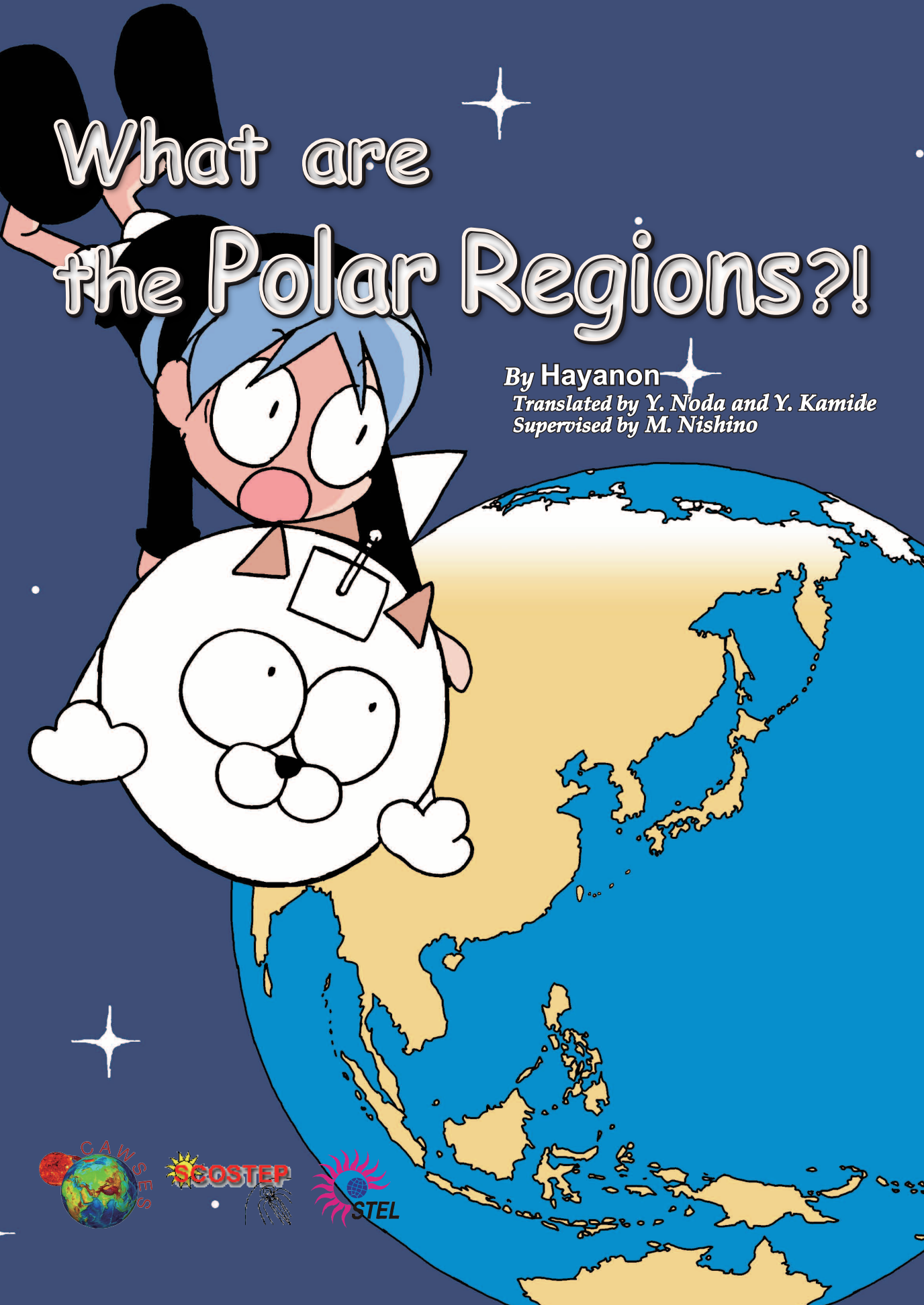
What are the Polar Regions?!

By Hayanon
Translated by Y. Noda and Y. Kamide
Supervised by M. Nishino



A Message from R. Amundsen

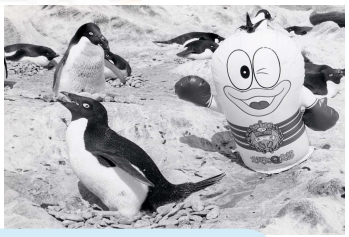
(Roald Engelbregt Gravning Amundsen, 1872 – 1928)

I was born in 1872 near Oslo, Norway. When I was a child, I was inspired to become a polar explorer by books on Arctic expeditions. By training myself to endure hardship and learning to sail, I was prepared for future adventures. Even after having grown up and becoming a medical student at the University of Oslo, I could not give up my childhood dream. In 1897, I joined the Belgian Antarctic expedition to gain experience.

Later, I began planning an expedition to the North Pole and borrowed the famous sailing ship "Fram" from the Norwegian explorer and the Nobel Peace Prize winner, F. Nansen. So, I think you will understand how I was shocked on hearing the news that the American explorer R. Peary reached the North Pole on April 6, 1909. I thus had to change my destination to the South Pole, notifying the British explorer R. Scott, who was also heading for the Pole, of my intentions.

Using sleds pulled by over 50 dogs, our team marched on to the Pole in

A roaring polar bear in the



Penguins in Antarctica, lovely

severe weather. The temperature there in summer was about −30°C. We experienced blizzard after blizzard. We made depots to store provisions for our return trip. On December 14, 1911, we finally stood at the South Pole! After planting a Norwegian flag to measure the position of the Pole, we left there to return home.

As for Captain Scott, his team set off on sleds pulled by ponies and motorized vehicles, but because the

(continued on the last page ...)

The airship mooring mast in Ny-Ålesund.

The Amundsen-Scott South Pole Station at the South Pole. *

* Photo from "Two Poles," Rika Nenpyo Dokuhon, Maruzen.

Mol, a science-loving girl, and her robotic dog Mirubo are heading to the South Pole.

Where am I, Mirubo?

