What is Humanosphere?

vol.2

What is Humanosphere?

This is the second collection of manga that first appeared in Seizonken Dayori, the newsletter that we publish at RISH, Kyoto University. A fruit of collaboration between RISH and the Faculty of Manga at Kyoto Seika University, this booklet offers an accessible introduction to our research activities at RISH. It is our sincere hope that you will enjoy casually reading this booklet while getting to know better what we do in the domain of Humanosphere Science.

Now, let's be on our way to explore the Humanosphere together!

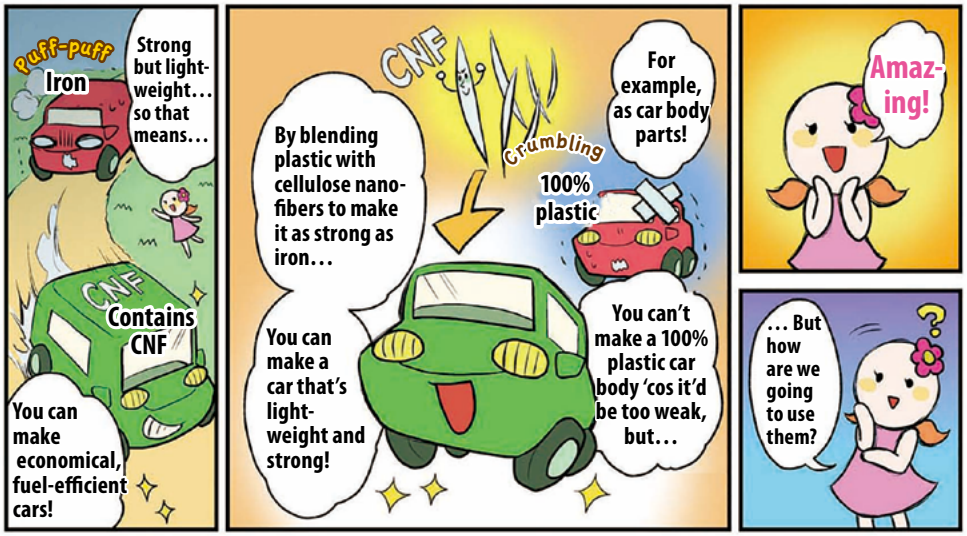
Have you ever heard the word "humanosphere"?

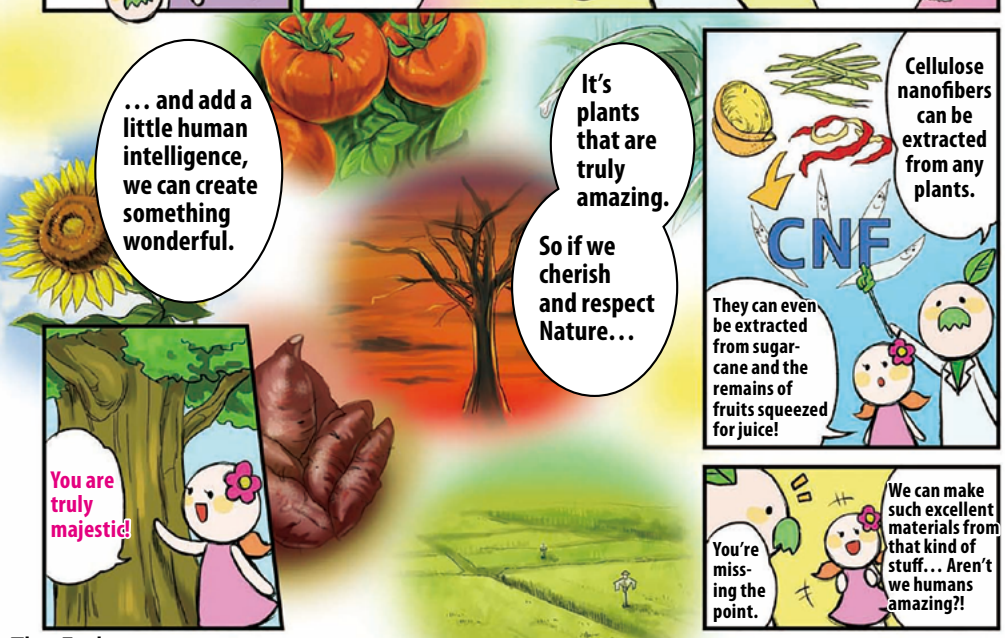
In the 21st century, we human beings are confronted with many problems that threaten our very survival, including global warming and the depletion of energy and resources.

The "humanosphere" refers to the totality of the spheres that we need for our survival. It encompasses the "human living environment" in which we lead our daily lives, the "atmosphere" that envelops us entirely, the "forest-sphere" that breathes in the atmosphere, and the "space environment" that links us with outer space.

These spheres coexist while interacting with each other. To understand them deeply and find solutions to present and future problems therein, we have recognized the need to create a new academic discipline transcending the conventional boundaries of specialization: Humanosphere Science.

At the Research Institute for Sustainable Humanosphere (RISH), Kyoto University, we researchers representing various fields are working in an interdisciplinary manner on a variety of research themes ranging in scale from the astronomical to the genetic, with "sciences for the sake of sustainable human development" as their common key phrase.



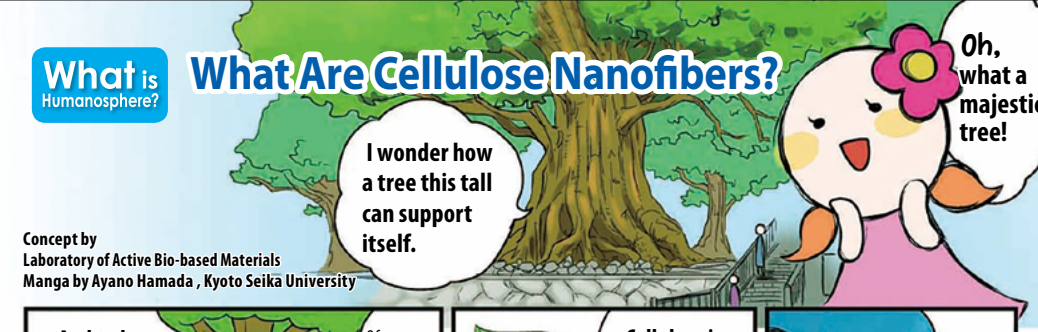


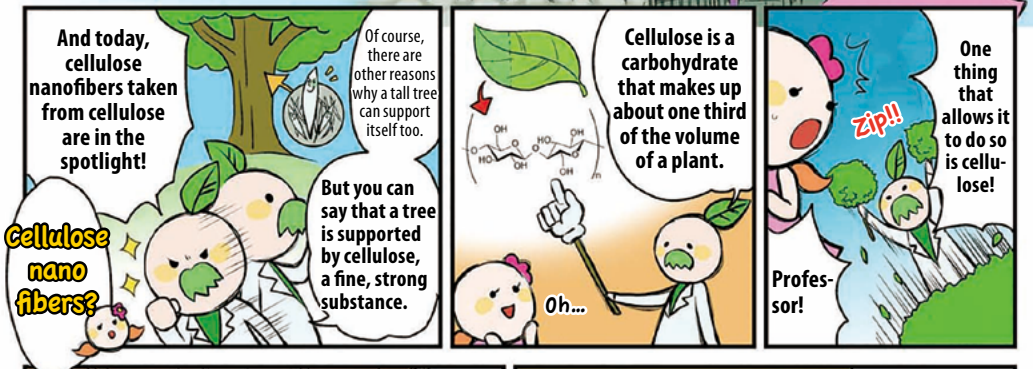
The End

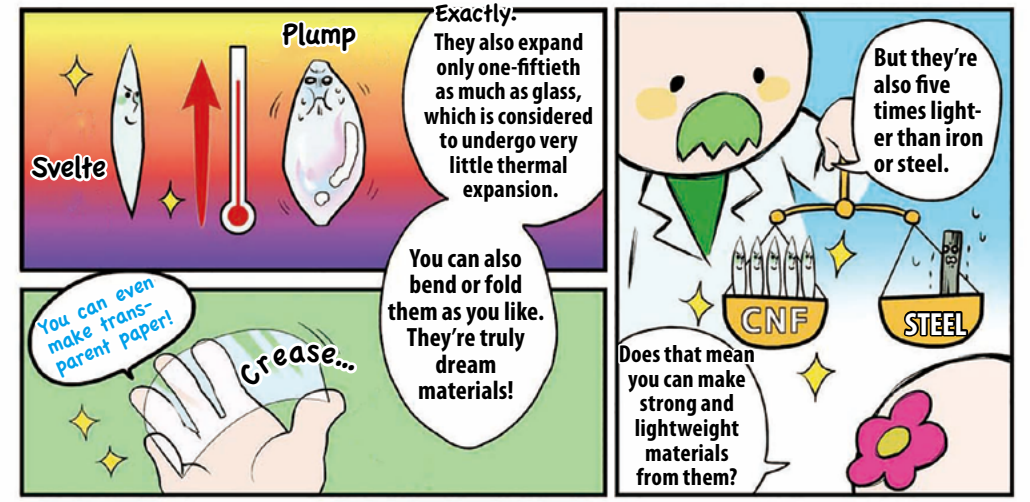
What is Humanosphere?

