# Using Tablet PCs to Help Students Become Better Collaborators, Critical Thinkers, and Communicators

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*Collaborator: Kathryn Miller, Professor, Biology*

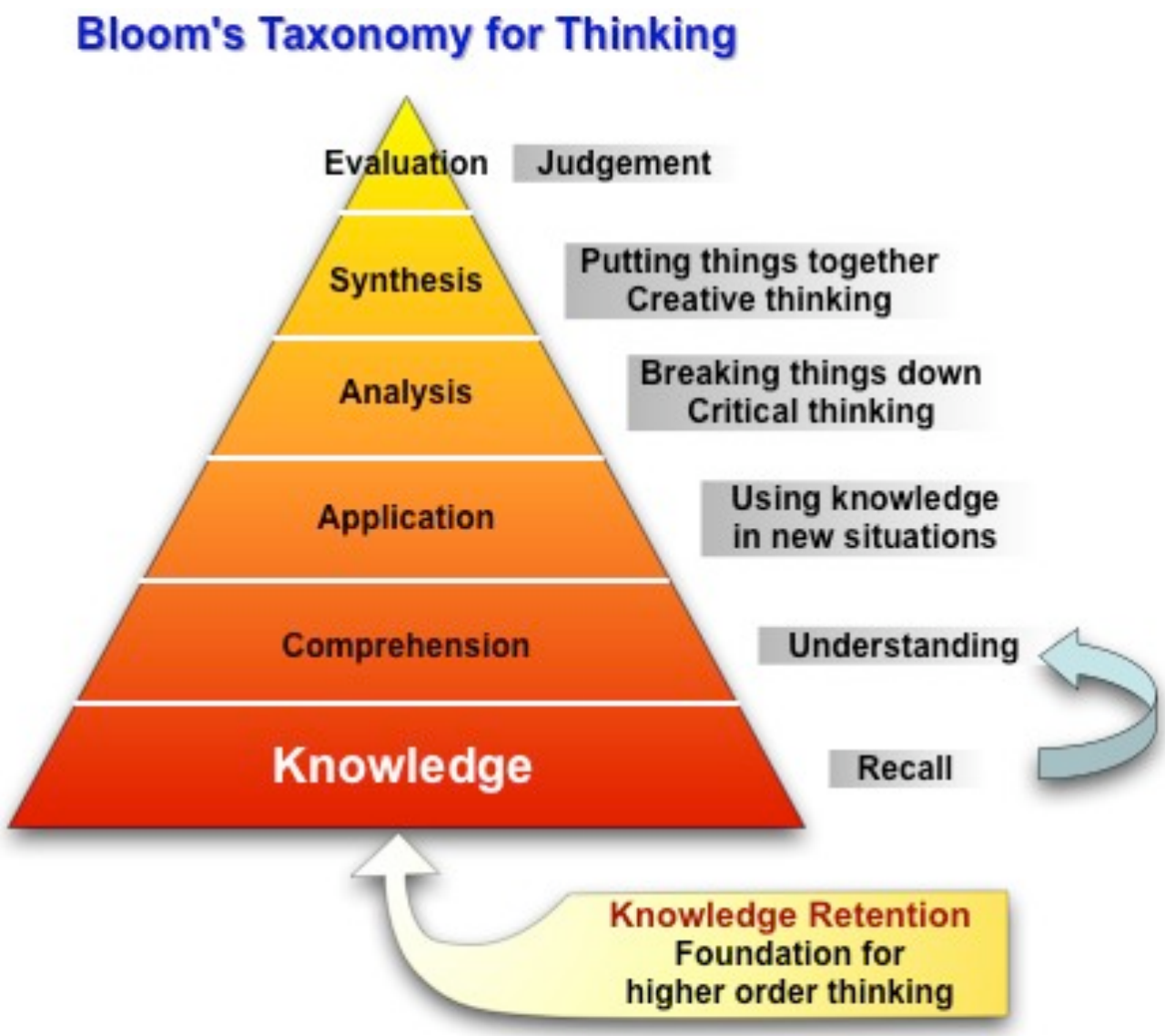
# The course

Biology 3191:

Molecular mechanisms in development

# Goals for the course

- Goals
- Why?


Bloom's Taxonomy for Thinking
Evaluation
Judgement
Synthesis
Putting things together
Creative thinking
Analysis
Breaking things down
Critical thinking
Application
Using knowledge
in new situations
Comprehension
Understanding
Knowledge
Recall
Knowledge Retention
Foundation for
higher order thinking

## How we used the Tablet PCs

1. Taking notes

2. Group discussion about data papers

3. Presentation of group work to the class

4. In-class writing assignments

# Daily Logistics

Before class:

1. Convert ppt file to jnt and upload to Telesis

In class

1. Students each grab “their” computer from cart
2. Download jnt file for that day from Telesis
3. Join class network if requested
4. Save as jnt, tif, or pdf on D drive and on a USB drive

