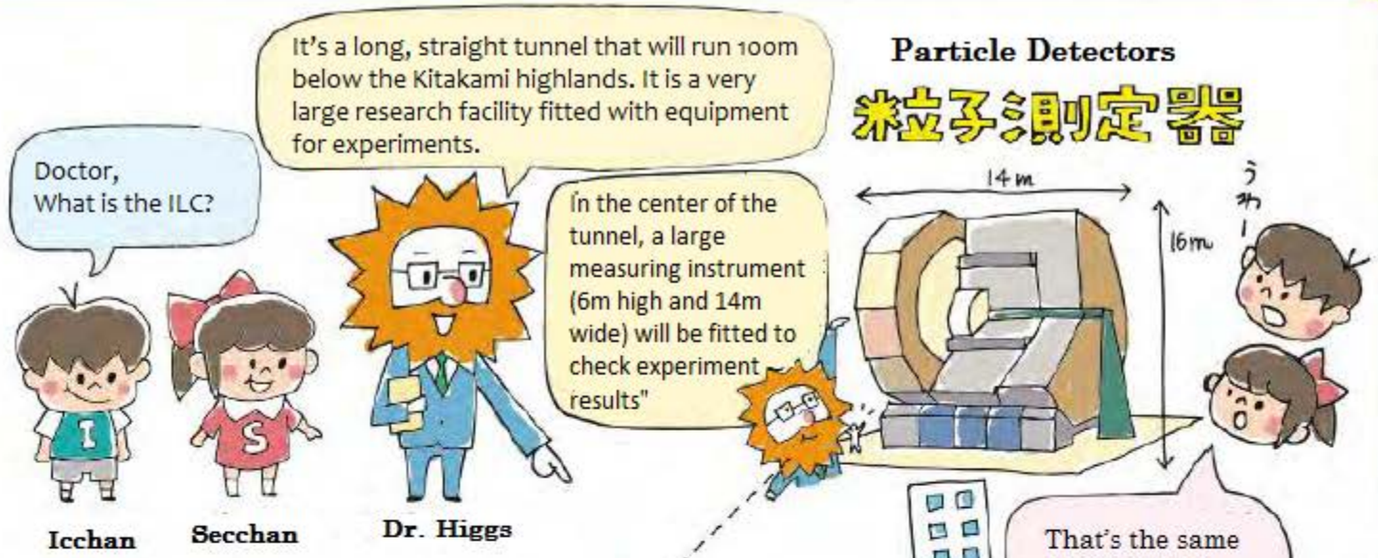
なるほどILC

おしえて!! ヒッグス博士 ILCって何?

I See!

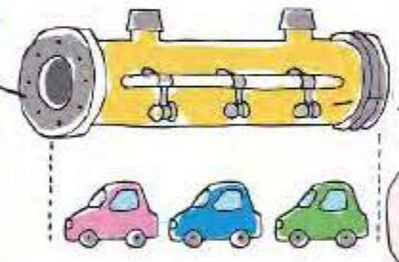
Teach me!! Dr. Higgs

What is the ILC?



クライオモジュール

CRYOMODULE

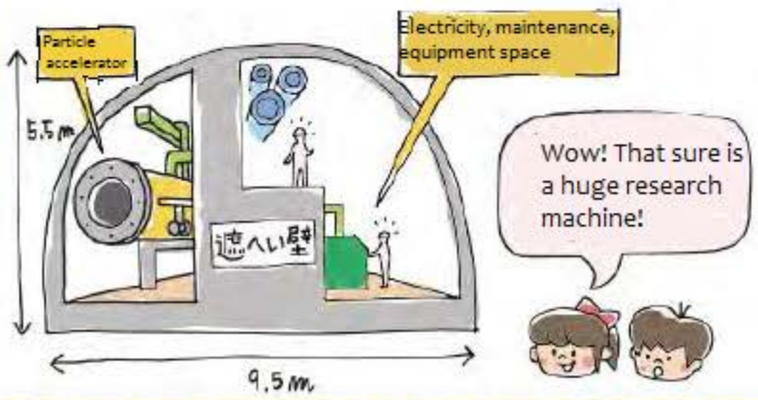


12m long cryomodules will be lined up for the experiment. Each one is the length of three cars!