What Are Cellulose Nanofibers?

Concept by
Laboratory of Active Bio-based Materials
Manga by Ayano Hamada , Kyoto Seika University







What Kind of Creatures Are Termites?

What is Humanosphere?

Concept by Tsuyoshi Yoshimura
Manga by Sakino Hamada , Kyoto Seika University

Waaaah! Termites have invaded our house from under the floor!!

Crumble...

Here they are.

Wow! Quite a job on the wood!

Termites are rare creatures that can digest wood.

Where are the termites?

Here are the nests of Formosan termites we've been raising here.

Boing!

Go to RISH. They're doing research on termites. Go get some information!

Wel-come!

So here I am to learn from you.

That's right.

Termites are called eusocial insects. They live in colonies of tens of thousands to millions of individuals.

Queen
Secondary queen
Nymph
Soldier
Worker

That's not the only symbiosis termites have. Some termites grow mushrooms on their own.

Termites grow mushrooms? Just like humans!

Japanese subterranean termite

Oh, cool!

Termites have many protozoa and bacteria living inside them, aiding their digestion. They form a symbiotic relationship.

To be precise, they don't digest it by themselves.

On the contrary, termites serve Nature by digesting wood (cellulose), which other animals can't, and turning it into animal protein, on which other animals can feed!

Highly nutritious

Eat

Eat

Wait!

Termites are usually regarded as pests, but actually no more than 100 of the 3,000 termite species are actually harmful.

Termites live in a society? Wow, they're really like humans...

... though they're only pests!

Twitch...

I've been talking about the beneficial side of termites so far, but they do damage wooden houses after all...

Ahem

Energy!

So termites are useful. Let's bring more of them to Japan!

Ah... wait a minute.

Methane Hydrogen

CH_4 & H_2

Oops, excuse me.

Moreover, termites' innards contain no oxygen, so they generate hydrogen, and symbiotic methane bacteria produce methane there. Scientists are conducting research today searching for ways to utilize hydrogen and methane from termites as energy sources.

The surest way to exterminate this type of termite is to cover the entire house and gas them, but this is an extremely expensive method.

Japanese subterranean termite

Western drywood termite

Unlike most termites, which prefer soft humid wood, these termites settle in places like attics and eat dry wood.

Today, western drywood termites, an invasive species from abroad, are causing problems.

Yes, exactly.

It's better to know how not to attract termites to our houses rather than how to kill them, isn't it?

Yes, yes

Low cost & Safety!!

If it's done correctly, there's nothing to be scared of regarding ordinary termite extermination.

In one major research project, we're searching for ways to detect termite damage as early as possible and eliminate termites in the least costly, safest, and most environmentally friendly way.

Even the regular termite extermination procedure seems scary to me, because of the harmful impact that so many chemicals might have on human health.

Hey, stop!

Don't go home with a winged alate on your shirt!!

It's been great talking with you!

Termites are pests and beneficial insects at the same time. I suppose they're something like dark heroes to us.

Thank you!

The End

What is Humanosphere?

Learning about Wood, Learning from Wood

Concept by Junji Sugiyama
Manga by Yukari Tsujimori , Kyoto Seika University

There's something romantic about it...

Many historical cultural assets in Kyoto and Nara are made of wood.

Wood must have been loved and cherished by Japanese people since olden times.

Hold it there!!

Aaaah

... examine it under a microscope to be able to identify it!

Samples

Huhh?!

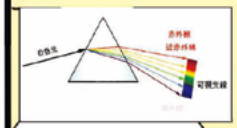
What?

We have to cut a piece of wood in cross-section and...

This is a Japanese red pine.

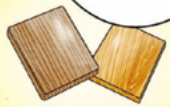
But I wonder which tree this one is made of...

What is near infrared light?



Set a sample in this machine, project near infrared light onto it, and you can identify the tree species.

Let me tell you about the method I've developed.



Wood samples

Twinkle!

There's also...

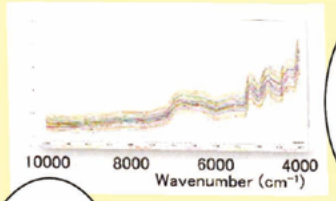
another way to identify trees.

Cute guy from Kyoto Uni...

... you can still identify them.

Looming up...

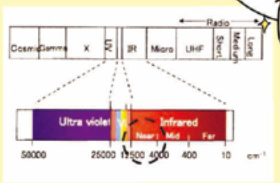
But even without samples, if you have image data...



You get slightly different graphs for different tree species.

Wow!

Each one is different!!



I'll show you how to identify tree species with images.

Image identification by CT scanning

... how to avoid damaging them.

That means you need a non-destructive method.

When you try to identify the tree species of wooden cultural assets, the most important thing is...

Gasp!

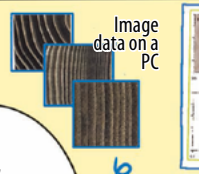
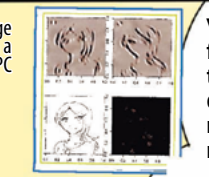


Image data on a PC

... reference images from the database.

Which one is this?



You know the facial recognition technology of digital cameras, right? In a similar manner...

... you can compare CT scans showing differences in grain and other traits with...

Yes!

I've seen something like this somewhere before...

She's appeared in a bigger frame than me...

Defeated

I hadn't thought of these familiar methods of identification!

Near infrared light projection and image recognition are technologies that are already used for various purposes!

Yes, yes!

If there is a perfect match...

You can discover the tree species!!

Exactly!

That statue is not made of wood...

Why don't we go and examine the Great Buddha of Nara?

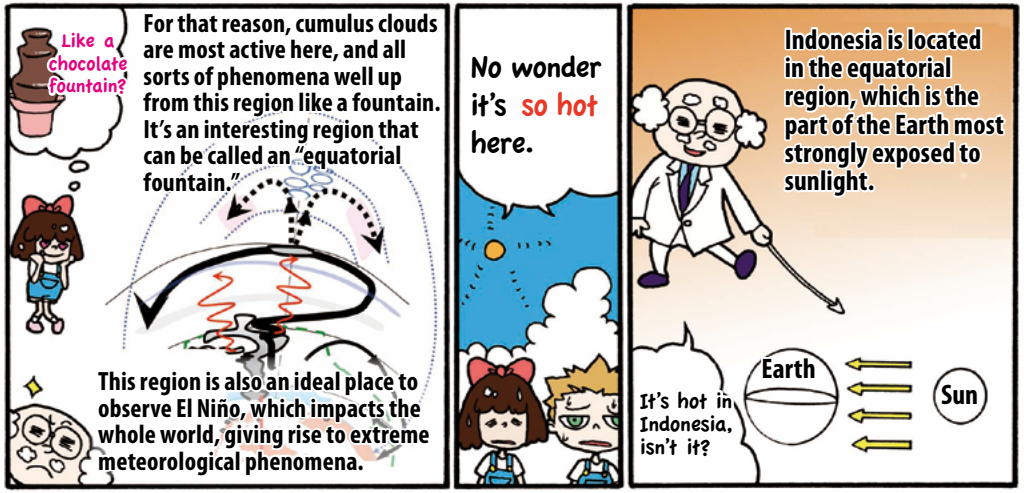
Oops

But also because we want to preserve the treasures that have been handed down to us from the past.

How admirable!!

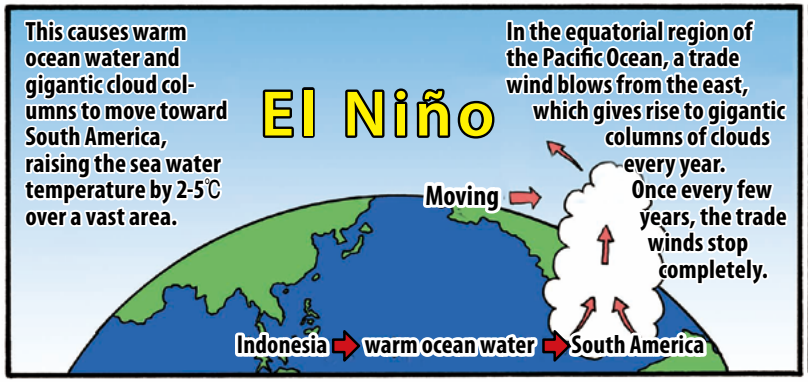
Well, we're doing our research basically because we are fascinated by the morphological diversity and structural beauty of trees.