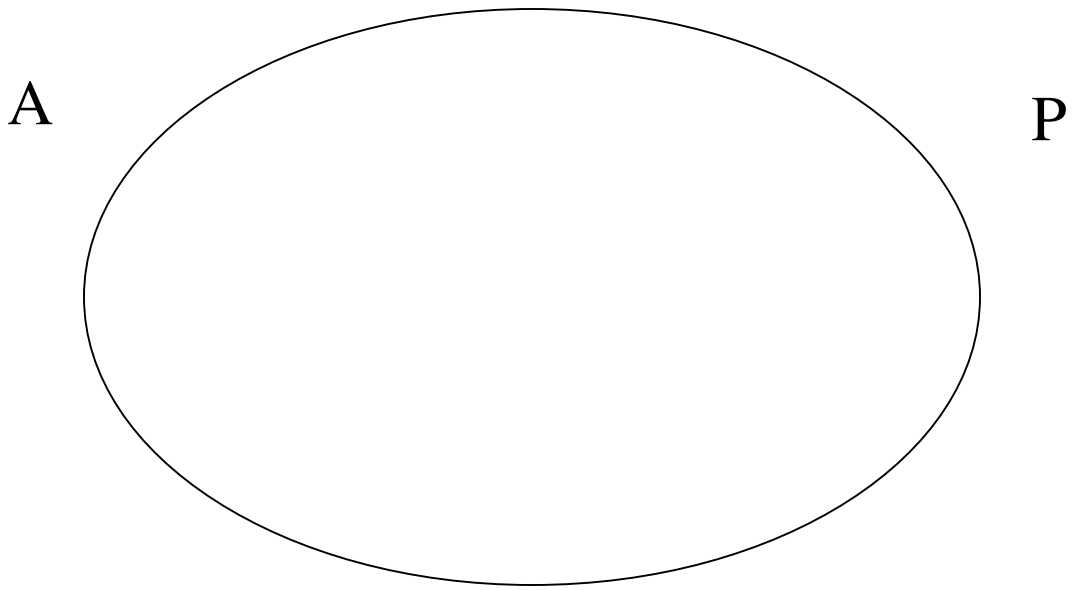
# Notebook PCs: an experiment!

- Label with your name
- Select the same computer for each class session
- Join the wireless network
- Use your first name (don’t use ‘student,’ which is the default)
- Go to telesis page and download windows journal file for class session (.jnt file)
- Open this file in windows journal
- use the pen to take notes (try some simple tasks)
- Save as a .tiff to external drive so you have access to class notes and materials
- All but D drive is erased upon shutdown/reboot

# 1. Taking Notes

**In *Caenorhabditis elegans*, a series of early asymmetric cleavages produce six founder cells with different cleavage patterns and cell fates. Anterior-posterior (A-P) polarity is established during the first cell cycle and correlates with a dynamic rearrangement of cytoplasm along the A-P axis which is defined by an extrinsic cue provided by sperm (Goldstein and Hird, 1996). Microfilaments accumulate at the anterior periphery (Strome, 1986), central cytoplasm flows toward the posterior pole and cortical cytoplasm flows in the opposite direction (Hird and White, 1993). The first mitotic spindle is placed posteriorly and the first cleavage becomes asymmetric, producing a large cell, AB, in the anterior and a small cell, P1, in the posterior.**

# My slide before class



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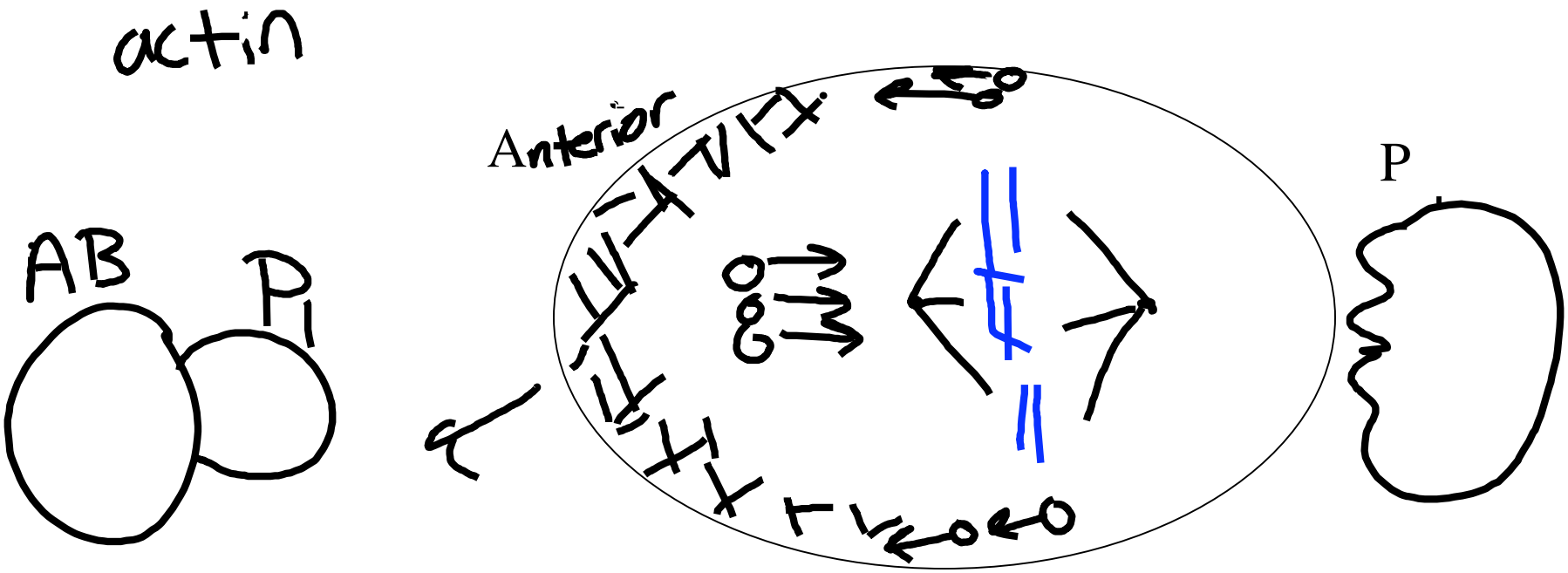

