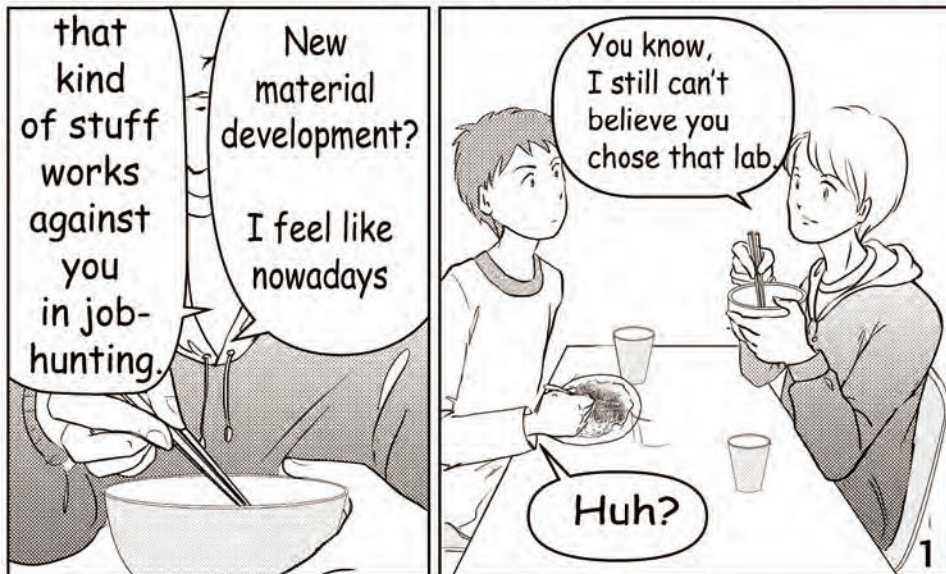


Chapter One: The Uninvited Senior Thesis Student



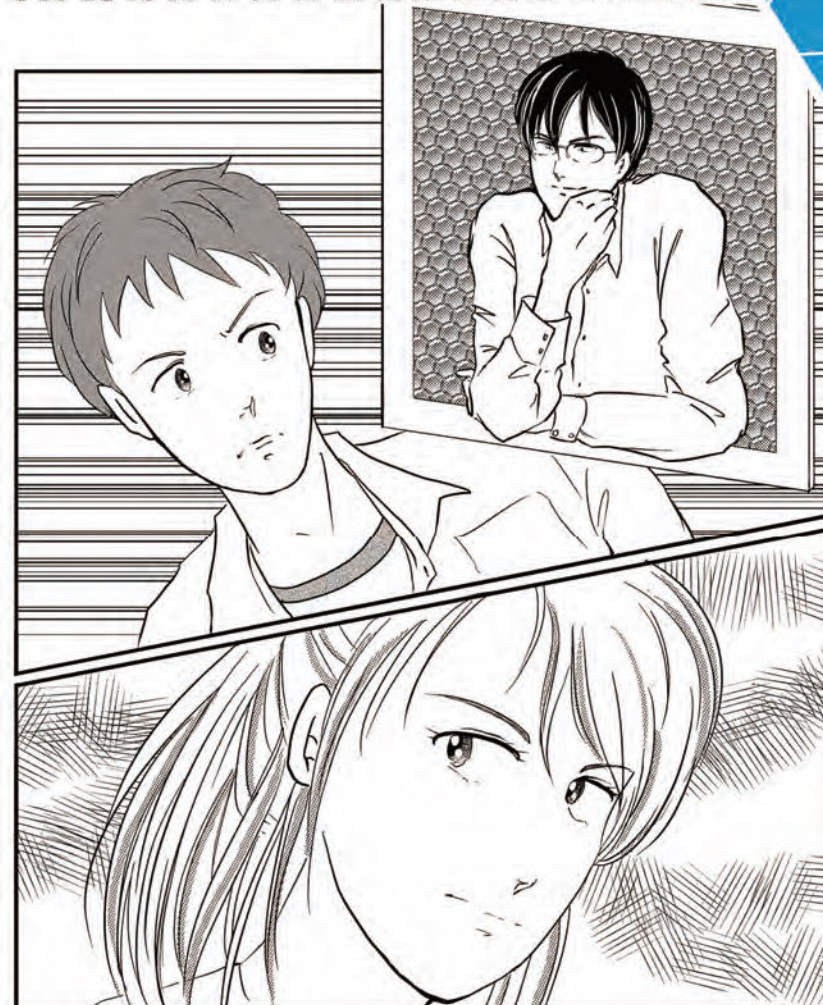
令和3(2021)年度学術変革領域研究(A)

2.5次元物質科学:
社会変革に向けた物質科学のパラダイムシフト

NEWS
LETTER

Welcome to
the 2.5 D Laboratory

© もんでんひでこ



That lab just has the one doctoral student. That's it.

