

# Mechano-transduction and prepatterning in *Drosophila*

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Mechanics and Genetics of Embryonic and  
Tumoral Development

Some memories from the first exercise ...

# Some memories from the first exercise ...

... In December, 2007

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**Mechanical induction of Twist in the Drosophila foregut/stomodaeal primordium**  
(2003) *Current Biology*, 13 (16), pp. 1365-1377.

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# Some memories from the first exercise ...

... In July, 2008

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## Some memories from the first exercise ...

	Stage	Time	Events
	1-4	00h00-02h10	Cleavage (divisions)
	5	02h10-02h50	Blastoderm cellularizes
	6-7	02h50-03h10	Gastrulation
	8-11	03h10-07h20	Germ-Band Elongates
	12-13	07h20-10h20	Germ-Band Retracts
	14-15	10h20-13h00	Head Involution and dorsal closure
	16-17	13h00-22h00	Differentiation

# Some memories from the first exercise ...

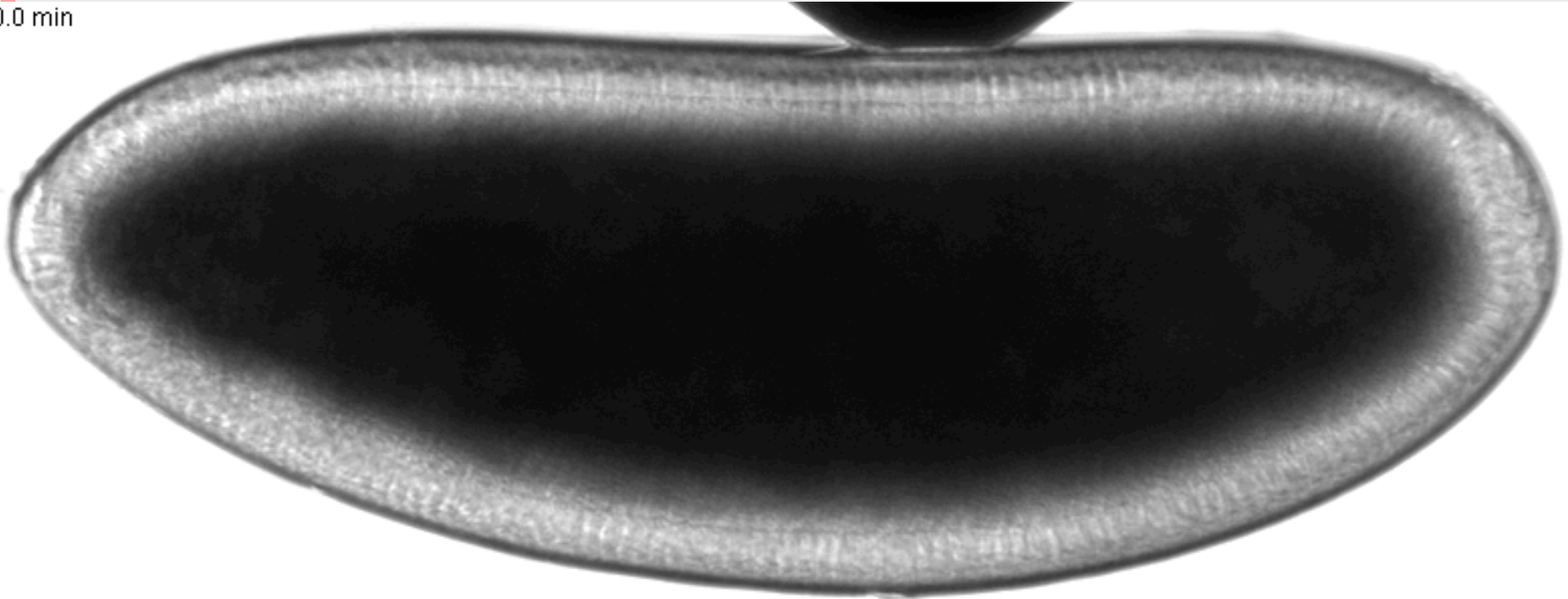
During Gastrulation, four major invaginations

	Stage	Time	Events
	1-4		Cellular divisions
	5		Cellularization
	6-7		Gastrulation
	8-11		Neural tube and Elongates
	12-13		Neural Band Retracts
	14-15		Neural tube and dorsal closure
	16-17		Cellular Differentiation

Some memories from the first exercise ...

During Gastrulation, four major invaginations

0.0 min

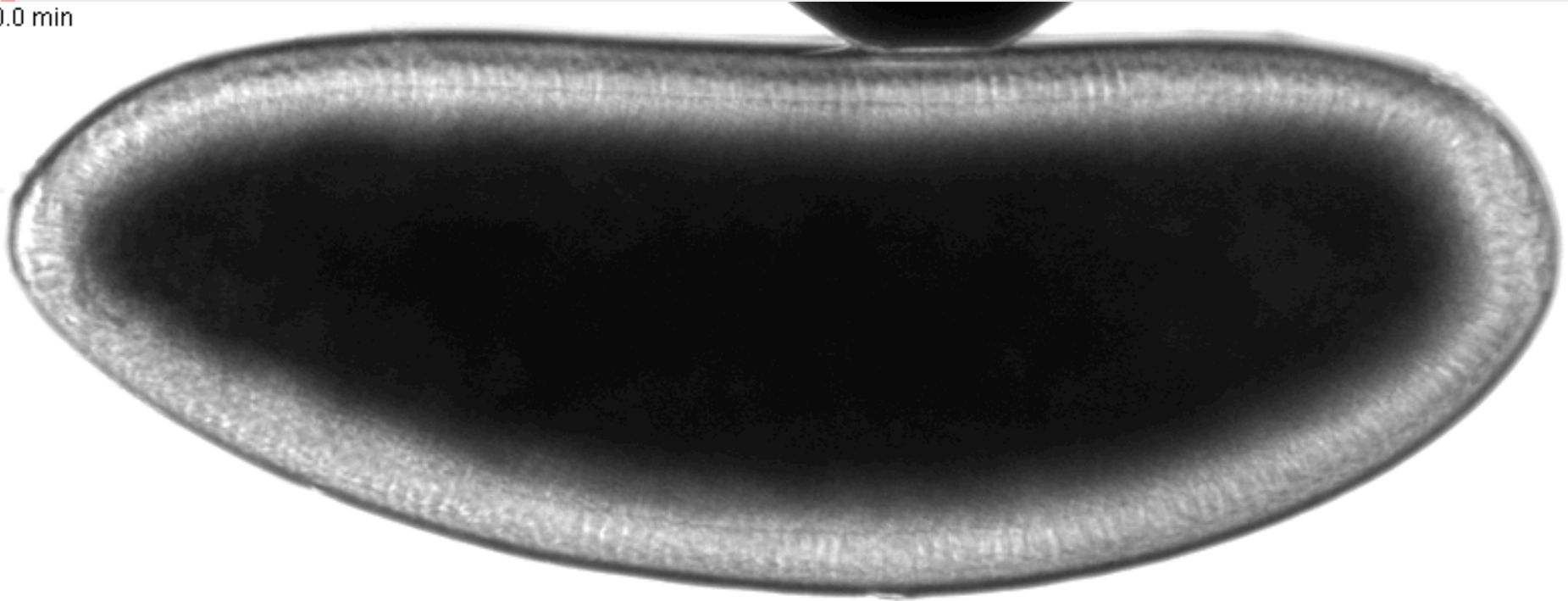


Ventral furrow & anterior midgut; cephalic furrow; proctodeal invagination

Some memories from the first exercise ...