トンネルの大きさ

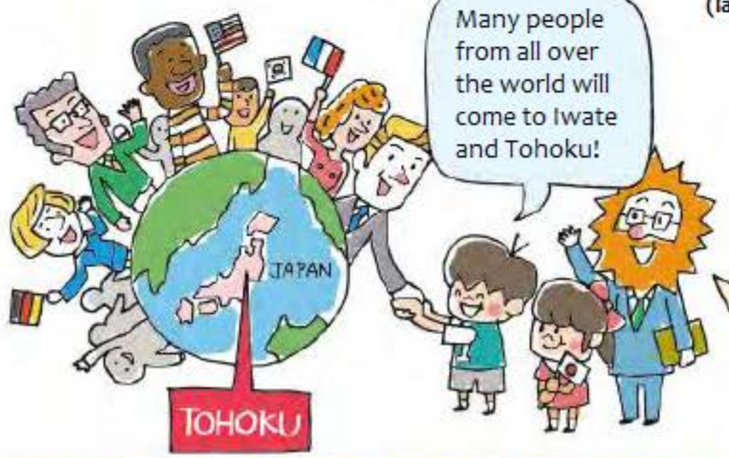
THE SIZE OF THE TUNNEL

The tunnel (5.5m high and 9.5m wide) has a large wall to separate the space for maintenance and large research equipment.



世界にひとつの実験施設
(直線の巨大加速器)

One of a kind research facility (large linear accelorator)



Researchers from 48 countries are working on the design of the ILC; and possibly even more countries will participate if the ILC is realized. This international project, the ILC, will be the only one of its kind.

おしえて!! ヒッグス博士
ILCで何を調べるの?

Teach me!! Dr. Higgs

What will the ILC research?

宇宙の誕生

The Birth of the Universe

13.8 billion years ago, an explosion called the 'Big Bang' created the universe. Matter was born right after the Big Bang but at present, we only understand 5%.

わかっているのは、5%だけ!

We only know 5%

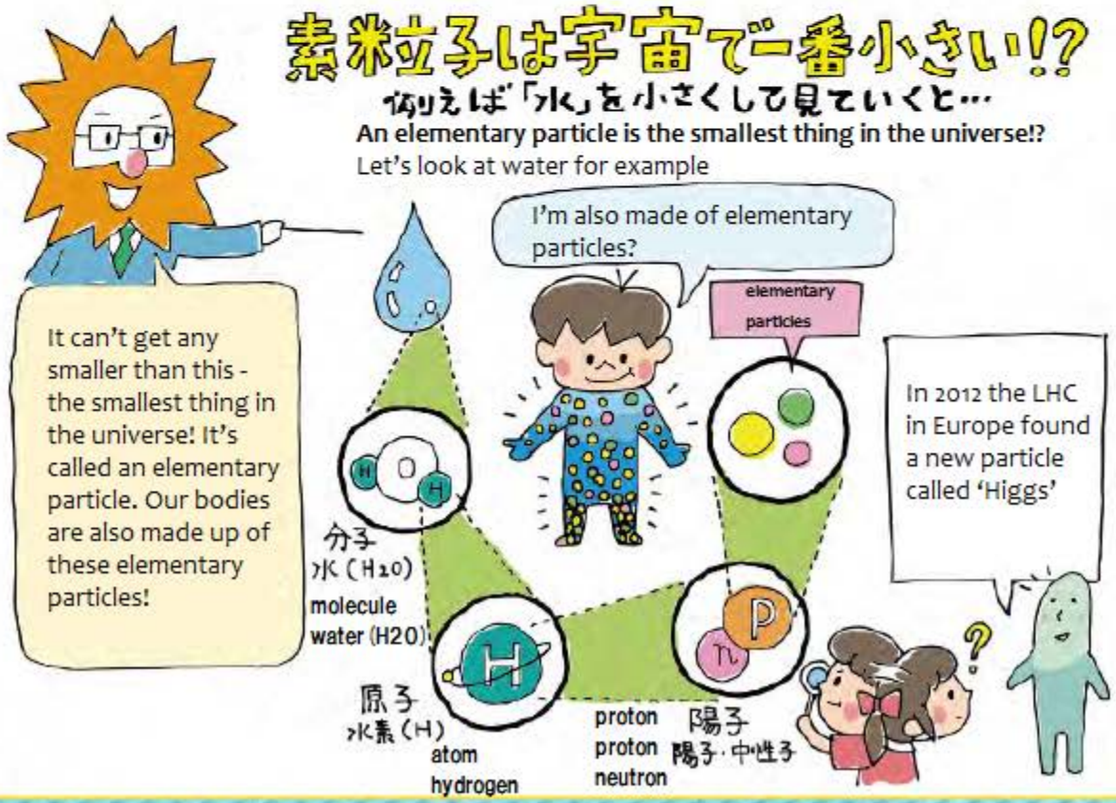
Every researcher who discovered an elementary particle has won a Nobel Prize!