You're telling me you chose it without doing any research?

No way.

No lab welcome party, hiking events?

What's!?

And you know, that doctoral student I hear she's a real nutcase.



けっ
体えな
...!!
Ugh, useless.

Nope.
Of course not.

I mean sure, but that's just not interesting to me.

There should be dreams

In the study...

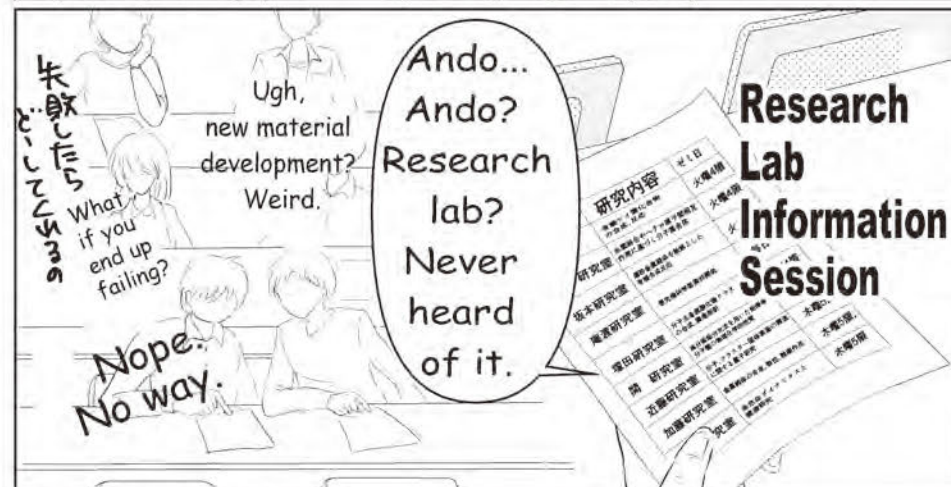
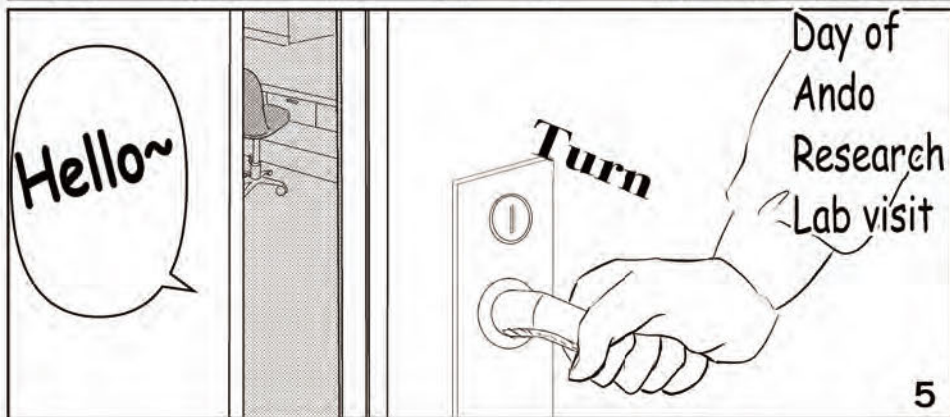
Companies are interested in materials that already have a future not new materials they don't even know if they'll be able to use.