During Gastrulation, four major invaginations

0.0 min

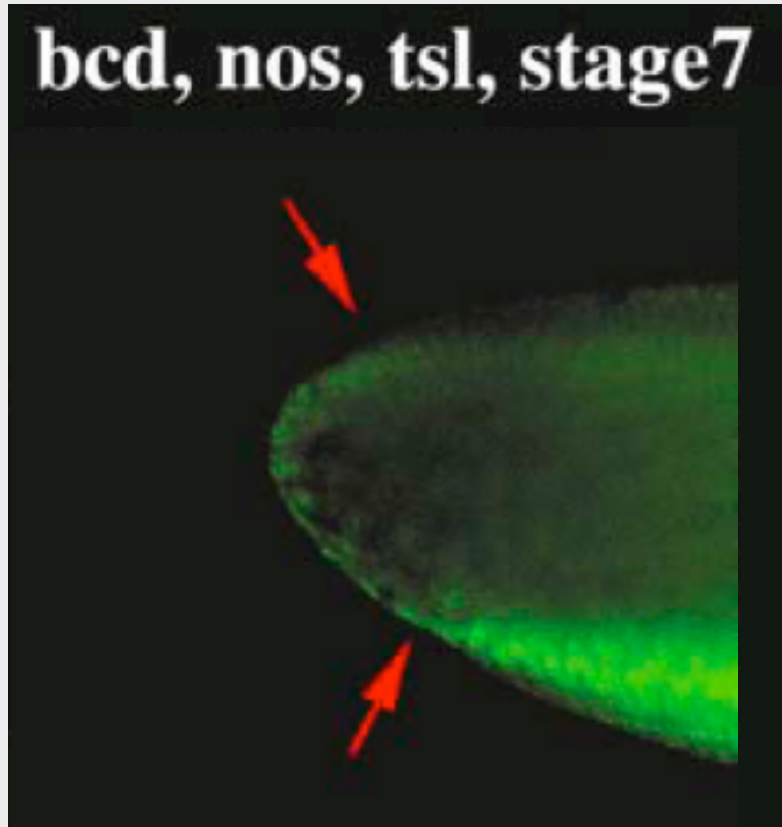


Ventral furrow & **anterior midgut**; cephalic furrow; proctodeal invagination



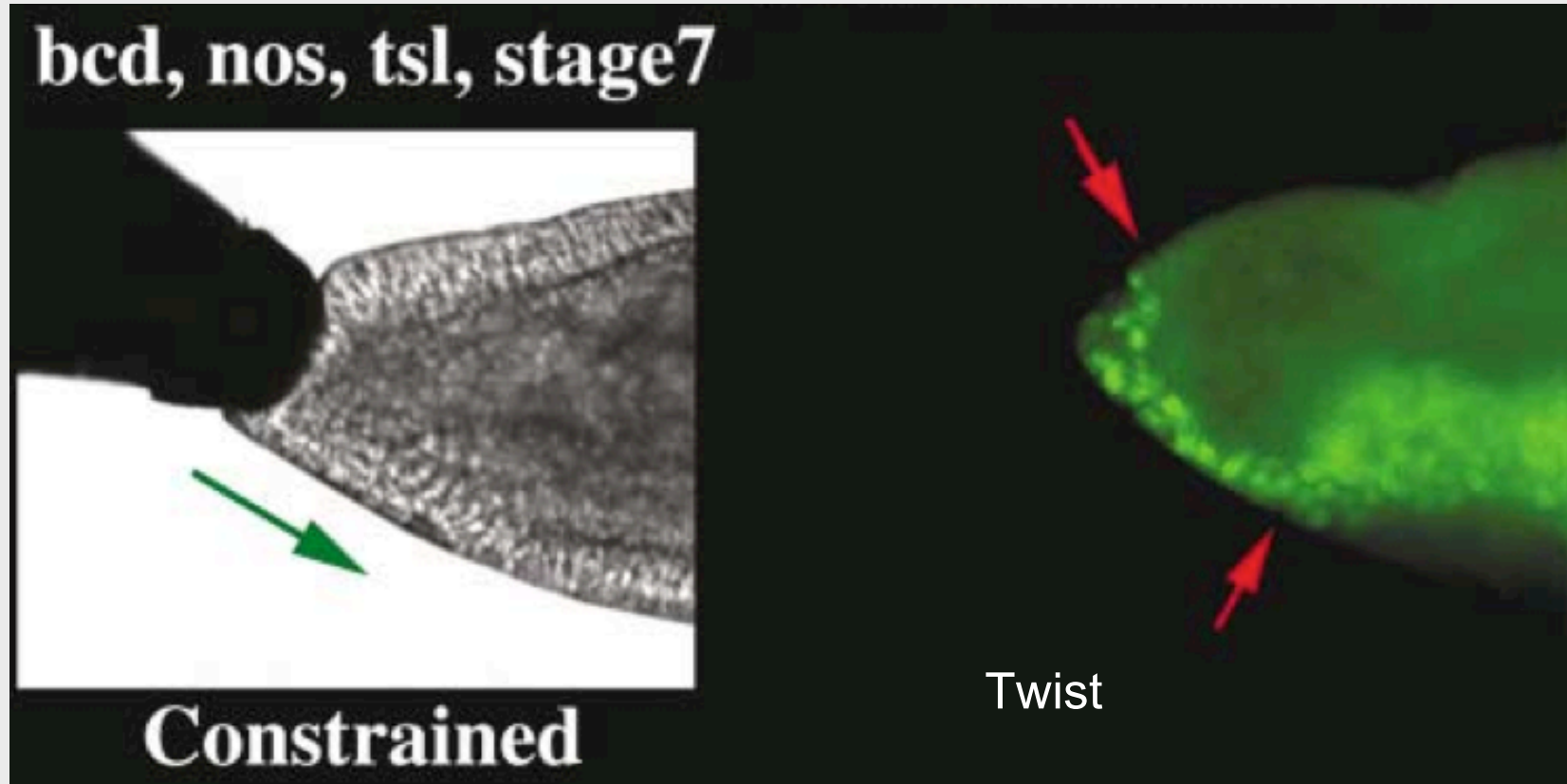
Some memories from the first exercise ...

