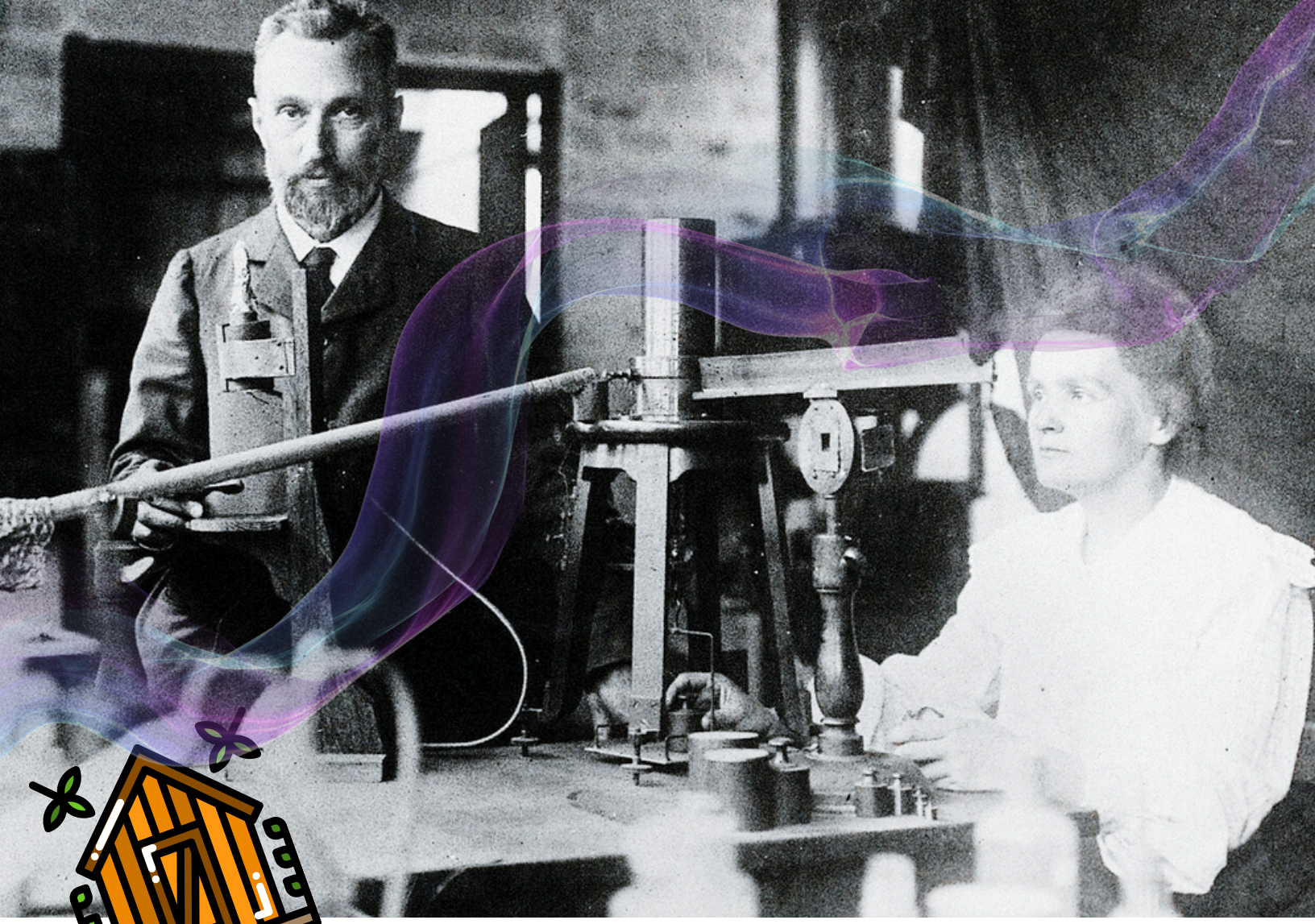


Day 3: Between a Stable and a Potato Shed

Day 3: Between a Stable and a Potato Shed

Marie and Pierre Curie Interactive Story Ideas!

Background scene:
Play this video in the background on a big screen, smart board, or laptop.
Fireflies at Night - Ambient
https://www.youtube.com/watch?v=ZgkLQkihoo8

Storytelling Role-Play: 1-5 sand dollars each
(2 Students to help cut out props and 10 students to role play)
Choose 3 girl students and 3 boy students to portray Marie, Pierre, the ore delivery worker, a grumpy member of the science committee and a glowing firefly.
Let students listen for their part and act out what is happening in the story.