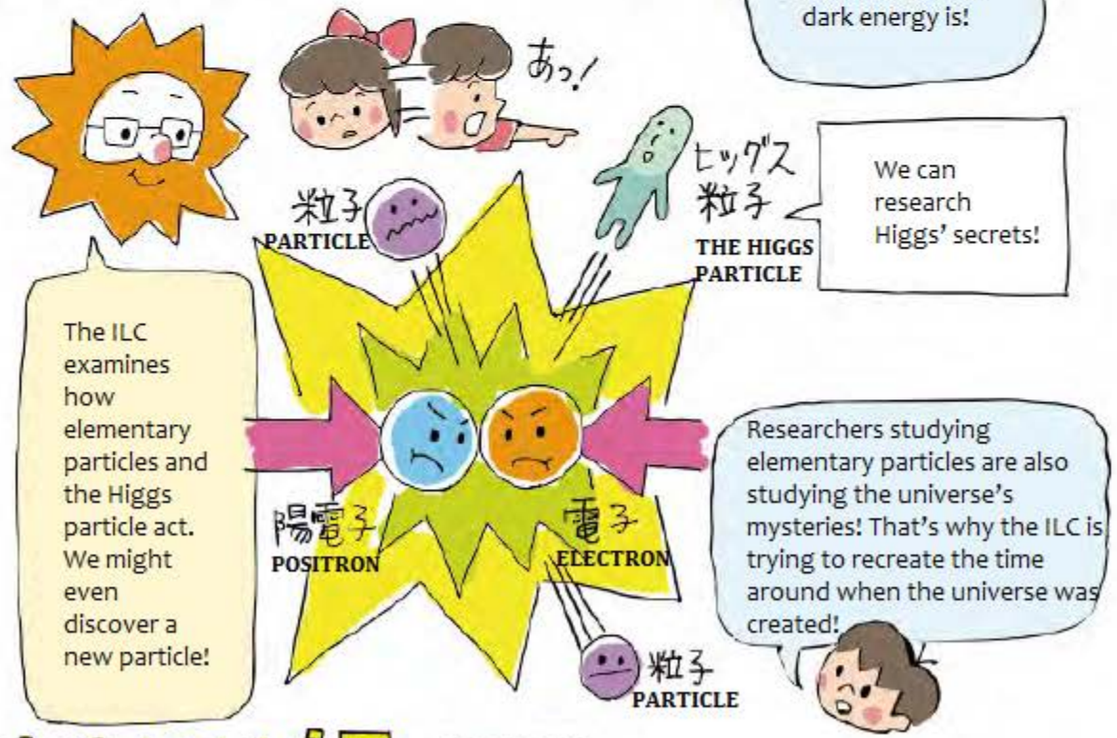
素粒子は宇宙で一番小さい!?

例えば「水」を小さくして見ていくと…

An elementary particle is the smallest thing in the universe!?

Let's look at water for example





素粒子を調べるILC

陽電子と電子を高エネルギーでぶつける実験

The ILC researches elementary particles

The high-energy experiment that collides electrons and positrons

おしえて!! ヒッグス博士 どのような実験をするの?

Teach me!!

Dr. Higgs

What kind of experiments will be conducted?

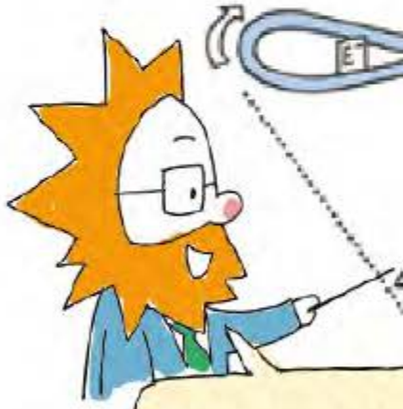
電子ビームは約200億個のかたまり

The electron beam consists of about 20 billion electrons

An 'electron beam' is a condensed band made out of 20 billion electrons extracted from material objects. Positrons are artificially created from electrons. Like electron beams, positrons are condensed to make positron beams.

Recreating the Big Bang!?

So this is where they accelerate up to the speed of light.

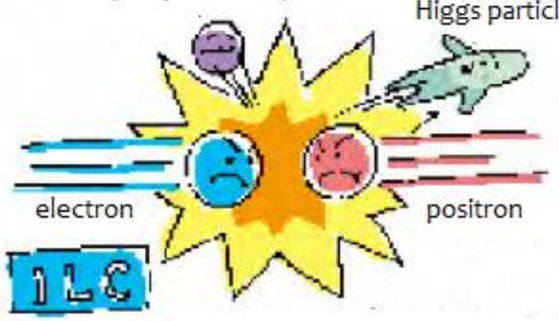


Electrons and positions are accelerated with an accelerator to increase energy and collide at the center. Unlike circular accelerators, the ILC can accelerate without waste and can increase energy. We can hope to discover new elementary particles.

Various particles are flying out!?

