Introduction: The Case of Ashy Larry (Day 1)

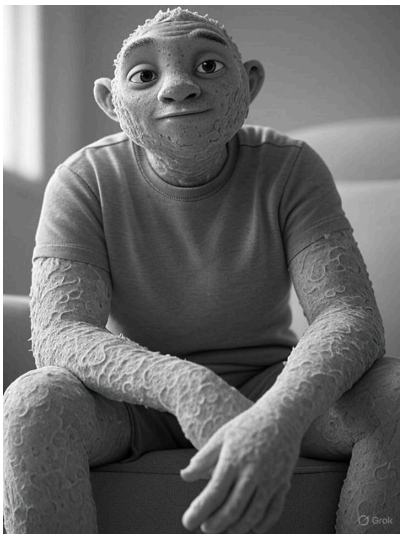
Discussion Starter	Meet Ashy Larry
Have you ever had dry, flaky skin? Maybe you've heard someone say their skin was "ashy"? Let's dive into the science behind this everyday mystery!	Take a close look at the picture of our friend "Ashy Larry." What do you think caused his skin to look like this? Time to put on your scientist hat!

YOUR MISSION

Turn to your partner and brainstorm **two scientific reasons** why Larry's skin might be so ashy and flaky. Think about what's happening at the cellular level! Use your science knowledge to create two explanations:

(1)

(2)



Detective Mission Briefing

Time to solve the case! You're now mitosis detectives investigating the culprit behind ashy, dry skin. The suspect? **Mitosis gone wrong!** Here's the science: "Ashiness" happens when dead skin cells pile up because new cells from mitosis push up too quickly or don't shed evenly, creating those flaky layers we see.

Group Discussion Notes

1	2	3
Write Your Clue You have 2 minutes to write a short clue (1-3 sentences) on a sticky note explaining how mitosis causes ashy skin. Keep it anonymous!	**Exchange Clues** Each table group exchanges their sticky note clues with another group - no peeking at who wrote what!	**Solve the Mystery** Read the clues from the other group and piece together the mitosis mystery.

NOTES:

Mitosis Video Reflection- Identifying the Culprit

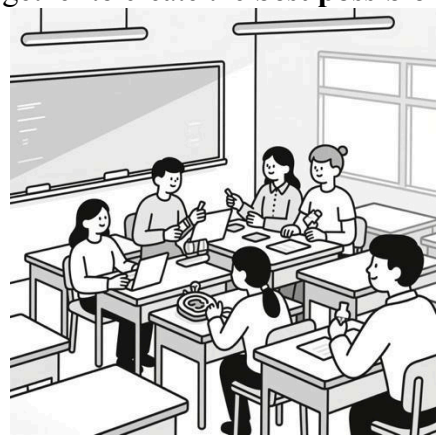
Directions: : Watch the mitosis video carefully with your group. As you observe how cells divide and multiply, work together to explore these key concepts. Take notes and discuss your thoughts - this will help you understand one of biology's most important processes!

1
DNA During Mitosis **Question:** When cells are copied in mitosis, what happens to the DNA? *Write your group's initial thoughts here…*
2
Cell Specialization **Question:** In mitosis, how do some cells become specialized for one function while others specialize in different roles? *Write your group's initial thoughts here...*
3
Growth & Development **Question:** How are things like the size of a tree or the length of our hair explained by mitosis? Write your group's initial thoughts here...

Small Group Detective Discussion

Share & Synthesize

Now it's time to compare ideas! Each group will share their responses to all three questions. Listen carefully to other groups' insights, then work together to create the **best possible answer** for each question that combines everyone's thinking.



Pro Tip: Look for connections between different groups' answers. The best responses often combine multiple perspectives!

Mitosis Debrief Notes

Directions: Get ready to dive deep into the fascinating world of mitosis! During this discussion session, your teacher will guide you through the incredible process of how our cells divide and multiply. This is your chance to connect the dots between what you've learned and how mitosis actually works in your body every single day.

