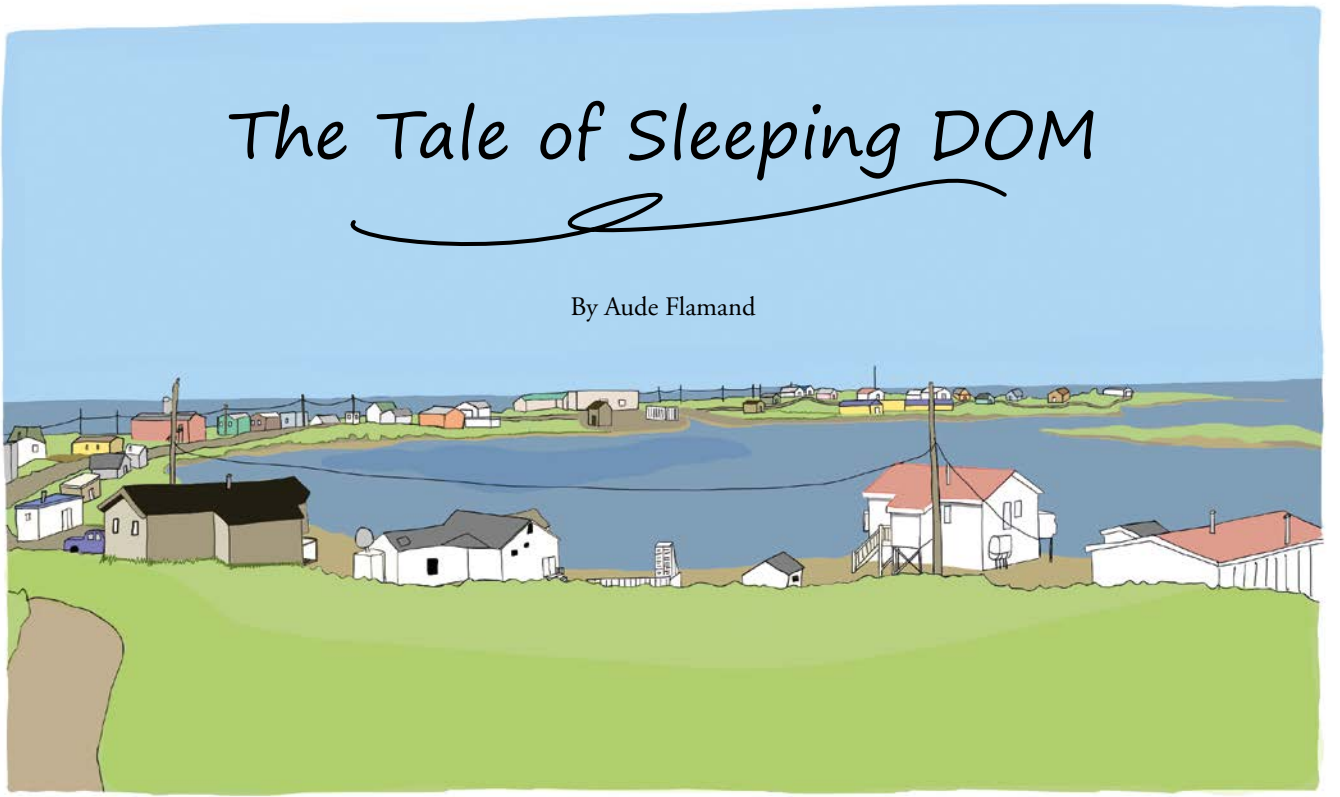
Thank you to Kanelsa Jade Noksana for making our summer 2021 memorable and for becoming a friend for life. Thank you to Bruce Noksana, Shania Noksana and Michele Tomasino for the amazing moments we shared together, for welcoming me into their home and for introducing me to country food. Quyanainni to Betty Elias for the amazing evenings we spent playing board games around a meal and for helping me in this project. Quyanainni to Maureen and James Pokiak who helped me in my field work and who warmly welcomed me in the Tuktu B&B. Thank you to my dear friend Charlotte Tessier-Larivière for the beautiful drawings and for all her help in the realisation of this book, it would of have not been possible without her. Lastly, thank you to Gwénaëlle Chaillou and Gwendoline Tommi-Morin for guiding and helping me throughout this project and to Bryan Mayhew and Bay Berry for being part of this incredible field trip and making it unforgettable.

The Tale of Sleeping DOM

By Aude Flamand



TuKtoyaKtuK, NWT


Nauyaq
Ivgit
Saqalikitaaq
DOM

nukatpiaq

Once upon a time... more than 120 000 years ago, a young man named Dom was peacefully picking flowers on a cliff overlooking the ocean, that we now know under the name Arctic Ocean.