Electrons and positrons collide!

measuring the reaction



The results are simple and easy to read

CONTINUOUS EXPERIMENTS 24HRS A DAY

24時間実験は続く

The recording of experiments will continue 24hrs daily. The ILC's main feature is that it is able to collide elementary particles which are the smallest substances in the universe. For that reason the reaction is clear and simple so it is easy to examine what elementary particles are born and how they fly out.

おしえて!! ヒッグス博士 加速器って何?

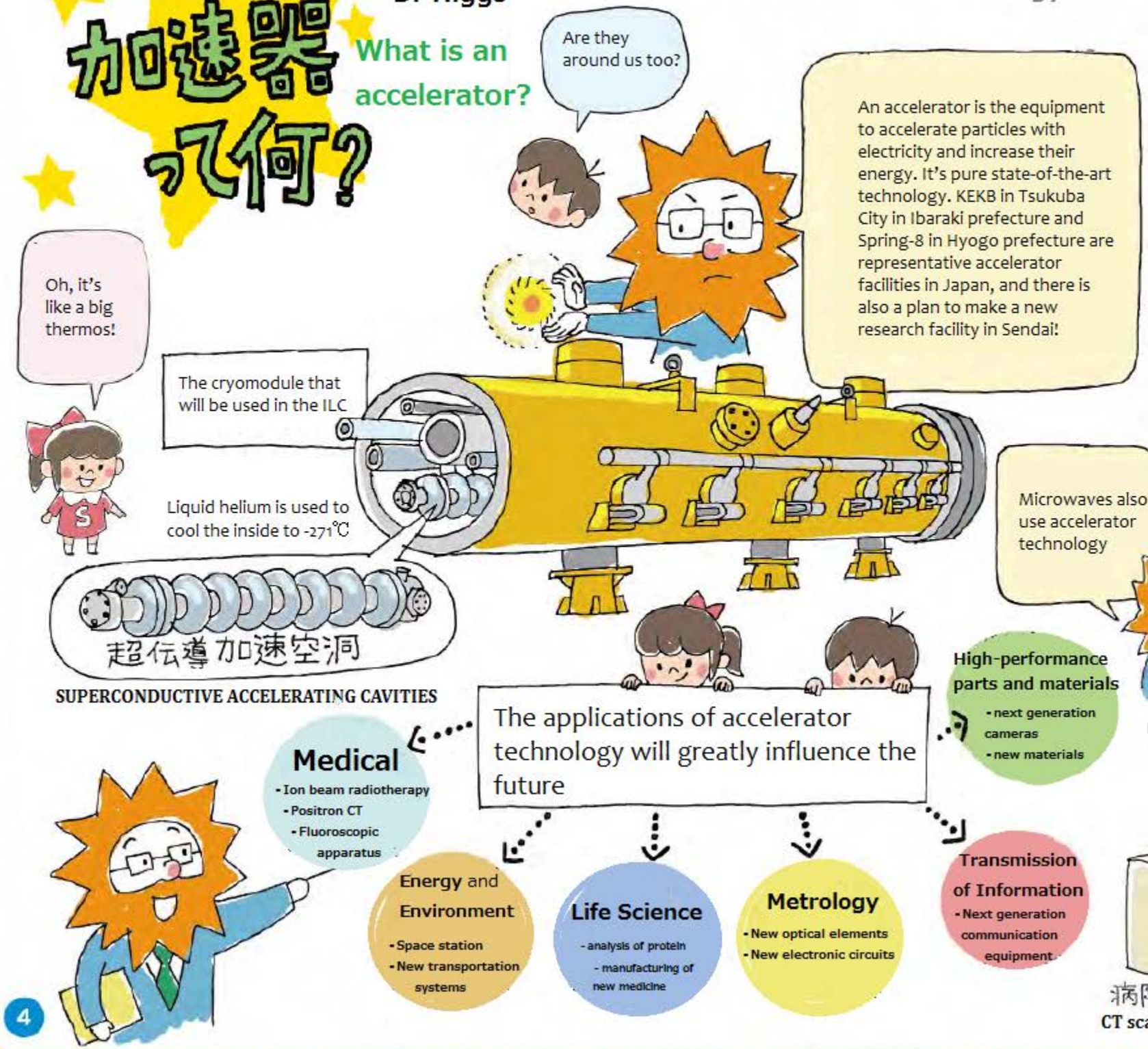
Teach me!!

Dr Higgs

What is an accelerator?

エネルギーを高める装置

A device that increases energy



An accelerator is the equipment to accelerate particles with electricity and increase their energy. It's pure state-of-the-art technology. KEKB in Tsukuba City in Ibaraki prefecture and Spring-8 in Hyogo prefecture are representative accelerator facilities in Japan, and there is also a plan to make a new research facility in Sendai!