The End

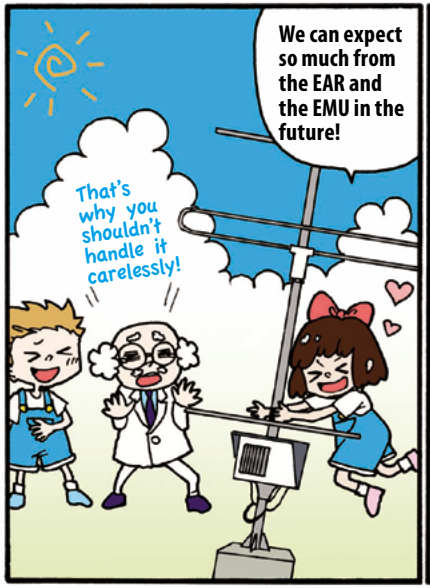

Like a chocolate fountain?
For that reason, cumulus clouds are most active here, and all sorts of phenomena well up from this region like a fountain. It's an interesting region that can be called an "equatorial fountain."
This region is also an ideal place to observe El Niño, which impacts the whole world, giving rise to extreme meteorological phenomena.

No wonder it's so hot here.

Indonesia is located in the equatorial region, which is the part of the Earth most strongly exposed to sunlight.
It's hot in Indonesia, isn't it?
Earth
Sun


El Niño
This causes warm ocean water and gigantic cloud columns to move toward South America, raising the sea water temperature by 2-5℃ over a vast area.
In the equatorial region of the Pacific Ocean, a trade wind blows from the east, which gives rise to gigantic columns of clouds every year.
Once every few years, the trade winds stop completely.
Moving
Indonesia
warm ocean water
South America

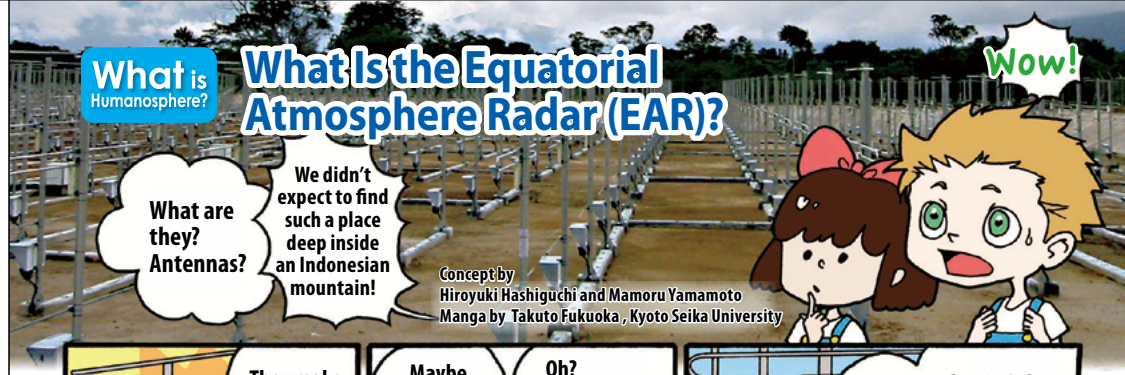

El Niño?
That sounds cute.
El... Niño...?

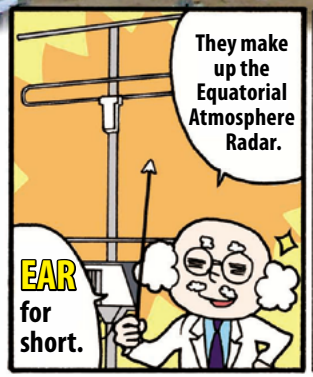

We can expect so much from the EAR and the EMU in the future!
That's why you shouldn't handle it carelessly!

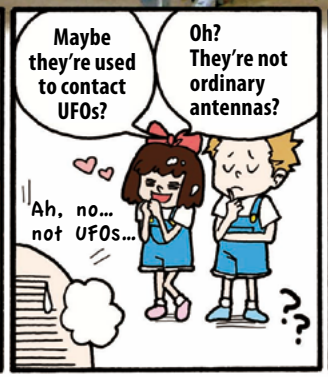

Now I know.
Atmospheric observations with the EAR are useful for predicting such disasters!
We are also planning to build an equatorial MU radar, EMU, which is 10 times more efficient than the EAR!

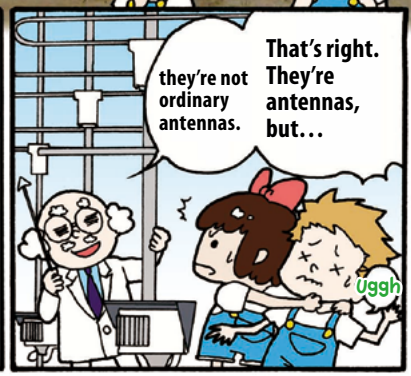

This triggers droughts, floods, forest fires and other natural disasters all over the world.
Oh...
That's terrible...

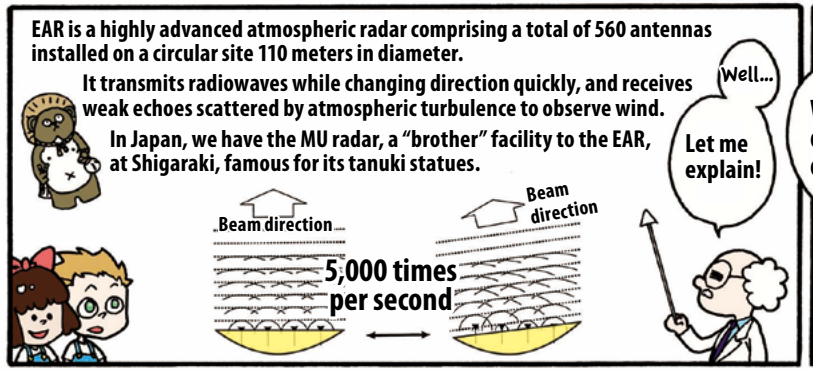
The End


What is Humanosphere?
What Is the Equatorial Atmosphere Radar (EAR)?
Wow!
What are they? Antennas?
We didn't expect to find such a place deep inside an Indonesian mountain!
Concept by
Hiroyuki Hashiguchi and Mamoru Yamamoto
Manga by Takuto Fukuoka , Kyoto Seika University

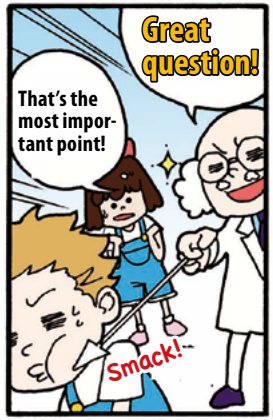

They make up the Equatorial Atmosphere Radar.
EAR for short.

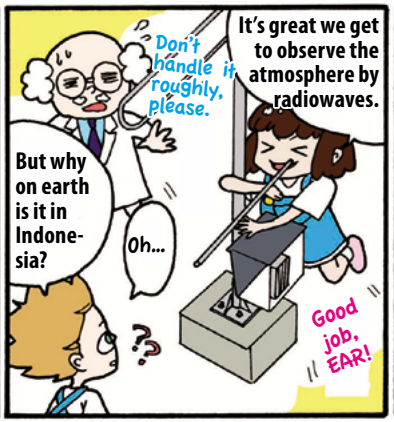

Maybe they're used to contact UFOs?
Oh? They're not ordinary antennas?
Ah, no... not UFOs...

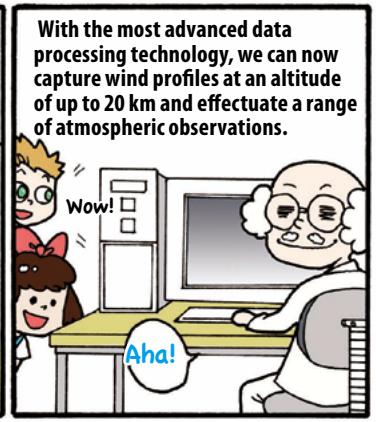

they're not ordinary antennas.
That's right. They're antennas, but...
Uggh


EAR is a highly advanced atmospheric radar comprising a total of 560 antennas installed on a circular site 110 meters in diameter.
It transmits radiowaves while changing direction quickly, and receives weak echoes scattered by atmospheric turbulence to observe wind.
In Japan, we have the MU radar, a "brother" facility to the EAR, at Shigaraki, famous for its tanuki statues.
Beam direction
Beam direction
5,000 times per second
Well...
Let me explain!


What does it do?
EAR... sounds cool...


Great question!
That's the most important point!
Smack!


Don't handle it roughly, please.
It's great we get to observe the atmosphere by radiowaves.
But why on earth is it in Indonesia?
Oh...
Good job, EAR!


With the most advanced data processing technology, we can now capture wind profiles at an altitude of up to 20 km and effectuate a range of atmospheric observations.
Wow!
Aha!