New word: 1-5 sand dollars
***Ore*:** Ore looks like a rock but contains other, more valuable minerals. It is not in its pure state, because ore has lots of rocks and other minerals from Earth's crust mixed in. When Marie saw that the ore was more active than the pure Uranium, she made a hypothesis that this must be because there is something else in the ore...something far more powerful and active.

Day 3: Marie and Pierre Curie

Marie hoped to secure a teaching position and help her homeland at the Polish university, but it denies her a job simply because she is a woman. Pierre convinces her to return to Paris. It is July, 1895, and Pierre and Marie are getting married in a simple ceremony. Ever sensible, Marie says, "I have no dress except the one I wear every day. If you are going to be kind enough to give me one, please let it be practical and dark so that I can put it on afterwards to go to the laboratory." (Dress prompt, wear the dress to the lab!)

They return to the lab like children racing to slides in a park, eager to work. It is a tiny garden shed with a glass roof that doesn't keep the rain out when it's cold, and becomes a sweltering oven when it's hot. Apart from worn pine tables, a stove, and a blackboard—Pierre's favorite—they have little room—or need—for anything else. The important part is their work ethic and amazing ideas. When a scientist friend visits later, he says he thought it was a practical joke that they had done such phenomenal work in such a miserable, 'Cross between a potato shed and a stable.'

With the little money they have, they purchase two bicycles so they can spend happy days exploring the beautiful countryside of France. (Two bicycles prompt, explore the countryside together!) Pierre excitedly surprises Marie with wildflowers in one hand and a croaky frog in the other. When she frowns, he looks crestfallen and says: "But no, see how pretty it is!" and she can't help but agree. To these two fine minds, *everything* is worthy of curiosity, wonder and exploration.

And it's this attitude that makes the most remarkable discoveries possible. In a damp store-room at Pierre's workplace lab, Marie makes a startling discovery. Another scientist, Henri Becquerel, has recently found that the element Uranium produces rays and has been experimenting with X-rays. Marie wants to spend more time understanding *how* a piece of matter can make it possible to see through skin and walls.

"What if..." she says to Pierre, biting her lip in excitement, "What if there is some other element in the ore that makes it behave like this?" The couple order literal tons of ore, or unprocessed rocks that might have Uranium, and who knows what else inside of them, from the Austrian government. When the giant load of brown sacks arrives, still dusty and mixed with prickly pine needles, they are giddy with excitement.

"Are you sure this is what you wanted?" ask the men who have carried the load all the way from what is now the Czech Republic suspiciously. (Sack prompt, put it down and pant because it is heavy.) They are confused—why would anyone be so thrilled to have dusty rocks?

"Oh yes indeed!" cries Pierre, "This exquisite material is exactly what we need."(Pine needles, rock and ore prompt. Marie and Pierre separate them.) They begin
a long, physically grueling and mentally challenging journey of separating the elements inside the rocks to figure out why some materials emit rays, or light.

Copyright WOMENSTEMtech

Day 3: Marie and Pierre Curie

The next two years pass by in a blur. As Marie would later write, it is like being in a dream. They do backbreaking work, shoveling loads of ore, then separating out physical matter like rocks and pine needles, and stirring huge boiling pots with a rod as tall as Marie to perform chemical separations. (Pick, shovel, beaker and cauldron prompt, shovel and break the rocks, boil and add the chemical).

It is July 1889, and their hard work is beginning to pay off. Pierre—who now helps his wife's research full time—and Marie have discovered a brand new element, hundreds of times more active than Uranium! Marie names it polonium, in loving memory of her homeland.

Marie's patience and steady hand with the apparatus Pierre has made means her results are highly accurate. Even though they have discovered Polonium, there is something more.

Later that year, the couple discovers another element that is, in some ways, like young Marie. It glows, and is not affected by high temperatures. It, too, challenges the way elements are expected to behave. In December, they announce they have discovered radium, using the Latin word 'ray' for the rays it produces. (Vial prompt, hold up the vial in victory.)