Main Domestic Accelerators

Overseas

LHC (Switzerland)、LCLS (America)

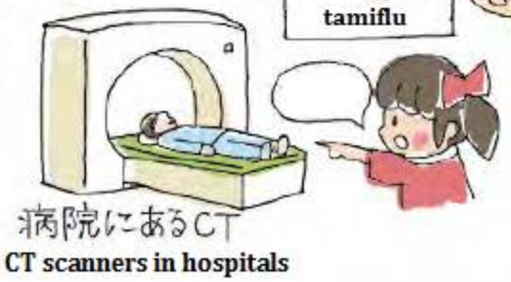
Tevatron (America)、欧州 XFEL (Germany)

身近にある加速器の技術

Accelerator technology used in things that you might be familiar with

Microwaves also use accelerator technology

Accelerator technology is also used in studies on medications for illnesses like influenza and testing and treatment equipment in hospitals!



The applications of accelerator technology will greatly influence the future

Medical
- Ion beam radiotherapy
- Positron CT
- Fluoroscopic apparatus

Energy and Environment
- Space station
- New transportation systems

Life Science
- analysis of protein
- manufacturing of new medicine

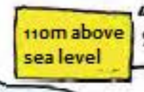
Metrology
- New optical elements
- New electronic circuits

Transmission of Information
- Next generation communication equipment

High-performance parts and materials
- next generation cameras
- new materials

おしえて!! ヒッグス博士
なぜ、東北なの?

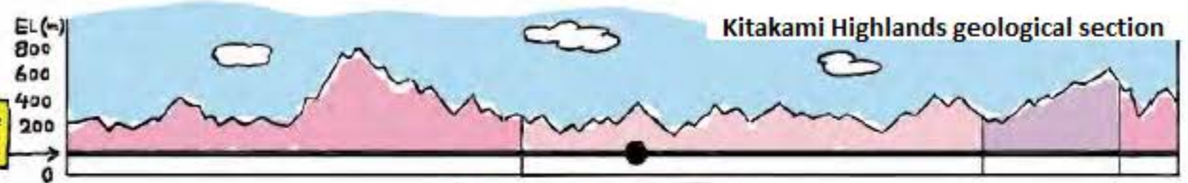
Teach me!! Dr. Higgs
Why Tohoku?

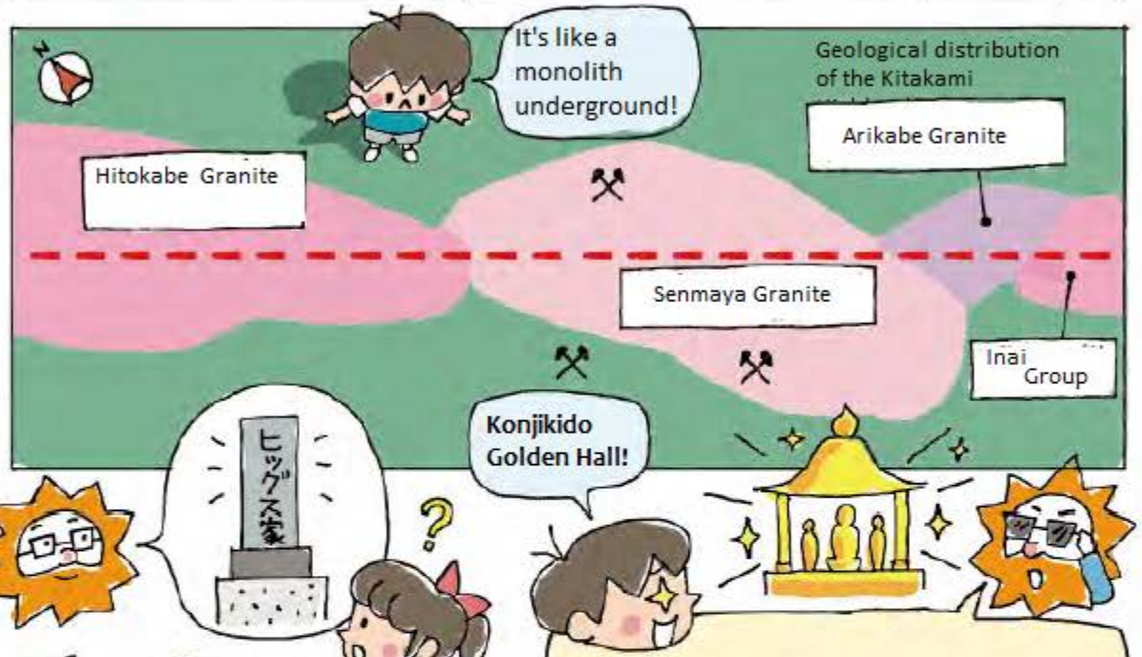


So the Kitakami Highlands satisfy the requirements!