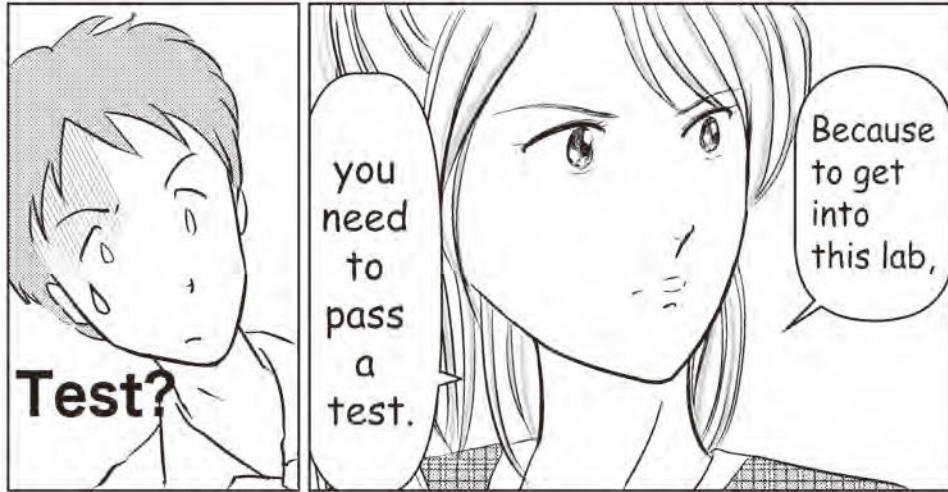
that lab has had zero applicants?