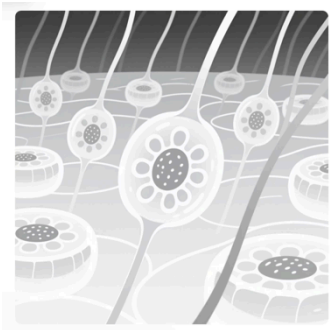
Listen Actively	**Take Detailed Notes**	**Reflect & Compare**
Pay close attention as your teacher explains the main concepts of mitosis. Focus on the key phases: prophase, metaphase, anaphase, and telophase.	Use the space provided to jot down important information about mitosis. Write down new vocabulary terms, draw simple diagrams if helpful.	As you learn, think about your previous understanding of cell division. What concepts are becoming clearer?

NOTES

Exit Ticket

Directions: Before student leave the room, they will answer two questions on an index card and hand it to the teachers:

(1) Explain how mitosis might be responsible for dry, "ashy" skin?



Pro Tip: Think about your

(2) **Why role does lotion play in the process?**

(3) **What else would you like to know about mitosis?**

Day 2: Seeing Mitosis Up Close

TIME	TASK	DESCRIPTION	NEEDS
10	**Look & Tell**	**Directions:** Join the google form. For the next few minutes you will watch a time lapsed video of skin cell repairing after an injury. As you watch answer the question in the google form. (1) What is happening beneath the skin for this to happen?	Video of skin growth (link)
5	**Min Lecture**	For 5 minutes the teacher will explain how mitotic cell division is happening beneath the skin	Teacher lecture notes
10	**Going Deep**	**Directions:** In the next few minutes we will look deep into the cell to see what cell replication look like. Be prepared to share your answer in the google form. (1) Explain mitosis in Bacteria. (2) Explain how mitosis heals cuts and wounds.	Slide deck and handout materials Video (Link)
10	**Review**	The teacher will review some of the answer for a brief discussion	
40 min	**Laboratory**	Students will use their digital microscopes for the laboratory activity working in groups of 3	Class set of 3D Printed Microscopes AR App downloaded on Phones Lab Instructions in Handout + Slides
10	**Debrief**	The teacher will lead a discussion. What were you able to see in the microscope? What evidence is now clear about mitosis. What was interesting about your observations?	Slide deck and handout materials

Look & Tell

Directions: Join the google form. For the next few minutes you will watch a time lapsed video of skin cell repairing after an injury. As you watch answer the question in the google form.

(1) What is happening beneath the skin for this to happen?

(2) How is this connected to ashy, flaky, or dry skin?

Lecture Notes

Directions: For 5 minutes the teacher will explain how mitotic cell division is happening beneath the skin, use the space below to take notes.

Going Deep

Directions: In the next few minutes we will look deep into the cell to see what cell replication look like. Be prepared to share your answer in the google form. (1) Explain mitosis in Bacteria. (2) Explain how mitosis heals cuts and wounds.

Explain how mitosis works in Bacteria?
Explain how mitosis heals cuts.

Teacher Review Notes

The teacher will review some of the answer for a brief discussion

Mitosis Laboratory

Directions: Students will use their digital microscopes for the laboratory activity working in groups of 3

Debrief Discussion

Directions: After our lab work in your small group to discuss these 3 question. Be sure to hear from every member of your group. Each person will share what they think now about the process of mitosis and ashy, dry, flaky, skin.

1
DNA During Mitosis **Question:** When cells are copied in mitosis, what happens to the DNA? *Write your group's initial thoughts here…*
2
Cell Specialization **Question:** In mitosis, how do some cells become specialized for one function while others specialize in different roles? *Write your group's initial thoughts here...*
3
Growth & Development **Question:** How are things like the size of a tree or the length of our hair explained by mitosis? Write your group's initial thoughts here...