WHIIR

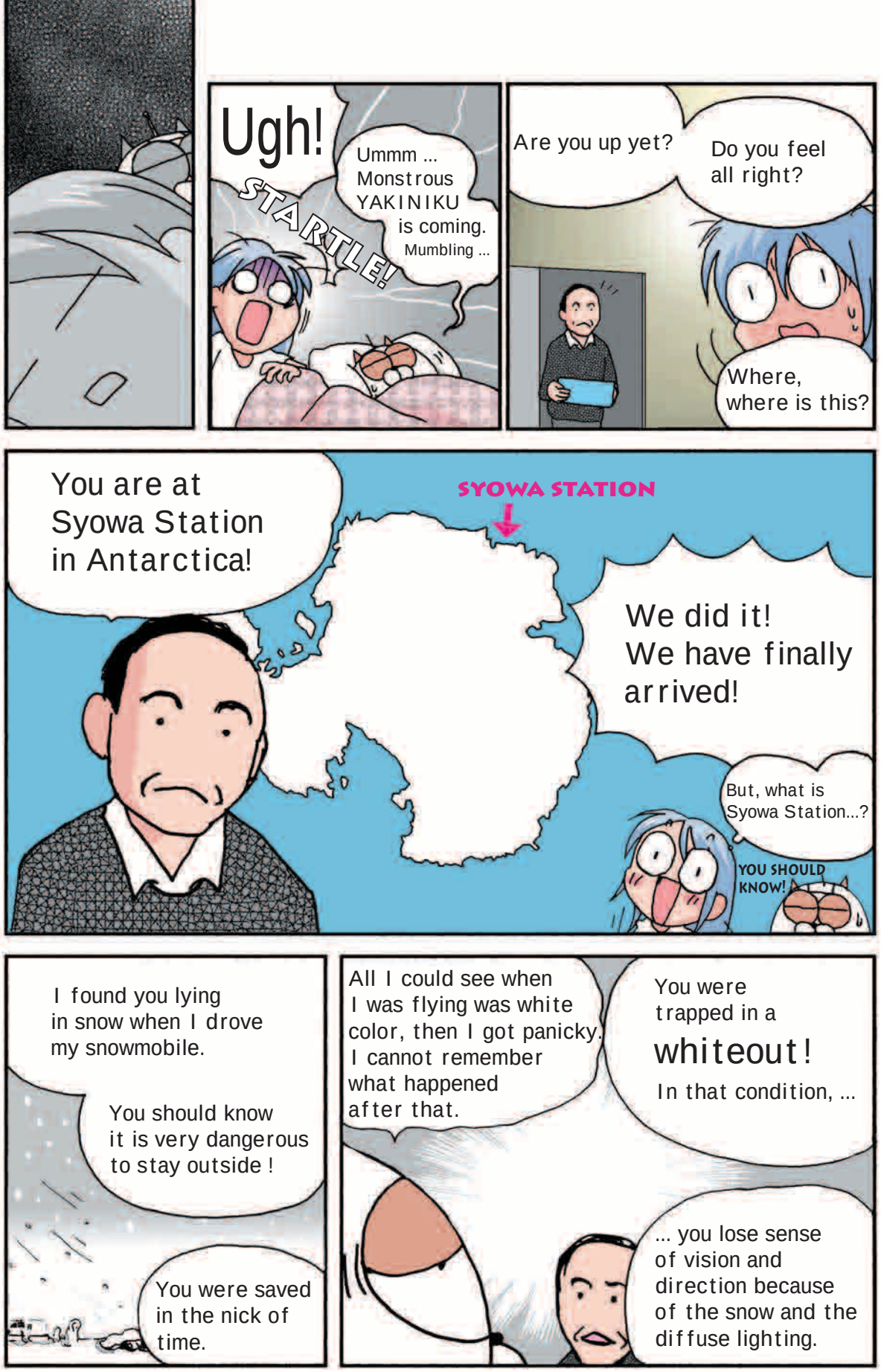
We are almost at the Pole, but I cannot see anything!