# Copy of a student's file

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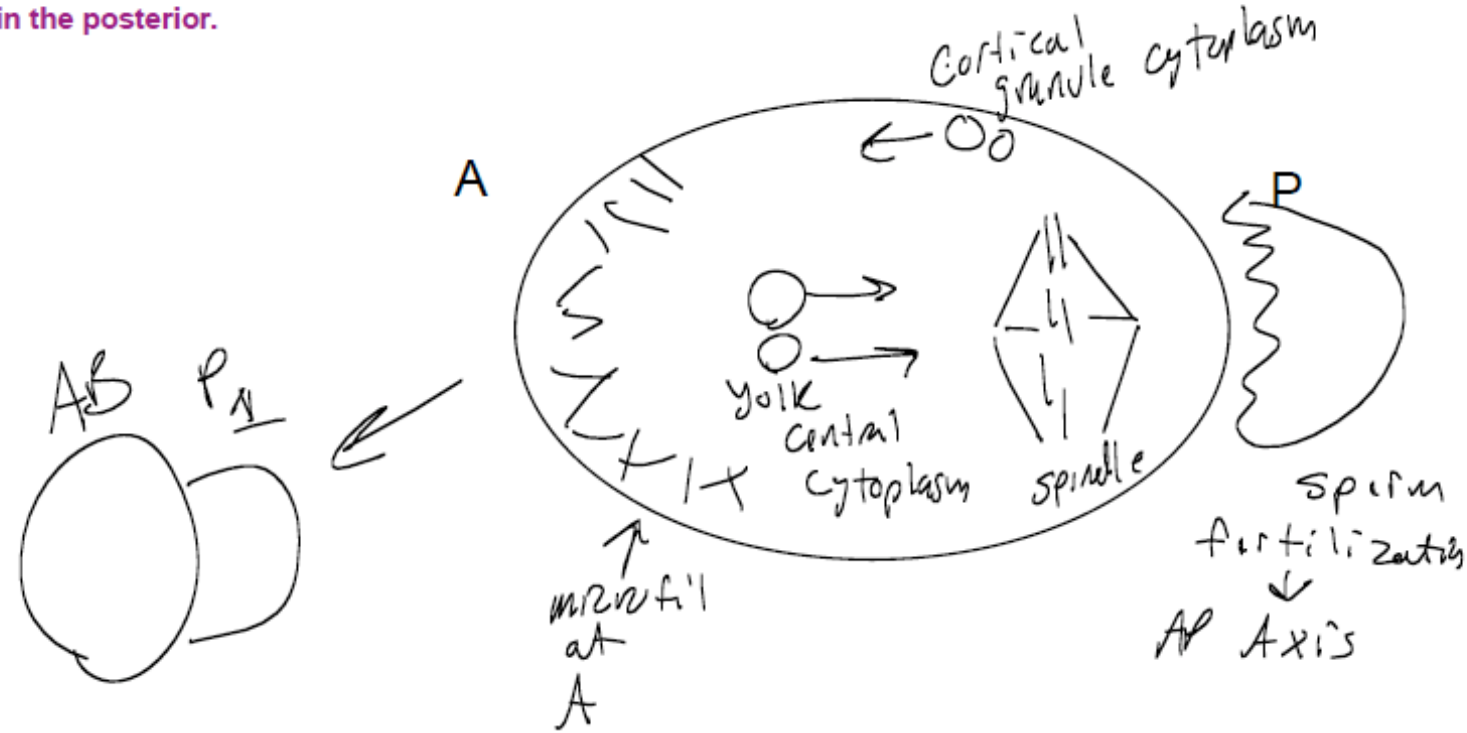
divisions

* founder cell - make type of lineage of cells (AB, E, MS, C, D, P4)