... Results: rescue of Twist expression by poking



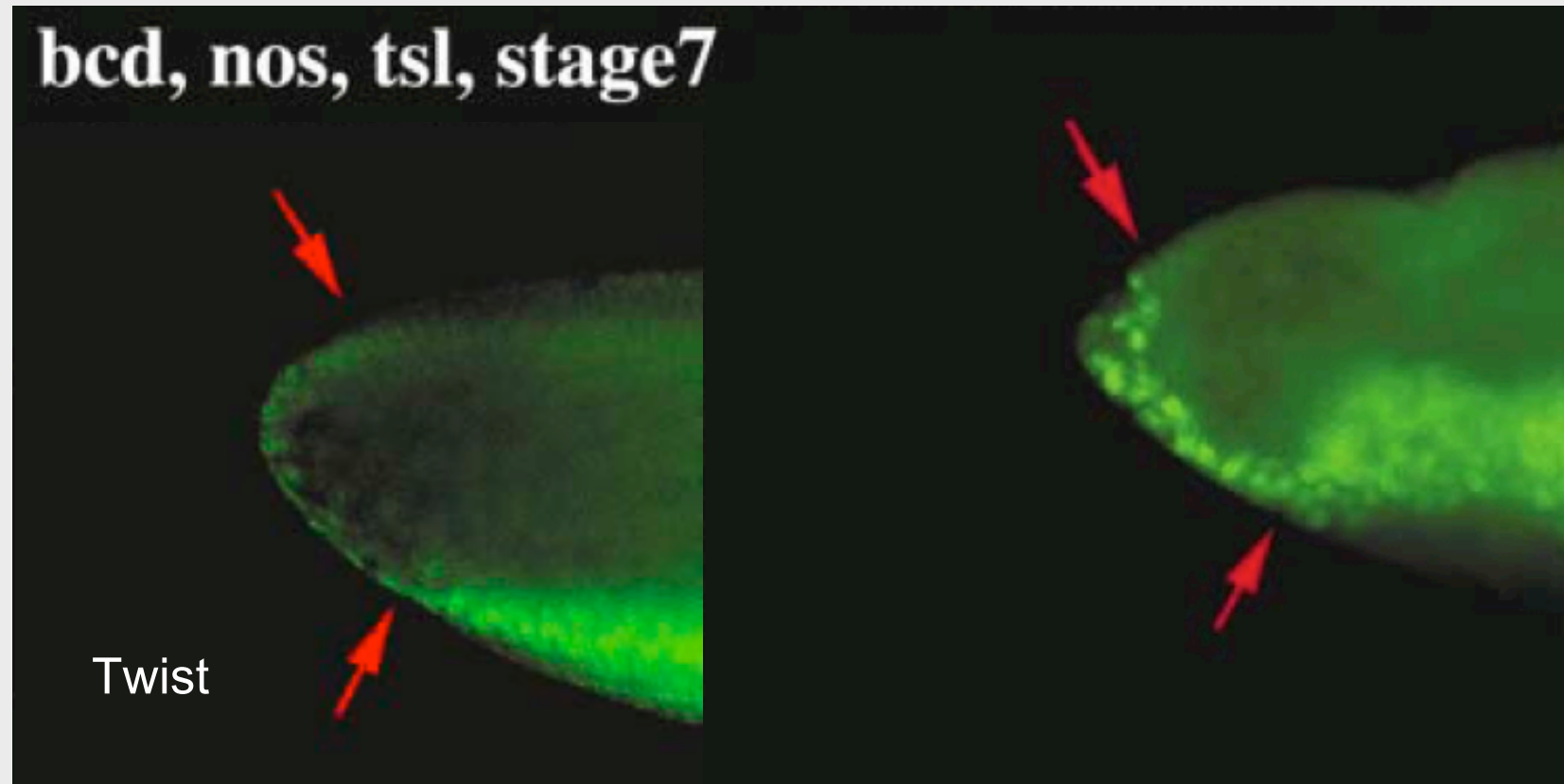
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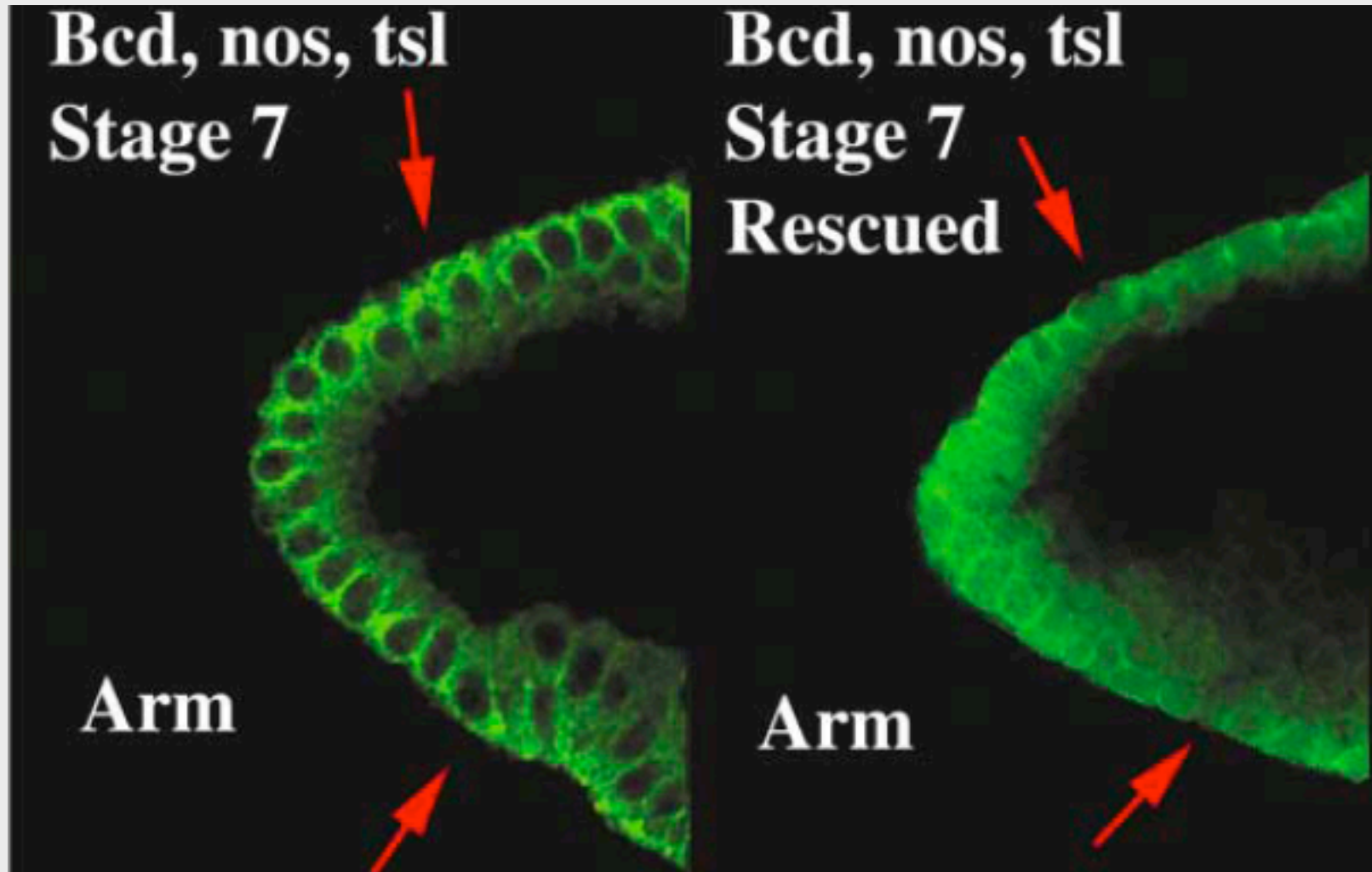
Some memories from the first exercise ...

