What is Humanosphere?

vol.1

What is Humanosphere?

This pamphlet is the first to collect our manga pieces that were issued on “Seizonken Dayori (Research Institute for Sustainable Humanosphere Newsletter)”, an informative magazine that we publish. This collaboration between Kyoto University’s Research Institute for Sustainable Humanosphere (RISH) and Kyoto Seika University’s Manga Department allows our research activities to be introduced in ways that are easily understood.

We hope that you read with ease, and that you understand a great deal more about the “Humanosphere Science.”

Ready? Let’s explore this Humanosphere together!

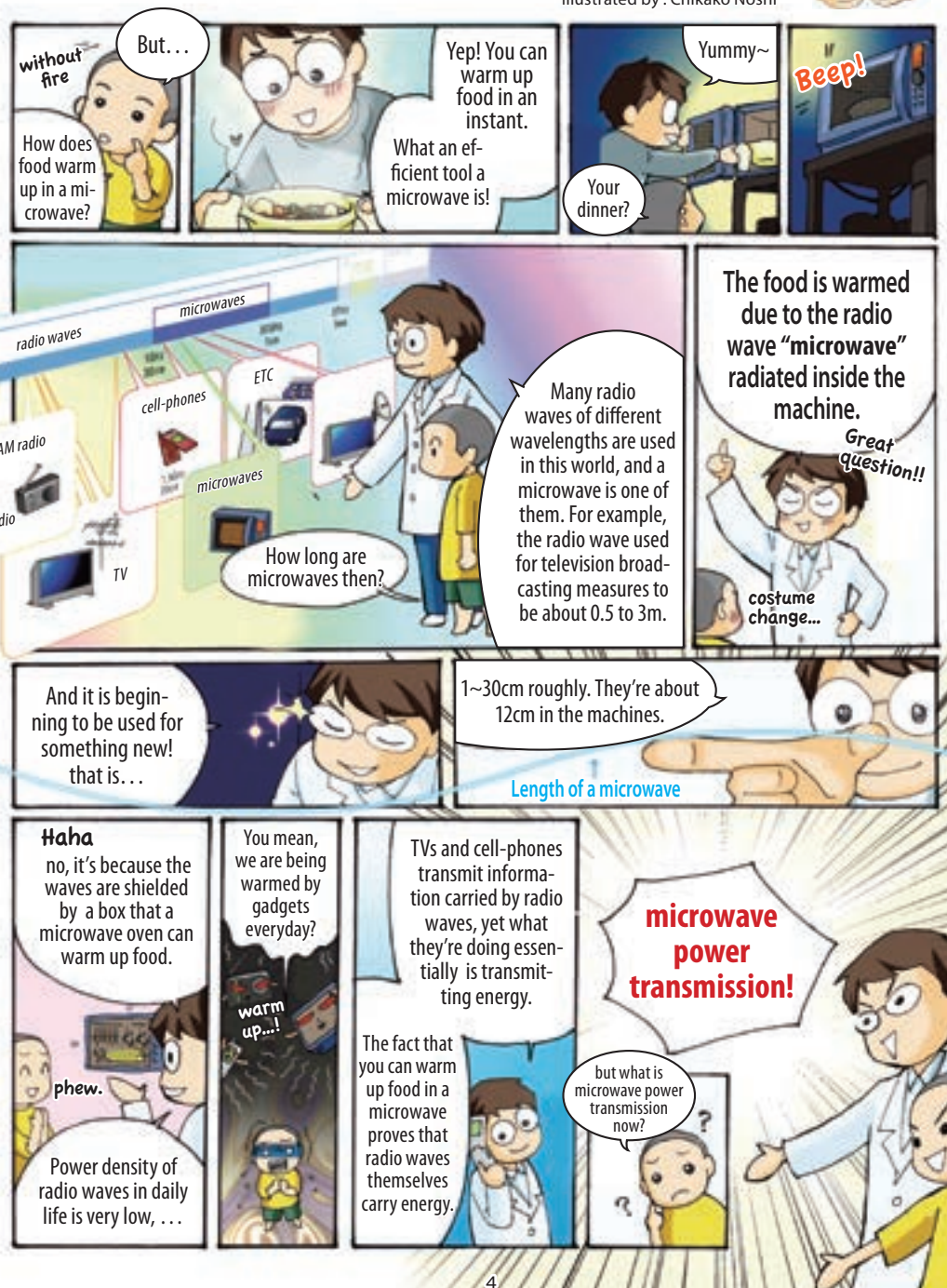
Has everybody heard of the word “Humanosphere” before?

Living in the 21st century, we are facing many issues threatening our very survival such as global warming, the diminishing of resources and energy, etc.
Humanosphere is a word describing the area and space needed for the survival of us humans.
We also have the human living environment in which we live, the atmosphere that covers us all, in which the forest sphere that breaths its air, and outer space that connect us to the outside.

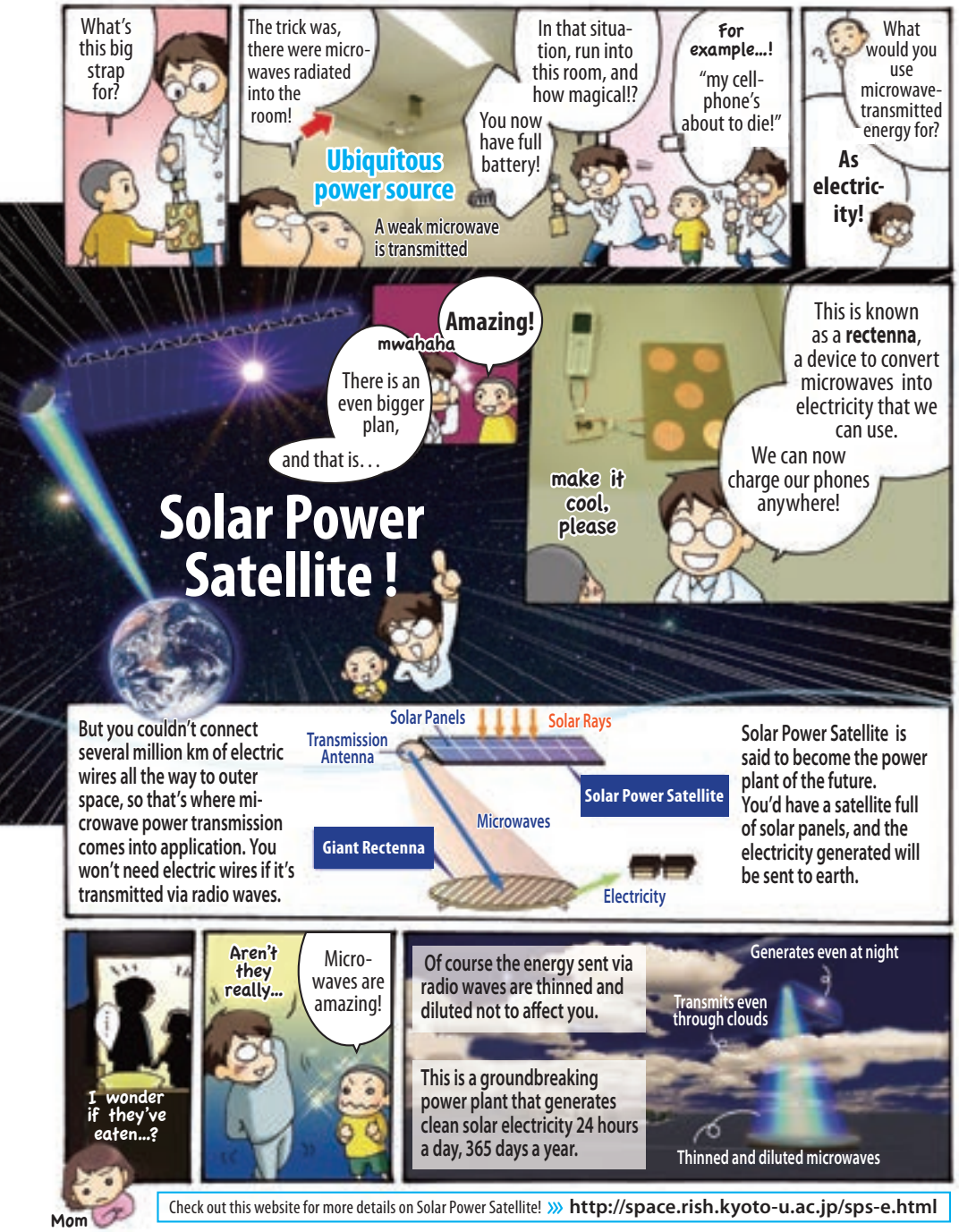
These spheres coexist in accordance with one another, and therefore a new school of thought needed to emerge in order to address the issues stretching across separations between many specialized fields.
And that is the “Humanosphere Science”
With “Science for the sake of sustainable human development” as a motto, a variety of researchers from the astronomical to the genetic study beyond disciplinary boundaries.