What is Humanosphere?

First in the World! Wood flow forming

Concept by Kozo Kanayama, Souichi Tanaka
Manga by Naoya Tajimi , Kyoto Seika University

Don't talk such rubbish!!

They say that wood burns, rots and warps… Seems I'm a total loser…

Plastic

Metal

Woody

These days, humans prefer other materials and don't use wood as much as they used to.

Wood is also beneficial to the global environment because trees absorb CO_2 in the atmosphere.

CO_2

CO_2

CO_2

Metals and plastics are known as "underground resources," and will be depleted one day.

On the other hand, wood is a renewable resource, and we don't have to worry about its depletion.

Professor!

Prof. Kanayama

You're an excellent material!

This structure is similar to reinforced concrete.

Wow!

Moreover, wood is very sturdy thanks to its closely stratified structure.

Is that a sake cup?

It's called "wood flow forming."

Take a look at this!!

You might also be interested to know that I invented the world's first wood-processing method.

Yeah...!!

I'm feeling confident again!

Heh-heh

I'll explain how.

Assistant Professor Souichi Tanaka

What?

Wood is softened like clay? But how!?

It's not just a sake cup. It was molded with wood softened like clay!

Load

Wood

Then, the wood softened by heat can be molded into any shape you like.

Load

Heat

Heat

We pour resin into the wood, set it in a die, and apply a load while heating.

We mold wood using this press.

Objects created with this technology are very solid because they retain the wooden traits.

Die

Heat

Heat

Once the wood is molded in the shape you want, you apply more heat to fix that shape.

Ha ha

Let's look forward to future developments.

I want to be an airplane!!

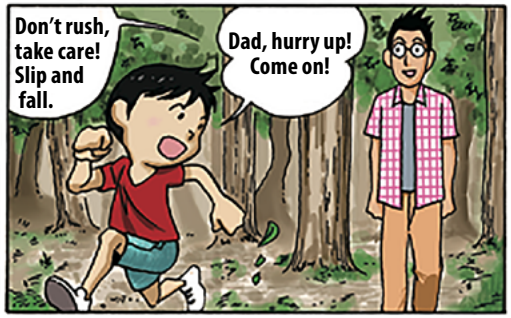
By further developing this technology, we will probably be able to make all kinds of goods out of wood in the future!

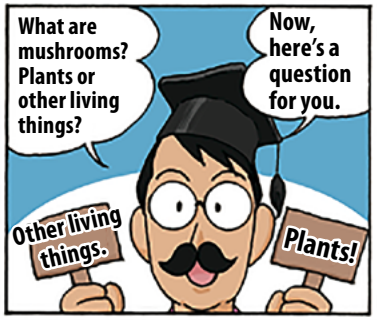
The End

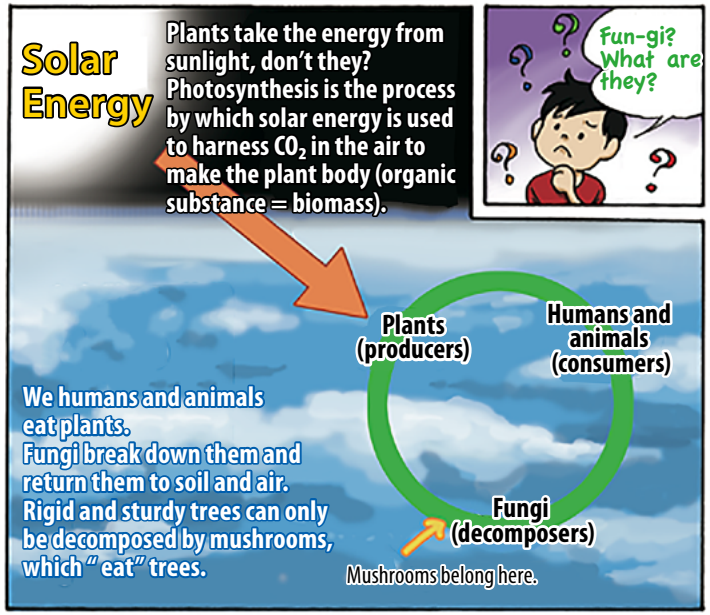
What are mushrooms eating?
- Mushrooms and Woody Biomass -

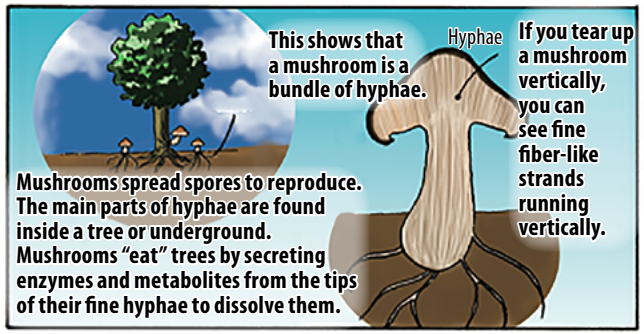
What is Humanosphere?

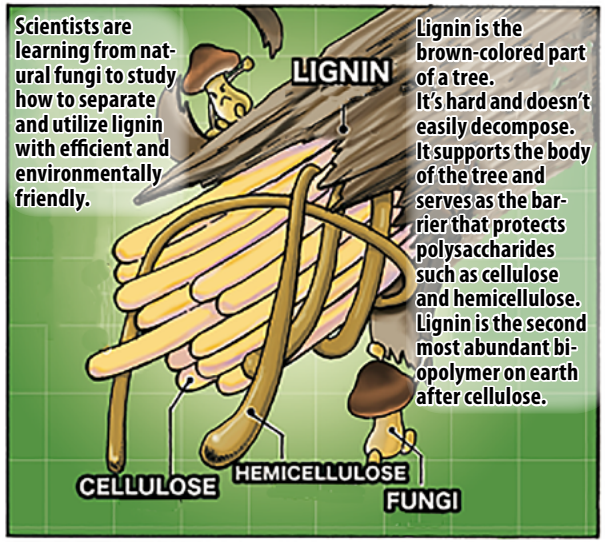
Concept by Hiroshi Nishimura
Manga by Rei Tobita , Kyoto Seika University

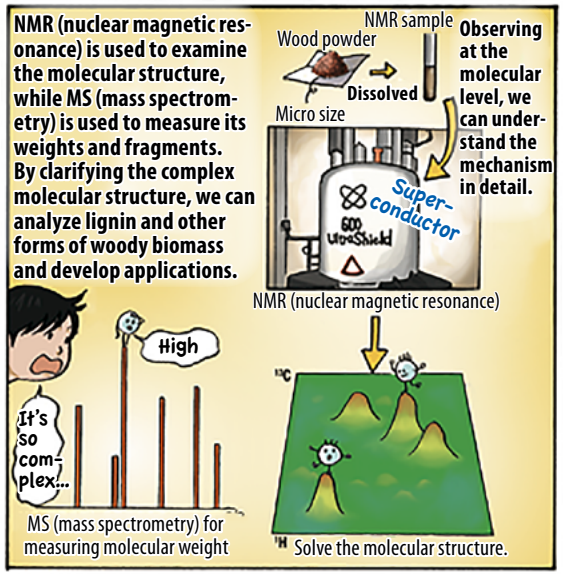












The End

What Are Plant Cell Walls?

Concept by Yuki Tobimatsu
Manga by Shoto Tanaka ,
Kyoto Seika University

What is Humanosphere?

Kids studying science

Hi there!

I am Mr. Cell Wall!

Thud!

Whoa!

It says here plant cells have walls called "cell walls" …which animal cells don't have.

What are cell walls?

Science

Humanosphere?

What has it got to do with plant cell walls?

Plant cell

Cell walls are much more.

Plant cell walls are one of the areas studied at Kyoto University's Research Institute for Sustainable Humanosphere (RISH).

Cell wall

Aren't they just walls?

I've come to show you how amazing cell walls are!

Oh no!

Sorry for bursting in on you.

Pathogens

Ultraviolet rays

Aridity

Gravity

This is why cell wall research is vital to the understanding of plant evolution processes and the mechanisms of their environmental adaptation.

Plants came to thrive not just in the sea but also on land, where environmental conditions are much harsher, so they developed the ability to lignify [harden like wood] their cell walls, which made their bodies stronger and better adapted to life on land.

Wow...

Cell wall lignification was key to plant evolution!

What is "lignification"?

Lignified cell wall

Secondary cell wall

S1 layer
S2 layer
S3 layer

Primary cell wall

Lignification

Cell walls are closely linked to plant evolution!

Primary cell wall
Thin and soft cell wall

Secondary cell wall
Very thick cell wall that forms inside the primary wall

There are all sorts of things made from biomass (cell walls)!

Just look around you…

Cellulose tape

Fabric for clothes

Houses and furniture

This too!?

TV and computer screens (optical films)

There's much more.