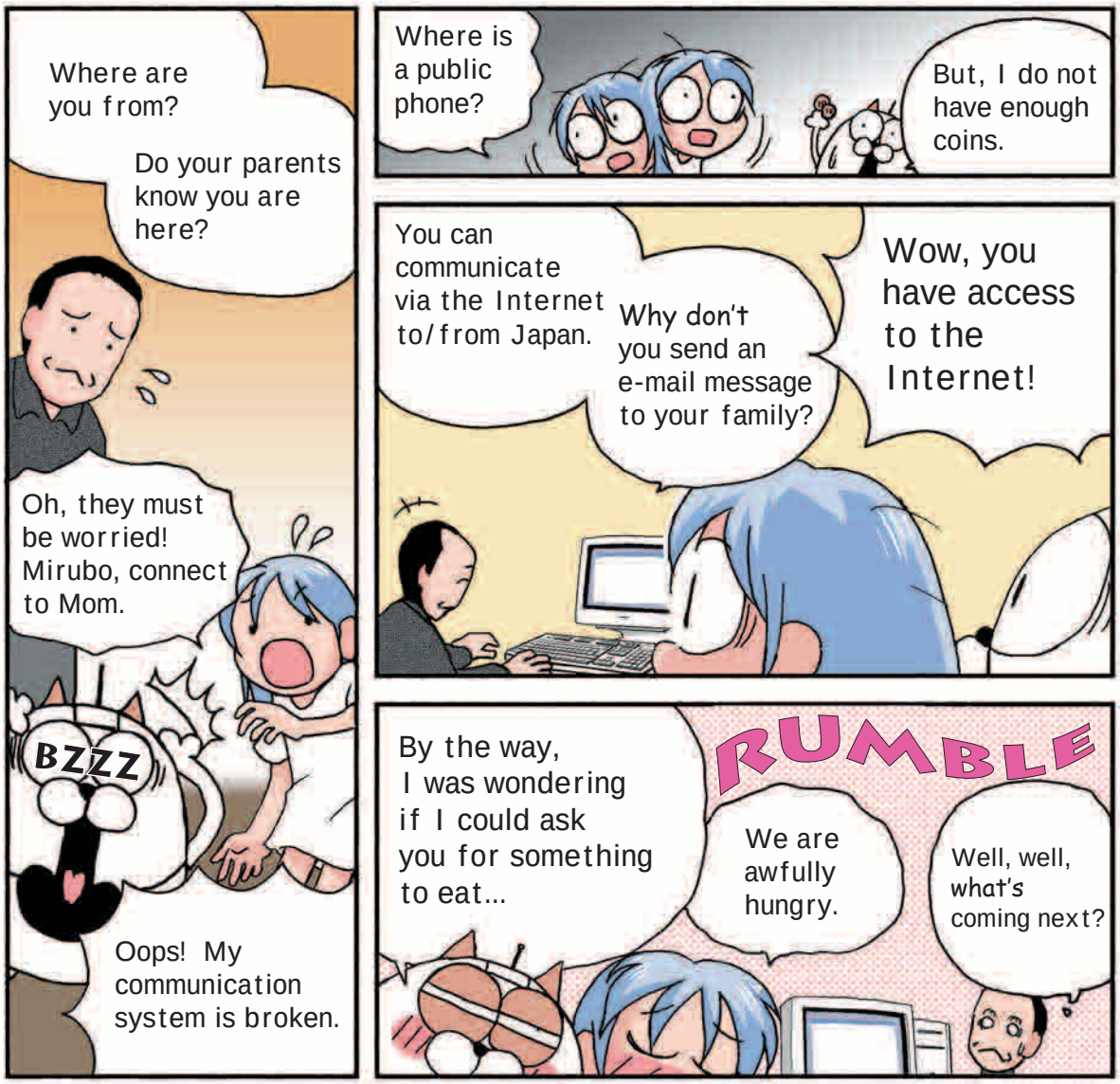
RRR

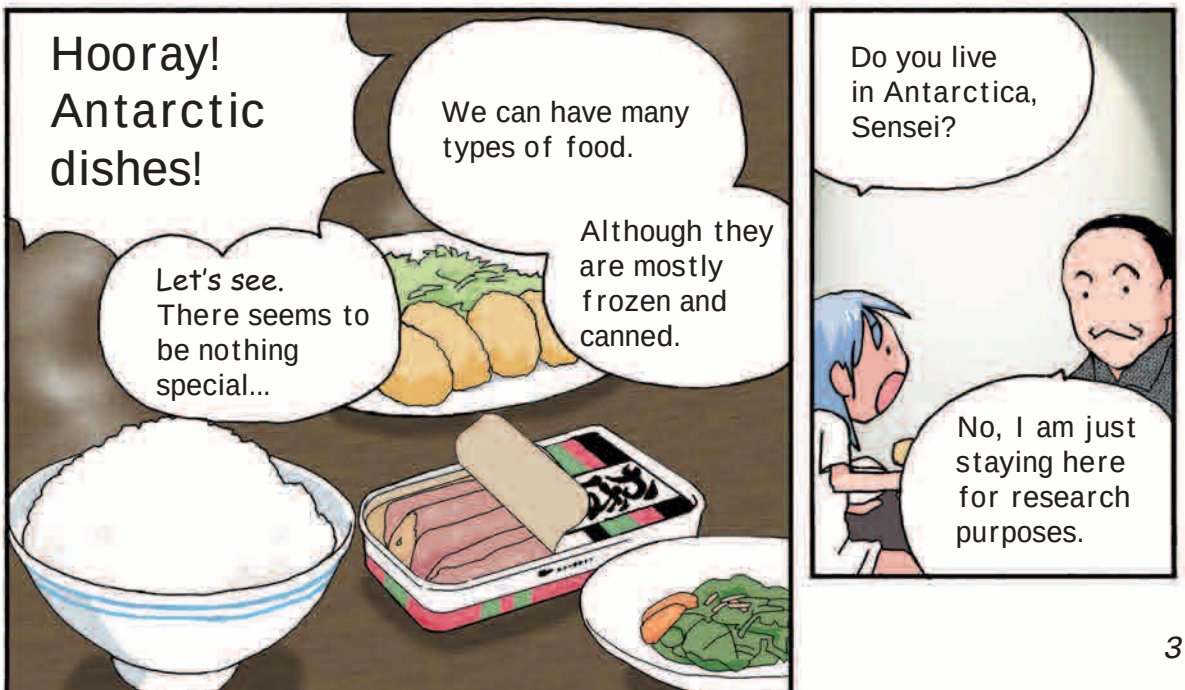
What a blizzard!

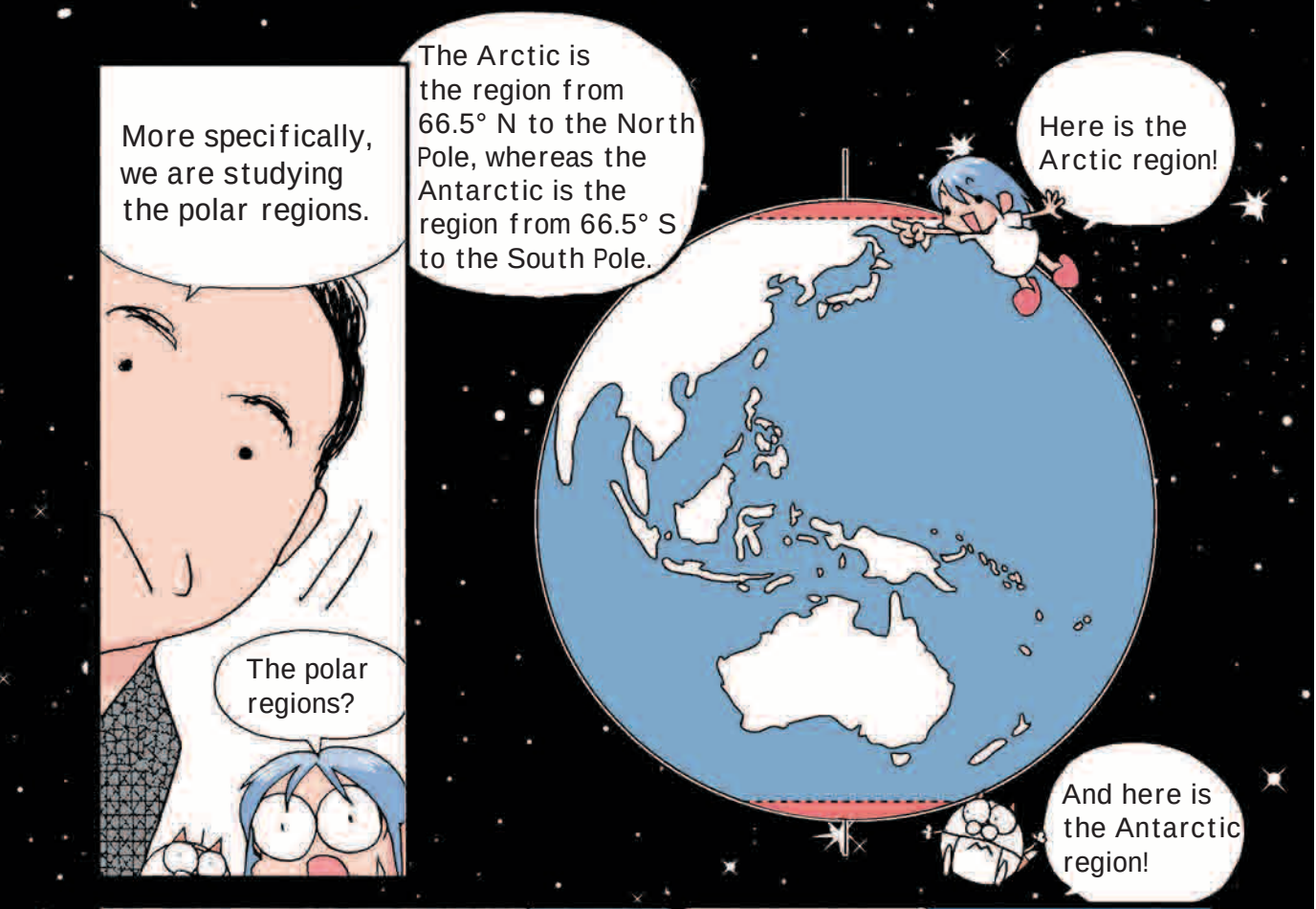
Oh No~~~~!