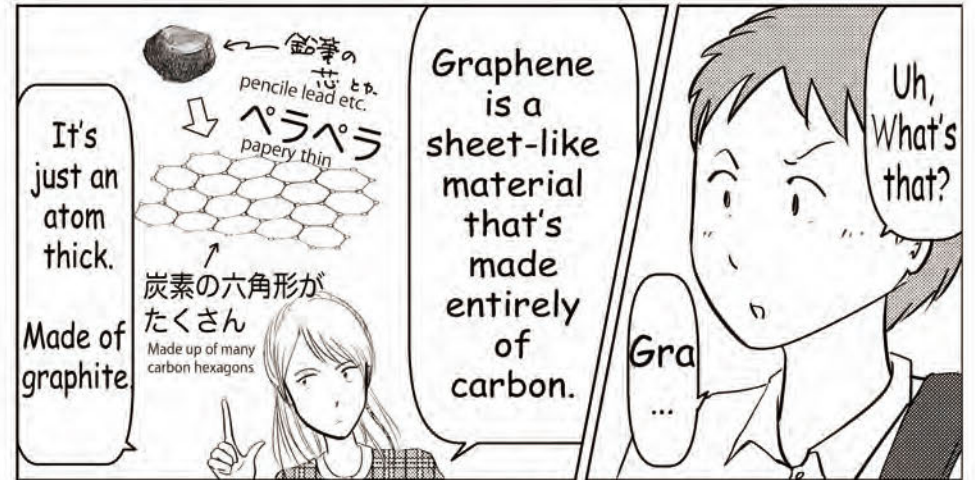
And you know for the past couple years,

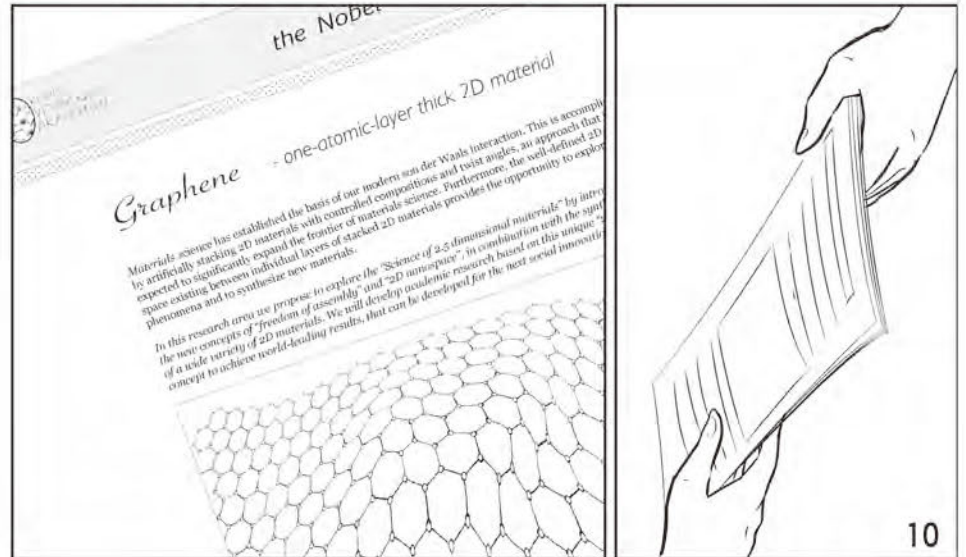
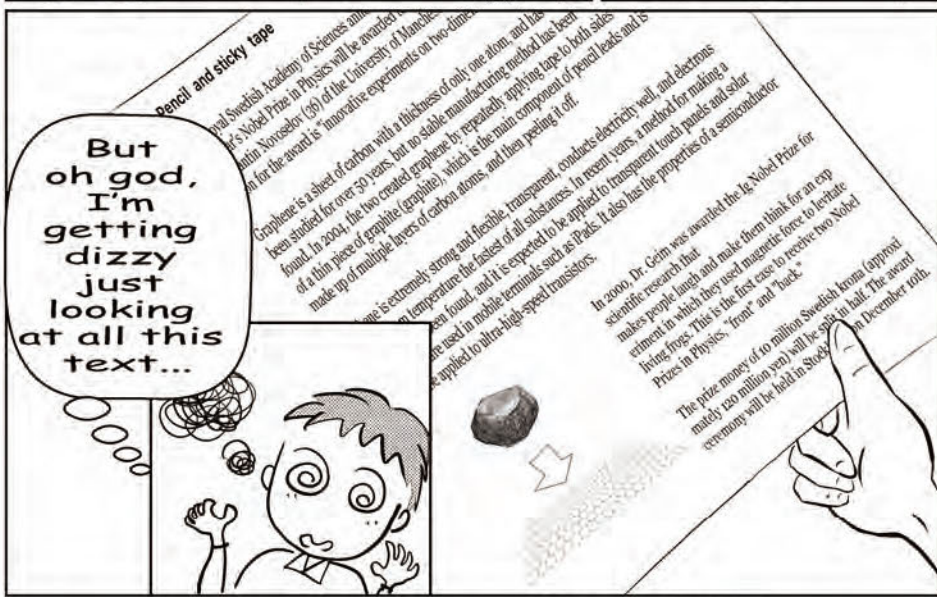
B-But what about?
...Or the others?

Huh?









He won't be around for a while.

Busy with a conference.

Aha

Oops

But I've never see his face!..

Well.

Alright then.

But I'm not even gonna be able to introduce myself?

What should I do this when I'm done reading it?

Squeeze

Oh well. Back to research.

Mm, come back after class the day after tomorrow.

You'll do the same experiment they did to make the graphene.

13

???

This is... cutting-edge science?

They really won the Nobel Prize with that?

Scotch tape is that white tape, isn't it?

They peeled out with that tape?

Um.

Um, excuse me, where's the professor?

Um, excuse me, where's the professor?

Not here?

Not here.

12

I see. So that itself was the mystery.

Smash
 Grind
 Snap

And now that I'm actually thinking about it, how do they even make a sheet that's only an atom thick?

But what were they even planning to do with something like that?

And... the paper she gave me was the one that got them the Nobel Prize.

Electric Field Effect in Atomically Thin Carbon Films
K.S. Novoselov¹, A.K. Geim¹, S.V. Morozov², D. Jiang², Y. Zhang², S.V. Dubonos², I.V. Grigorieva¹, A.A. Firsov¹
¹Department of Physics, University of Manchester, M13 9PL, Manchester, UK
²Institute for Microelectronics Technology, 142432 Chernogolovka, Russia

We describe monocrystalline graphitic films, which are just a few atoms thick but nonetheless stable under ambient conditions, metallic and of remarkably high quality. The films are found to be a two-dimensional semimetal with a tiny overlap between valence and conduction bands and to exhibit a strong ambipolar electric-field effect such that electron and hole concentrations up to 10^{13} cm^{-2} and with room-temperature mobilities $\approx 10,000 \text{ cm}^2/\text{Vs}$ can be in situ tuned by means of gate voltage.

One-sentence summary: We report a naturally occurring flat fullerene molecule, - describe its electronic structure and its ballistic transport at submicrometer scales.