How?

Cell walls also play roles in your day-to-day lives!

"Biomass"

Animal- and plant-derived organic matter available as useful resources

Bio-mass?

Cell walls are also biomass.

Really?

Using biomass isn't easy, though, because of its structural complexity…

However!

Instead of oil, coal and other finite fossil resources, people are increasingly looking to use biomass resources.

Biorefinery

Biomass

Carbon sequestration through photosynthesis

Cell walls (lignocellulose) CO_2

Fractionation, depolymerization, saccharification, etc.

Carbohydrates Lignin Lipids Syngas

Biomass conversion processes

Biofuels Biochemicals fibers Plastics

Using biomass has the additional benefit of reducing greenhouse gas (CO_2) emissions!

Woody biomass, as it happens, is also renewable and currently abundant.

Estimated annual amount of biomass produced by woods and grasslands throughout the world

80 billion tons

The world's annual crude oil consumption

5 billion tons

Research at RISH

3. Analyze plants

Study about biomass (cell wall) structures and the genes involved

2. Breed plants

Rice, Arabidopsis, poplar, etc.

Molecular breeding

New cultivars with enhanced biomass (cell wall) productivity and usefulness

1. Collect plants

From woods, grasslands, and farmland around the world

I see!

Research at RISH is trying to elucidate the complex structure of biomass (cell walls) and the mechanisms of cell wall formation in plants so that we can harness them to achieve a sustainable society!

Perhaps one day we'll be living with cell walls all around us…

Someday…

Advances in research will make cell walls even more useful for your daily lives!

Arabidopsis root (protoxylem vessel)

These images were obtained in the course of our research.

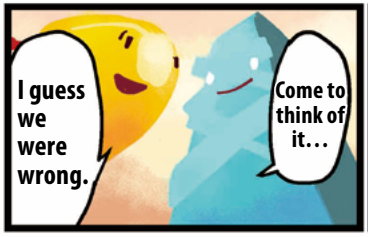
Rice stalk (vascular bundle)

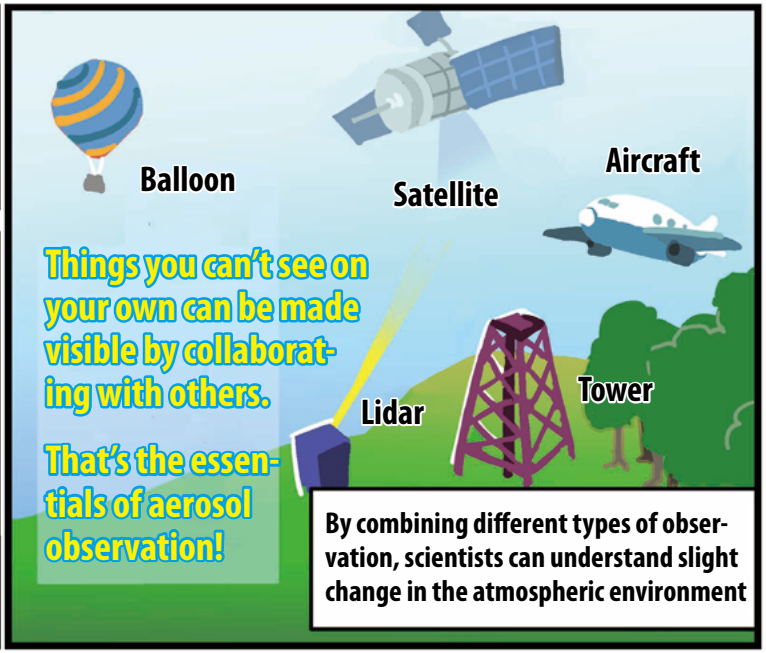
Fluorescence image of cell wall formation

How pretty!

Arabidopsis root (metaxylem vessel)

The End



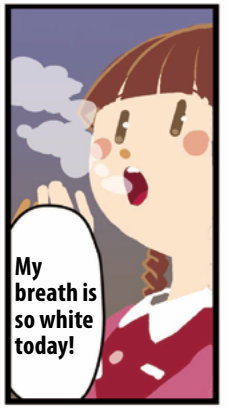


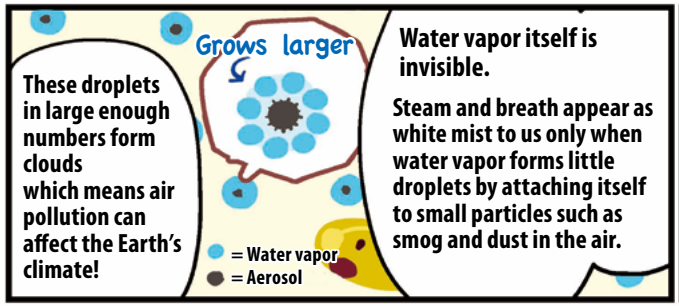
The End

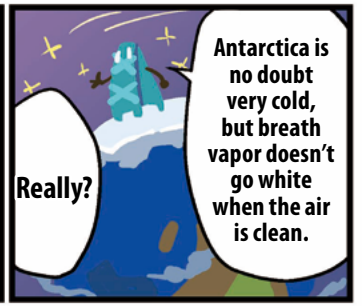
Atmospheric Aerosols: What Are They?

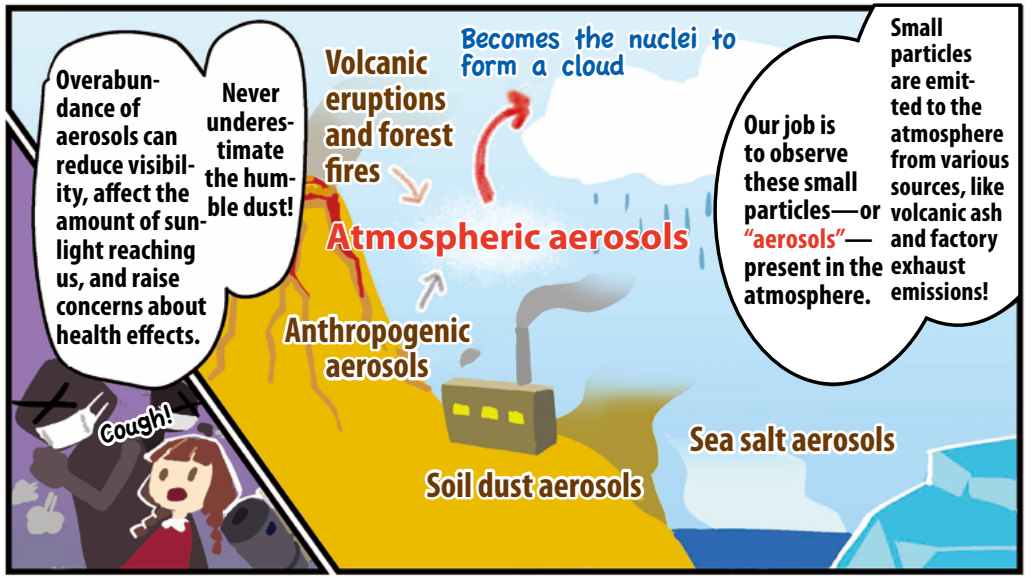
What is Humanosphere?

Concept by Masanori Yabuki
Manga by Rena Kashihara, Kyoto Seika University









What is Humanosphere?

Electron Beams for Manufacturing: A Super Technology Waiting to Be Discovered

Concept by Satoko Okubayashi
Manga by Akane Yamashita, Kyoto Seika University

Hmmm, "Clothes made from electron-beam-treated fibers" it says.

I love this outfit!

It sounds a bit scary, the use of radiation...

Not so fast! Some people may feel uneasy about the word "radiation."

Uh-oh!

"Potent" radiation?

Hi, I'm the store manager!

Good-question!

Electron beams are a very potent type of radiation that can alter the characteristics of materials!

Whoosh!

Electron beams

Whoa!

What on earth are "electron beams"?

SELL

Beams? That sounds cool!

Direction of irradiation

Apply high voltage

Electron beams are bunches of electrons accelerated by applying high voltages.

They are beams of electrons!

But used appropriately, it can benefit everyday living.

This technology is already used for the production of tires and kickboards.

Material with no particular property

Electron beam irradiation

Electron beams can treat materials in various ways!

For instance, electron beam irradiation can make materials stronger, or water absorbent.

Adds water-absorbent properties!

CRT TV mechanism

Aha! Mom and I used to watch this type of TV.

Electron gun emits electron beams

Deflecting coil

Electron beams deflected by the coils

RGB fluorescent material

For example, electron beams are used in CRT TV sets.

Images are formed by dots lighting up where the electron beams have hit the fluorescent material.

That dress remains wrinkle-free, wash after wash!

It permanently keeps its shape and stylishness.

What does this dress do?

Our store is one of the first to chiefly offer garments made from electron-beam-treated fibers!

Wow...