The underground geology in the Kitakami Highlands consist of continuous, hard granite rock. Fewer vibrations can be felt below ground so it is suitable for colliding those tiny, invisible electrons and positrons.

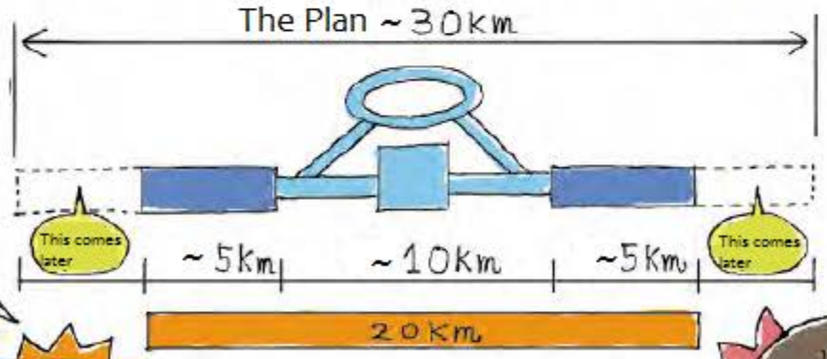
とても固い岩盤が続いている
Continuous, solid bedrock





Where there is granite, there's gold! The geology of the region supports Hiraizumi's cultural use of gold, and this time it will support world research.

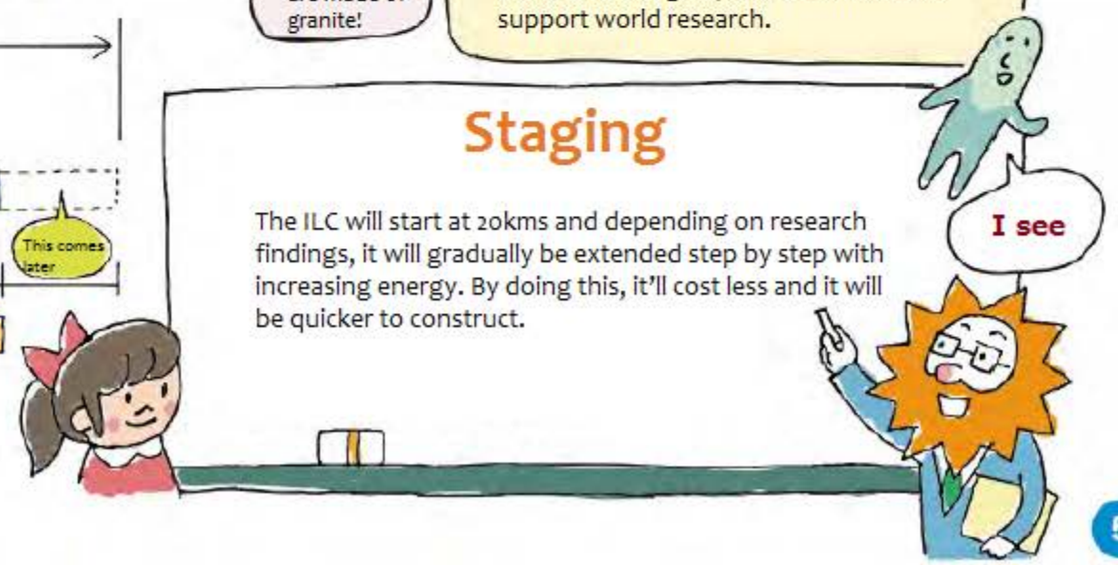
What is 'staging'?
ILCのステージングって?



The construction will take about ten years but the examination of the research environment is already under way. Since it is an international project, construction costs need to be discussed with other countries.