nautchiat

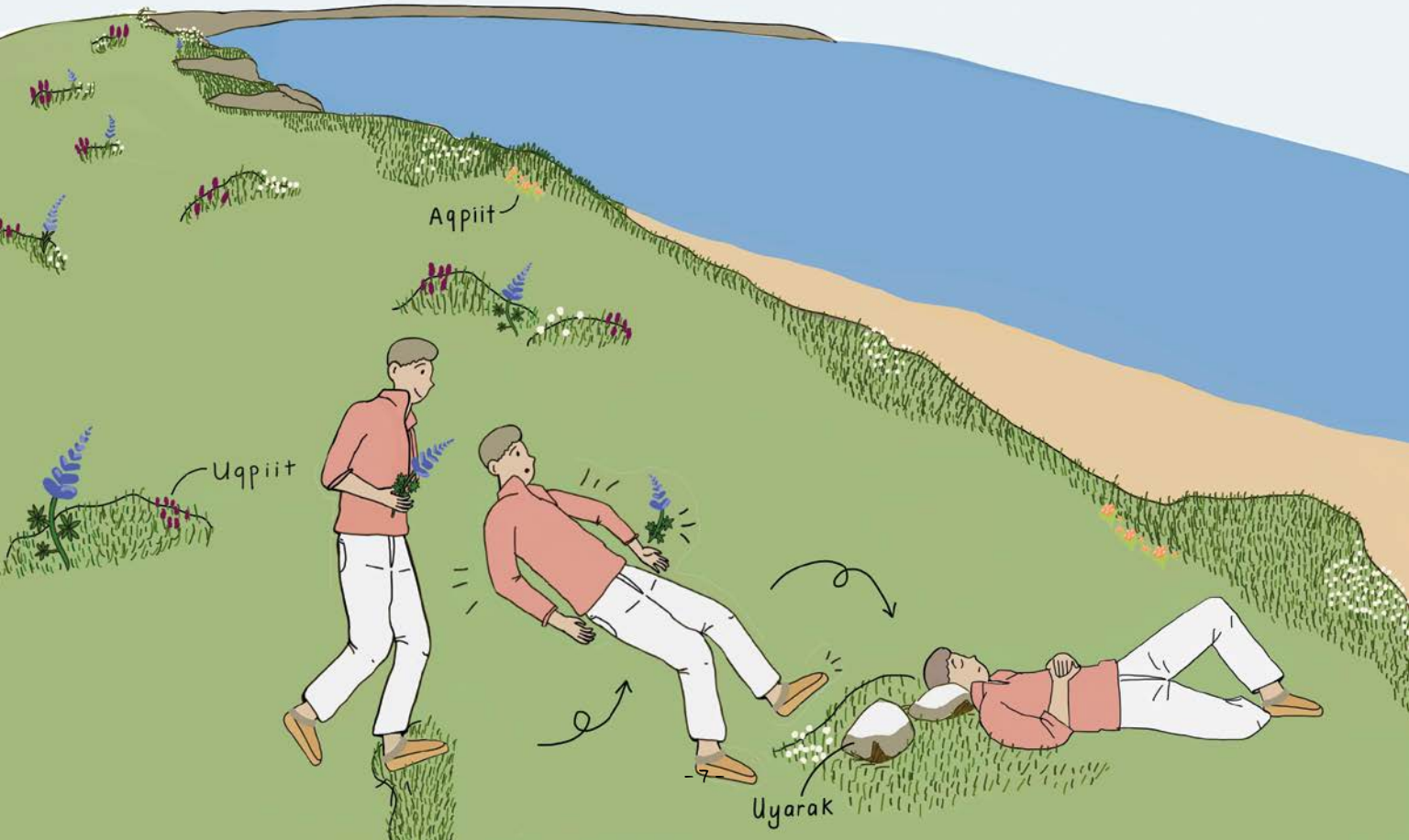
tariuq

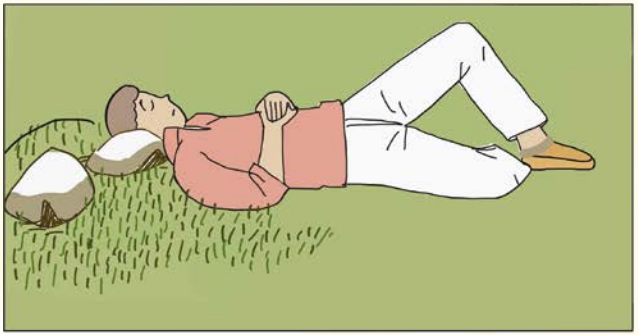
nuna

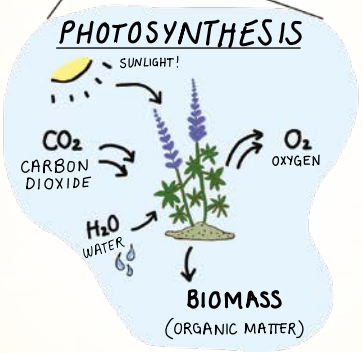
Blinded by the beauty of the land, Dom was no longer paying attention to where he was stepping, and suddenly, he tripped and fell, hitting his head on a rock.

niaquq

uyarak


Aqpiit
Uqpiit
Uyarak




PHOTOSYNTHESIS
SUNLIGHT!
CO_2
CARBON DIOXIDE
O_2
OXYGEN
H_2O
WATER
BIOMASS
(ORGANIC MATTER)

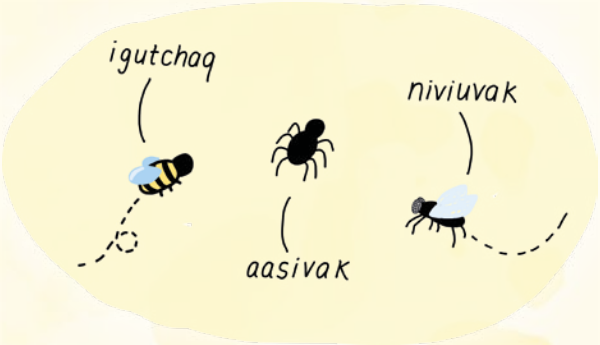
nukatpiaq

As a result, the young man fell into a deep coma and his close ones would never know what happened to their dear Dom.

As days, months and seasons passed, the body of the young man was buried by the build up of organic matter: a product of photoshynthesis*, rotting plants, dead insects and animals which degraded over time.