The ability to control electronic properties of modern electronics. In many cases, it is the concentration in a semiconductor device. In the semiconductor industry, there is a constant search for materials that can be used to make transistors that operate at high frequencies and have low power consumption. Graphene, a single layer of carbon atoms, has been shown to have a high carrier concentration and high carrier mobility, making it a promising material for high-speed electronics.

Electric Field Effect? elections and holes...

Whoa. That's pretty cool. single layer graphene... making devices from them...

I guess it conducts electricity really well?

Huh

15

You can't do it, you're out.

Am I gonna be a stray senior, wandering around looking for a lab?

God, I said I'd do it, but... what a situation.

Thank you!

Ando Laboratory

16:34

Thud

Oh well. Time to do some research.

This is the experiment that won them the Nobel Prize

What's Graphene?

Oh well. Time to do some research.

These two really became Nobel Prize winners because of some Scotch tape?

"Super Low-Tech Experiment Wins Scientists Nobel Prize."

2010 Nobel Prize in Physics

Dr. Andre Geim

Dr. Konstantin Novoselov

"Super Low-Tech Experiment Wins Scientists Nobel Prize." Makes a great headline, but... How does that actually work?

14

What is Professor Ando planning to do with this graphene anyway?

ウツ、 Dump

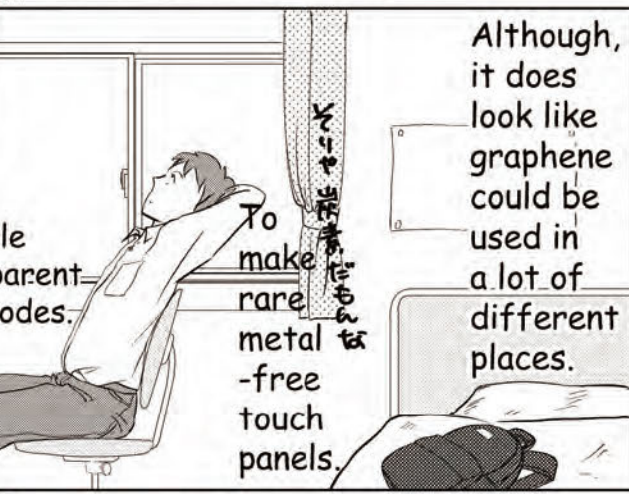


Semiconductors, photonics devices...

Flexible transparent electrodes.

To make rare metal-free touch panels.

CV...



Huh. We can make it bigger.

CV...

科学技術ニュース

科学技術NEWS

Wait. Solar panels?

It can be used to make solar panels?

Graphene is so small.

17

Hey, don't even joke.

Um...

Hey, soon-to-be fifth-year

I guess it wasn't just a flimsy sheet of carbon.

お前がまたか。 You again.

and will probably have to stay another year to graduate?

What, about the fact that you chose a weird lab and won't be able to write a senior thesis

科学技術ニュース

大学前

See, I told you it was a bad idea.

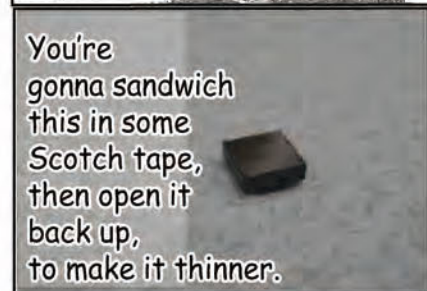
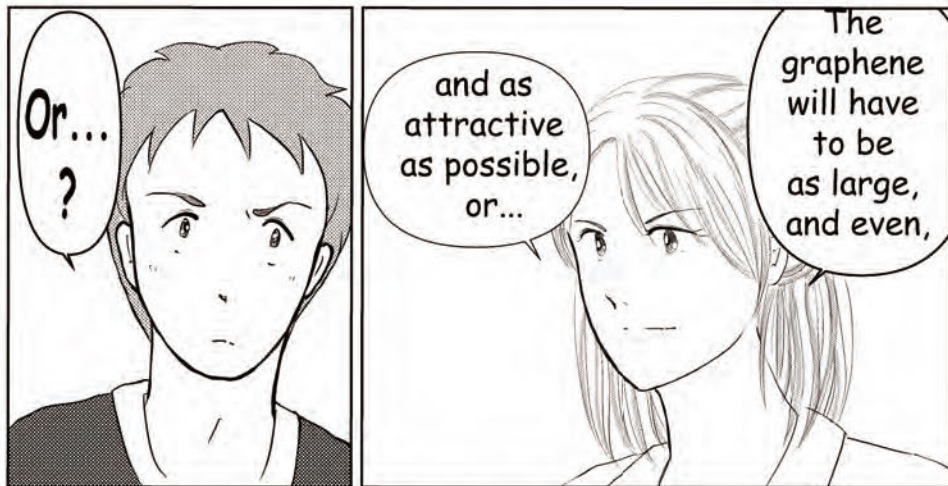
Uh, what?