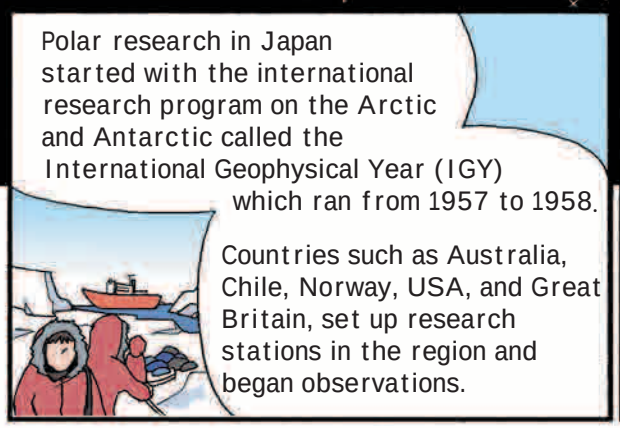
FAAAAAAALING.....

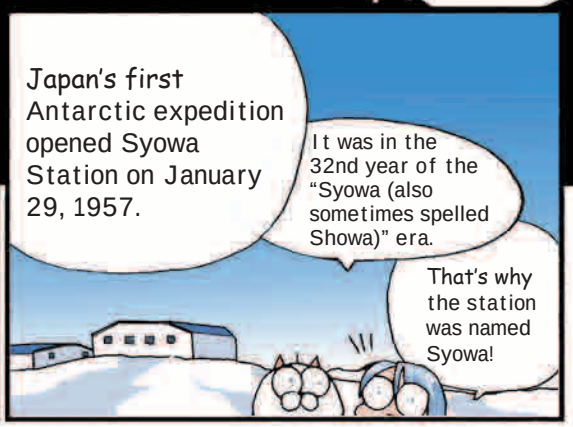

Ugh!
STARTLE!
Ummm ... Monstrous YAKINIKU is coming. Mumbling ...
Are you up yet?
Do you feel all right?
Where, where is this?
You are at Syowa Station in Antarctica!
SYOWA STATION
We did it! We have finally arrived!
But, what is Syowa Station...?
YOU SHOULD KNOW!
I found you lying in snow when I drove my snowmobile.
You should know it is very dangerous to stay outside !
You were saved in the nick of time.
All I could see when I was flying was white color, then I got panicky. I cannot remember what happened after that.
You were trapped in a whiteout!
In that condition, ...
... you lose sense of vision and direction because of the snow and the diffuse lighting.

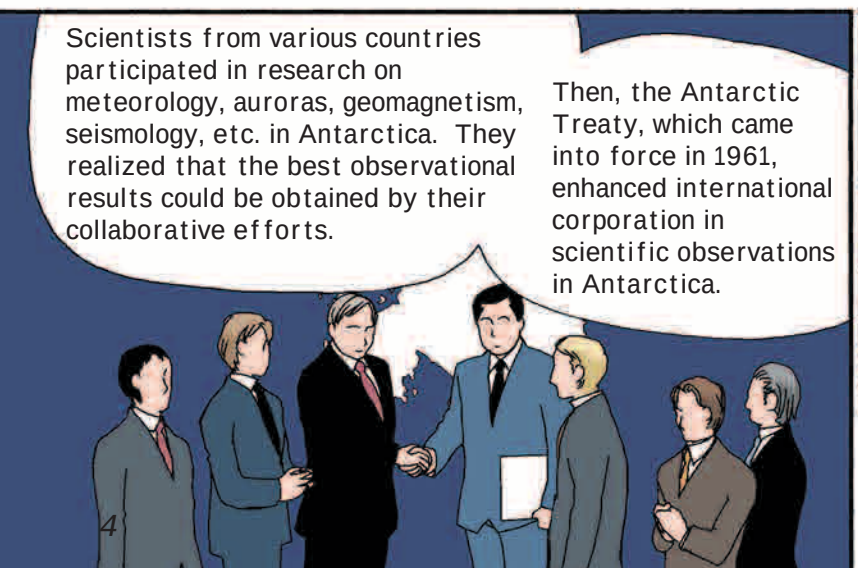

Where are you from?
Do your parents know you are here?
Oh, they must be worried! Mirubo, connect to Mom.
BZZZ
Oops! My communication system is broken.
Where is a public phone?
But, I do not have enough coins.
You can communicate via the Internet to/from Japan.
Why don't you send an e-mail message to your family?
Wow, you have access to the Internet!
By the way, I was wondering if I could ask you for something to eat...
RUMBLE
We are awfully hungry.
Well, well, what's coming next?