What is "Microwave Power Transmission!?"

Written by : Tomohiko Mitani
Illustrated by : Chikako Noshi

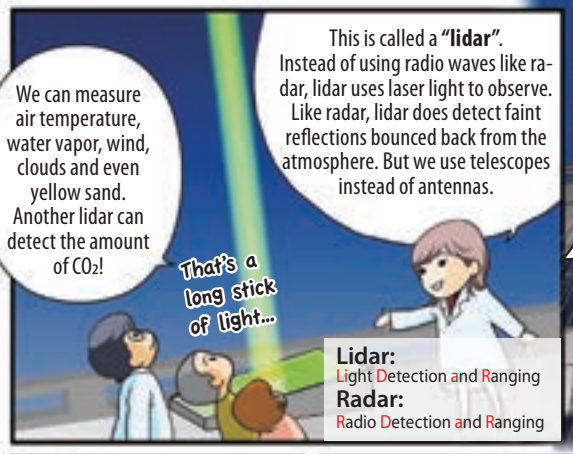


What is Humanosphere?

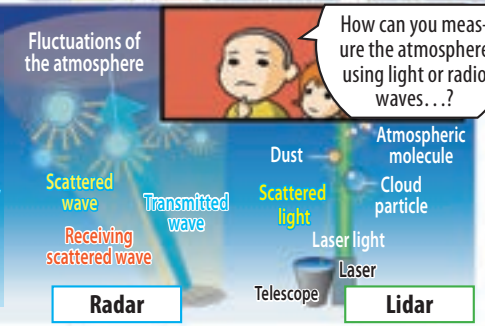


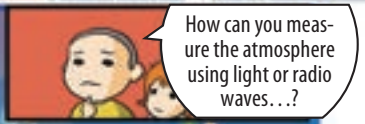
What is Humanosphere?

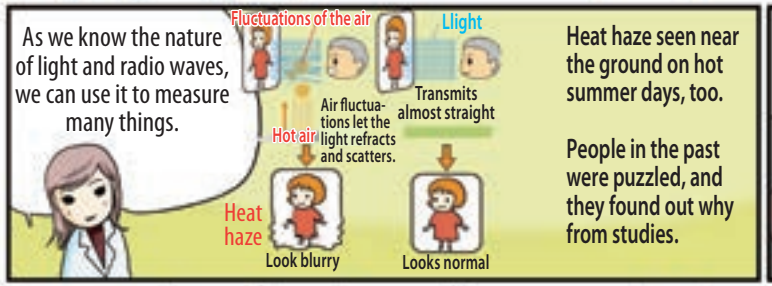
Written by : Takeshi Horinouchi/
Masayuki Yamamoto
Illustrated by : Chikako Noshi

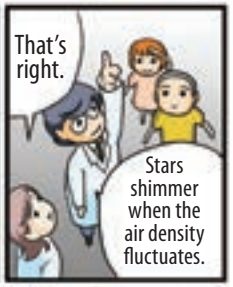


Radio wave reflects at fluctuations of air temperature or water vapor, and light does the same when it comes across molecules in the air (such as Nitrogen and Oxygen), dust, or clouds. We can measure the atmosphere by the reflected radio wave and light.



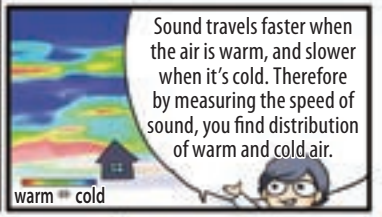


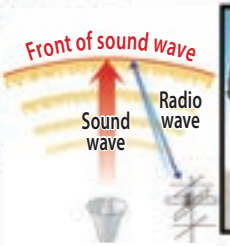




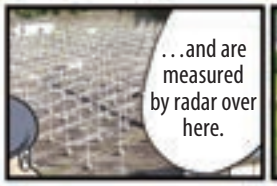
The End

What's "measure the atmosphere using radio waves and light"?



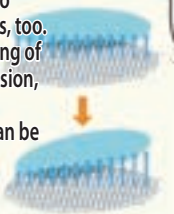


RASS:
Radio Acoustic Sounding System

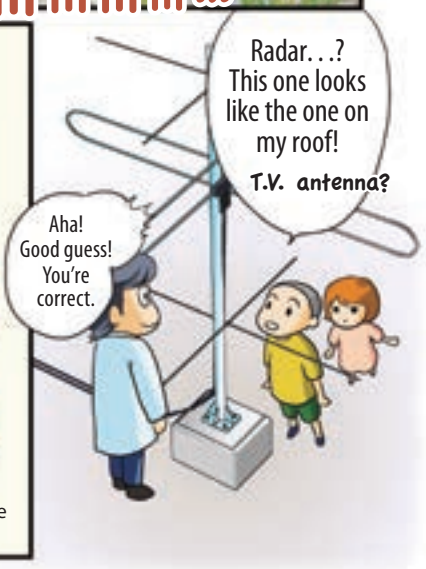


The Yagi antennas used here for our MU radar are the same as T.V. antennas. We connect 475 of them to work as one antenna. But unlike T.V. antennas they transmit as well as receive.

We use them to measure winds, too. Changing timing of wave transmission, The surface of observation can be slanted.



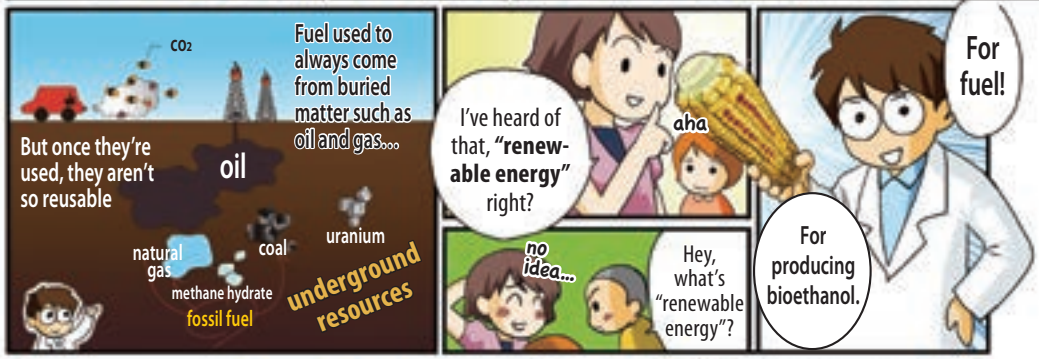
MU:
Middle and Upper Atmosphere
(10~100km) (100~500km or more)