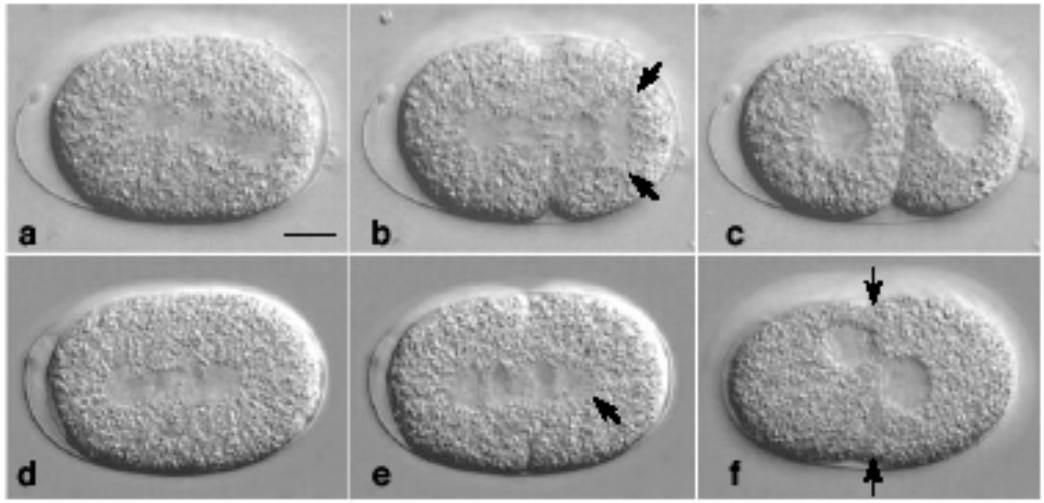


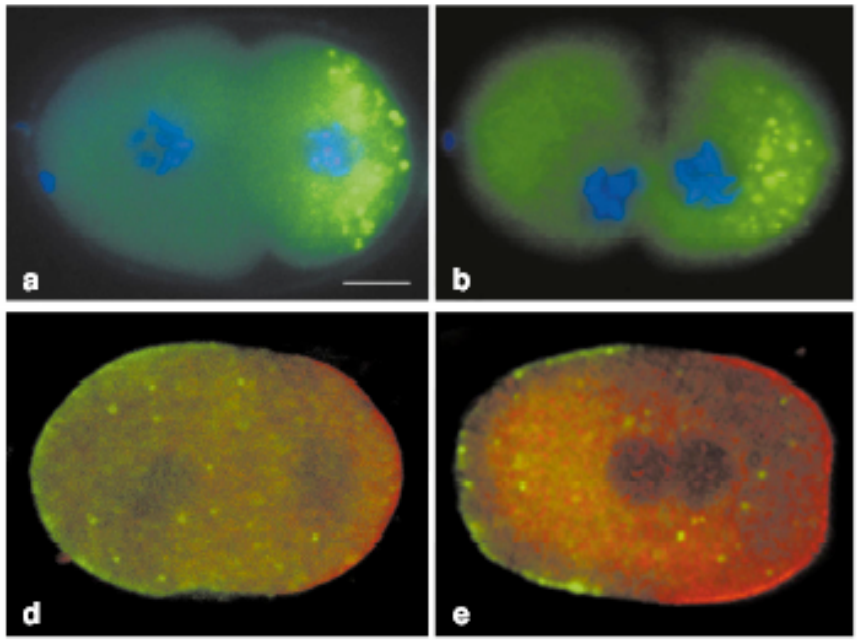
**My slide before class**

What is the mediator between PARs and spindle positioning?

Wildtype

Gα RNAi




**P granules**

**PAR-3**
**PAR-2**

Gotta and Ahringer (2001) Nature Cell Biol. 3: 297

**My slide after class**

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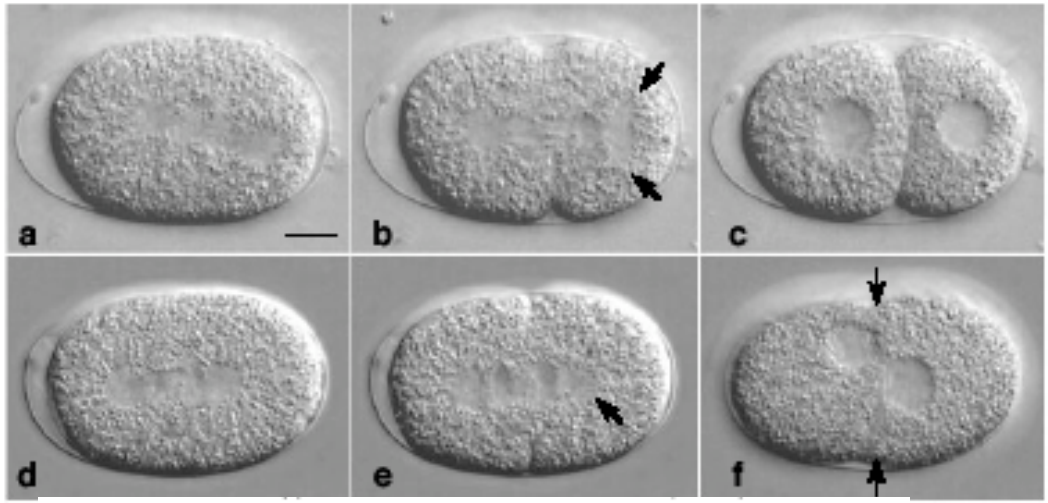