Day 3: Building your Ad for Mitosis Products

TIME	TASK	DESCRIPTION	NEEDS
10	**Read & Retell**	**Directions:** To Start class, we will read a brief reading about mitosis. As your read prepare by first reading the questions about the text, then read the full text. Be prepared to share what you learned from the reading.	Short Reading on Mitosis
15	**Re-tell & Apply**	**Directions:** Working in your small group, reflect on what you learned in your reading. Come up with 2 explanations: (1) Explain how Ashy Larry might be ashy and offer a solution? (2) Imagine our friend Mayra fell and injured herself skating a Cunningham Park in San Jose. How does mitosis explain how the injury might heal?	Slide deck and handout materials
40	**Ad Campaign**	**Directions:** Your job is to create a brief advertisement for TikTok, Instagram or YouTube. In your Ad Campaign you will explain the process of mitosis, discuss the DNA exchange in the process, and discuss how it is responsible growth. You you will share your ad by a link to your teacher.	Slide deck and handout materials
25	**Group Grade with Rubric**	**Directions:** Working in small groups, each group will be assigned another group's ad and a rubric to analyze. Analyze the ad, score it using the rubric, and give feedback for each group to improve their ad using the google form.	We need a rubric for assessing add campaigns
HW	**Revise & Resubmit**	**Directions:** For homework, each group of 3 will turn in their revised project and the rubric feedback information	Slide deck and handout materials

Read & Retell

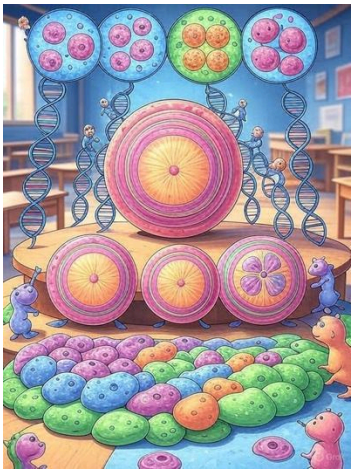
DIRECTIONS: To start class, we will read a brief reading about mitosis. As you read, prepare by first reading the questions about the text, then read the full text. Be prepared to share what you learned from the reading.

MITOSIS MINI TEXT

Mitosis: The Cell's Wild Dance Party of Division!

Welcome to the World of Mitosis – Where Cells Multiply Like Rabbits on a Sugar Rush!

Hey there, Biologists Imagine your body as a massive construction site that's always buzzing with activity. Cells are the workers, and sometimes they need to make more of themselves to build bigger and better things – like growing taller or healing a scraped knee. That's where mitosis comes in! Mitosis is like the cell's ultimate copy-paste function, where one cell splits into two identical twins. But hold up – it's not just any split; it's a carefully choreographed dance that ensures everything, especially the DNA, gets duplicated perfectly. Without mitosis, you'd still be a single-celled blob floating in a pond. Yikes!



Now, let's zoom in on the star of the show: **DNA replication.** This happens *before* the actual mitosis party kicks off, during a chill phase called *interphase.* DNA is like the blueprint for life – a twisty ladder made of nucleotides. Scientists have given each of these nucleotides names. (think of them as Lego bricks with letters Adenine, Thymine, Cytosine, and Guanine). To replicate, the DNA helix "unzips" like your favorite pair of jeans. Enzymes (the cell's little helpers) break the bonds between the bases, and new nucleotides float in to match up: A with T, C with G. They match with each other based on their shape. It's like a puzzle. Once done, you have **two identical DNA strands**, each coiled into chromosomes. Before the cell makes another copy it has 2 set of DNA in this interphase. This ensures the new cells get the full set of instructions – no half-baked recipes here.