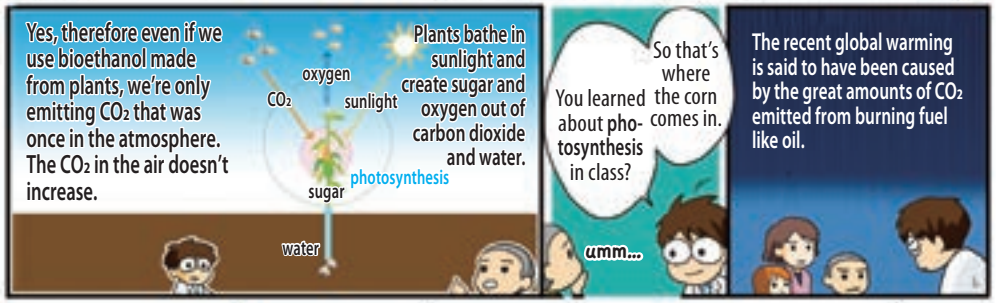


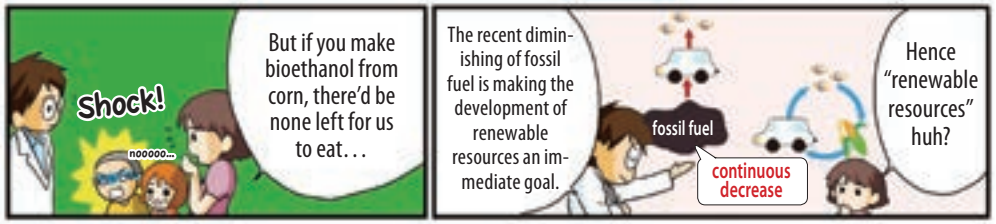
What's Bioethanol!?

What is Humanosphere?

Written by : Yuichi Setokawa/ Takashi Watanabe
Illustrated by : Chikako Noshi





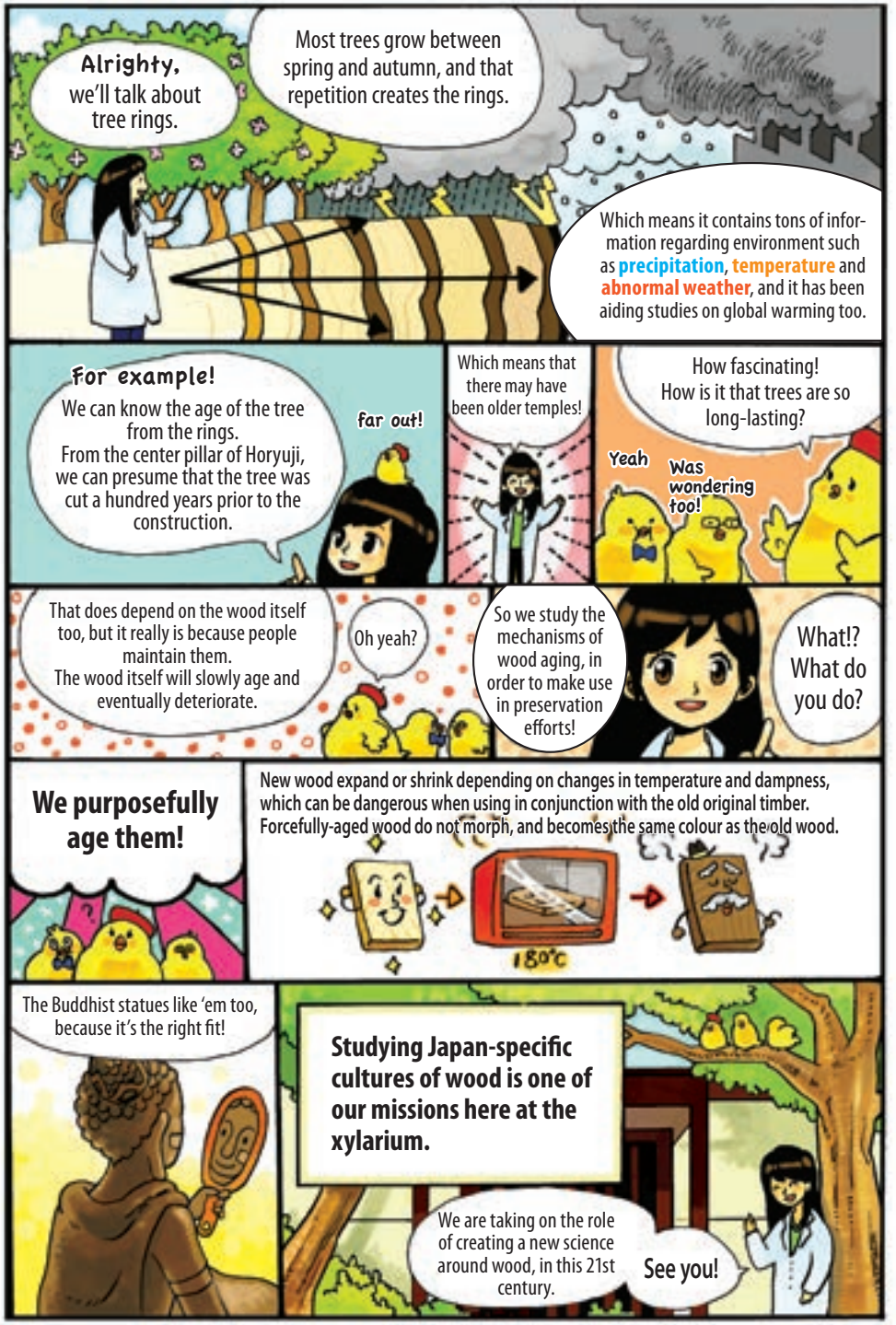


What is Humanosphere?

The Xylarium Story

The Xylarium was officially registered as a facility for International Xylarium Index in 1978, and the current station was founded in 1980.

Written by : Junji Sugiyama
Manga Production by :
Kyoto Seika University Graduate School of Art
Illustrated by : Kim Unhi
Edited by : Haduki Ishida



The End

What's Charcoal!?

What is Humanosphere?

Written by : Toshimitsu Hata
Manga Production by :
Kyoto Seika University Graduate School of Art
Illustrated by : An Hijyun
Edited by : Haduki Ishida

The gas stove fire contains moisture, but charcoal does not.

For sure, the meat is cooked more tender and tasty compared to the gas stove.

Charcoal barbecued meat is tasteful and also perfect with beer...

Charcoal

Hey papa, charcoal barbecue is the best!

My tennis racket is made from carbon too!

You mean carbon which often uses in carbon heaters and handles of umbrellas, that carbon?

Have you heard of "carbon"?

No... how?

By the way do you know that there are other uses for charcoal?

That's a function utilizing the many holes on the charcoal's surface. Other than that they have the quality of conducting electricity after carbonizing it above a certain temperature.

So charcoal and carbon are family, huh? I just remembered hearing in my science class about a project to clean a river using charcoal made from wood and bamboo.

Organic compound mainly comprised of carbon elements, when heated turn into carbon.

Yep, and the charcoal that we're burning is formed from the same element carbon.

Come on ♪

It suddenly begins to conduct electricity!

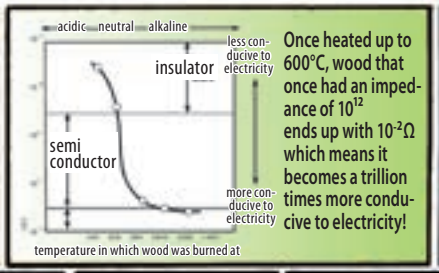
After burning it to around 600°C...

But

Prior to burning, a wood is an electrical insulator

What?
I thought wood didn't conduct electricity.

Whoa!
How does it do that all of a sudden!?



Once heated up to 600°C, wood that once had an impedance of 10^{12} ends up with $10^{-2}\Omega$ which means it becomes a trillion times more conducive to electricity!

Do you know of the unit Ω (ohm), used for measuring impedance?

Yep, learned it the other day.