Really?

あーあ

Turns out they might not even let me into the lab.

16

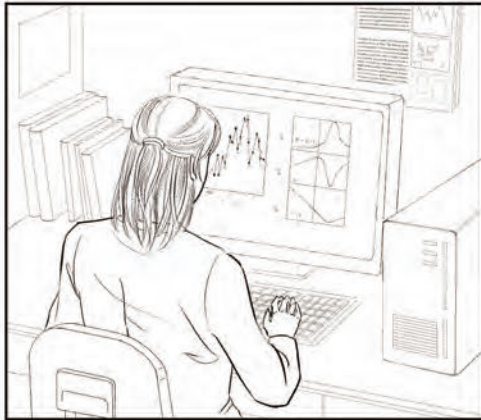


...you'll transfer it to a silicon substrate



Once you do it about 10 times and it gets a lot thinner...





Excuse me,
why does this peel so nicely like this?

10th...

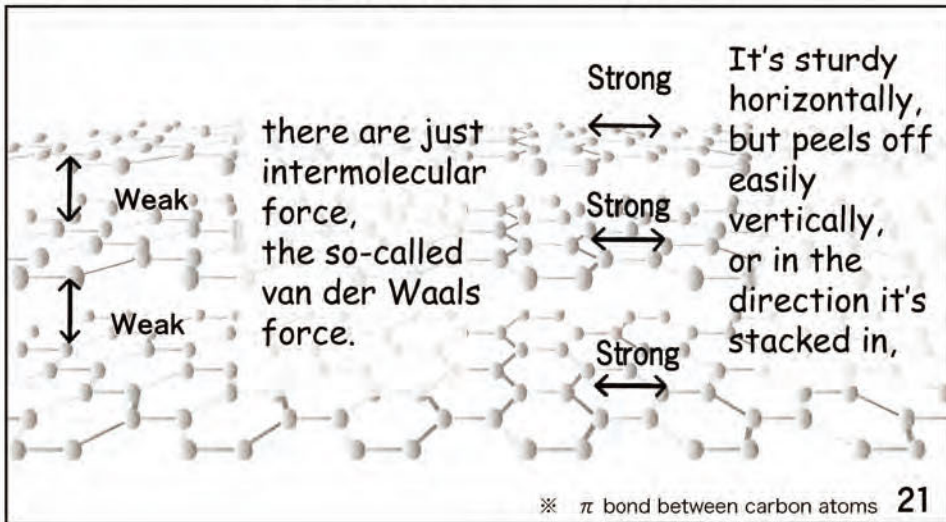
Don't tell me you didn't read the paper.

The van der Waals force.

Turn

Was there such a word?

Ooops



Why is it so small

But god, am I clumsy.



Press it together, and open it back up.

But it's pretty. This is the mass of carbon.