What follows is a symphony of mind-boggling firsts. Marie becomes the first woman in France to get her doctorate, and in 1903, they win the Nobel Peace Prize! At first, the scientific community haws and hems about awarding it to a woman, writing only Henri and Pierre's names. But Pierre refuses the award without her being recognized. Finally the three are awarded the prize together, with Marie becoming the first woman to receive the prize. They are both the first married couple to share the prize as well. Although they are happy their work is recognized, Pierre hates the publicity and finds it difficult to concentrate with people swarming around them all the time.

Because far more precious than fame or awards is the element they have so painstakingly separated. Often, in the middle of the night, they creep hand in hand into the shed to gaze at the fruit of their labor—a tenth of a gram of Radium. "Why, they're like earthly stars, aren't they, Pierre?" They stand staring in wonder at the luminous silhouettes of the bottles and capsules containing the direct result of their hard work. The glowing tubes look like fireflies suspended in flight, (Glowing firefly prompt, flutter and dance.) or faint fairy lights. It's the most beautiful thing they've ever seen.

Questions/Reading discussion: 1-5 sand dollars
(Students can earn a sand dollar for discussion participation)

Ask: What did Marie and Pierre discover?

Example: Two new elements, Poloniun and Radium

Ask: What was different about these elements?

Example: They glowed

Copyright © STEMTaught

Cut out this sack to try to separate= the ore and the pine needles.

Cut out the ore and pine needles for Marie and Pierre to separate.

Day 3: Marie and Pierre Curie story student props.

Delivery worker: Carry the heavy sack like Santa Claus carries toys on his shoulder. It is heavy. Put it down and pant. Be confused when Marie and Pierre jump up and down.

Marie and Pierre:
Sort the pine needles from the rocks and the ore.

Marie and Pierre:
Sort the pine needles from the rocks and the ore.

Marie and Pierre:
Sort the pine needles from the rocks and the ore.

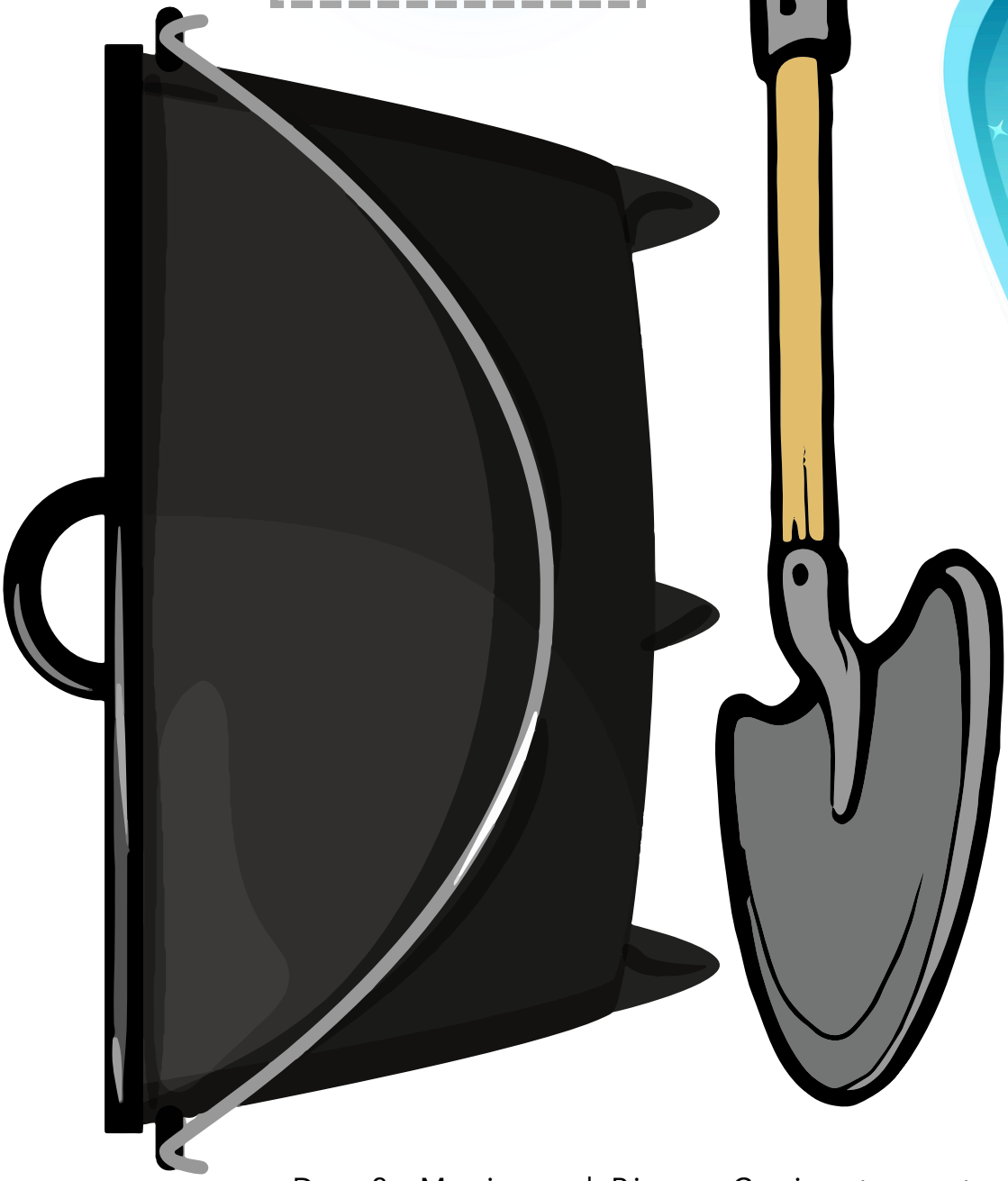
Marie and Pierre:
Sort the pine needles from the rocks and the ore.