nunam niryutait

nautchiat

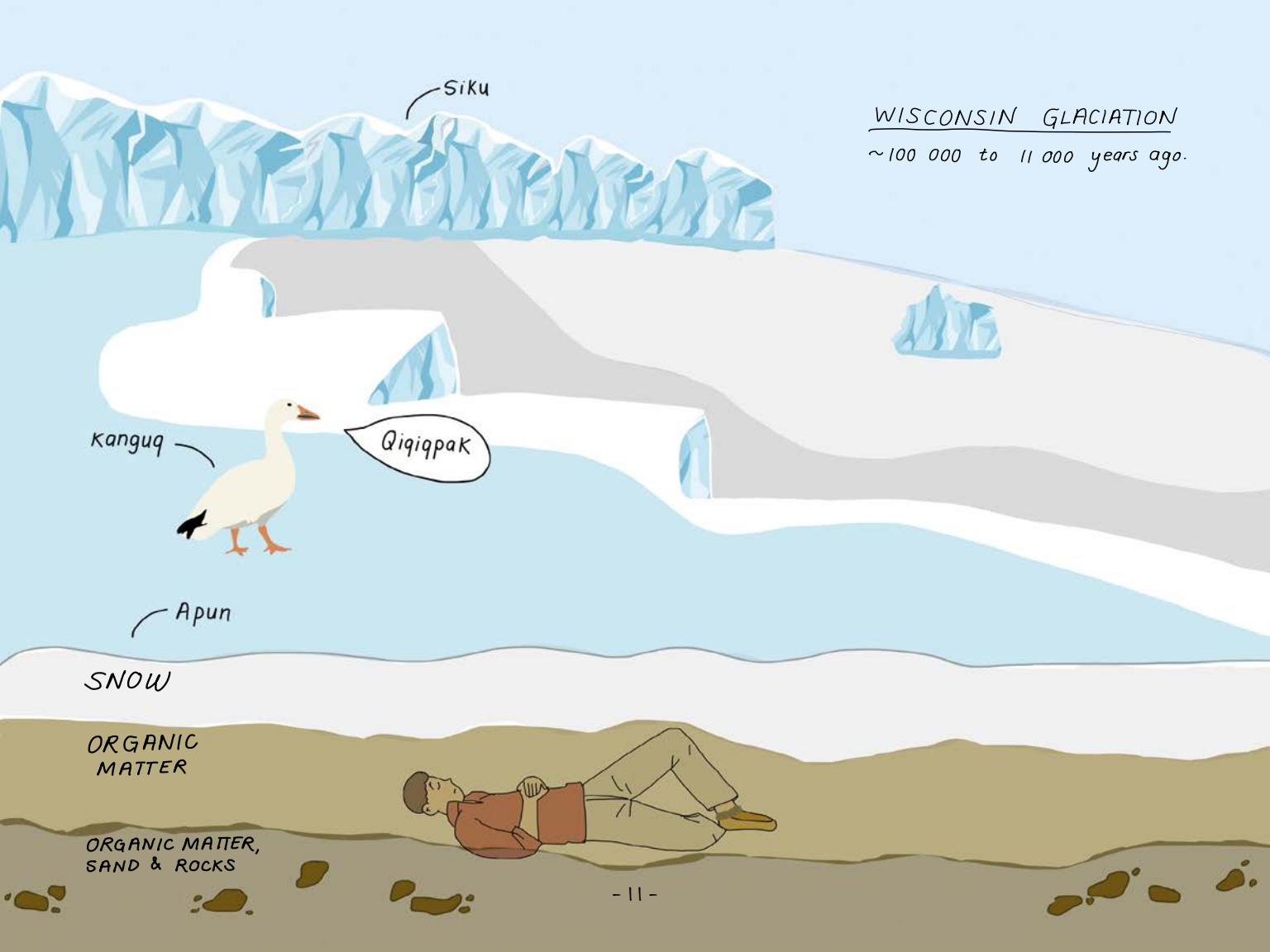


* Photosynthesis is the vital process that allows plants to grow and create organic matter using sunlight.

As Dom's body was starting to slowly decompose, the planet plunged into an ice age, the Wisconsin glaciation, which lasted for tens of thousands of years.

siku

The ice and the extreme cold temperatures kept his body perfectly preserved, protecting him from bad weather, bacteria, and sunlight, that would have lead to his decomposition.


Siku
WISCONSIN GLACIATION
~100 000 to 11 000 years ago.
Kanguq
Qiqiqpak
Apun
SNOW
ORGANIC MATTER
ORGANIC MATTER, SAND & ROCKS

AGRICULTURAL ACTIVITIES

INDUSTRIALISATION

FOSSIL FUEL EXTRACTION

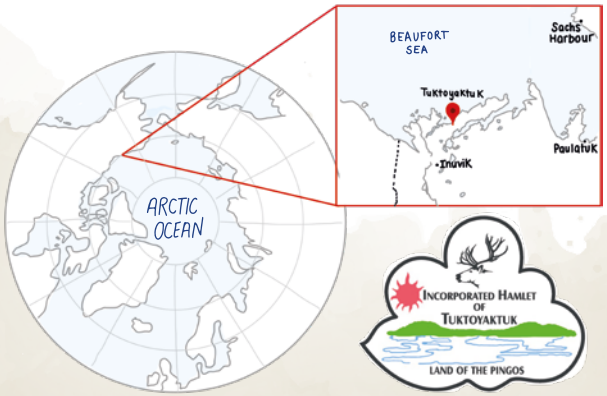
PULLEN ISLAND, PICTURE BY LINA MADAJ

CLIMATE CHANGE CAUSES THE ICE IN PERMAFROST TO THAW, WEAKENING SOIL STRUCTURE AND CREATING MASSIVE LANDSLIDES !

More than 120,000 years later, as the temperature started rising to a more livable environment, big cities were developing at a rapid rate. Pollution caused by industrialisation, agricultural activities, and fossil fuel extraction, led the atmosphere toward higher concentrations of greenhouse gases, causing the climate to become warmer and warmer.