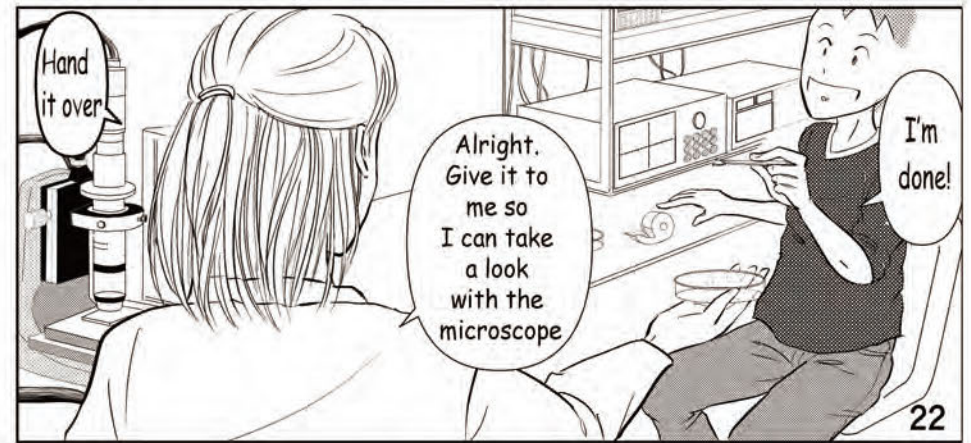
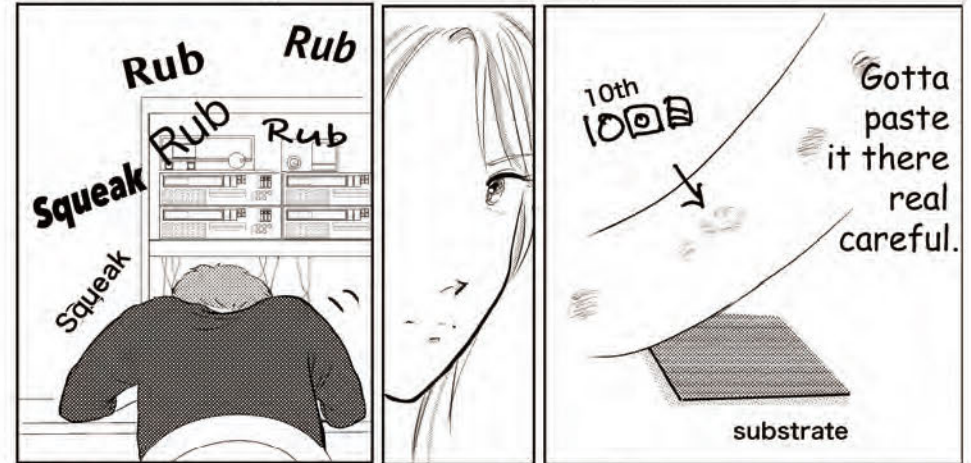
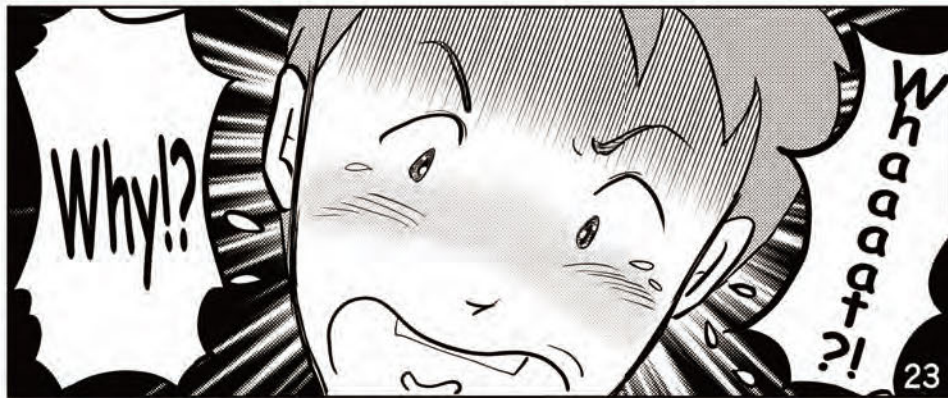
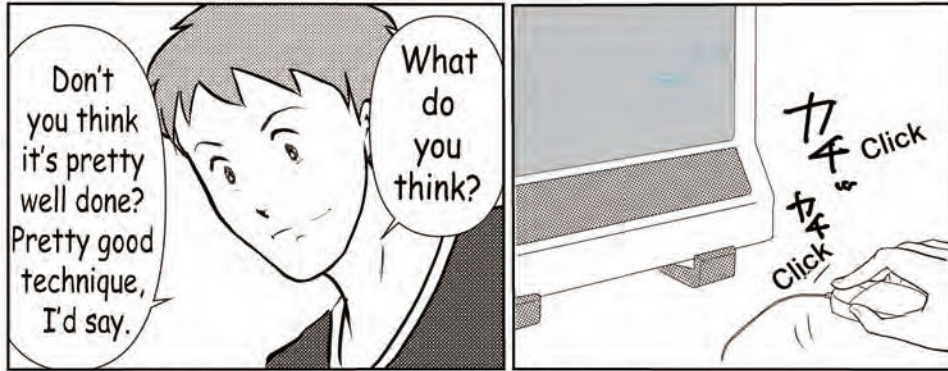
Scared me...