Hooray! Antarctic dishes!
We can have many types of food.
Although they are mostly frozen and canned.
Let's see. There seems to be nothing special...
Do you live in Antarctica, Sensei?
No, I am just staying here for research purposes.


More specifically, we are studying the polar regions.
The polar regions?
The Arctic is the region from 66.5° N to the North Pole, whereas the Antarctic is the region from 66.5° S to the South Pole.
Here is the Arctic region!
And here is the Antarctic region!


Polar research in Japan started with the international research program on the Arctic and Antarctic called the International Geophysical Year (IGY) which ran from 1957 to 1958.
Countries such as Australia, Chile, Norway, USA, and Great Britain, set up research stations in the region and began observations.


Japan's first Antarctic expedition opened Syowa Station on January 29, 1957.
It was in the 32nd year of the "Syowa (also sometimes spelled Showa)" era.
That's why the station was named Syowa!


Scientists from various countries participated in research on meteorology, auroras, geomagnetism, seismology, etc. in Antarctica. They realized that the best observational results could be obtained by their collaborative efforts.
Then, the Antarctic Treaty, which came into force in 1961, enhanced international corporation in scientific observations in Antarctica.


During the IGY, collaborative observations were also conducted on Svalbard in the Arctic, although Japan did not join this effort.

Polar regions have unique characteristics compared with other regions on the Earth.

The Earth has a geomagnetic field - it is like a huge magnet.

The Earth's magnetic field is distorted by the solar wind.

Charged particles accumulate and are energized here.

Then, they come down into the atmosphere over the polar regions, creating the aurora!

We are able to peer into the universe through the polar regions.

"Windows to the universe"

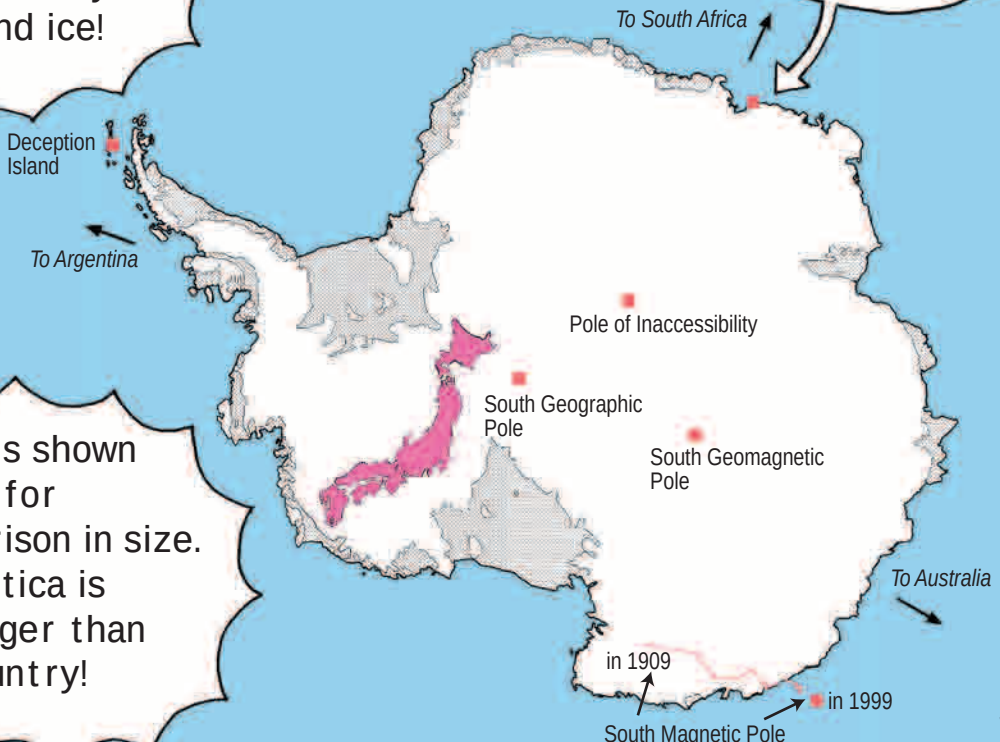
As we call the polar regions.

Hey Mol, here is a map of Antarctica!

Oh, that is nice!

It is amazing that almost the entire continent is covered by snow and ice!

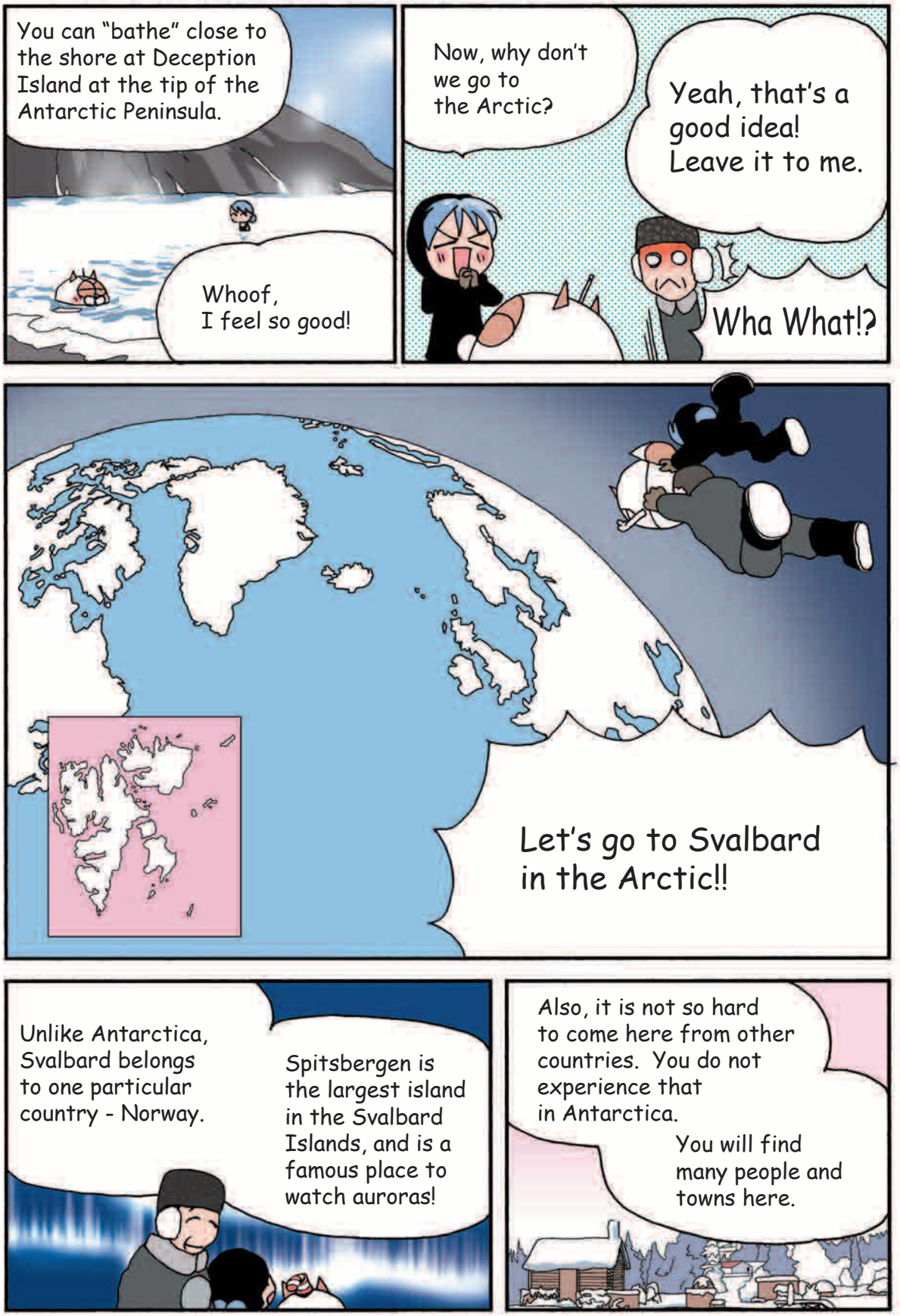
We are here at Syowa Station.