Electron diffraction image of the crystal of the diamond

Nano diamond

When you look closer, the wood carbonized at 700°C contains nanodiamond inside.

Wow... I want to see too!

A trunk of wood is made up of cells, and the carbon in their cell walls rearrange at around 600°C enabling it to be conducive to electricity. Under an electronic microscope, you are actually able to observe the carbon rearrangement.

Hahaha

Well it is a diamond but the size of 10^{-6}mm. So, you cannot see with naked eyes.It might cost more to observe this tiny diamond than its worth.

Make my racket with diamond!

Please bring me some next time!

DIAMOND!

Diamonds!
Diamonds!!!
Ahahahaha

Aaahh, it burned!

Ah, our meal also turned into charcoal!

Can anybody smell something?

The End

What is Humanosphere?

Possibilities of Timber Structure!

Written by:
Akihisa Kitamori/Takuro Mori
Manga production:
Kyoto Seika University,
Graduate School of Manga
Illustrated by: Tamao Nukina

Today, we have come to view the [natural material house] known as the [eco-house].

Whoa, smells so nice!

Wooden houses have such a warm feel!

Welcome to the **[Eco-House]!**

Teacher!

Wood is more and more important for housing material in the future. Study it well!

Yes!

Wood, despite the light weight, has a structure that is stronger in a longitudinal direction.

This is a cross-section of a cedar, seen through an electronic microscope.You can see those hollow parts?

Wood is strong in the direction of the fibre, and weaker from the side, yet flexible.

If used well, wood can build robust and ductile houses.

It must be good for the environment as well!

Certainly!

Because wood is a resource that is grown by the solar energy,

Using wood for structure functions to capture and decrease the CO_2 in the atmosphere.

But mustn't we preserve our forest?

Sure we must. But a planted forest require thinning for its trees to grow, and they won't absorb as much CO_2 without it. There must be effective methods of utilizing the trees that we do cut.

Hmmm... but wooden houses seem more susceptible to earthquake damage, and concrete or steel structures seem better...

Ping!

mwahaha...

That's why we researchers are here!

If we can merge the traditional architecture and modern-day science...

Look out! Here comes a wooden house, tougher against the earthquake!

Lattice wall by Half-lapped joints

Bring in light and air, yet very ductile

Thick plank walls, thick plank floors

Focused as practical use of the wood

Timberwork seems fun, like a puzzle!

Do you know what the world' oldest remaining wooden structure is?

I learned it, it's Horyuji temple!

Yep, Japan had the structural techniques of timber building to last a thousand years.

Evaluation of strength performance of traditional wooden joint

Re-evaluation of mud walls in seismic resisting performance.

We are studying these methods to be able to safely use today by re-evaluation

Of course we will bring in contemporary designs.

for-example the glued laminated timber which is used for this wood composite hall was a new method at that time.

This massive thing is "glued laminated timber"!?

Yep, we are now capable of building large spaces using wood by the advancement of technologies and materials.

large finger joint

These are large, too!

lagscrewbolt

So, will we see wooden high-rise buildings in the future?

Haha, it's possible!

We wish wooden buildings are able to help humans live well with our environment.

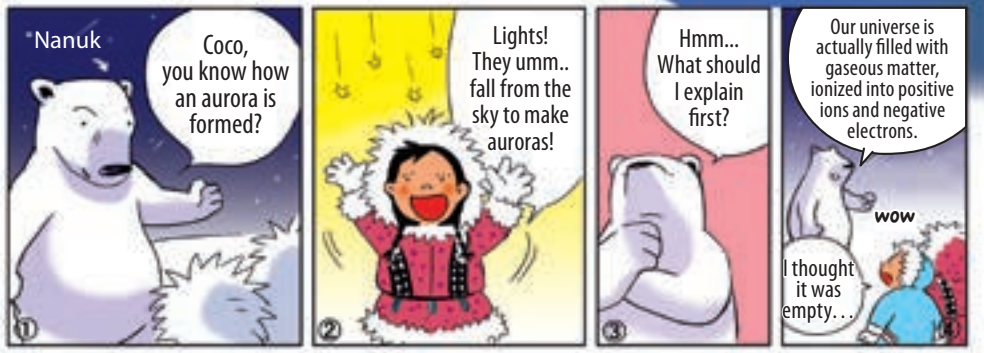
The End

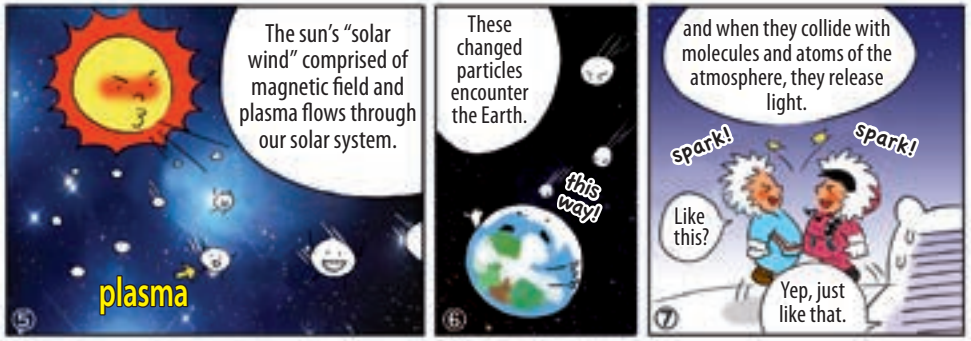
Singing Melodies from Outer-space

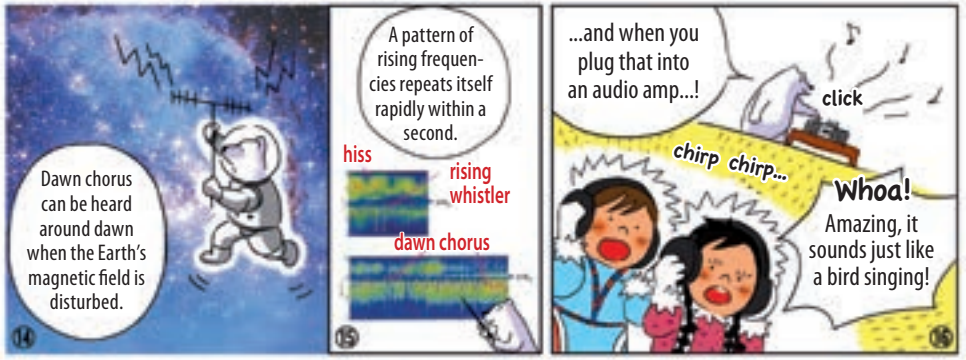
Wow...
What an unbelievably beautiful auroral!!

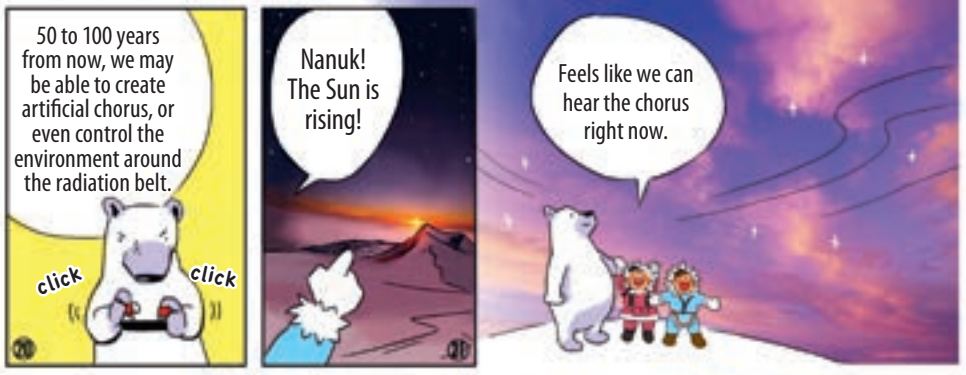
What is Humanosphere?