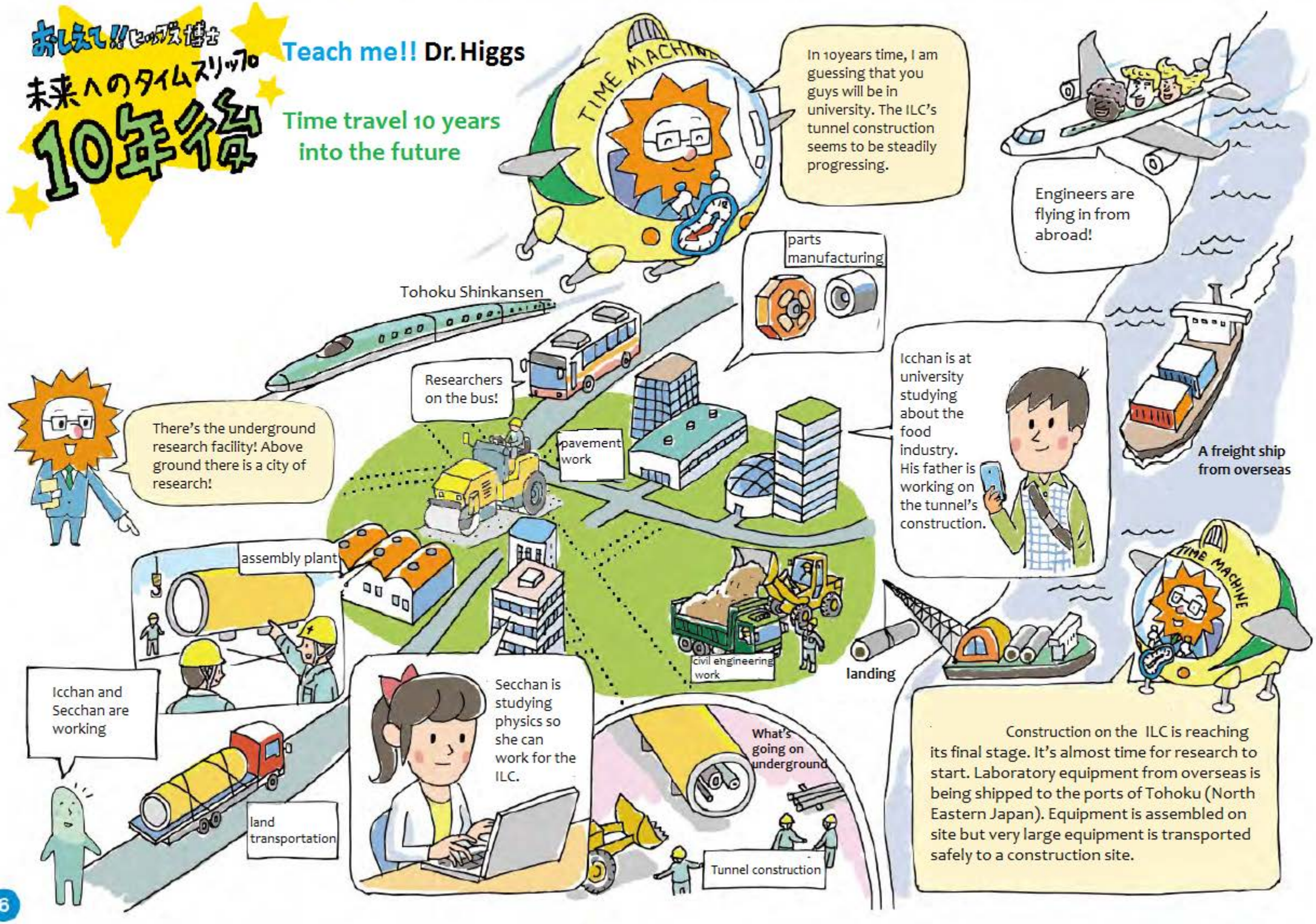
Staging

The ILC will start at 20kms and depending on research findings, it will gradually be extended step by step with increasing energy. By doing this, it'll cost less and it will be quicker to construct.



おしえて!! ヒッグス博士
未来へのタイムスリップ 10年後

Teach me!! Dr. Higgs
Time travel 10 years into the future



Construction on the ILC is reaching its final stage. It's almost time for research to start. Laboratory equipment from overseas is being shipped to the ports of Tohoku (North Eastern Japan). Equipment is assembled on site but very large equipment is transported safely to a construction site.

おしえて!! ヒッグズ博士
未来へのタイムスリップ
20年後

Teach me!!
Dr. Higgs
Time travel 20 years into the future

I opened a restaurant in the research town!

Chef-Ichhan working at his restaurant.

Experiments and research are progressing and various fields are working together.

I'm working in an ILC laboratory.

Sometimes I need to speak English, but I am used to it now.

Many of the researchers live close to the facility. Everyone in the community is getting on well.

Oh! Restaurants and public facilities have multilingual signs. Street signs are also multilingual!

I gather local students and hold 'science café'.

Secchan lecturing at science cafe.

tea ceremony hospitality

Cultural exchange is flourishing

TIME MACHINE

"If you have any problems regarding your day to day, don't be afraid to ask!"

It seems like a great place to live.