... Results: rescue of Twist expression by poking



Some memories from the first exercise ...

... Results: relocation of Armadillo by poking



## Some memories from the first exercise ...

... Results:

- ✓ Armadillo (Beta-catenin homologue) is relocated from membranes to nucleus under cell shape changes.
- ✓ Armadillo acts as a transcription factor and triggers Twist expression
- ✓ The deformation of anterior cell shapes is caused by germ band extension

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... And unanswered questions!

Some memories from the first exercise ...

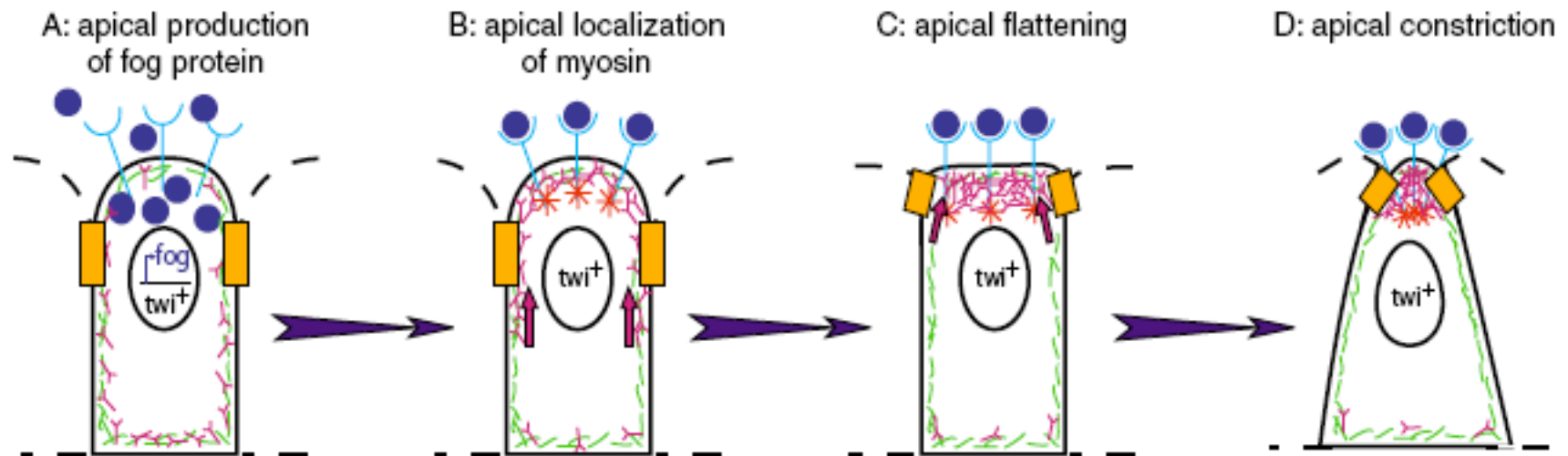
... And unanswered questions!

✓ Role of Twist in invagination?

# Some memories from the first exercise ...

... And unanswered questions!

✓ Role of Twist in invagination?



From Wieschau, 2005



## Some memories from the first exercise ...

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✓ Role of Twist in invagination?

✓ Generality of the mechanism (other invagination)  
+ Cooperation with other mechanisms?

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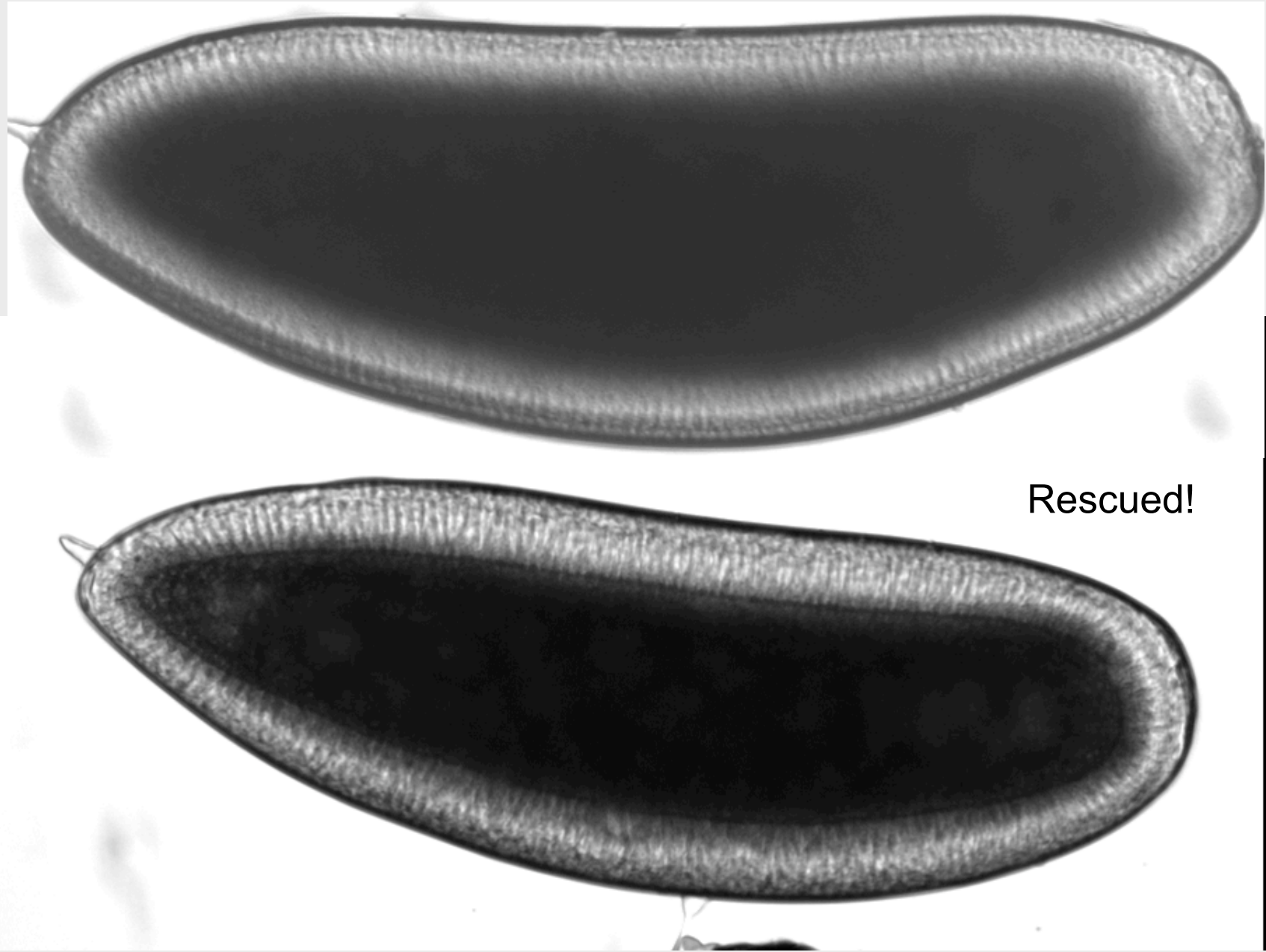
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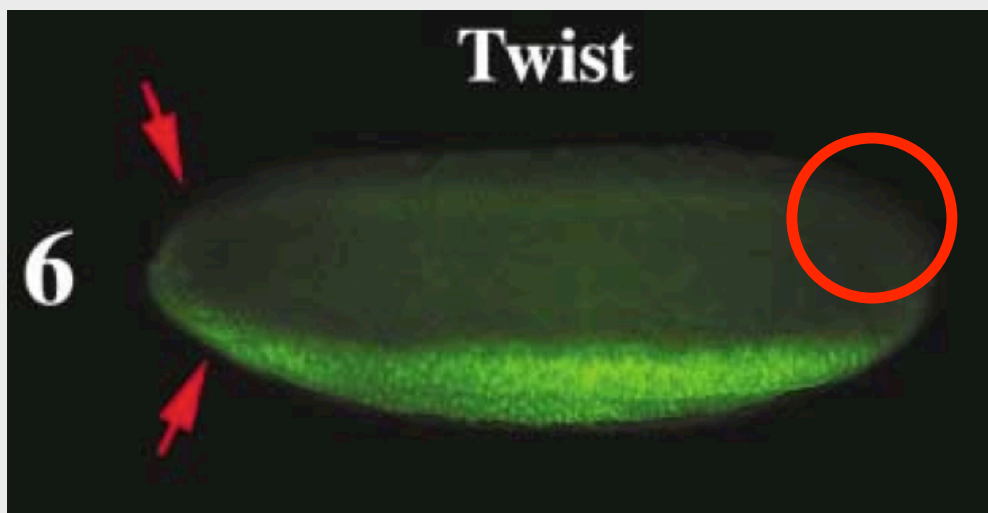
... Yes!