Written by : Yoshiharu Omura
Manga production :
Kyoto Seika University Manga Department
Illustrated by : Kim Jihyon
Edited by : Haduki Ishida







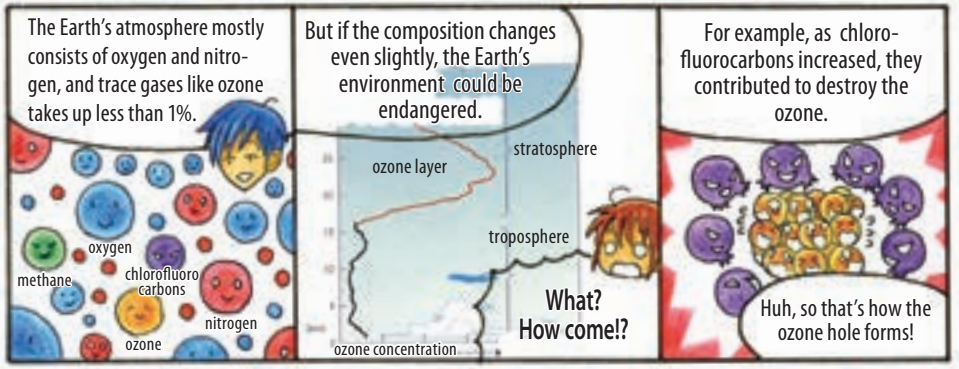


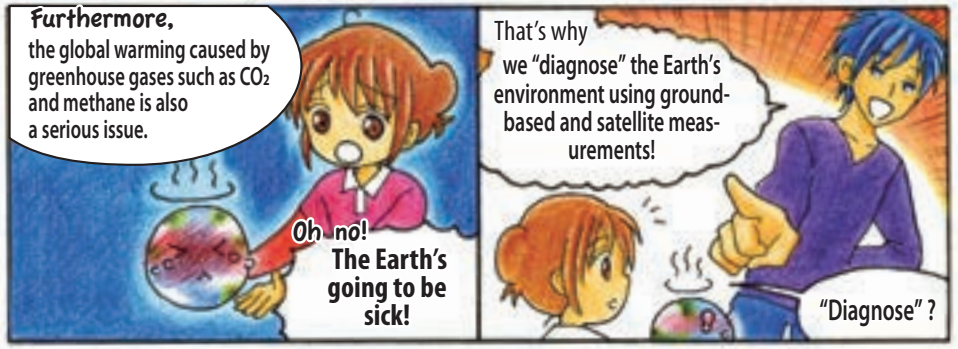
The End

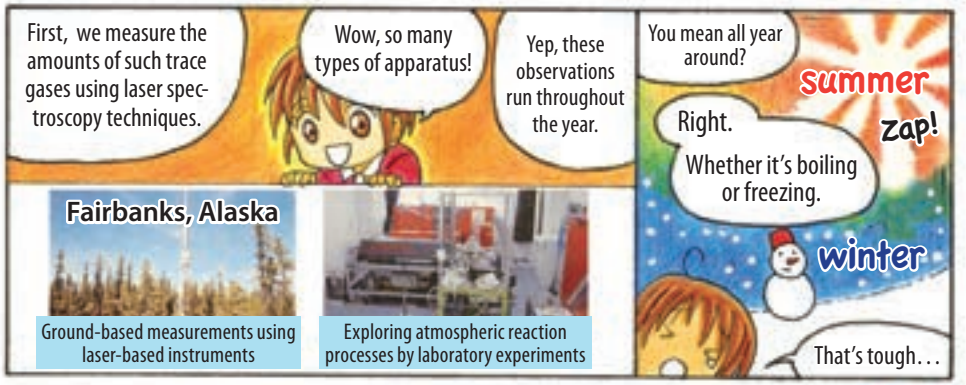
Who's the Doctor of the Atmosphere?

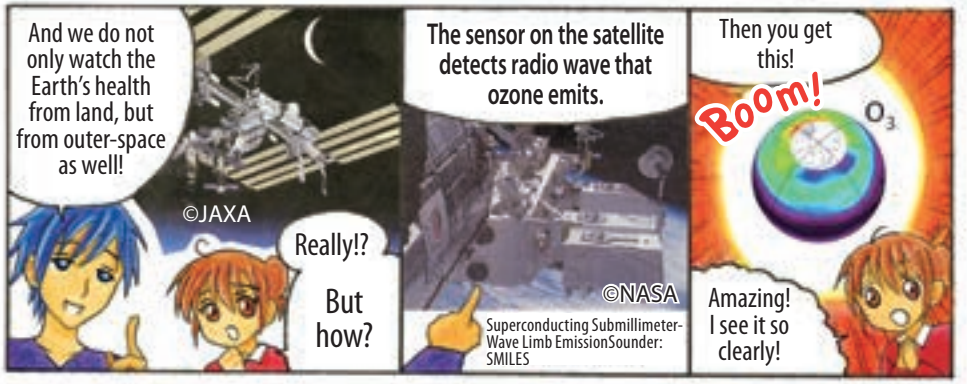
Originally written by:
Masato Shiotani / Kenshi Takahashi
Manga production :
Kyoto Seika University
Manga Department
Illustrated by : Mika Ikeda
Edited by : Haduki Ishida

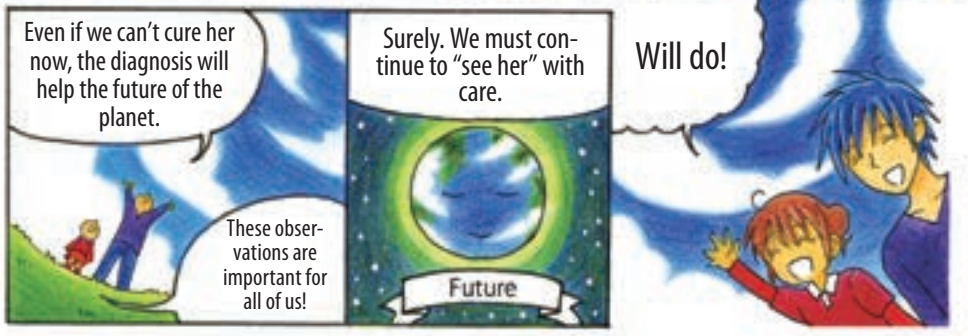
What is Humanosphere?









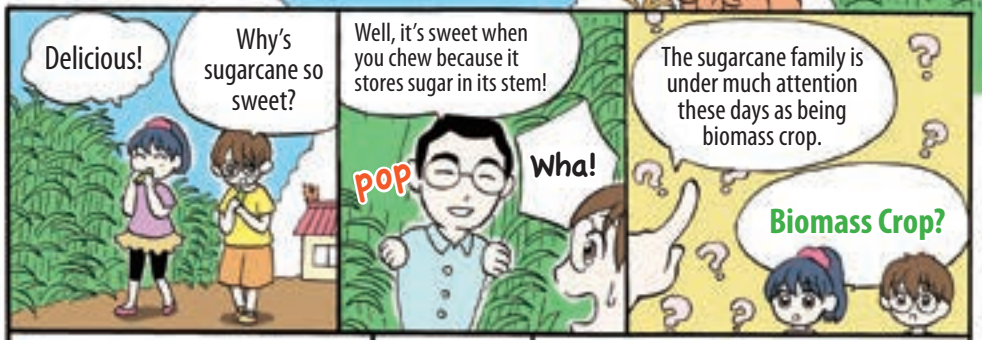


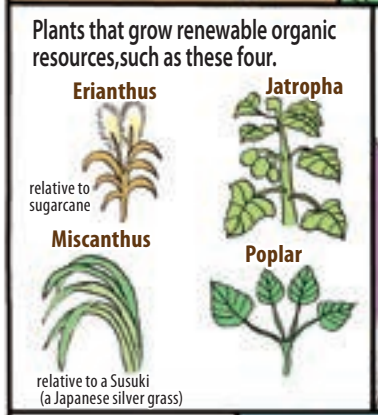
The End

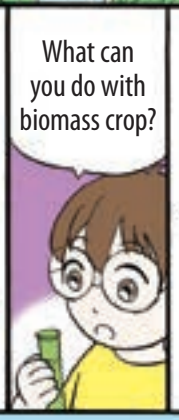
What is Humanosphere?