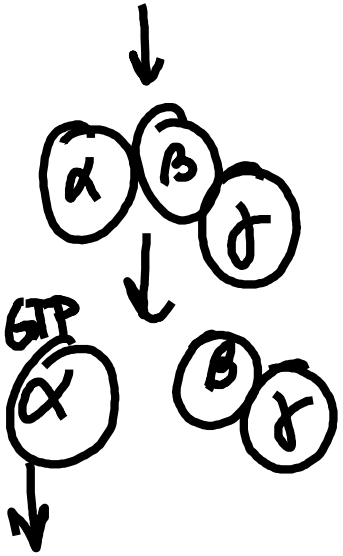


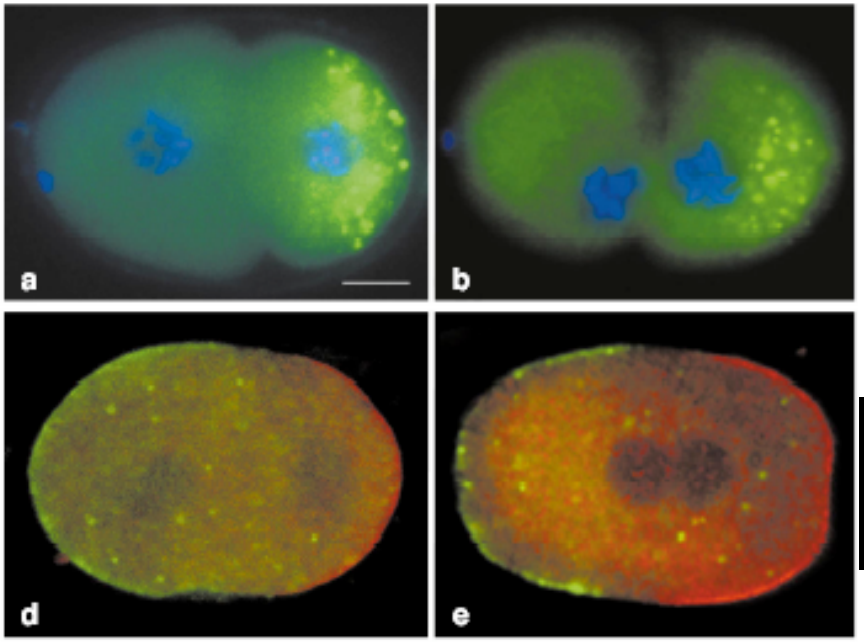


**P granules**

**PAR-3**
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# Copy of a student's file

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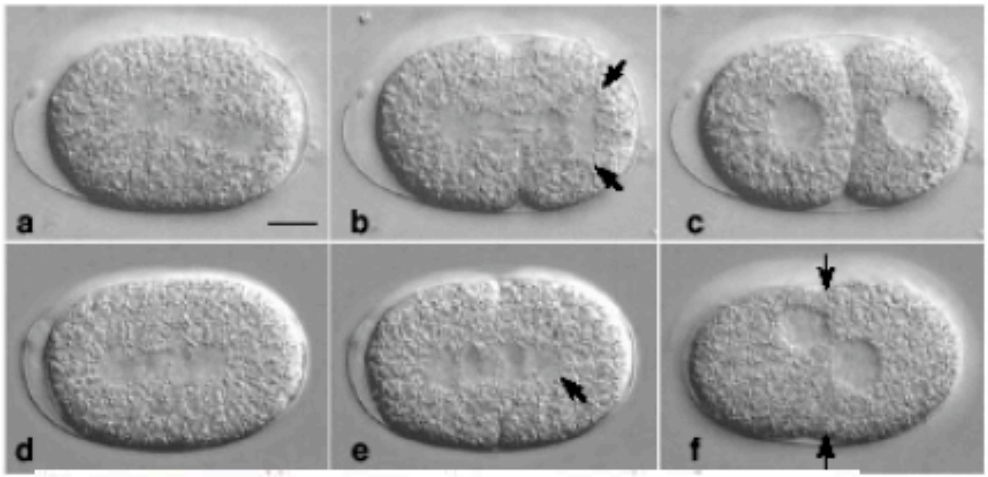
[Gα] RNAi




spindle NOT displaced

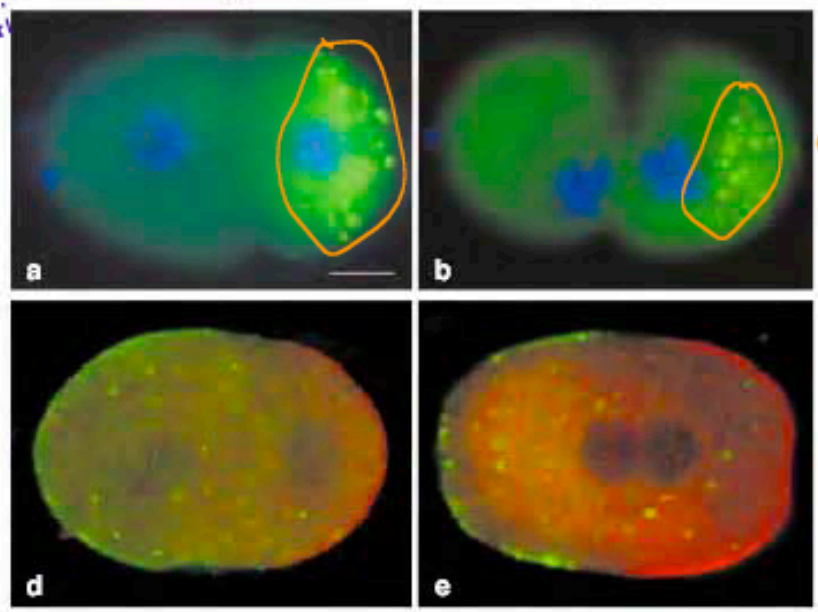
α β γ

GTP

α β γ

signal

Gα RNAi




P granules

localized correctly

Downstream of polarity

PAR-3

PAR-2

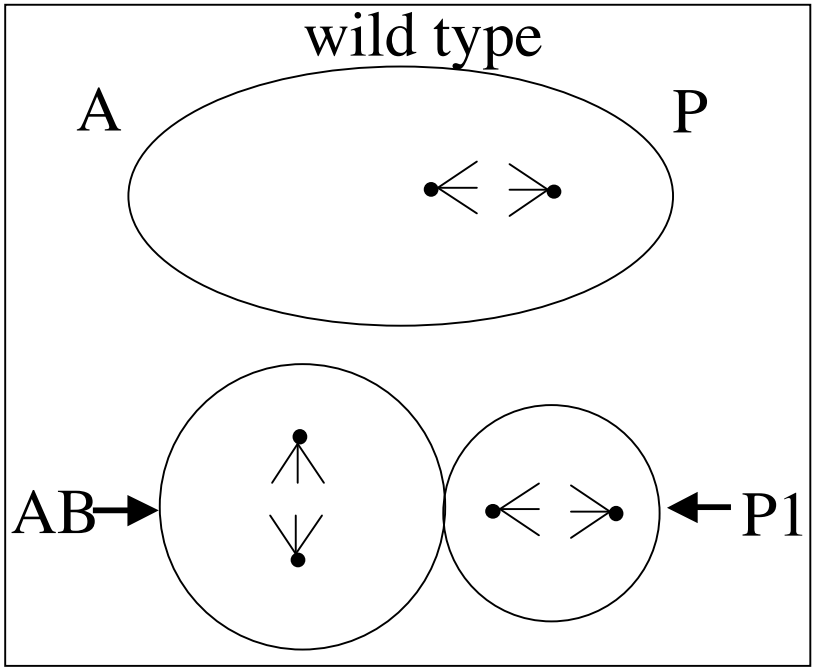
Gotta and Ahringer (2001) Nature Cell Biol. 3: 297