Am I actually pretty good at this?

2nd 1st 3rd

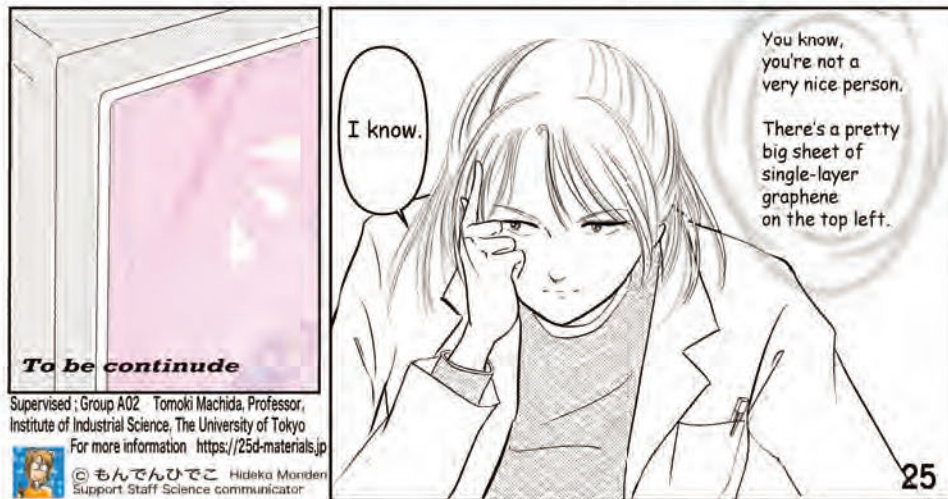
Hey, it actually peels away pretty nicely.

20





What am I supposed to do?



I know.

You know, you're not a very nice person.

There's a pretty big sheet of single-layer graphene on the top left.

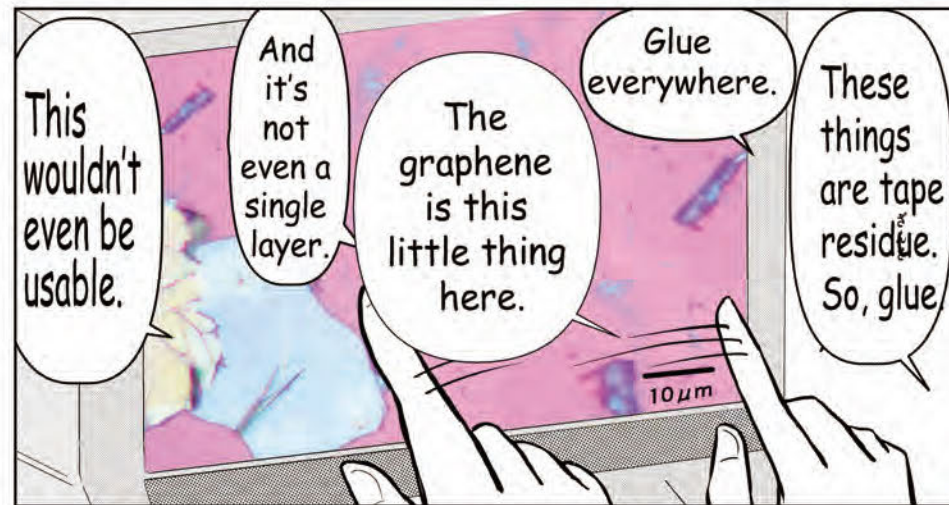
To be continue

Supervised ; Group A02 Tomoki Machida, Professor, Institute of Industrial Science, The University of Tokyo

For more information <https://25d-materials.jp>



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This wouldn't even be usable.

And it's not even a single layer.

The graphene is this little thing here.

Glue everywhere.

These things are tape residue. So, glue



Just one more chance.

P-Please just let me try one more time!



Bye!

and you're brute-forcing it.

I was watching you. And you seem clumsy,

Doesn't matter. You'll get the same results.