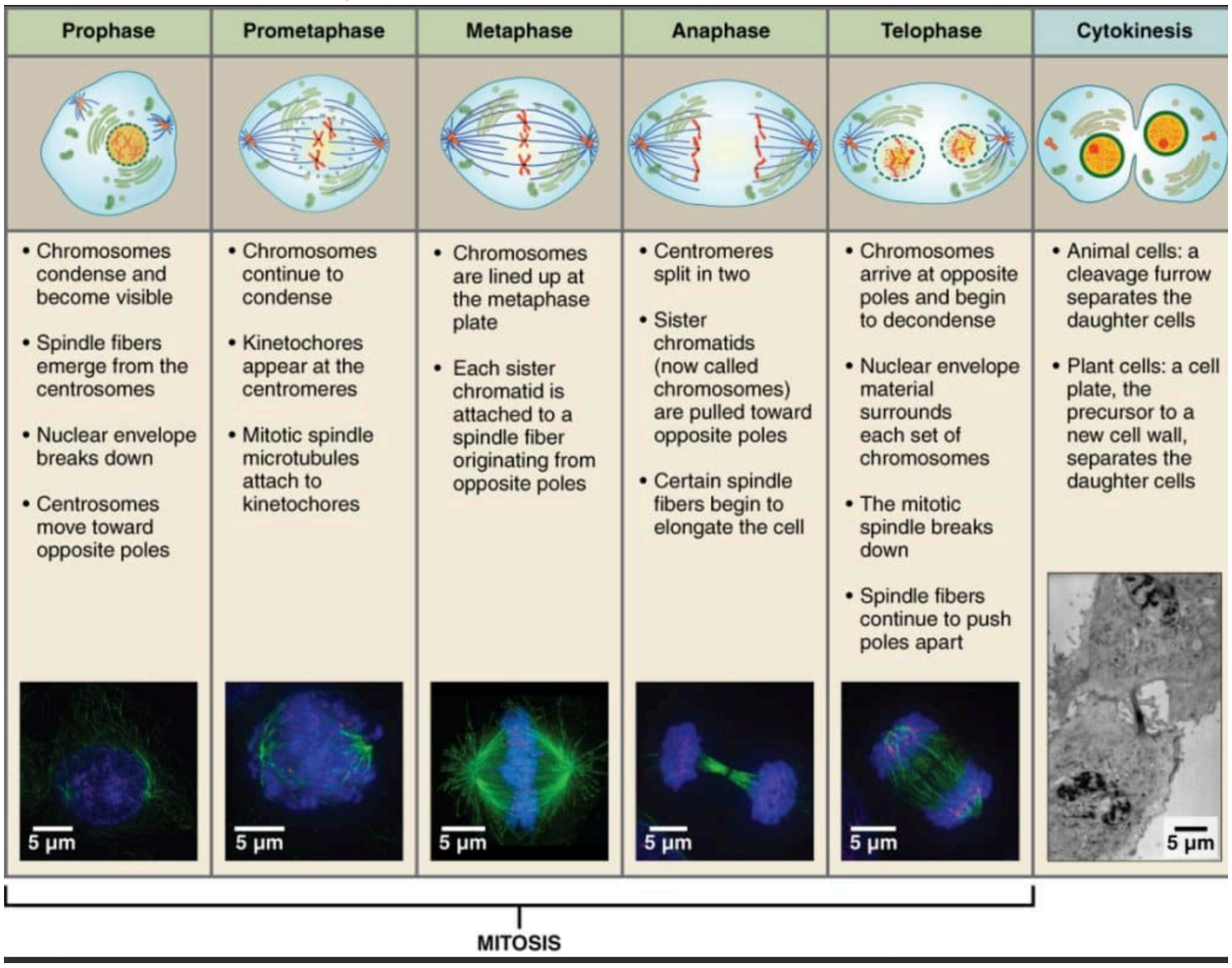
But why all this fuss? DNA replication is crucial because it passes on genetic info for traits for everything our cells do. This could mean information about size, color, and function. Mistakes? That's when things get wonky, like a photocopy with smudges leading to mutations. Hilarious in cartoons, but serious in real life!

The Mitosis Moves – Prophase to Telophase, With DNA Taking Center Stage!

Alright, scientists now that DNA's duplicated, mitosis cranks up the music with four main stages: prophase, metaphase, anaphase, and telophase (plus cytokinesis to split the cell). Think of it as a rock concert where chromosomes are the rock stars.

In **Prophase** the chromosomes *thicken up like* bodybuilders flexing – you can see them under a microscope now! The nuclear membrane dissolves like it got stage fright, and spindle fibers (like invisible ropes) form from centrosomes. DNA's role? Those duplicated chromosomes *pair up as sisters, connected at the centromere, ready to be pulled apart.*

Next, **Metaphase:** The chromosomes line up at the cell's equator like kids in a lunch line. Spindle fibers attach to each centromere, tugging gently. It's tense – one wrong move, and the DNA copies could go haywire!



Then **Anaphase** hits like the drum solo: **The sister chromatids (DNA copies) split** and zoom to opposite ends, pulled by the spindles. Each pole gets a full set of chromosomes – fair share for everyone!