The Arctic is greatly affected by these environmental changes, making the summer season last longer, therefore causing more permafrost to thaw, this soil which had been frozen for thousands of years.

auyaq



ilannariik

auyaq

niviaqsiraq

Meanwhile, during a particularly hot summer day, near the Inuvialuit community of Tuktoyaktuk, in the Northwest Territories, Canada, a girl named Irony and two of her friends were walking on the shore along the Arctic Ocean.

sina

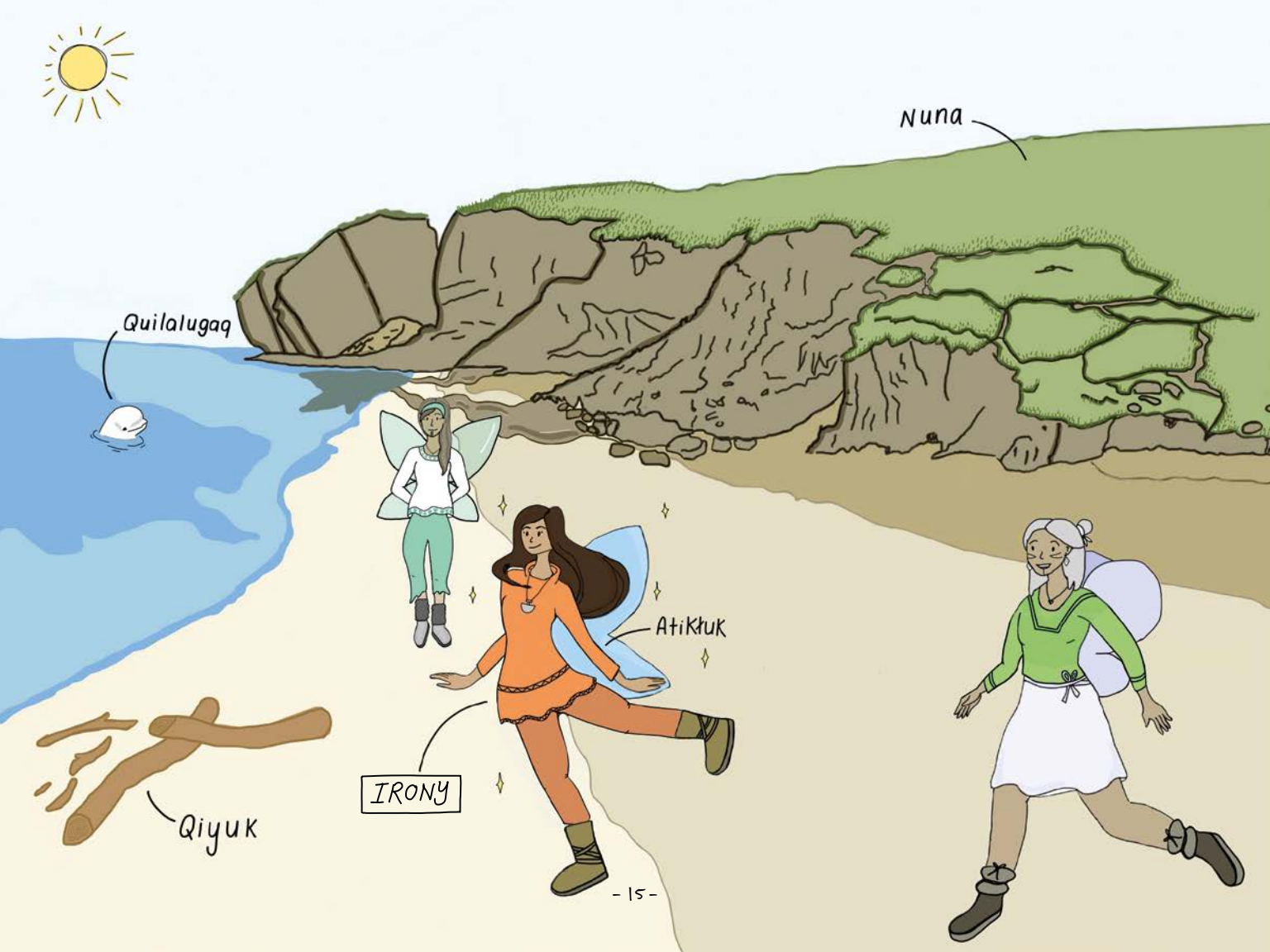
The girls were astonished by how quickly the coastal landscape was changing day after day.