## 2. Group discussion about a data paper

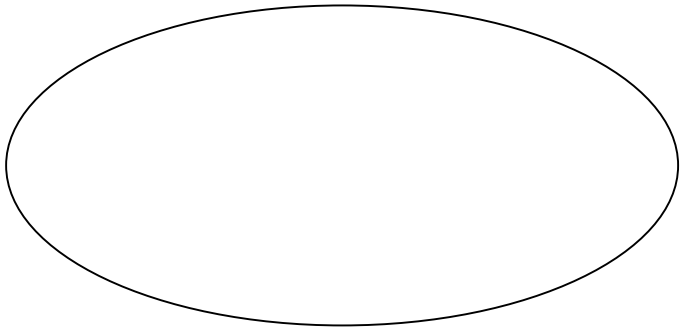
1. I put figures we may want to discuss into the class session slides file
2. Divide students into groups to discuss the paper
3. Give them specific tasks:
    1. Explain a particular figure from a paper, or
    2. Identify and explain data that supports a conclusion of the authors
4. After 10-15 minutes, groups present work to the class

# My slide before class

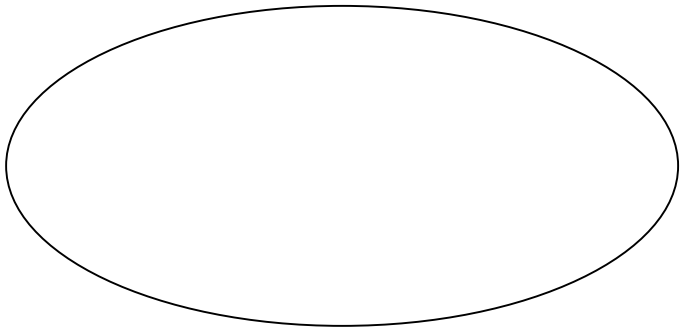
**Interference of normal functions of these genes causes extensive polarity defects in the 1-cell embryo and results in loss of many early asymmetries (Kemphues et al., 1988; Crittenden et al., 1997; Bowerman et al., 1997). Of the six *par* genes so far identified, *par-1*, *par-2*, *par-3*, *par-5* and *par-6* mutant embryos exhibit the symmetrically placed first cleavage spindle and the equal-sized AB and P1 blastomeres. P granules fail to be distributed exclusively to P blastomeres in *par-1*, *par-3*, *par-4*, *par-5* and *par-6* embryos. Both AB and P1 spindles at the second cleavage of *par-1*, *par-2*, *par-4* and *par-5* embryos are aligned transversely like the wild-type AB spindle, while they are aligned longitudinally in *par-3* and *par-6* embryos.**




*par-1*, *par-2*, *par-4*, *par-5* mutant



*par-3*, *par-6* mutant



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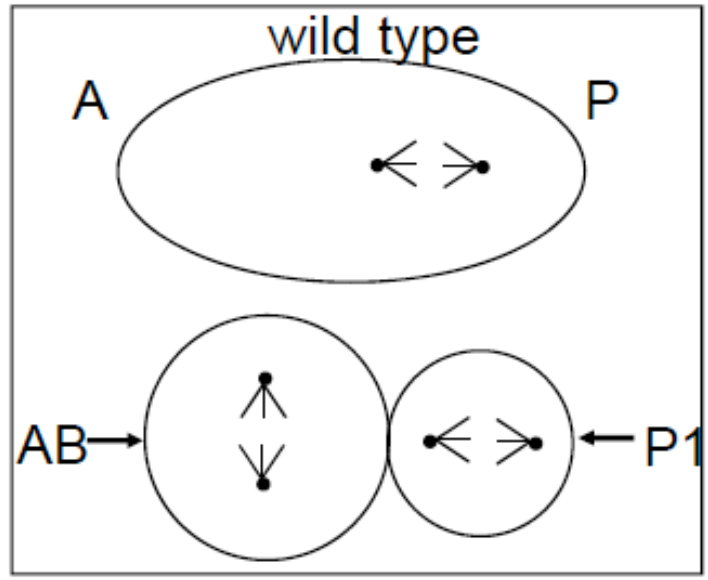
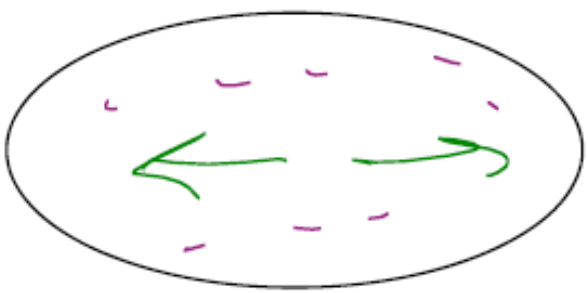
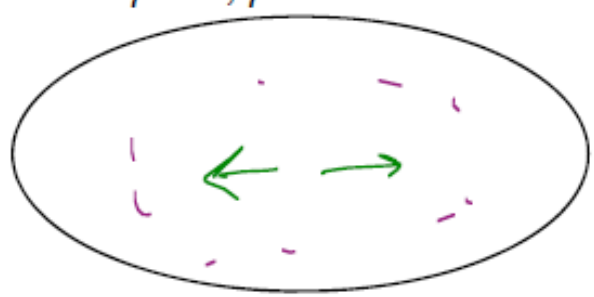



*par-1*, *par-2*, *par-4*, *par-5* mutant




Identical size

*par-3*, *par-6* mutant




Symmetric

## Questions of Tabuse et al., 1998

1. How do embryos establish polarity?
2. What factors are involved?
3. Does aPKC function with PAR-3 in polarity establishment in *C. elegans* embryogenesis?