Snail --> 20% of random ventral cell contraction --> mechanically induced inhibition of Fog endocytosis --> relocalization of myosin apically --> general contraction [--> Twist = self reinforcement] --> ventral furrow formation...  
???

Snail minus homozygous: no ventral furrow formation



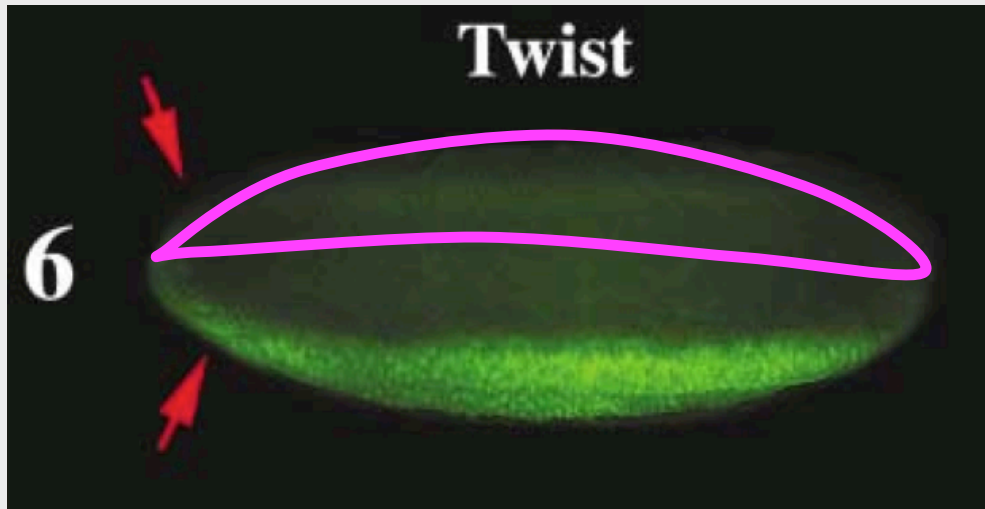
## My unanswered question and our plan to answer it



No strong Twist expression on the back!

... but still physical compression & an invagination!

## My unanswered question and our plan to answer it

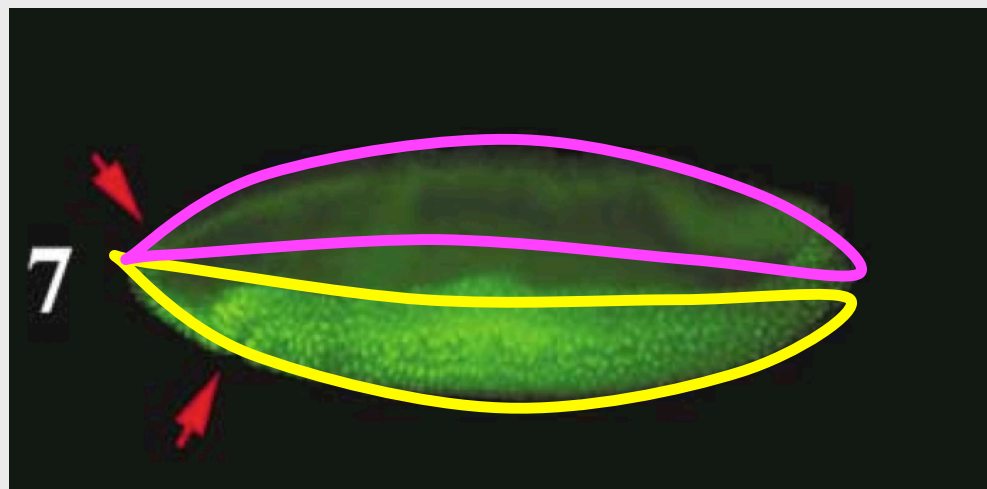
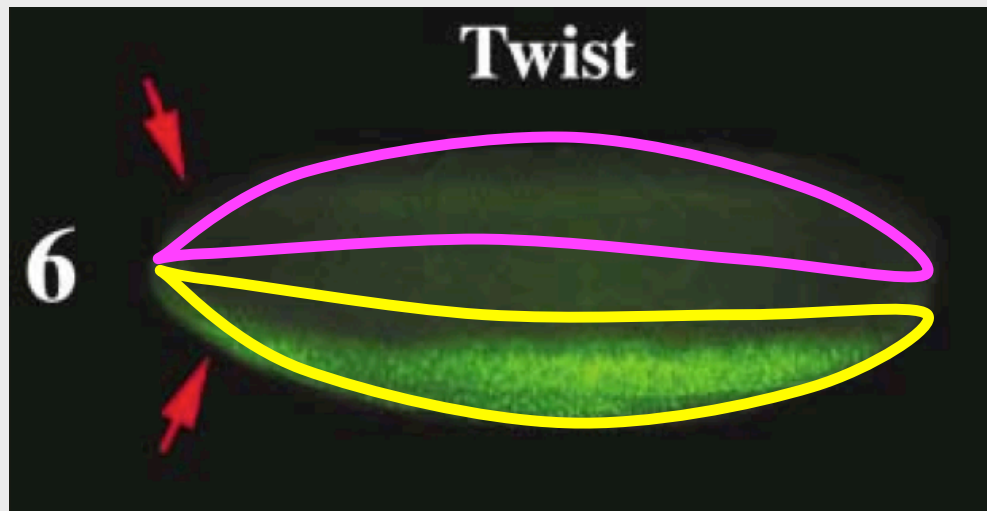