Marie and Pierre:
Sort the pine needles from the rocks and the ore.

Marie and Pierre:
Sort the pine needles from the rocks and the ore.

Cut out these materials for the lab and let students be fireflies at the end.

Cut out this vial of Radium for the Curies to carry with them everywhere.



Student firefly:
Dance and twirl around as Marie and Pierre watch. Glow!

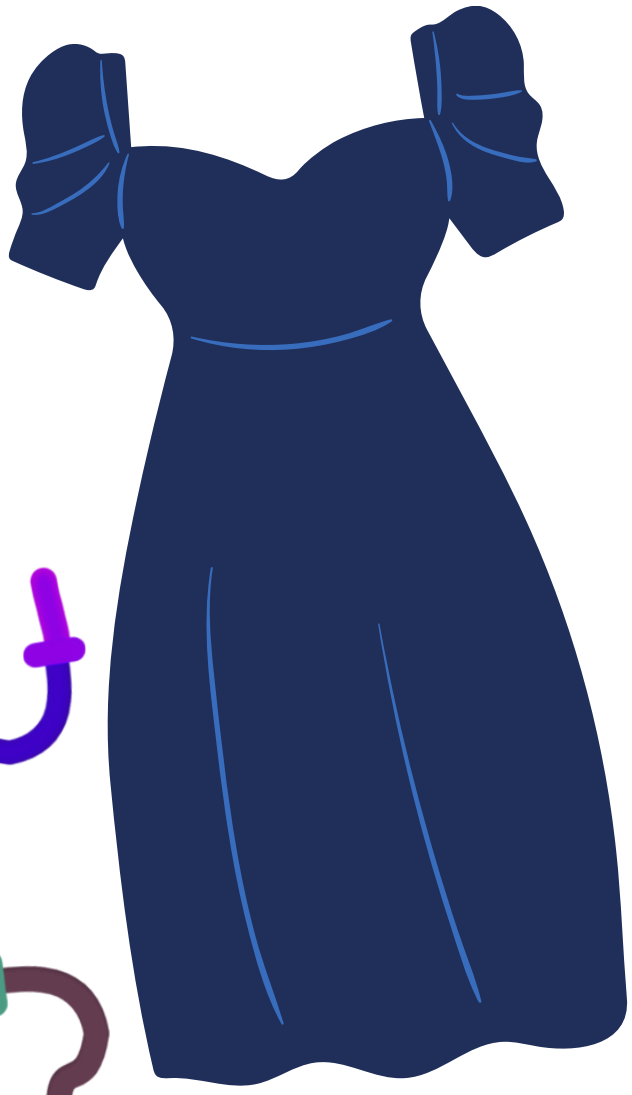
Marie: Finally you have radium! Tuck this vial in your pocket.

Marie: Stand and stir this cauldron full of the ore. It is heavy!

Pierre: Use this shovel to lift heavy loads of ore and pour them into the cauldron.

Student firefly:
Dance and twirl around as Marie and Pierre watch. Glow!

Cut out this dress for Marie to wear.