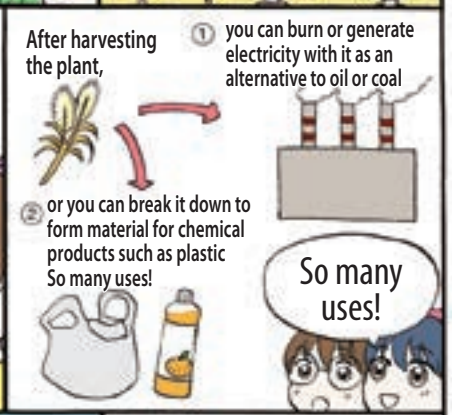
What's Biomass Crop?

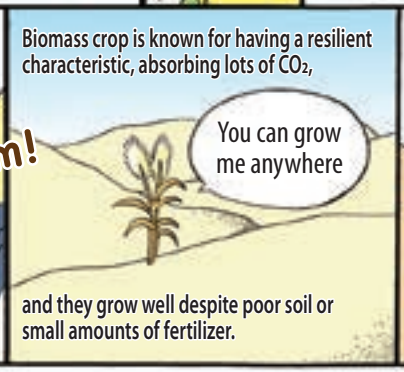
Originally written by : Shirou Suzuki
Manga production :
Kyoto Seika University Graduate School of Manga
Illustrated by : Ayayuki Kimiya

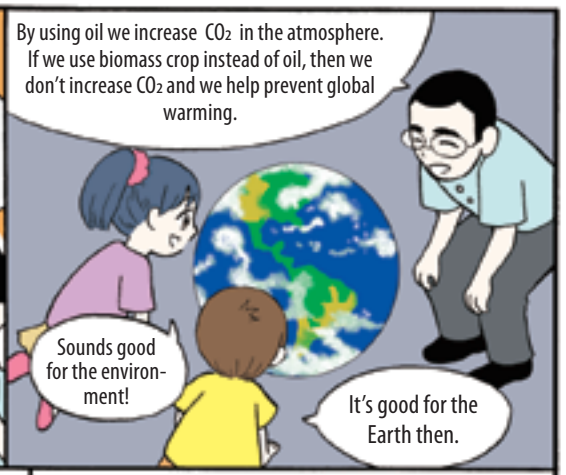


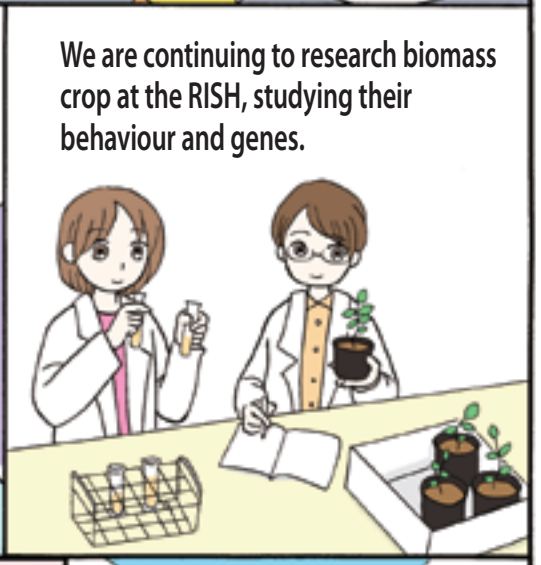










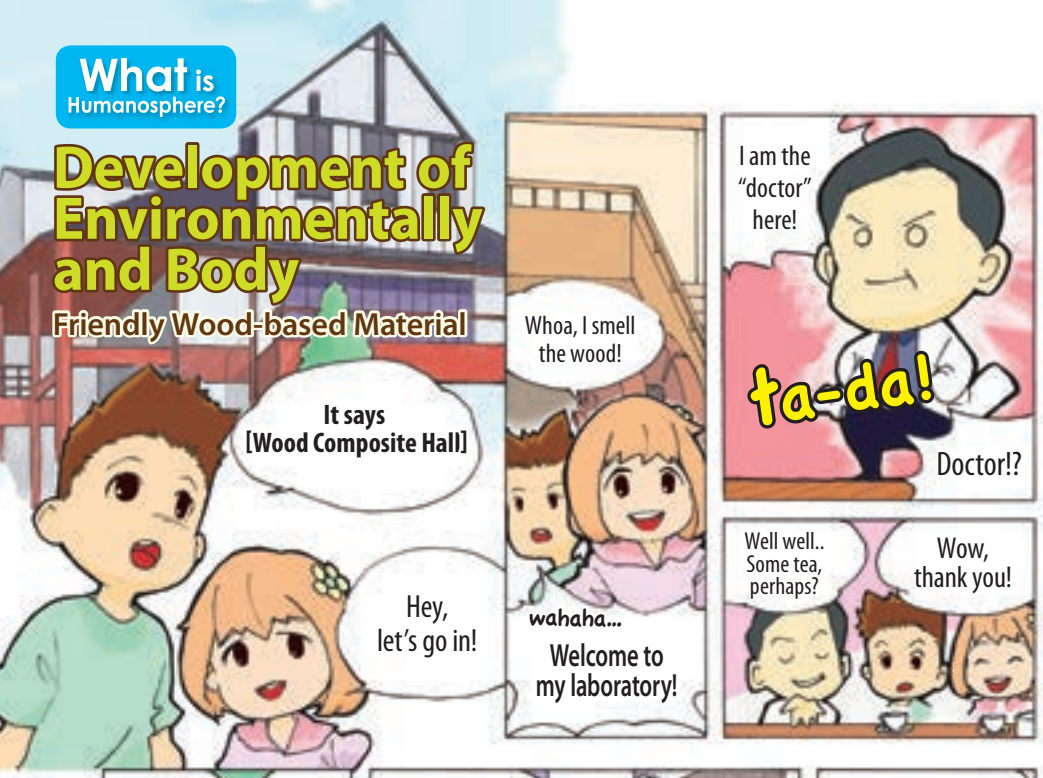


The End

Originally written by : Kenji Umemura/Shuichi Kawai
Manga production : Kyoto Seika University Graduate School of Manga
Illustrated by : Koudai Kusuhara

What is Humanosphere?

Development of Environmentally and Body Friendly Wood-based Material



* Industrially, citric acid are produced from starch and sugar.

What is Humanosphere?

Space Environment and Utilization

—Developing new flight plans, propulsion, and measuring technologies

Written by : Yoshikatu Ueda
Manga production :
Kyoto Seika University Graduate School of Manga
Illustrated by : Sonoko Fukushima

Let's take a trip to space on this rocket!

I'm so excited!

Dr. Yamakawa

Dr. Kojima

I will accompany you to the ISS.

ISS?

It's an international space station located 400km overhead.

Really?

What's this?

A small plasma wave sensor probe.

Space is filled with plasmas. Their turbulence can cause interference in radio waves, and it can even cause astronauts to be exposed to high energy particles. Plasma waves play a key role in turbulence of plasmas.

That's why we need to resolve these issues in relation to the plasma wave.

What's currently being suggested as a new use of the small plasma wave sensor probe is a system called **MSEE.**

MSEE :
Monitor system for Space Electromagnetic Environments

The MSEE system has the capability in detecting the time and spatial variations of space plasmas which are caused by artificial structures such as a space station.