In addition to researchers, there are people involved in equipment maintenance; information processing and IT-related work, maintenance of facilities and work to support the researchers.

researcher

data processor

chef

maintenance engineer

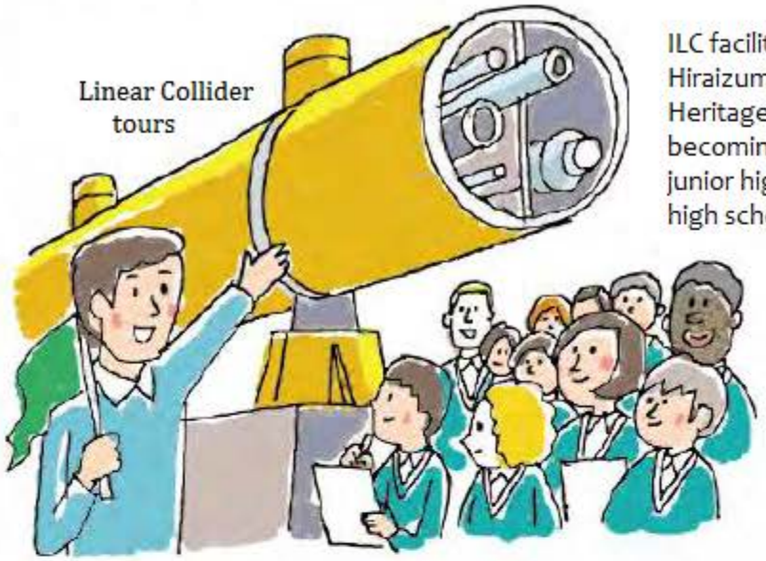
おしえて!! ヒッグス博士

近未来へのタイムスリップ。

Teach me!! Dr. Higgs

Time travel into the near future

Companies worldwide have come to Tohoku in order to utilize ILC's technologies. Local companies are also active in developing ILC equipment and are now global companies.



ILC facilities and Hiraizumi World Heritage sites are becoming popular for junior high school and high school trips.

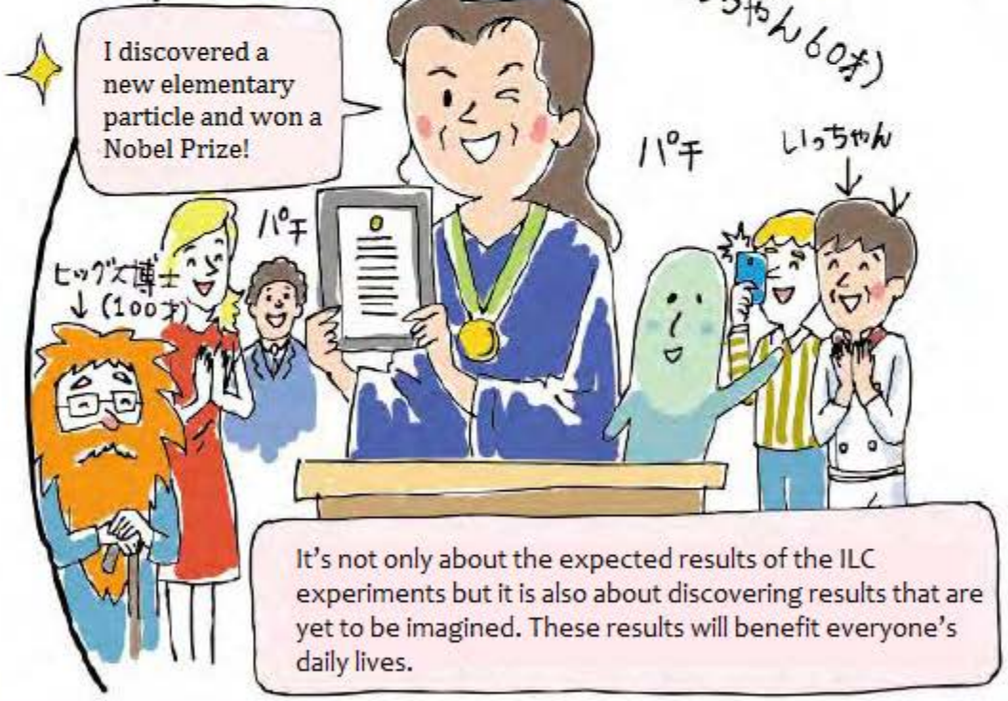
Chef Icchan

We are introducing local meat, vegetables and seafood to people from abroad. Today's tour includes freshly prepared scallops and oysters from the Sanriku Coast. It has been a real hit!

Researcher Secchan

The ILC's length has been extended, the equipment's technology has advanced, new research has started, and the experiments are still ongoing!

せっちゃんノーベル賞受賞!!



It's not only about the expected results of the ILC experiments but it is also about discovering results that are yet to be imagined. These results will benefit everyone's daily lives.

発行 岩手県一関市 市長公室 ILC推進課　〒021-8501 岩手県一関市竹山町7番2号
TEL 0191-21-2111　FAX 0191-21-2164　URL http://www.city.ichinoseki.iwate.jp/ilc/