## Conclusions of Tabuse et al., 1998

1. aPKC is required for asymmetric divisions and loss of *aPKC* is similar to loss of *par-3*
2. aPKC and PAR-3 function together
    1. co-localization
    2. binding
3. aPKC and PARs are mutually dependent on one another

What question is being asked?

Why are the authors asking this question?

What is the rationale for the experimental set-up (ie. why did they do the expt. the way they did?

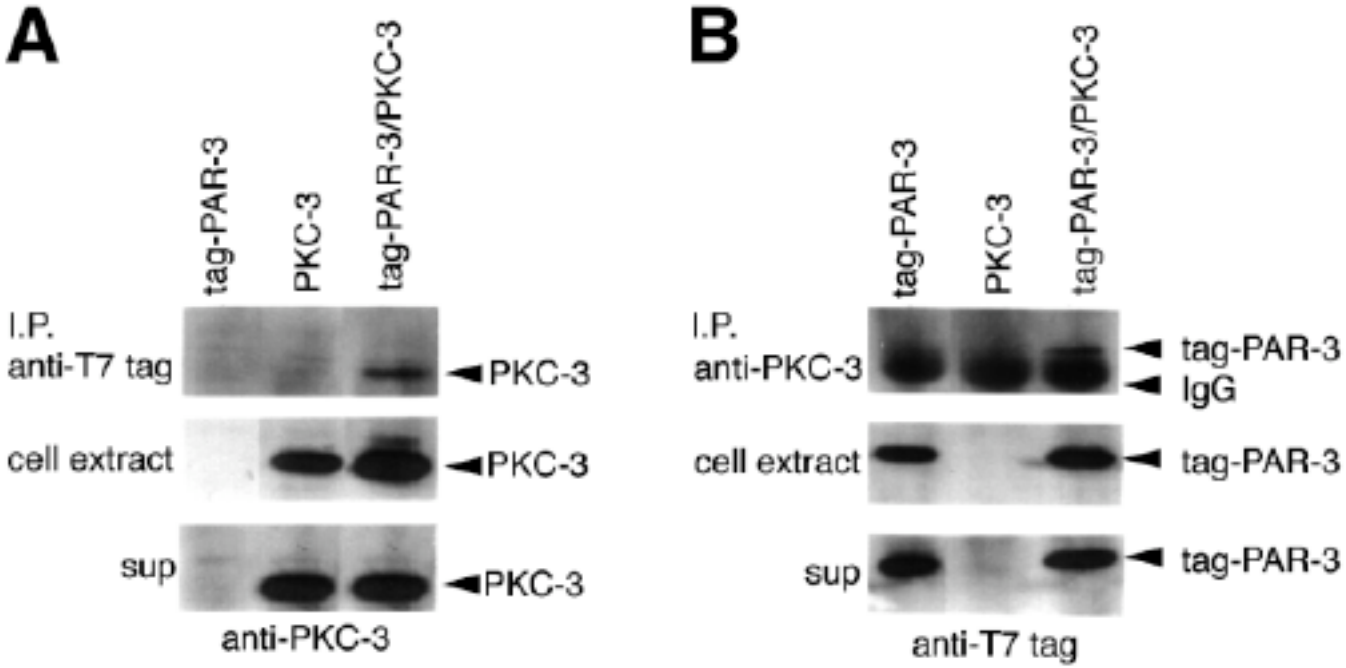
What is being done? (make a diagram if that will help)

What is shown in each part of the figure?  (adding labels will help!)

What is the conclusion/answer?