niviaqsiqat

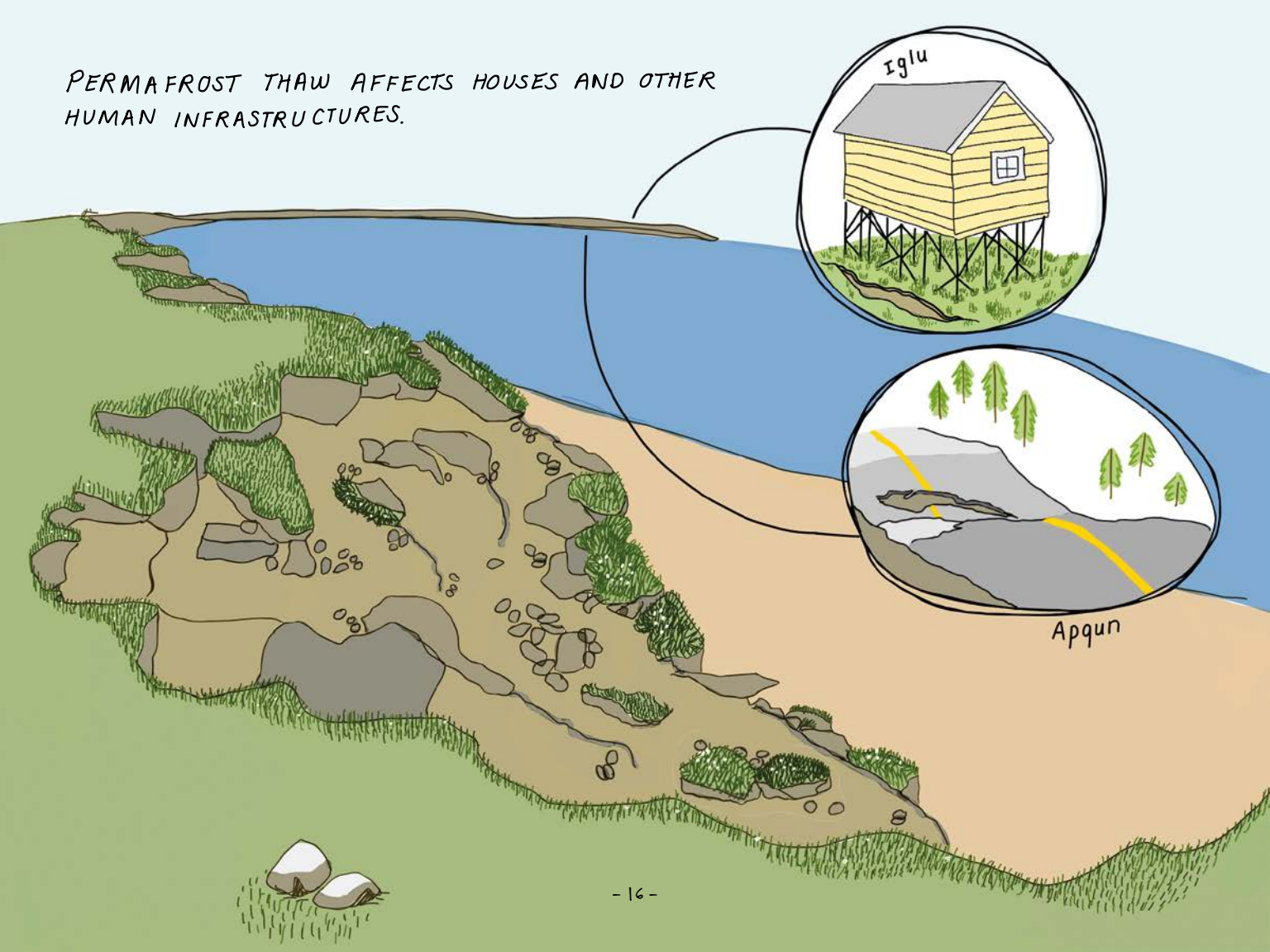
tariuq

The permafrost was thawing at alarmingly fast, releasing a great quantity of very old but perfectly preserved organic matter into the ocean, disturbing the water composition and the health of ecosystems, impacting fish, belugas and ultimately humans.

qilalugaq


Nuna
Quilalugaq
Atikłuk
IRONY
Qiyuk

PERMAFROST THAW AFFECTS HOUSES AND OTHER HUMAN INFRASTRUCTURES.



iglut or igluit

apqutit

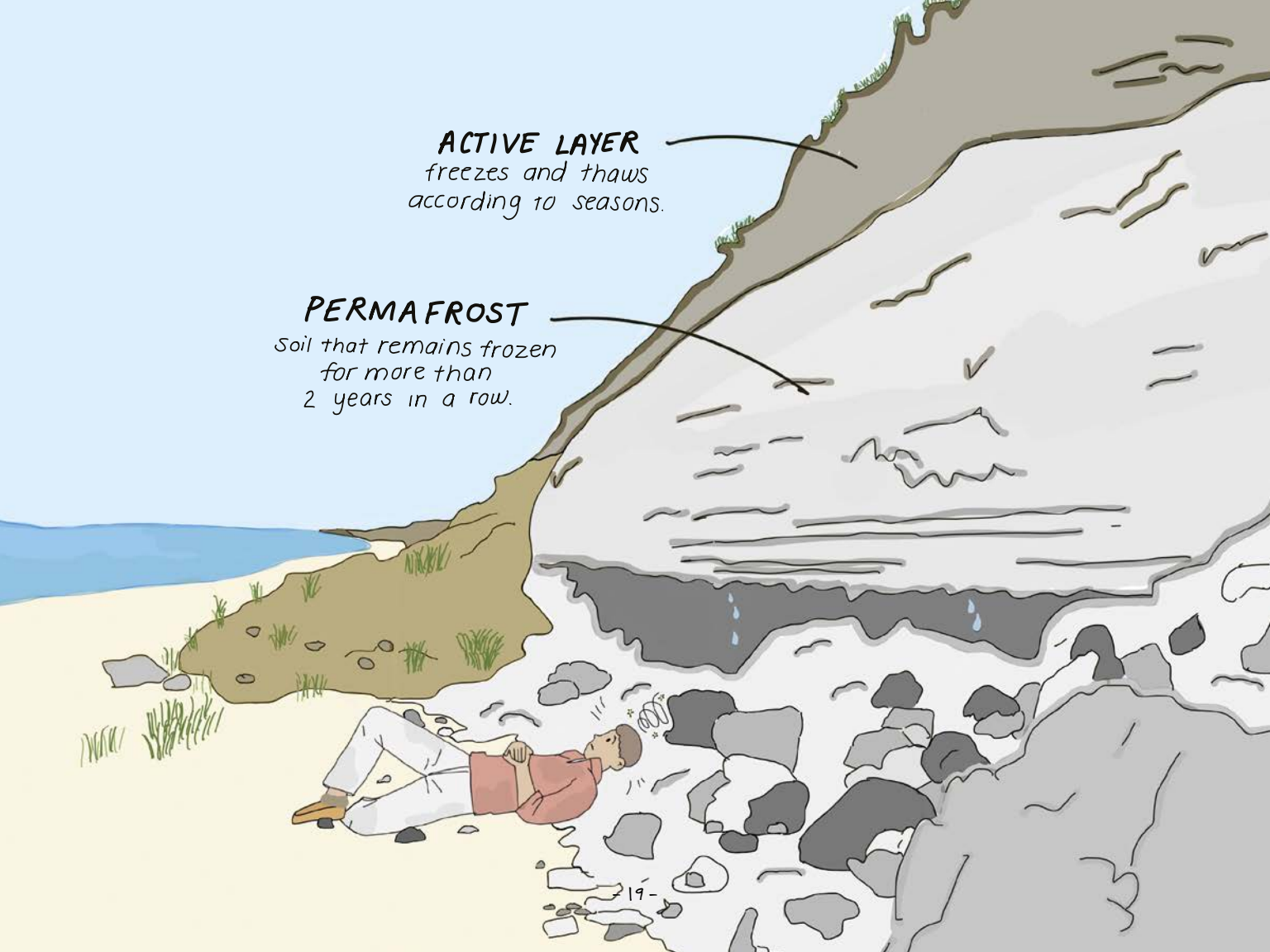
Thawing permafrost weakens the soil where houses, roads and other human-made infrastructures are built.