Suggestion and development of a new system utilizing chip-sized plasma wave receivers

Detecting turbulence in space through miniaturized sensor probes scattered randomly in space

The space sensor network

-Measurement of plasma waves at high spatial and temporal resolutions that science satellites cannot reach.
Target
- Artificial turbulence near artificial structures (environmental assessment)
- Separation of time and spatial variations in natural phenomena

Thud!

Guess we've arrived at ISS!

Well, I have observation duties, so farewell everybody!

We're going to continue to the edge of the solar system!

What function does this rocket have?

This rocket uses a cutting edge of tecnology, so-called "Magnetic sail".

Magnetic sail?

It's a magnetically powered satellite. Special magnets (superconductive coil) generates a strong magnetic field at minus 250°C.

solar wind

solar wind

The wind from the sun is known as the solar wind, and it flows at 500km per second.

You're basically catching that by extending a sail made of magnetic field, similarly to a yacht.

The solar wind pushes the magnetic sail, and that's how it gets pushed forward.

Magnetic sails are intended to allow travel to the edge of the solar system in 10 years, instead of the 40 years it took for the U.S.' Voyager space probe.

plasma ejection

space probe

solar array paddle

magnetic field

Look! We're at Neptune!

We've come to the edge of the solar system.

Hmm... how must we go back?

What!?

The End

Surprising technique GPS Meteorology!!

—Now-cast torrential rain clouds

Written by : Kazutoshi Sato
Manga production : Kyoto Seika University Graduate School of Manga
Illustrated by : Isana Takeguchi

What is Humanosphere?

whoosh!

Noooo! A torrential rainfall! Was it just cloudy expected today!?

A serious problem

This is going to cause serious problems!

huh!? . . . and it's gone!

Can't this random weather be predicted. . .?

Thud

Poke

You wanna know if it's predictable or not, huh?

Oh, hello Ms. senior!

Shocked!

Actually torrential rainfall is caused by large cumulonimbus clouds that form within minutes, which is difficult to find using current observations that only detect rain drops

Mechanism of torrential rainfall

Expands rapidly from an "egg of a cloud" to a cumulonimbus cloud, causing sudden rainfall.

What!?

That's all current technologies can do!?

Therefore . . .

Have you heard of "GPS meteorology"?

Of course!

It's in my phone!

No, I'm talking about meteorology.

GPS, used for many services, is a global positioning system which uses approximately 30 satellites that orbit the Earth.

Car navigation system

GEONET

GPS "tsunami" monitor

A groundbreaking method of meteorology based on GPS is currently being developed.

That's "GPS meteorology"!

GPS=Global Positioning System

So using GPS for weather...??

Let me explain

umm...

The radio waves sent from the GPS satellite delays when passing through an "egg of a cloud".
We can analyze these delays and predict "precipitable water vapor"* in real-time.

Huh! So we can detect rainclouds before they form!

GPS satellites

Weather sensor

GPS receiver

egg of a cloud

Antenna

Using this system, dangers of torrential rainfall can be quickly communicated to people.

Warning to people

Incredible!

wow

Antennas set up in approximately 2km intervals

Data collection server

Local governments, firefighters, etc.

If we utilize the Japanese GPS satellites that will start operation,

we can expect improved accuracy and. . .

If GPS receivers are set together with current cellphone antennas, we won't need extra infrastructures. Quite realistic isn't it?

Let's start setting it up right away!

We're currently running tests in Indonesia. . . hum?

Rain?

whoosh

Ahhh!! Please, shall we use the umbrella?

Oh this? It was broken a moment ago. . .

Gushhhhhhhhhh

WHAAT!?

* Precipitable water vapor : Total amount of water vapor in the column atmosphere measured as water depth if all fall as rain.