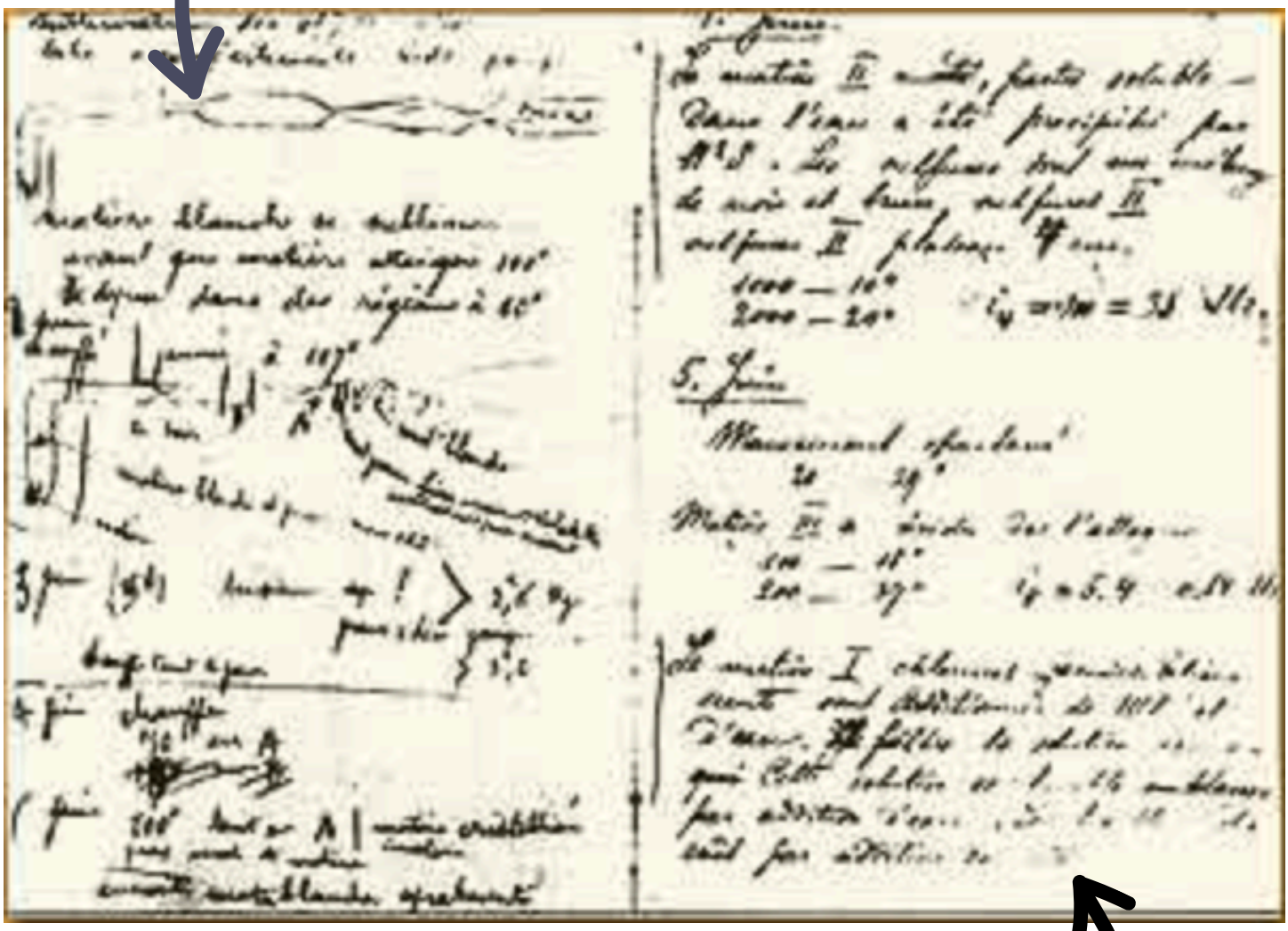
Cut out these bicycles for Pierre and Marie to ride.

Marie: Walk down an imaginary aisle wearing your very sensible dress and then run to the lab.

Marie and Pierre: Ride your bicycles through the beautiful French countryside. Stop frequently to look at flowers and animals. Wave!