Northern communities that are built on these frozen grounds are greatly affected by these changes, caused by a warming climate.

imnaq

Suddenly, BOOM!!! The cliff that they were observing collapsed in front of their eyes, revealing Dom's long-forgotten body.

iyik


ACTIVE LAYER
freezes and thaws according to seasons.
PERMAFROST
Soil that remains frozen for more than 2 years in a row.


Hee...
Hello!

nukatpiaq

niviaqsiraq

Freed from his coma, the young man and the young girl they had barely had time to look at each other that an intense chemistry developed between the pair.

The two individuals were looking deeply into each other's eyes: "Hee... Hello!" chirped Dom.

iyik

taliq

Suddenly Dom let out a shrill cry: “Ahhhhh”. Dom looked down at his arm and noticed that his skin was starting to break down.

Without hesitation, Irony rushed to him.


Tariuq
Ulu
AHHH!!!
KqmmaK

She held him tightly in her arms to protect him. Determined to help the young boy, Irony's friends followed her lead.

Confused, Dom did not understand what was going on, but he realised that he was no longer in pain.

The barrier created by the girls protected him from degrading.

niviaqsiqat

ilannariik

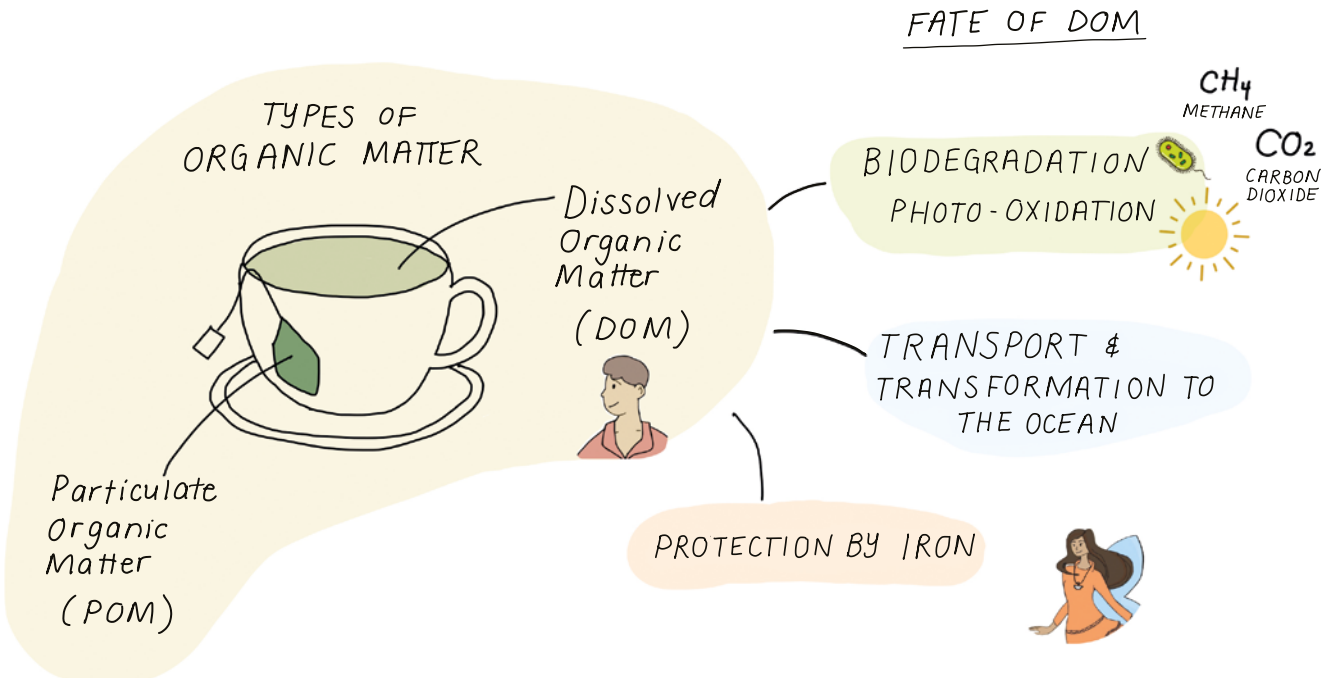
In fact, Irony and her friends had learned earlier in the week that once exposed to the air, the old material, which had been perfectly preserved in the frozen soil, was very quickly degraded by microbes and sun rays.