My slide before class

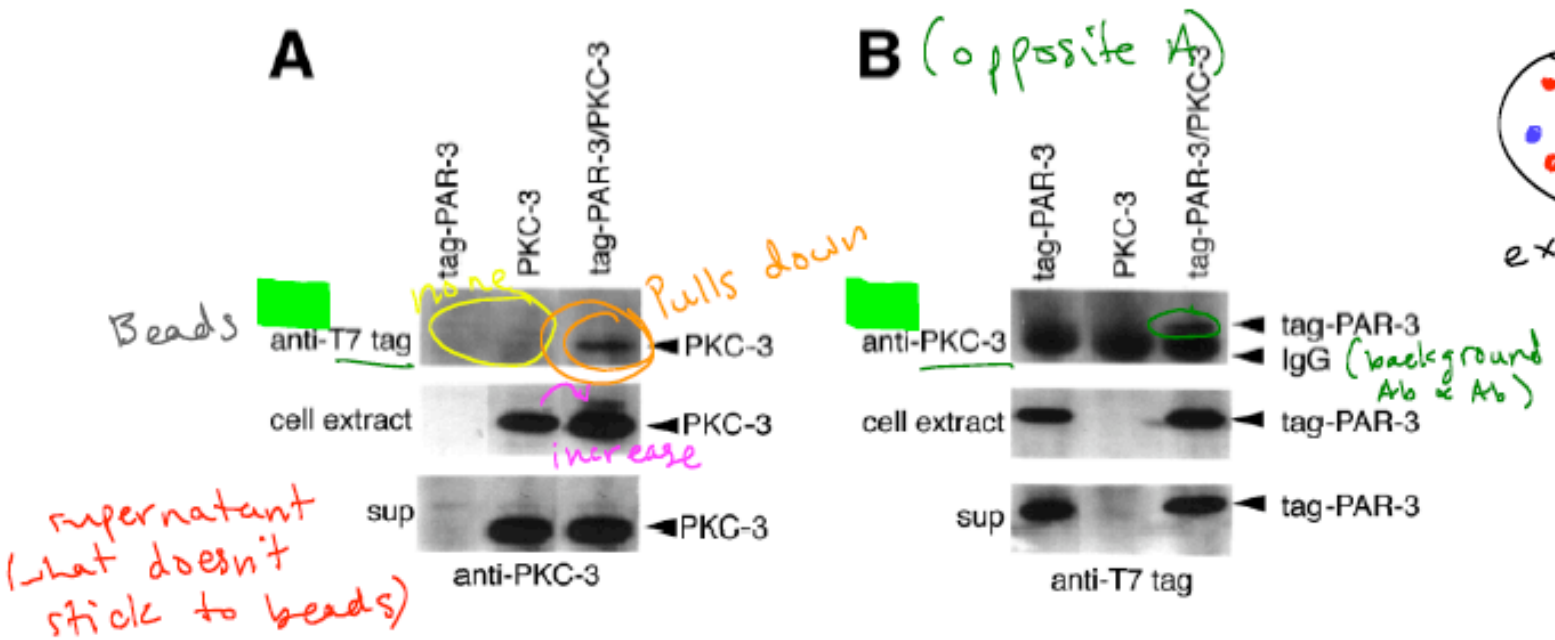
Figure 4

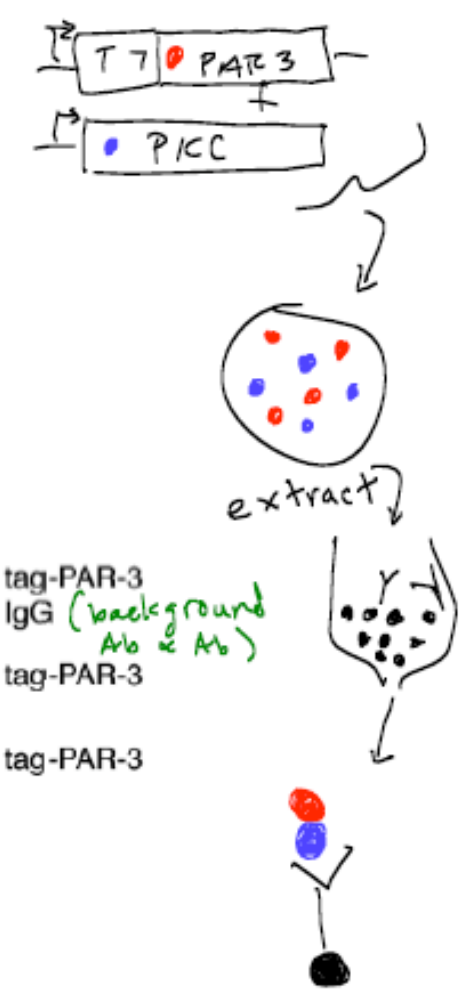


# Copy of a student's file

* Do PAR-3 & PKC bind each other?
* why ask: if interaction → function together?

Figure 4 - COS7 cells




They interact!

## Promoting Participation and Collaboration

<u>Group Jobs</u>

1. Annotate figure, draw pics of experimental set-up
2. Explain question being addressed
3. Describe experimental set-up
4. Explain result

## In-class writing assignments

- Question based on a short reading or question
- Usually ~1 paragraph
- Students wrote in Word, then uploaded to Telesis

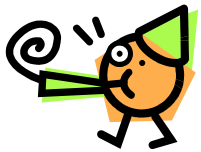
## The Negatives

1. Start up time
2. Save and shut down time
3. Network
4. Only 1 room currently
5. Sharing files between students is not easy
6. Can only be used in the classroom
7. There will always be detractors…

"I was often distracted by the tablets and would have preferred normal powerpoints and notebooks for notes."

"The tablet PC's (sic) were a useful addition to class, though I think at times they were more work and used up more time than they were worth. With better technology in the future, their usefulness will increase."

## The Positives



1. Easy to use
2. Paperless note taking
3. Promote group work and active learning
4. Sharing ideas

   "I liked how lecture set a background, and the group collaborations helped us to take that background and the papers we had already read and came to make sense out of it on our own."

5. Paperless in-class writing assignments
6. Cool-ness factor!

## Aspects we'd like to improve:

1. Increasing inter-group interaction

   Jigsaw method

   "… often times group work motivates student to focus on their own part, … not enough time to write down and think about what others think."

2. Better summarizing of main points of groups by instructor

3. Use Tablet PCs for in-class writing for feedback

   One minute themes on big questions being addressed

4. File sharing via social networking groups both in and out of class?

## Other ways the Tablet PCs could be used:

1. Access databases

2. Access online tools

3. Analytical software

4. Grading/commenting on essays - could be all paperless

Questions?

Comments?

Suggestions?