Hmmm...

Do they not have any environmental impact?

Pop!

Like magic electron beams are!

We also have clothes that repel rain but absorb sweat...

...and workwear items that self-remove odor! These are just some of the transformations electron beam irradiation can bring to fibers.

It's good know that there are technologies out there that are both versatile and eco-friendly!

Right.

Conventional treatments consume lots of water and chemicals

but electron beams can reduce the use of both!

Electron beam treatment machine in commercial use

Not to worry!

To begin with, none of the radiation remains on the fabric.

Photo courtesy of NHV Corporation

Electronic-beam technology is not yet widespread.

But it can become essential to our daily lives in the very near future!

This artificial wool looks exactly like sheep wool!

That's very ambitious!

A long-term goal is to use electron beams to create synthetic fibers from oil

reproducing wool, silk, and other complex fibers only animals can produce!

Thank you very much, sir!

Yeah, why not?

I'll have two of these and that dress we just saw, please.

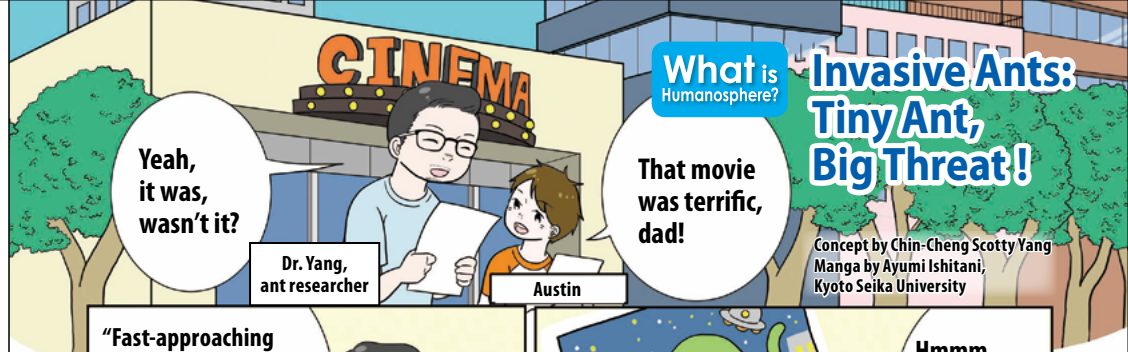
By the way...

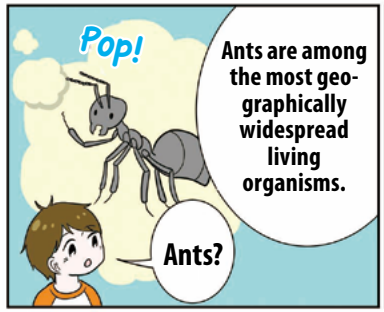
Now that we all know how great electron beams are, why not try this one?

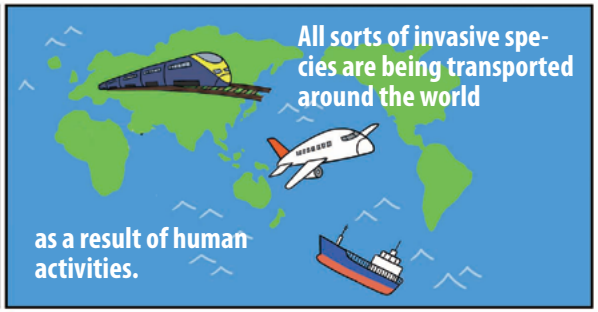
The End

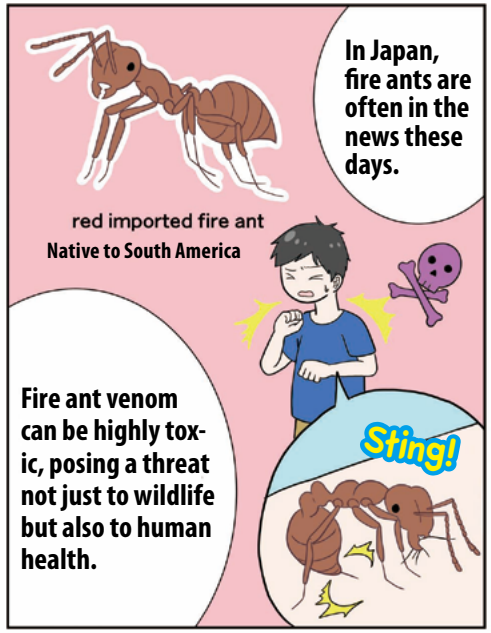
Invasive Ants: Tiny Ant, Big Threat!

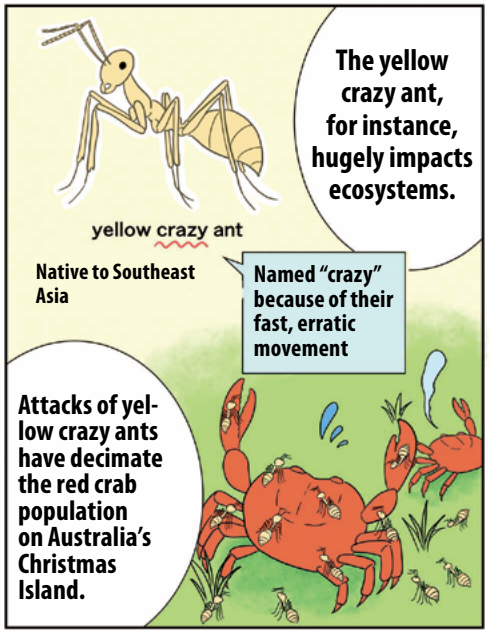
Concept by Chin-Cheng Scotty Yang
Manga by Ayumi Ishitani, Kyoto Seika University