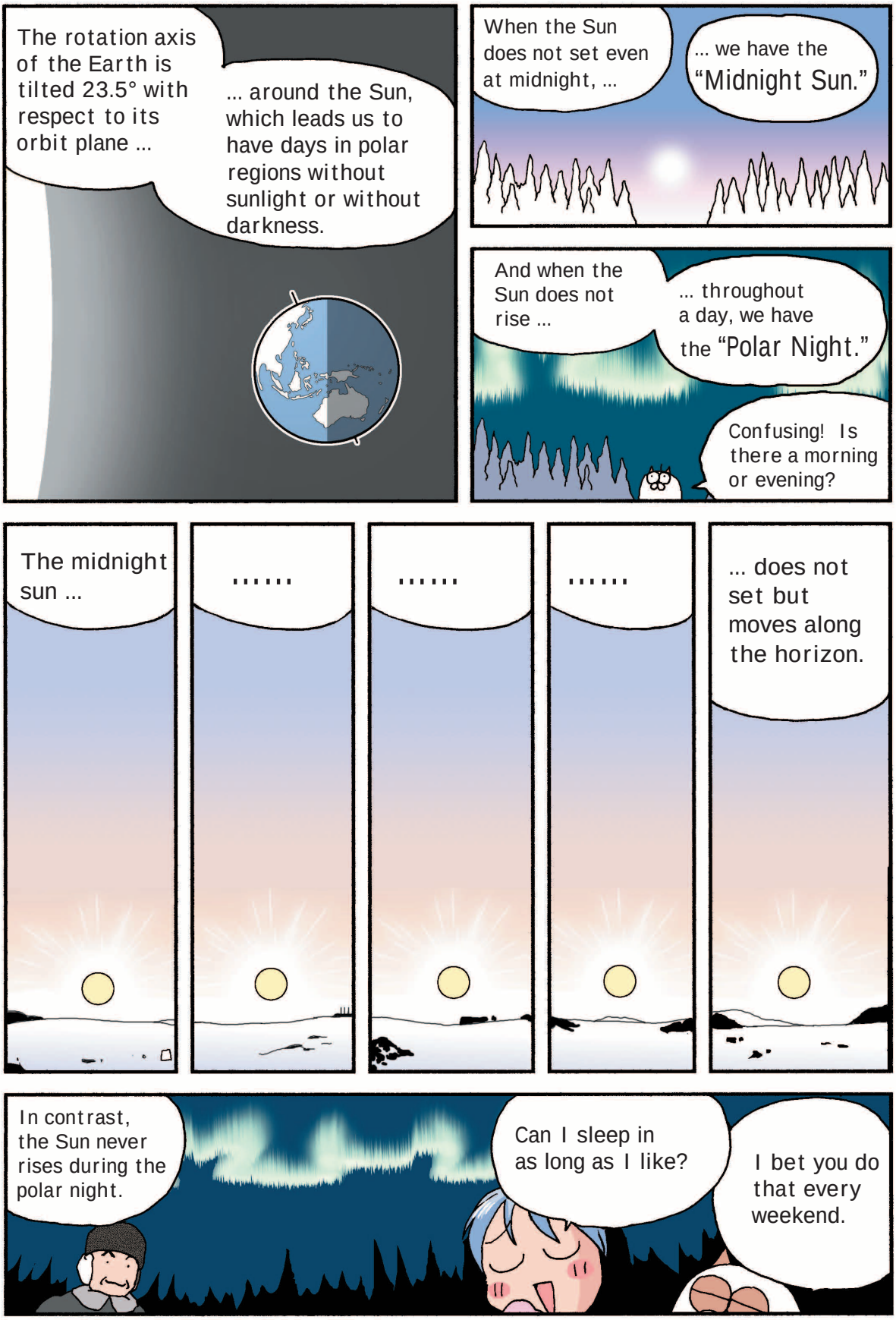
Japan is shown in pink for comparison in size. Antarctica is far bigger than our country!