siqiniq

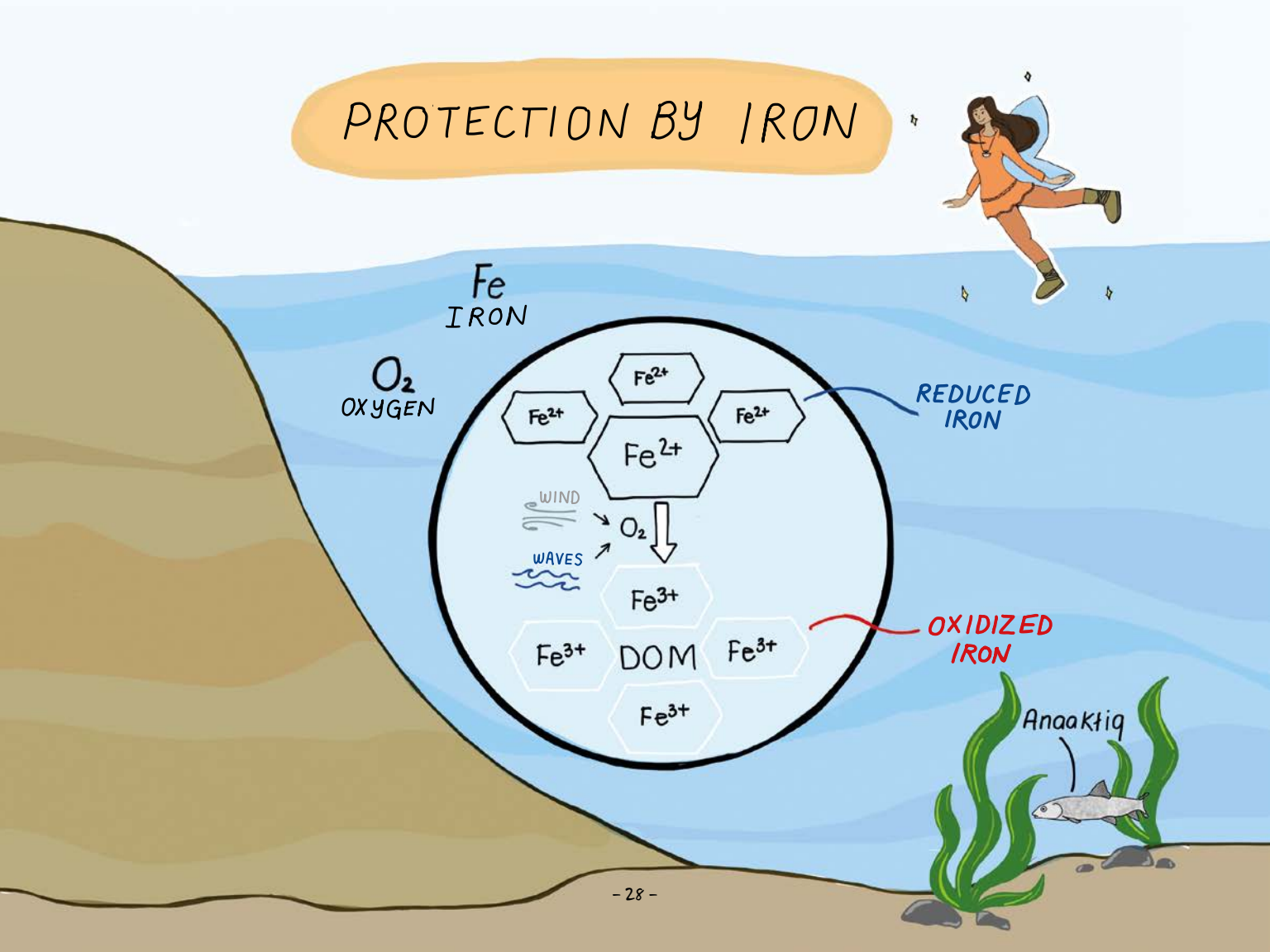
These processes, also called mineralization, had the ability to break down organic matter ultimately releasing greenhouse gases into the atmosphere.

tariuq

This matter could also be carried away by the hungry ocean, which would have rushed to transform him into smaller parts.


TYPES OF ORGANIC MATTER
Dissolved Organic Matter (DOM)
Particulate Organic Matter (POM)
FATE OF DOM
BIODEGRADATION
PHOTO-OXIDATION
CH4
METHANE
CO2
CARBON DIOXIDE
TRANSPORT & TRANSFORMATION TO THE OCEAN
PROTECTION BY IRON

PROTECTION BY IRON



iqitaa

Irony had the instinct to hug Dom, because she had also learned that there were processes which could protect this matter.

malik

sina

Indeed, in a coastal environment, where waves break on the shore and storms beat down on cliffs; oxygen comes and go, favouring the settling of compounds such as iron.

imnaq

Once in contact with the oxygen, the iron traps the old organic matter into its core, protecting it from decomposition and capturing it in the sea floor.

natiq

It is this same phenomenon that had pushed Irony and her friends to protect Dom.

ilannariik

For the sake of climate change, Dom, Irony and her friends remained inseparable and lived together happily ever after.

Let's not exaggerate here, this strong friendship could be broken if an argument were to break out within the group.

In other words, this protective bond might not last forever, and Dom would once again be a potential source of greenhouse gases in the atmosphere.

LEXICON

Inuvialuktun	=	English
Aasivak	=	Spider
Anaakłiq	=	Whitefish
Apqun	=	Road (s)
Apqutit	=	Roads (p)
Apun	=	Snow
Aqpiit	=	Cloudberries
Atikłuk	=	Traditional tunic
Auyaq	=	Summer
Iglu	=	House (s)
Iglut or igluit	=	Houses (p)
Igutchaq	=	Bee
Ilannariik	=	Friend
Imnaq	=	Cliff
Iqitaa	=	Hug
Ivgit	=	Grass
Iyik	=	Eyes
Kanguq	=	Snow goose
Kammak	=	Traditional boots (p)
Malik	=	Wave
Natiq	=	Seafloor
Nautchiat	=	Flowers or plants
Nauyaq	=	Seagull
Niaquq	=	Head
Niviaqsiraq	=	Girls (s)
Niviaqsiqat	=	Girl (p)
Niviuvak	=	Fly
Nukatpiaq	=	Young man
Nuna	=	Land
Nunam niryutait	=	Animal (from the land)
Qilalugaq	=	Beluga
Qiqiqpak	=	Cold weather (spoken expression)
Qiyuk	=	Drift wood
Quyanainni	=	Thank you
Saqalikitaaq	=	Butterfly
Siku	=	Ice
Sina	=	Shore
Siqiniq	=	Sun
Taliq	=	Arm
Tariuq	=	Ocean
Ulu	=	Small woman's knife
Uqpiit	=	Willows
Uyarak	=	Rock

DRAWINGS OF THE LAND OF TUKTOYAKTUK SEEN BY THE YOUTH

ILLUSTRATOR

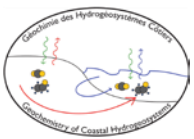
Charlotte is a master's student in oceanography at the Institut des Sciences de la Mer de l'Université du Québec à Rimouski (ISMER-UQAR, Québec). She works on the trophic (diet) ecology of marine mammals in the Gulf of St. Lawrence in the laboratory of Veronique Lesage at the Maurice Lamontagne Institute (IML), Quebec. Charlotte is passionate about marine life, especially when it comes to their preservation and protection. In her free time, you can find her on her paddleboard, drawing on her iPad or even camping with her Bernese Mountain dog.