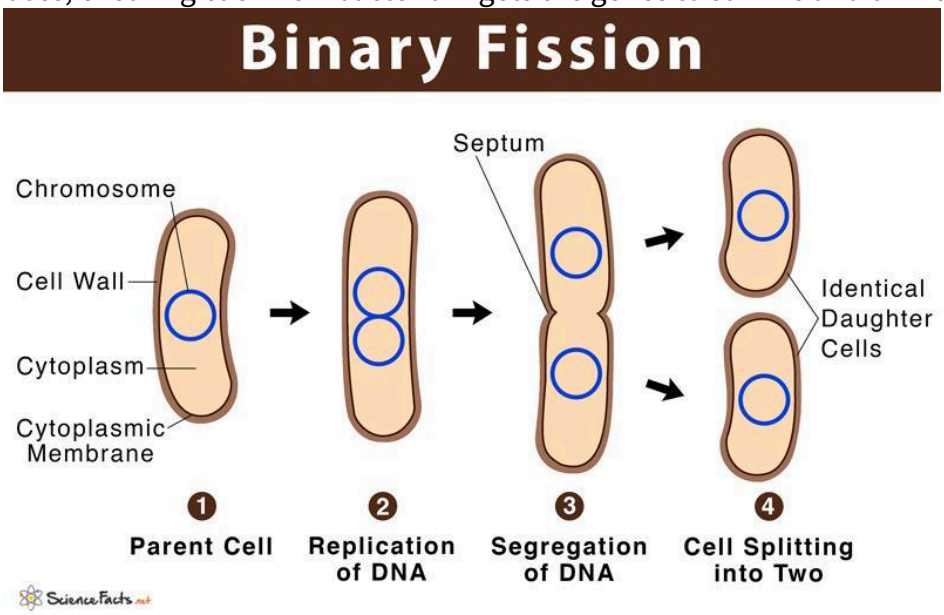
Finally, **Telophase** Chromosomes unwind, nuclear membranes reform, and it's curtain call. **Cytokinesis** follows, pinching the cell in two (more on that later). The whole thing takes about an hour – faster than binge-watching an episode!

Mitosis Across the Kingdom – Animals, Plants, and Bacteria Get Their Groove On!

Mitosis isn't a one-size-fits-all deal; it varies by organism. In Animals (like you and your pet dog), it's all about that pinch! During cytokinesis, a ring of proteins squeezes the cell like a belt too tight after pizza night, forming two daughter cells. DNA replication ensures growth – think of a puppy turning into a full-grown dog because skin, muscle, and bone cells multiply with identical DNA.

For Plants things are stiffer thanks to rigid cell walls. Instead of pinching, a cell plate forms in the middle like a wall being built by tiny construction elves. Vesicles dump materials to create new walls, splitting the cell. DNA drives plant growth too – a seedling sprouts leaves because root and stem cells divide, copying DNA for more chlorophyll-making machinery.

Now, Bacteria They're **Prokaryotes,** so no fancy mitosis stages – they *do binary fission*, a simpler cousin. DNA replicates (unzips and matches bases, just like eukaryotes), attaches to the membrane, and the cell elongates before pinching in two. It's like mitosis on easy mode: quick and dirty, perfect for bacteria multiplying in your yogurt overnight. But DNA's still the boss, ensuring each new bacterium gets the genes to survive and thrive.



In animals, mitosis heals your cut finger by replicating skin cell DNA – like photocopying repair manuals. In plants, it grows your backyard tomato from a seed, with DNA dictating juicy red fruit. Bacteria? They use it to turn milk into cheese – yum or gross, depending on your taste!

So, how does DNA fuel growth? In animals, mitosis copies DNA to add cells for height (bones elongating) or muscle (from scrawny to strong after workouts). Example: A baby elephant grows massive ears because ear cells divide, replicating DNA with "big ear" instructions. Without it, you'd stay baby-sized forever – adorable, but impractical!

Plants grow similarly: DNA replication in meristem cells (growth tips) adds length to roots (for water) or height to stems (for sun). Think of a sunflower stretching tall – mitosis duplicates DNA with "grow upward" genes, turning a sprout into a giant.