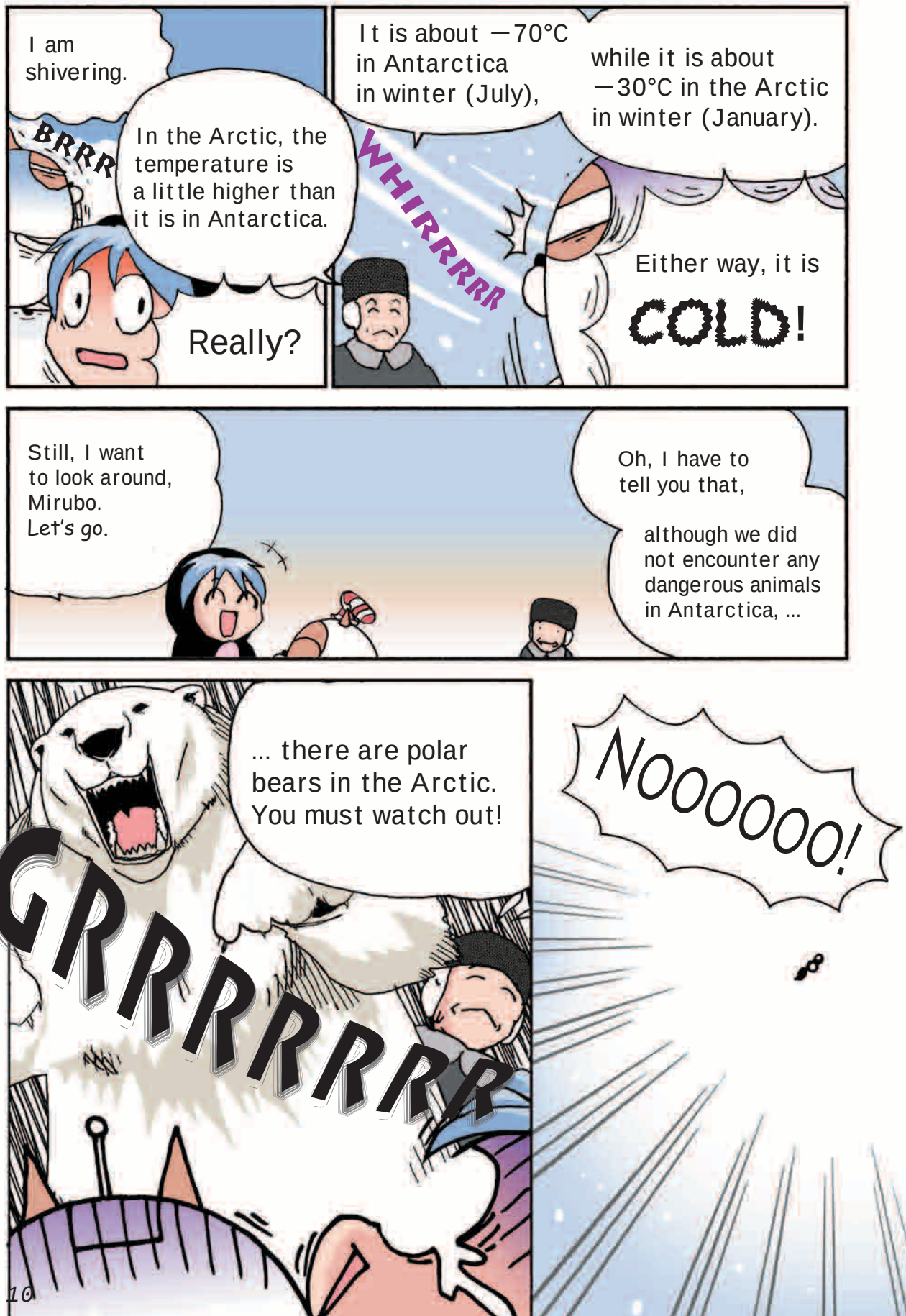

I want to go to the South Pole!
Eh!?
I got it. Hold on to me, Sensei and Mol!
Look! Penguins!
A lot of Adelie penguins live around our station.
Those sea birds eat Antarctic krill, squid, and fish.
There are no trees, but mosses and algae grow on the ice- and snow-free ground.
There is no snow over there!
Here we are at the South Pole. Amundsen went through tremendous hardship to reach here, ...
... but it is an easy job for a super-dooper robot like me.
Ah..., this is the ceremonial South Pole set up mainly for tourists.
The true South Geographic Pole changes slowly with the drift of the ice.
WHUMP!

Three South Poles: ① The South Geographic Pole at 90° S, ② The South Geomagnetic Pole at 79.6° S and 108.4° E (in 2001), and ③ The South Magnetic Pole at 64.6° S and 138.2° E (in 2001).



There are three North Poles: ① The North Geographic Pole at 90° N, ② The North Geomagnetic Pole at 79.6° N and 71.6° W (in 2001), and ③ The North Magnetic Pole at 81.4° N and 110.9° W (in 2001).


The rotation axis of the Earth is tilted 23.5° with respect to its orbit plane ...
... around the Sun, which leads us to have days in polar regions without sunlight or without darkness.
When the Sun does not set even at midnight, ...
... we have the "Midnight Sun."
And when the Sun does not rise ...
... throughout a day, we have the "Polar Night."
Confusing! Is there a morning or evening?
The midnight sun ...
.....
.....
.....
... does not set but moves along the horizon.
In contrast, the Sun never rises during the polar night.
Can I sleep in as long as I like?
I bet you do that every weekend.


I am shivering.
BRRR
In the Arctic, the temperature is a little higher than it is in Antarctica.
Really?
It is about −70°C in Antarctica in winter (July),
while it is about −30°C in the Arctic in winter (January).
WHIRRRRR
Either way, it is COLD!
Still, I want to look around, Mirubo. Let's go.
Oh, I have to tell you that,
although we did not encounter any dangerous animals in Antarctica, ...
... there are polar bears in the Arctic. You must watch out!
GRRRRRRR
NOOOOOO!


This should be high enough! We are safe!
Wow,
I can see only snow and ice like in Antarctica!
It is an ice world!
The polar regions hold about 99% of the world's total ice.
The polar regions are mysterious places!
We have a lot to learn from the polar regions, about weather phenomena, auroras, animals, and plants.
I am freezing. I want to eat hot noodles!
Oh well, anything you want, kids ...
HACHOO!
Mol and Mirubo were fascinated by the wonders of the polar regions.

What are the Polar Regions?!


Unnhh... Oh, good timing, Sensei! I was just reading a news article reporting that the ice in the polar regions is decreasing. I would like to know more about the Arctic and Antarctic.