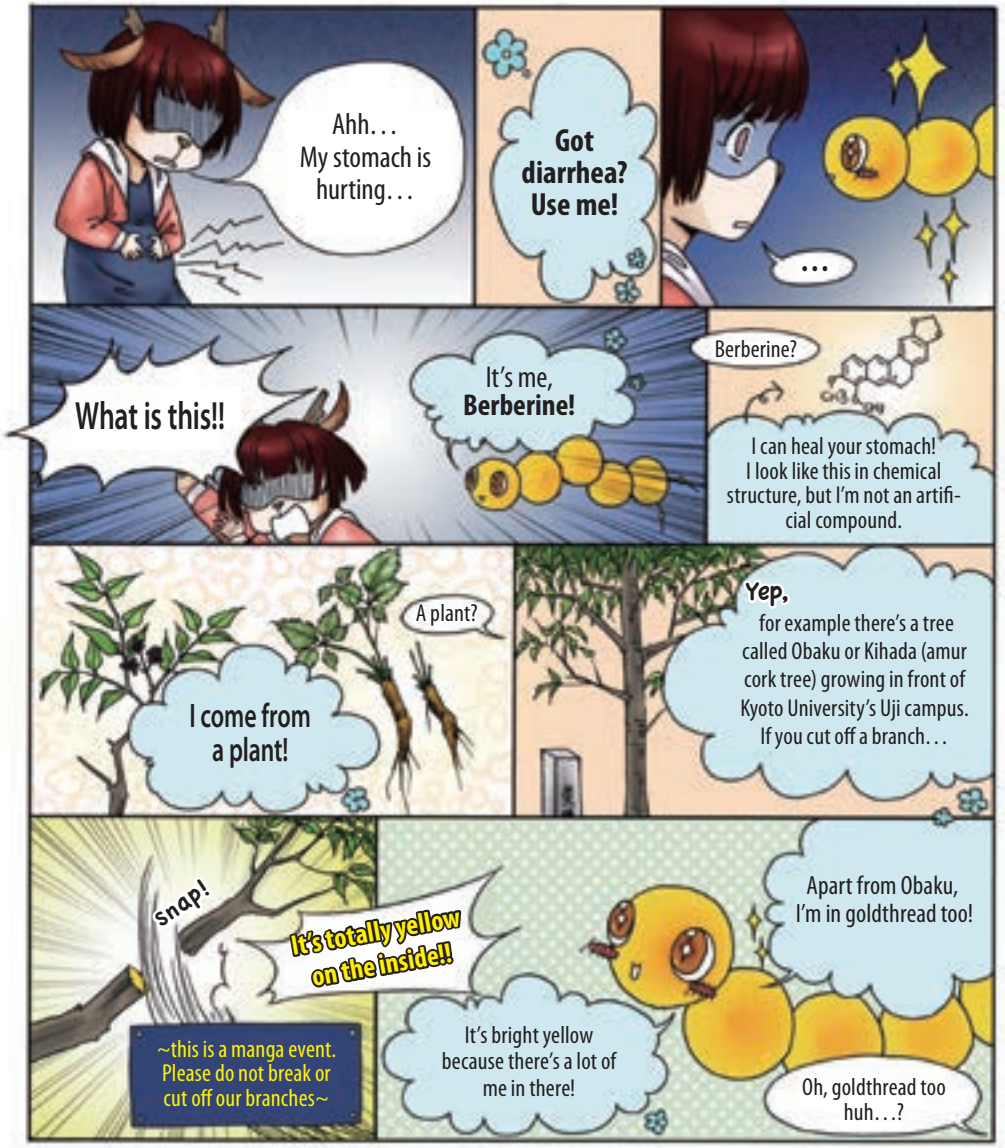
The End

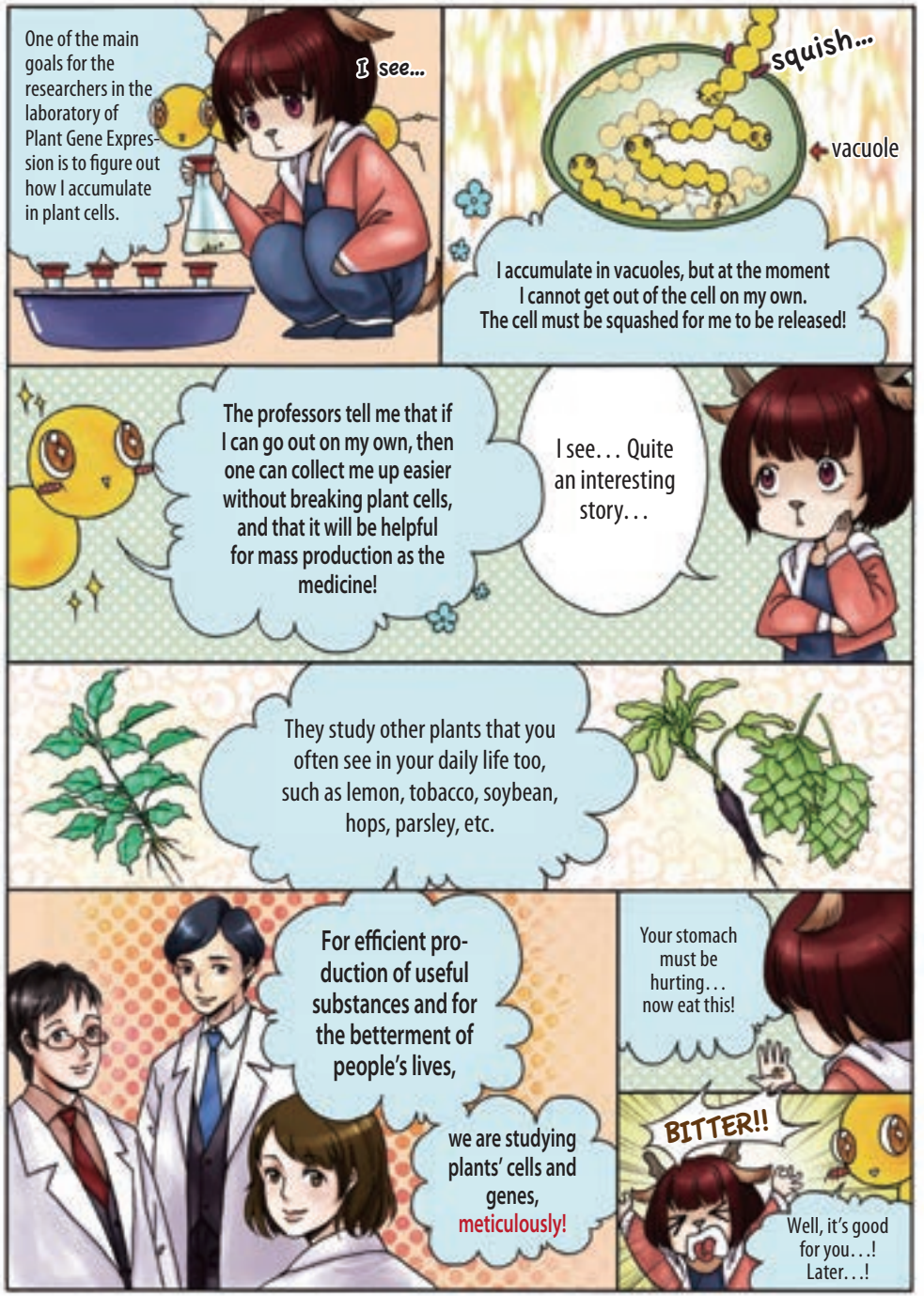
What is Humanosphere?

Medicine from the Hills!

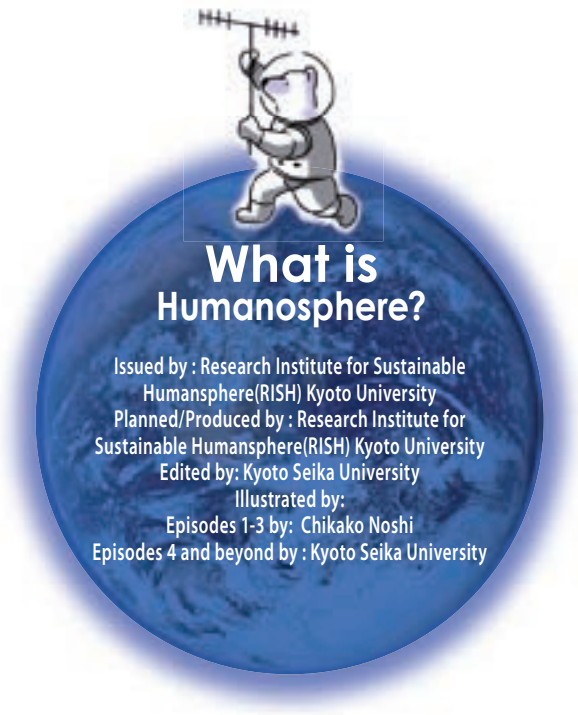
— Defeating sickness with plants

Written by : Kojiro Takanashi
Manga production : Kyoto Seika University Graduate School of Manga
Illustrated by : Sen Shika





The End



What is Humanosphere?

Issued by : Research Institute for Sustainable Humansphere(RISH) Kyoto University
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Here at the Research Institute for Sustainable Humanosphere (RISH), we unify the human living environment, the forest sphere, the atmosphere and outer space as the Humanosphere. Our goal is to understand the great range of phenomena that occur here, and at the same time to contribute to society through advancing basic scientific technologies vital to the construction of a sustainable humanosphere.
We are tackling the below four missions, which we consider as some of the most important topics to explore.

Mission 1 Assessment and Remediation of the Humanosphere

This mission is based on the reorganization and incorporation of different research field such as observations of the atmosphere, biochemical research on genetics of woody plants, and effective utilization of forest resources. The aim of the mission is to create foundations that permit sustainable ways of using forest resources while maintaining well being environment. This will be made possible by understanding the current conditions and the fluctuations of Humanosphere as accurately as possible.

Mission 2 Development of Science and Technology through Biomass and Solar Satellite Research toward a Solar Energy Society

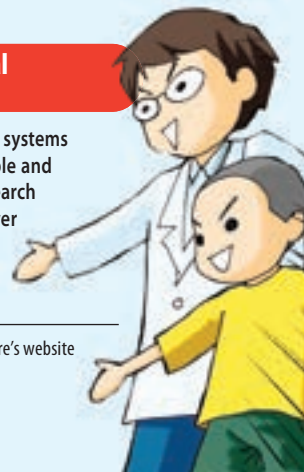
The aim of this mission is to create sustainable societies relying more on renewable energy such as solar and biomass energy. The research on solar power station/satellite (SPS), microwave power transmission, and the conversion of wood biomass to fuels, chemicals and advanced carbon materials are conducted.

Mission 3 Study of the Space Environment and its Utilization

The ultimate goal of this mission is to build research foundations for expanding the Humanosphere into space for the future generations. The scope of the research on space plasmas and cosmic rays are now expanded to include this objective. The investigation of the space environment surrounding the Earth, development of new technologies for exploring of the space, quantitative evaluation of artificially perturbed environments around spacecrafts as well as the evaluation of natural space plasmas are conducted. The possible utilization of new wood materials in space environment is also investigated.

Mission 4 Development of Technology and Materials for Cyclical Utilization of Bio-based Resources

This mission aims to realize sustainable societies by building resource cycling systems of forest resources. Among bio-based resources, forest resources are renewable and have a possible capacity of a large scale production. Through conducting research on forest resources, the development of fundamental technologies with lower environmental impacts on every phase of the biomaterial life cycle involving production, processing, utilization, disposal and reuse is achieved.

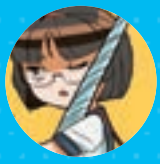


For more information, please visit Kyoto University Research Institute for Sustainable Humanosphere's website

http://www.rish.kyoto-u.ac.jp





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