Hypothesis:  
There is a dorso-ventral pre-pattern:

- on ventral side  
Armadillo is competent  
to trigger Twist
- on dorsal side  
Armadillo is not

Arm inhibitor

## My unanswered question and our plan to answer it



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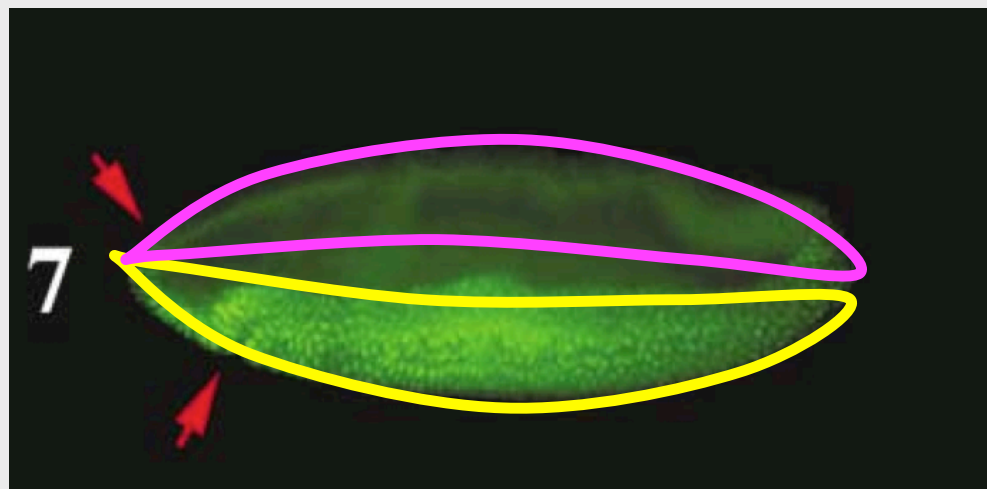
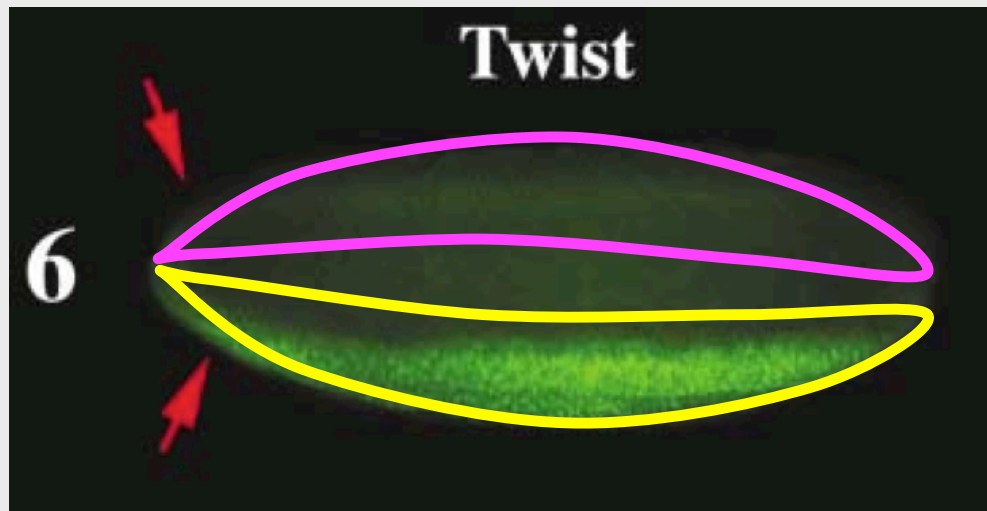
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# My unanswered question and our plan to answer it ... in principles

1) A gene candidate approach with two criteria:

- ✓ A dorso-ventral expression pattern
- ✓ An interaction with Armadillo or Twist



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3) ... And I wouldn't do this for my PhD!

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- Unknow expression pattern of P&R
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... And cephalic furrow is twist independant, and occurs along Dorso ventral axis!

My unanswered question and our plan to answer it  
... in practice

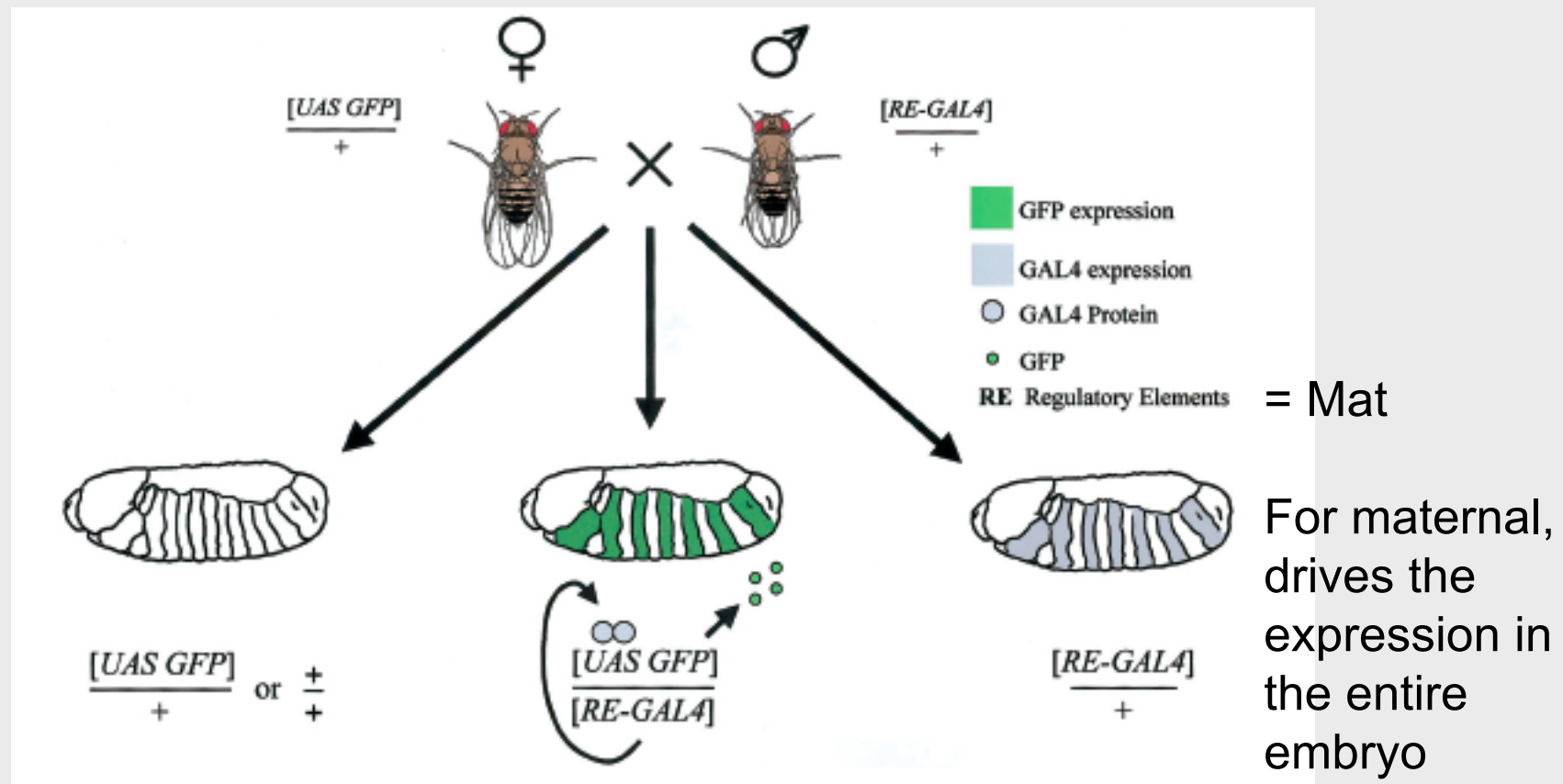
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My unanswered question and our plan to answer it  
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UAS-candidate negative dominant