INUVIALUKTUN TRANSLATOR

Betty Elias is an Inuvialuit elder who lives in the Hamlet of Tuktoyaktuk. In the community she takes an important part to share her knowledge with younger generations and to preserve the native language: Inuvialuktun. She enjoys making Tuktoyaktuk souvenirs using wood and fur and in the fall, you can find her picking akpik (cloud berries) in the tundra.

"Inuvialuktun is like a flowing river, it flows and flows and never ends"
Father Lemur - previous Tuktoyaktuk priest

This book was made possible with the financial support of Québec-Océan, ISMER-UQAR and the Network of Centres of Excellence of Canada, ArcticNet. My research takes part in the international permafrost research project, Nunataryuk, which aims to understand how thawing permafrost on land, along the coast and below the sea, changes the global climate and life for people in the Arctic. This project was also possible with the contribution of Québec-Océan, Réseau Québec maritime, Natural Resources Canada and the Northern Scientific Training Program.



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Université du Québec à Rimouski
Institut des sciences de la mer de Rimouski

Québec OCÉAN

RÉSEAU QUÉBEC MARITIME

Natural Resources Canada | Ressources naturelles Canada
Canada

NSTP PFSN

CRSNG NSERC

NUNATARYUK

ArcticNet

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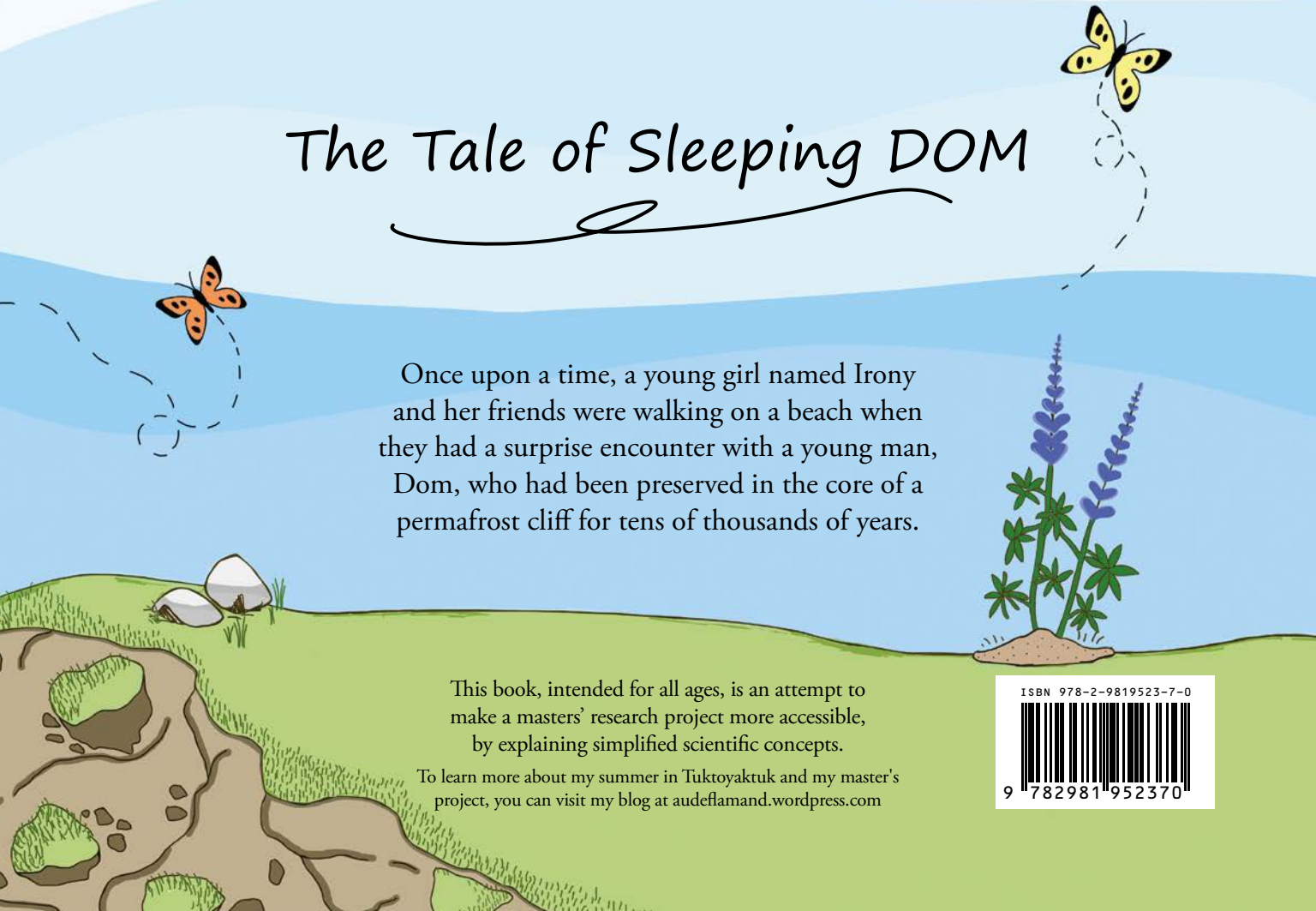
2021 2030 United Nations Decade of Ocean Science for Sustainable Development

2022-2032 | INTERNATIONAL DECADE OF Indigenous Languages

Incorporated Hamlet of Tuktoyaktuk
Land of the Pingos

The Tale of Sleeping DOM



Once upon a time, a young girl named Irony and her friends were walking on a beach when they had a surprise encounter with a young man, Dom, who had been preserved in the core of a permafrost cliff for tens of thousands of years.

This book, intended for all ages, is an attempt to make a masters' research project more accessible, by explaining simplified scientific concepts.

To learn more about my summer in Tuktoyaktuk and my master's project, you can visit my blog at audeflamand.wordpress.com

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