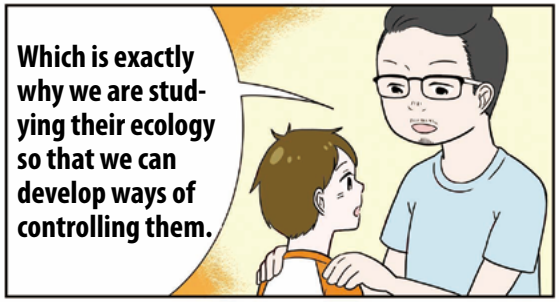


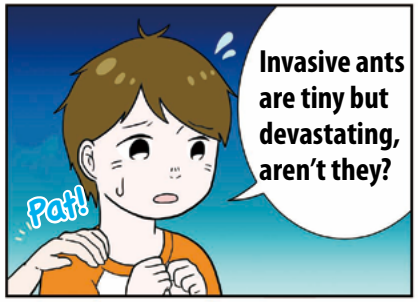


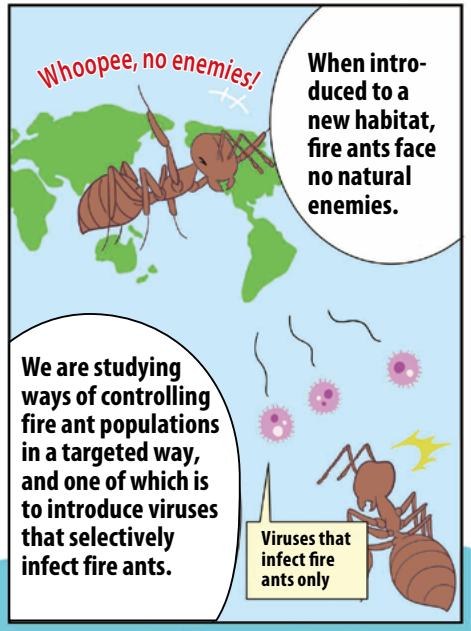


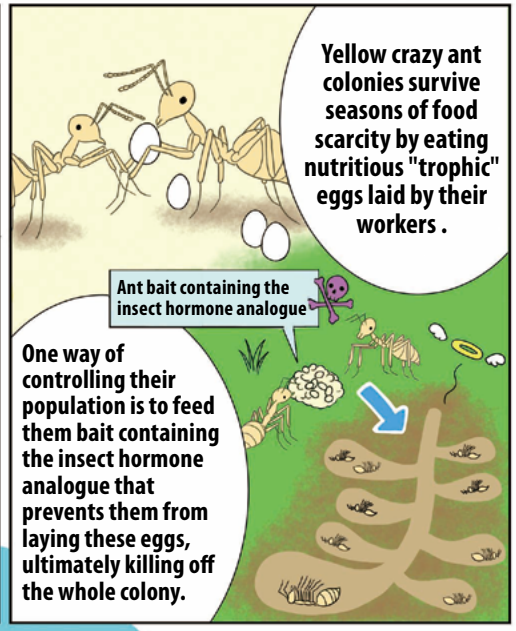


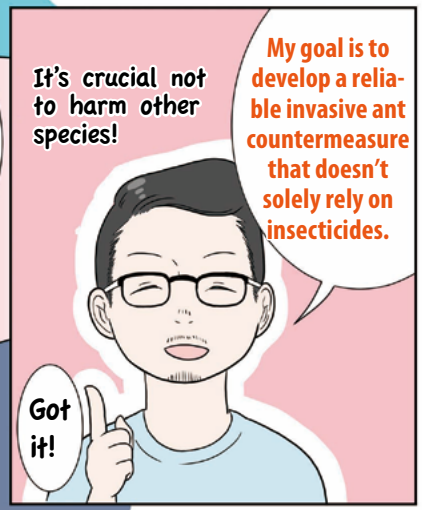


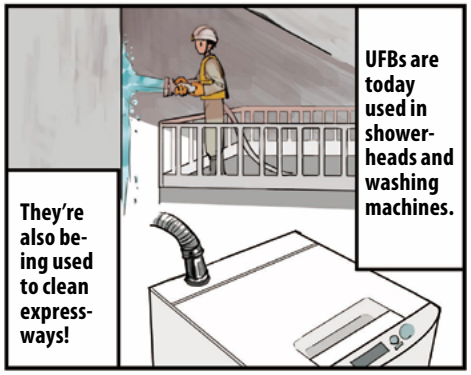


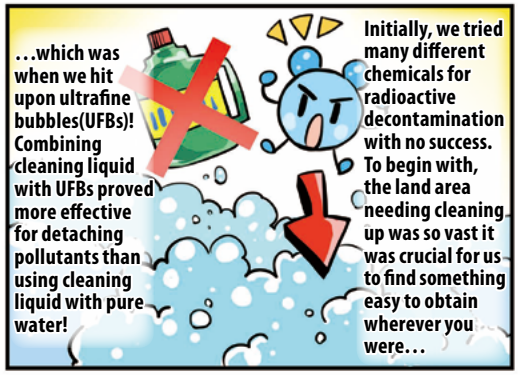


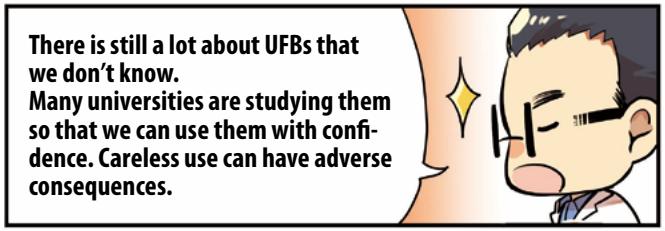


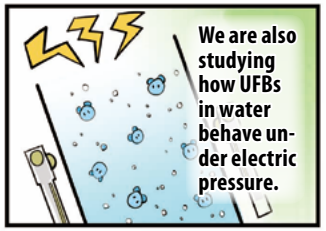


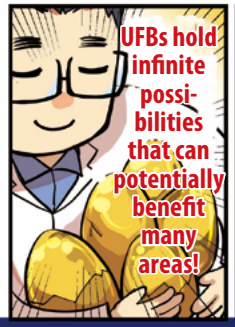


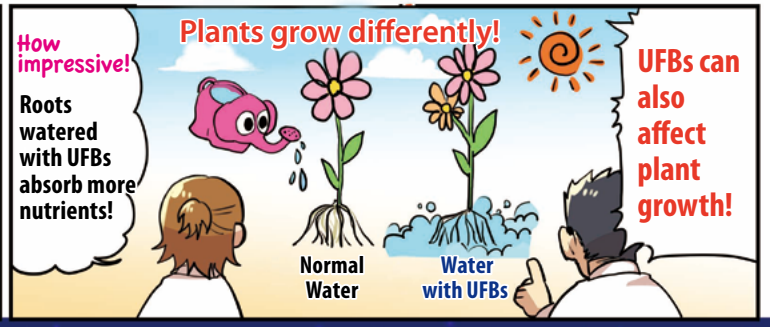

They're also being used to clean expressways!
UFBs are today used in showerheads and washing machines.


…which was when we hit upon ultrafine bubbles(UFBs)! Combining cleaning liquid with UFBs proved more effective for detaching pollutants than using cleaning liquid with pure water!
Initially, we tried many different chemicals for radioactive decontamination with no success. To begin with, the land area needing cleaning up was so vast it was crucial for us to find something easy to obtain wherever you were…


There is still a lot about UFBs that we don't know.
Many universities are studying them so that we can use them with confidence. Careless use can have adverse consequences.


We are also studying how UFBs in water behave under electric pressure.


UFBs hold infinite possibilities that can potentially benefit many areas!


How impressive!
Roots watered with UFBs absorb more nutrients!
Plants grow differently!
Normal Water
Water with UFBs
UFBs can also affect plant growth!


I wanted a photo of it!
Oh no, my latte art's gone!

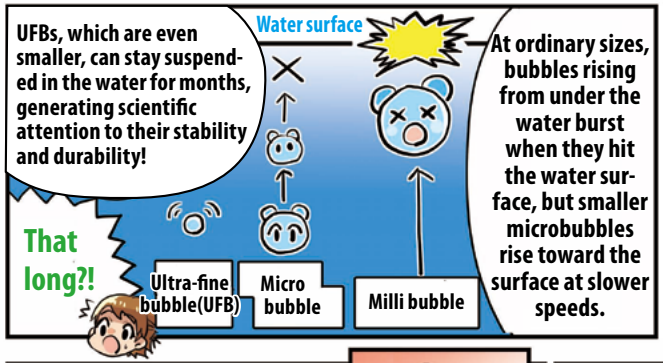
So tiny but so potent, aren't they?


A long-term goal of my research is to…
…find uses for UFBs in space!

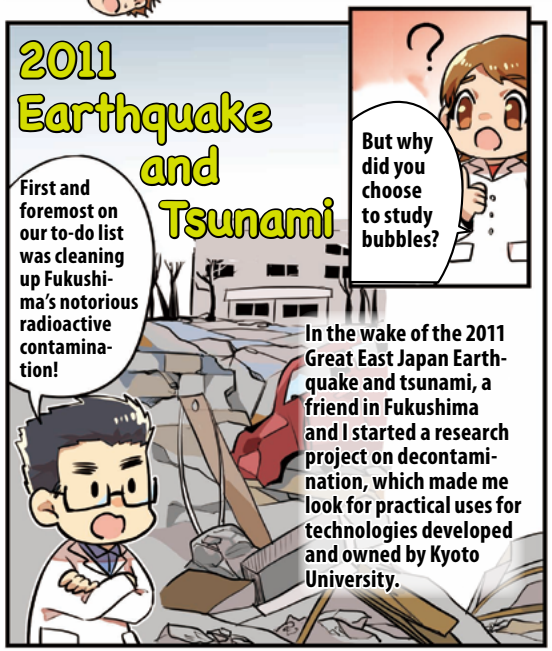
The End

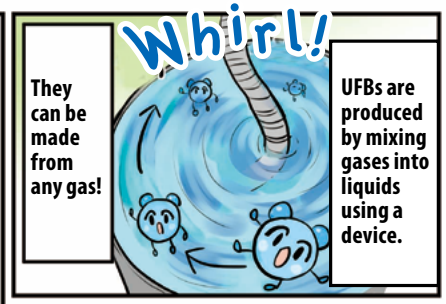

Splash!
That's because milk and air have mixed to form bubbles!
Whoa!

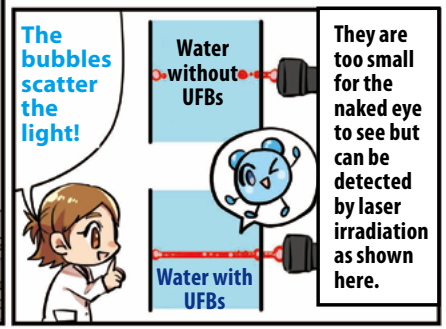

What is Humanosphere?
What Are UltraFineBubble(UFB)?
Huh?
Gurgle… gurgle…
It's amazing that a picture like this can be made with just milk…
How cute is this latte art? I've got to take a photo!
Concept by Yoshikatsu Ueda
Manga by Ayako Nagasawa, Kyoto Seika University


UFBs, which are even smaller, can stay suspended in the water for months, generating scientific attention to their stability and durability!
That long?!
Water surface
Ultra-fine bubble(UFB)
Micro bubble
Milli bubble
At ordinary sizes, bubbles rising from under the water burst when they hit the water surface, but smaller microbubbles rise toward the surface at slower speeds.


Include many that involve very tiny bubbles!
Oh, hello, Dr. Ueda!
New research projects in the spotlight recently


2011 Earthquake and Tsunami
First and foremost on our to-do list was cleaning up Fukushima's notorious radioactive contamination!
But why did you choose to study bubbles?
In the wake of the 2011 Great East Japan Earthquake and tsunami, a friend in Fukushima and I started a research project on decontamination, which made me look for practical uses for technologies developed and owned by Kyoto University.