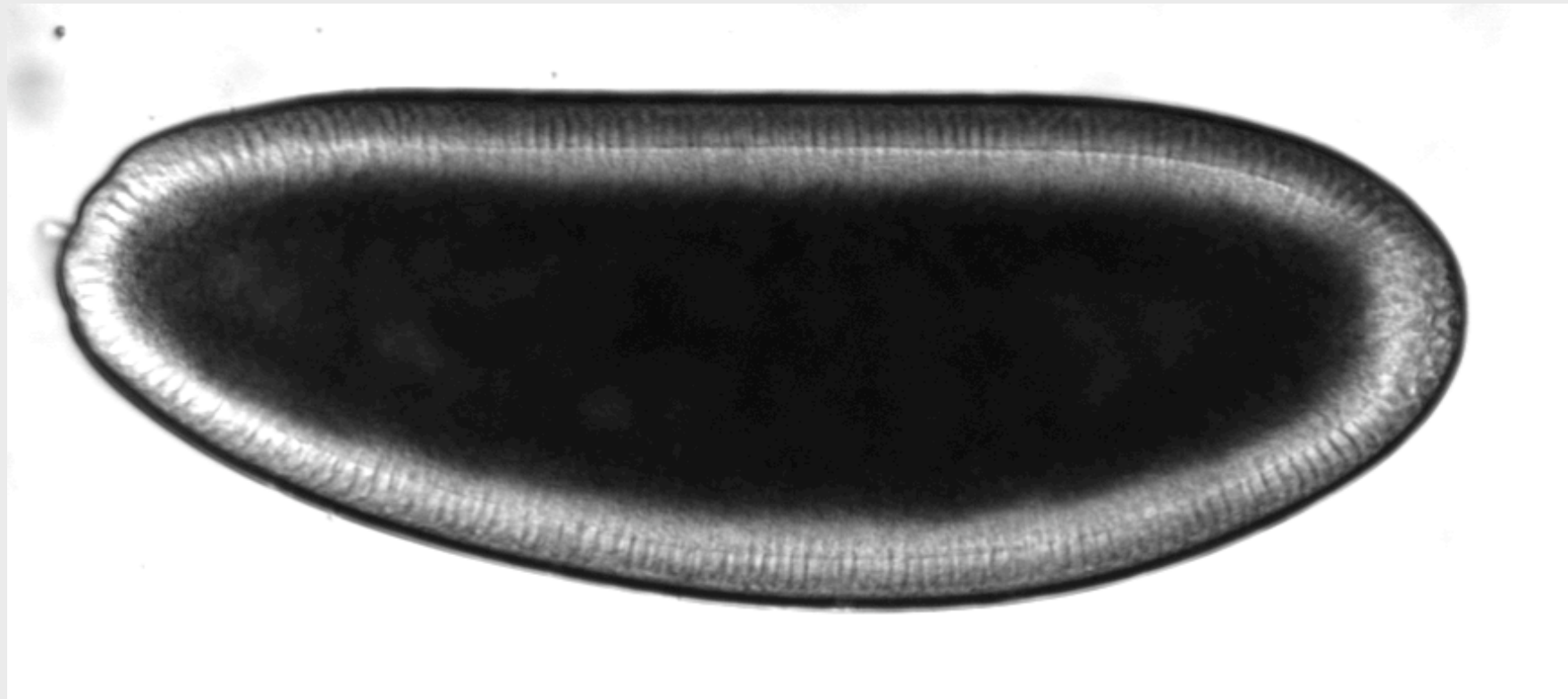
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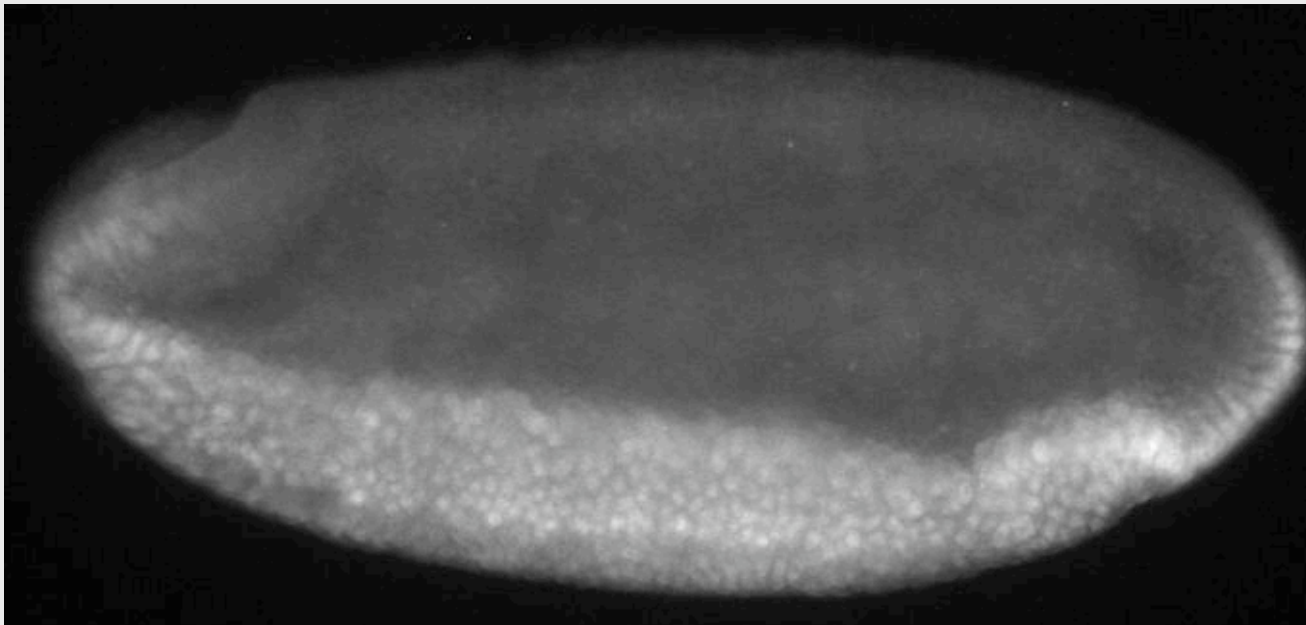
My unanswered question and our plan to answer it  
... practically