The Arctic is the region from 66.5° N to the North Pole, whereas the Antarctic is the region from 66.5° S to the South Pole. The North Pole is located in the sea surrounded by northern Europe, Greenland, Canada, and Russia. It is a one day flight from Japan.

The South Pole, on the other hand, is on the "continent of ice," Antarctica surrounded by the Pacific, Atlantic, and Indian Oceans. It takes more than one month to travel from Japan to the Syowa Station on an icebreaker.


Is it true that research on meteorology, auroras, geomagnetism, and seismology has been carried out at the Syowa Station since 1957?


That is correct. The data obtained from long-term observations are crucial for research on space phenomena and the Earth's climate change. Recently, exploratory ice core drillings and ozone observations conducted in Antarctica have been drawing attention.


But they have to work in a temperature of −70°! BRRRR!


More accurate data are available in polar regions that are free from artificial contamination compared with mid- and low-latitudes.

Also, ice core samples reveal changes in the temperature over as much as about 800,000 years. It is the important record of Earth's temperature that can allow us to tackle global warming.


Tell me about the aurora, then. Could the auroras in both polar regions be seen at the same time from space?


Yes. If you compare these auroras, you will find the directions of their spirals are opposite.


Oh, it sounds confusing! Are there any other differences between the polar regions?


Of course, there are many. For instance, the sizes of glaciers and icebergs. An Antarctic iceberg sometimes is as big as one of the Japanese islands, Shikoku (18,300 km^2)! It disappears in the warm water as it moves equatorward, though.

In addition, the two polar regions have different species.


I like to see lovely penguins!


They nest and breed in summer (December - January) near Syowa Station, then move to the north. It is so delightful to watch them marching in a line. In the Arctic, on the contrary, you have to be watchful for polar bears.


How do people live in the polar regions?


Well, Arctic research stations are located near towns, where they watch TV and use the Internet. Their daily life there is not so different from ours.

In Antarctica, however, research stations are remote from populated areas. Terrestrial television broadcasting cannot be received in the usual way. Communications used to rely on the wireless telephone and telegraph, but the electromagnetic waves used for them are disturbed when auroras occur. Recently, it has been possible to communicate over the Internet via satellite transmission. A wide variety of food is delivered to the stations; foods that are similar to what you have at home.

Once you step outside, however, you may face dangerous situations such as severe cold, crevasses, or blizzards.


Still, I want to join polar expeditions in the future. Let's start training for it, Mirubo!


You are the boss...

(... continued from the inside cover.)

ponies all died and his vehicles broke down, they had to pull sleds by themselves. One month after us they arrived at the Pole. Scott and his crew all perished on the return trip due to exhaustion and severe weather. I was glad to learn that the US station constructed in Antarctica in November 1956 was named after Scott and myself, "Amundsen-Scott South Pole Station."

Now, after my Antarctic expedition I set the next goal of taking an expedition to the North Pole, and in 1926, I made the crossing of the Arctic Ocean in an airship "Norge." I became the first person to reach both poles!

Then, it was in June 1928 that the Italian explorer U. Nobile, who had reached the North Pole with me, got lost during another Arctic expedition. I decided to take part in the rescue mission, although there had been a dispute between him and me over the credit for the North Pole expedition. After all, we were friends with each other. I flew from Spitsbergen to look for him, but unfortunately, it became my last journey. That is, while Nobile was rescued, I myself met with a mishap and never returned...

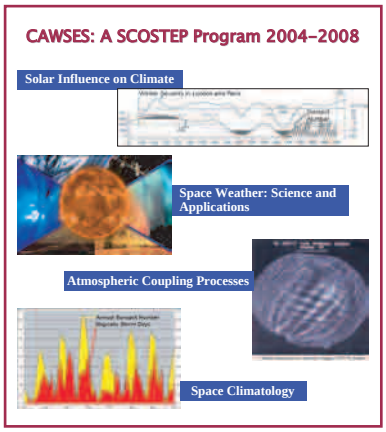
In Ny-Ålesund, you will find my statue watching people's challenge of a scientific understanding of the Arctic.

Up: The Valley Glacier in the Arctic.
Down: Shirase Glacier in Antarctica.*

The statue of R. Amundsen in Ny-Ålesund.

Auroras in the Arctic (left) and in Antarctica (right)*. The two spirals are in opposite directions.

*Photos from "Two Poles," Rika Nenpyo Dokuhon, Maruzen.



Climate and Weather of the Sun-Earth System (CAWSES)

CAWSES is an international program sponsored by SCOSTEP (Scientific Committee on Solar-Terrestrial Physics) and has been established with the aim of significantly enhancing our understanding of the space environment and its impacts on life and society. The main functions of CAWSES are to help coordinate international activities in observations, modeling and theory crucial to achieving this understanding, to involve scientists in both developed and developing countries, and to provide educational opportunities for students at all levels. The CAWSES office is located at Boston University, Boston, MA, USA. The four science Themes of CAWSES are shown in the figure.

http://www.bu.edu/cawses/
http://www.scostep.ucar.edu/

Solar-Terrestrial Environment Laboratory (STEL), Nagoya University

STEL is operated under an inter-university cooperative system in Japan. Its purpose is to promote “research on the structure and dynamics of the solar-terrestrial system,” in collaboration with a number of universities and institutions both in Japan and abroad. The Laboratory consists of four research Divisions: Atmospheric Environment, Ionospheric and Magnetospheric Environment, Heliospheric Environment, and Integrated Studies. The Geospace Research Center is also affiliated to the Laboratory to coordinate and promote joint research projects. At its seven Observatories/Stations, ground-based observations of various physical and chemical entities are conducted nationwide.

http://www.stelab.nagoya-u.ac.jp/

はやのん Hayanon

Graduated from the Department of Physics of Ryukyu University, Hayanon, a writer and cartoonist, has contributed a number of serials in popular magazines on the basis of her strong background in science and computer games. Her consistent writing style, expressing a love for science, is well accepted.

http://www.hayanon.jp/

子供の科学 Kodomo no Kagaku (Science for Kids)

Kodomo no Kagaku, published by the Seibundo Shinkosha Publishing Co., Ltd. is a monthly magazine for juniors. Since the inaugural issue in 1924, the magazine has continuously promoted science education by providing various facets of science, from scientific phenomena in everyday life to cutting edge research topics.

http://www.seibundo.net/

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