Differentiation

But wait, mitosis leads to **Differentiation** too! All those identical daughter cells don't stay the same; they specialize based on DNA signals. In animals, some become nerve cells (for thinking about pizza), others muscle (for eating it). It's like stem cells at a career fair, reading DNA resumes to pick jobs. In plants, differentiated cells form bark (tough protection) or flowers (pretty pollinators). Bacteria don't differentiate much – they're simpletons – but in multicellular organisms, it's how a zygote becomes a full you! If cells didn't differentiate, you'd be a blob of identical blobs – like a human-shaped jelly. Thanks, mitosis and DNA, for the variety!

NOTES:
(Use this space to jot down key points from the reading, answers to questions, and what you'll share.)
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Re-tell & Apply

Directions: Working in your small group, reflect on what you learned in your reading. Come up with 2 explanations:

(1) Explain how Ashy Larry might be ashy and offer a solution?

(2) Imagine our friend Mayra fell and injured herself skating at Cunningham Park in San Jose. How does mitosis explain how the injury might heal?

Notes Section

(Use this space to brainstorm group explanations, ideas for solutions, and connections to mitosis.)

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Ad Campaign

Directions: Your job is to create a brief advertisement for TikTok, Instagram or YouTube. In your Ad Campaign you will explain the process of mitosis, discuss (1) the DNA exchange in the process, (2)discuss how it is responsible for growth, (3) Explain how mitosis different in Bacteria, & (4) Explain how Mitosis is connected to differentiation. You will share your ad by a link to your teacher.

Notes Section

(Use this space to outline your ad script, sketch ideas for visuals, and note key mitosis facts to include.)

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Group Grade with Rubric

Directions: Working in small groups, each group will be assigned another group's ad and a rubric to analyze. Analyze the ad, score it using the rubric, and give feedback for each group to improve their ad using the Google form.

9th Grade Science: Mitosis Ad Campaign Rubric

Criteria	4 - Exceeds Expectations	3 - Meets Expectations	2 - Approaching Expectations	1 - Needs Improvement
Explanation of Mitosis Concept	Provides a clear, thorough, and accurate explanation of mitosis with detailed scientific language	Provides a clear and accurate explanation of mitosis	Explanation of mitosis is somewhat clear but lacks detail or has minor inaccuracies	Explanation of mitosis is unclear, incomplete, or inaccurate
Description of DNA Replication in Mitosis	Describes DNA replication process during mitosis accurately and in detail	Describes DNA replication process accurately	DNA replication description is incomplete or somewhat inaccurate	DNA replication description is missing or incorrect
Explanation of Growth via Mitosis	Clearly and accurately explains how human and plant growth result from mitosis	Adequately explains how growth is related to mitosis	Explanation of growth related to mitosis is limited or partially incorrect	Explanation of growth and mitosis connection is missing or inaccurate
Comparison: Bacterial vs. Plant/Animal Mitosis	Provides a detailed, accurate comparison highlighting key differences	Provides an accurate comparison of differences	Comparison is superficial or partially inaccurate	Comparison is missing or incorrect
Connection Between Mitosis and Differentiation	Explains clearly and accurately how mitosis is connected to differentiation with specific examples	Provides a clear explanation of the connection between mitosis and differentiation	Explanation of connection is vague or partially inaccurate	Explanation is missing or incorrect
Creativity and Functionality of Ad Campaign	Ad campaign is highly creative, engaging, and fully functional on chosen platform; demonstrates excellent artistic elements	Ad campaign is creative, engaging, and functional on chosen platform; includes good artistic elements	Ad campaign shows some creativity; functional but may lack engagement or artistic quality	Ad campaign lacks creativity, is not functional, or is missing key components
Clarity and Communication	Information is communicated clearly, logically, and effectively; language is appropriate for the audience	Information is clear and generally easy to follow; language is appropriate	Communication is somewhat unclear or disorganized; language may be too technical or too simple	Communication is unclear, confusing, or inappropriate for the audience
Submission and Link Sharing	Ad campaign link is submitted correctly and accessible without issues	Ad campaign link is submitted and accessible	Link submission is late or has minor accessibility issues	Link is missing or not accessible

Notes Section:

(Use this space to record scores, feedback points, and suggestions for improvements based on the rubric.)

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Revise & Resubmit

Directions: For homework, each group of 3 will turn in their revised project and the rubric feedback information.

Notes Section:
(Use this space to plan revisions based on feedback, list changes to make, and reminders for submission.)

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