They can be made from any gas!
Whirl!
UFBs are produced by mixing gases into liquids using a device.


The bubbles scatter the light!
Water without UFBs
Water with UFBs
They are too small for the naked eye to see but can be detected by laser irradiation as shown here.

Concept by Hiroshi Isoda and Takafumi Nakagawa Manga by Manaka Komatsu , Kyoto Seika University

Timber Structure: Proving and Visualizing Safety

What is Humanosphere?

Tall, multi-story timber buildings are constructing around the world!

Brock Commons, Vancouver: 53 m

Dalston Lane, London: 33 m

HoHo, Wien: 84 m

Doesn't wood use sound harmful to the environment!?

Quite the opposite, actually!

Rattle, rattle...

What the...?

Sustainable tall timber building is a growing trend also in Japan, except...

Timber sourced from a properly managed forest is a sustainable material. Harvesting such wood is an environment-friendly activity that helps the growth of remaining trees!

Overcrowding stunts tree growth, so selective removal revitalizes the whole forest!

Carbon dioxide (CO_2) remains sequestrated in the wood unless it is burned.

Harvested tree is utilized as timber.

Yep.

It's the unsustainable logging of tropical rainforests that is seen as problematic.

Isn't it, Professor?

Japan is an earthquake hotspot!

Rumble!

Eek!

Rumble!

We develop and test cross-laminated timber (CLT) and other types of strong construction materials.

We analyze the seismic behavior of structures.

That's where our research comes in!

Smirk!

...meaning timber structure is not viable here!?

Japan is almost unrivaled in its frequency of earthquakes...

Clatter

Clatter...

Wobble, wobble

Yeah, I've seen those tests in house building company ads!

We conduct tests to see how well they withstand earthquakes.

Used in the right places in combination with other materials, such as reinforced concrete, it can make a...

very strong building!

This is cross-laminated timber (CLT), a new type of panel made by gluing layers of lumber in alternating directions to make it strong. It can be made to any shape or size.

Wow!

More people know about these tests nowadays because house building companies have actively adopted them, making it easier for us to live safely in timber structures.

These technologies are shared free of charge as a way of returning the fruits of our research to society!

That means you can test as many times as you like before building!

Click-click

To save cost, time and materials for building real houses for every test, we also develop and use simulation technologies.

Here comes another day of hard work!

Indeed!

Research must go on for better technologies that visibly offer peace of mind!

Timber materials are subjected to destructive testing many times to collect data on their strength, which we use to conduct simulations!

Thumbs up!

The End

The Research Institute for Sustainable Humanosphere (RISH) Kyoto University understands the "humanosphere" as a place essential for human survival and pursues the following five missions to address issues especially significant to the humanosphere.

Mission 1 Environmental Diagnosis and Regulation of Circulatory Function

In order to project future environmental fluctuations, such as global warming and the increase of extreme weather events, this mission diagnoses atmospheric conditions using highly sensitive radar and satellite measurements. It also investigates the mechanisms of material transport and exchange between the biosphere and the atmosphere. The mission seeks to ultimately establish fossil-fuel-independent sustainable production and utilization systems of plant biomass resources and useful substances through the analysis and regulation of plant and microbe functions in resource and material circulation. Research under Mission 1 has expanded its scope to include the underground biosphere in order to gain a comprehensive picture of the humanosphere from the perspective of material circulation.

Mission 2 Advanced Development of Science and Technology toward a Solar Energy Society

In order to achieve solar energy conversion for advanced utilization, research under this mission pursues direct conversion of solar energy into electric, electromagnetic wave, and thermal energies, using applied microwave engineering, biotechnology, and chemical reactions. Research is also conducted into indirect conversion of solar energy into highly functional substances and materials through biomass, a product of carbon fixation achieved by photosynthesis, as well as into the efficient utilization of such materials. Mission 2 places focus on the conversion of solar energy into highly functional substances, applying research findings to both underlying technologies and entire systems.

Mission 3 Sustainable Space Environments for Humankind

Using satellites, space stations, sounding rockets, ground-based radar, computer simulations, and other means, Mission 3 seeks to advance and interconnect studies into space and atmospheric environments and investigate how these environments interact with the human living environment and the forest-sphere. Research under this mission also seeks to advance the understanding of radiation belt and geomagnetic storm fluctuations caused by solar flares and build the capacity to propose measures against threats from space, such as near-Earth space debris and asteroids. By contributing to the maintenance and development of space infrastructure, such as weather, navigation, and communications satellites, research under Mission 3 responds to social demand for the sustainable utilization of space environments. Also tackled by Mission 3 research are engineering solutions for making minor adjustments to the paths of asteroids to prevent collisions with Earth and the significant impact such events can have on human living on Earth. Mission 3 covers not only the understanding and utilization of space environments but also how to maintain and improve them for human living, and it also places focus on their interactions with the atmosphere, forest-sphere, and the human living environment.

Mission 4 Development and Utilization of Wood-based Sustainable Materials in Harmony with the Human Living Environment

In order to achieve both environmental friendliness and efficient biomaterial utilization, Mission 4 seeks to advance the sustainable utilization of "circular" biological resources, in particular, wood resources. To this end, research under Mission 4 mobilizes all available knowhow in humanosphere science to better understand the inherent structures and functions of living organisms; to create a wide variety of functional materials capitalizing on the strengths of living organisms; and to develop safe and sound construction technologies employing wood-based and other materials. Research is also conducted into the management and utilization of trees, plants, insects, and microorganisms toward maintaining and improving the harmony between human activities and the ecosystems that provide the resources consumed by humans. Both basic and applied research will be conducted into future modes of environmentally sustainable human living rooted in cultural wealth, aiming to preserve and conserve forest environments and by doing so improving the human living environment. Innovation is the key goal of this mission, which seeks improvement through the creation of wood-based and other technologies and materials that inherit and preserve human harmony with nature.

Mission 5 Quality of the Future Humanosphere

Rapid expansion of industrial and economic activities has brought drastic changes to the character of the humanosphere, posing environmental threats to healthy, safe, and secure human living. To address this situation, Mission 5 seeks to improve the quality of the humanosphere by applying the fruits of past RISH missions to the achievement of harmony between the environment and human health, to the achievement of a fossil-fuel-free society, and to the building and maintenance of space infrastructure for obtaining and communicating information for daily living, as well as by applying the culture and civilization of wood use to the betterment of society. Mission 5 evolved out of "Frontier Research on the Sustainable Humanosphere," a 5-year, problem-based joint research project conducted by RISH until FY2015. Under Mission 5, RISH will collaborate with communities at home and abroad to drive problem-solving research toward improving the human living environment based on the fruits of all RISH missions.

Mission 5-1 Harmonization of Human Health and the Environment

Bioactive Compounds, Biological Effects of Electromagnetic Fields, and Air Quality Issues

This mission addresses divergent themes related to human health and environmental harmonization, namely, bioactive compounds derived from plant mass, evaluation of biological effects of electromagnetic fields, and air quality issues surrounding human environments.

Mission 5-2 Establishing a Society with Reduced Dependence on Fossil Resources

Plants, Biomass, Energy, and Materials

This mission studies microwave energy transfer, useful plant breeding, and systems for their conversion into energy, chemicals, and materials to help achieve a society less dependent on fossil resources.

Mission 5-3 Space-Atmosphere-Ground Interaction in Daily Life

Maintenance and Utilization of Navigation, Observation, and Communications Functions

Navigation, observation, communications and other social infrastructure functions vital to human living depend heavily on space systems. This mission pursues research for maintaining space infrastructure, including technology development for removing space debris that can harm space systems and technology development for atmospheric sensing.

Mission 5-4 Scientific Research on Wood Selection and its Contribution to Society

Wooden Architecture, Living Environments, Wood Resources/Databases, and Transition of Usage

Studying Japan's cross-cultural exchange involving wood use can yield greater knowledge about Japan's relationship with neighboring countries. This mission seeks to contribute to the establishment of a sustainable, circular society by studying wood use for creating living environments of tomorrow based on a sound understanding of wood utilization.

Research Institute for Sustainable Humanosphere (RISH)
Kyoto University website

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

What is Humanosphere?

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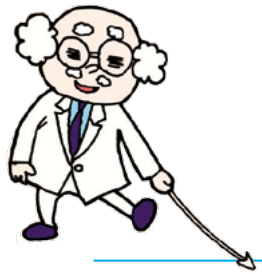
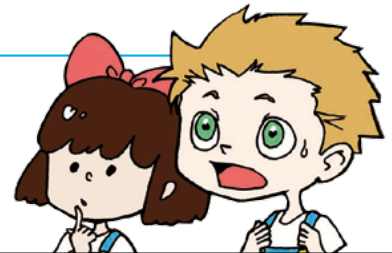
Illustration : Kyoto Seika University



MEMO



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