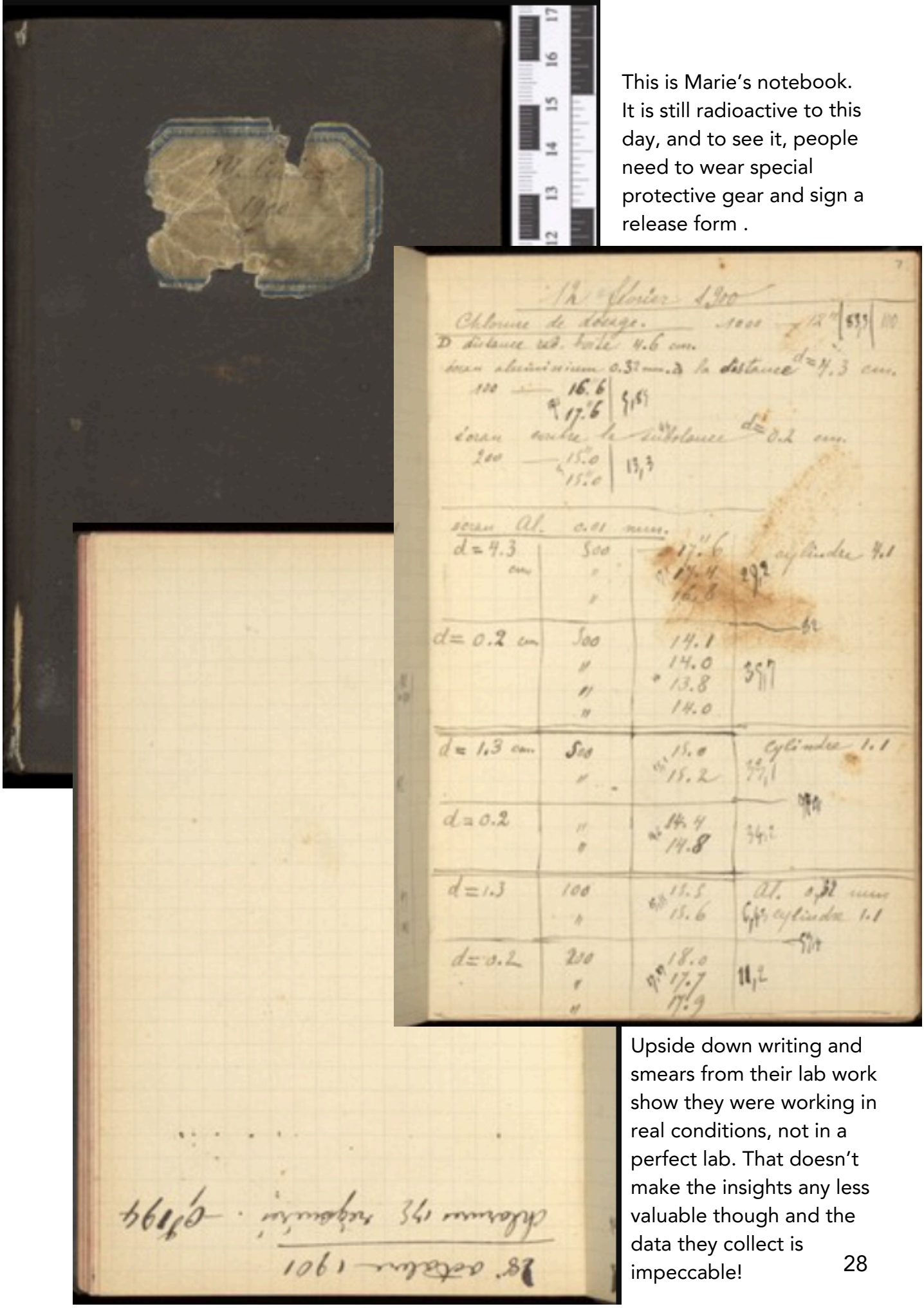
Marie and Pierre: Ride your bicycles through the beautiful French countryside. Stop frequently to look at flowers and animals. Wave!

Pierre is writing about the way to change a solid directly to a vapor in a process called sublimation.



Marie is writing about how to change the structure of a raw material through chemical processing! Photo courtesy: ACJC

The notebooks of Pierre and Marie Curie reveal their love for their work. Sometimes, there are dirt stains overlapping the carefully measured test results. Sometimes, Marie writes upside down. Sometimes, they both write in the same notebooks! That's wonderful, and that's okay!



This is Marie's notebook. It is still radioactive to this day, and to see it, people need to wear special protective gear and sign a release form .

Upside down writing and smears from their lab work show they were working in real conditions, not in a perfect lab. That doesn't make the insights any less valuable though and the data they collect is impeccable!