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- 2) Poke the back of a stage 6 offspring for 4 minutes at 28°C



My unanswered question and our plan to answer it  
... practically

- 1) Cross Mat-Gal4 F or M with UAS-candidate M or F at 28°C
- 2) Poke the back of a stage 6 offspring for 4 minutes at 28°C
- 3) Label with Twist Ab and look for a dorsal Twist pattern

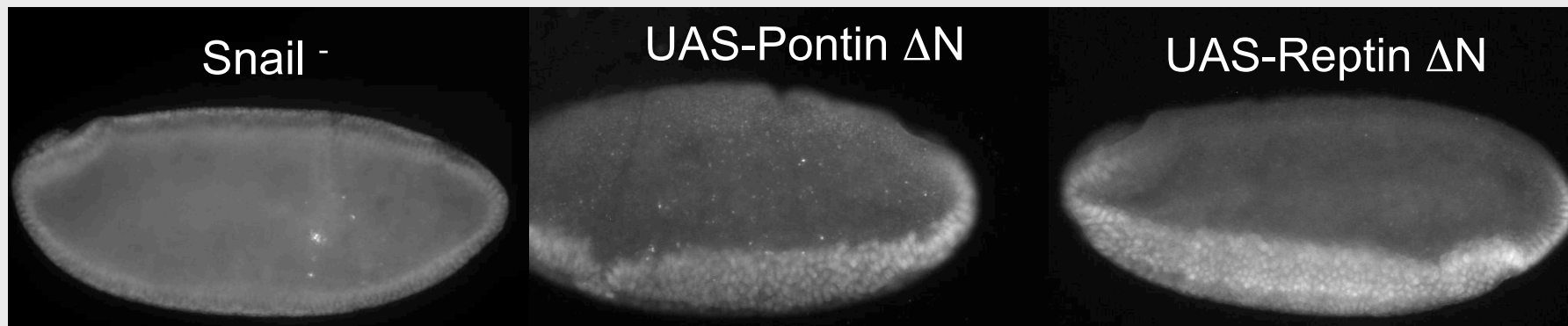
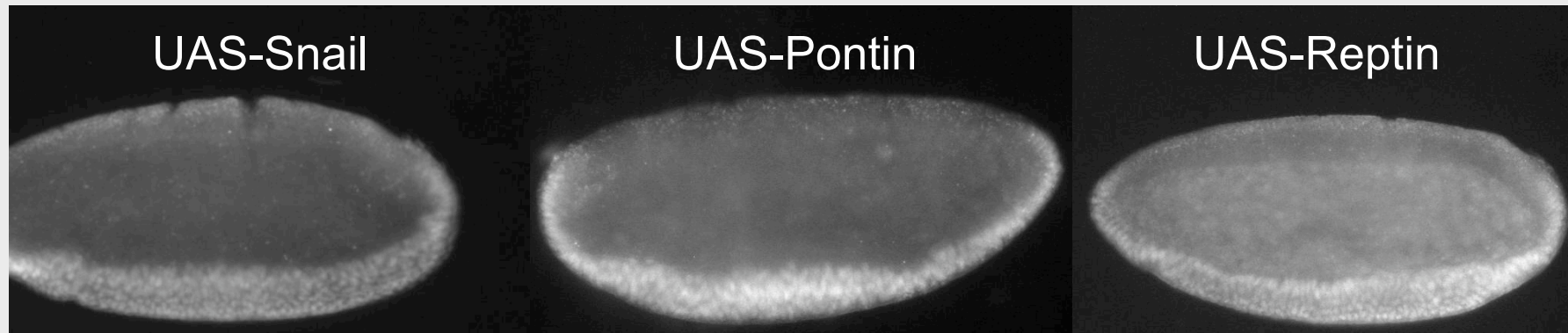


Missed!



# The negative results to my unanswered question

Twist Ab labelling:



## Reasons for keeping on working on July...

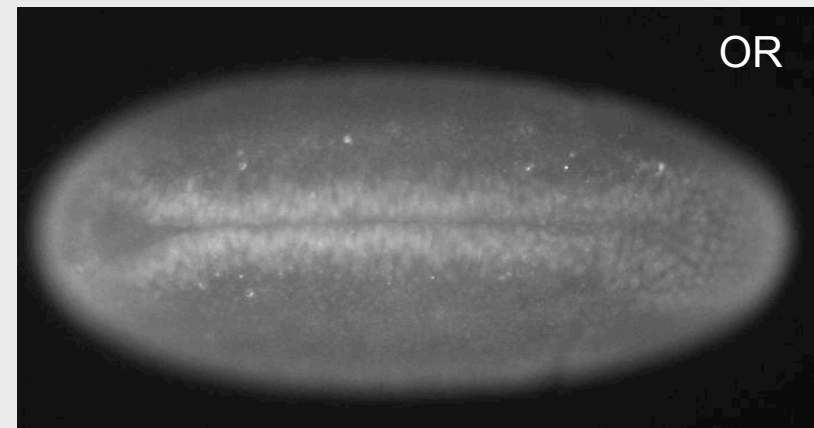
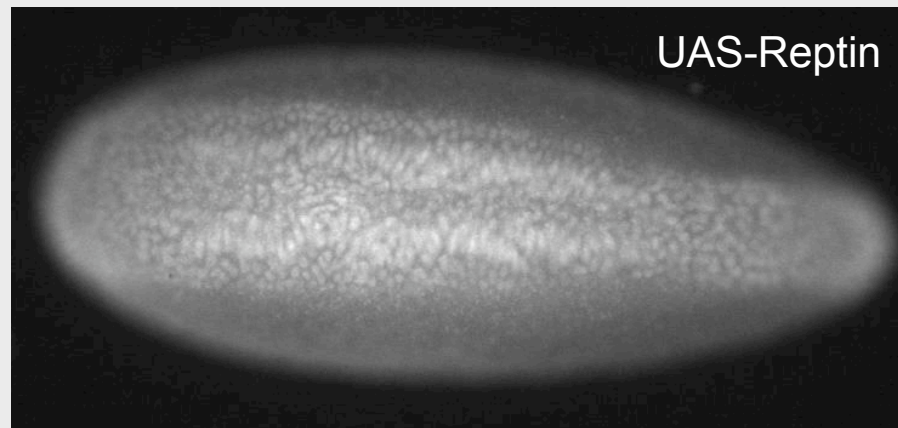
1. The poking was supposed to be 10 minutes ...  
... but 10 minutes at 21°C = 6 minutes at 28°C (fast development)  
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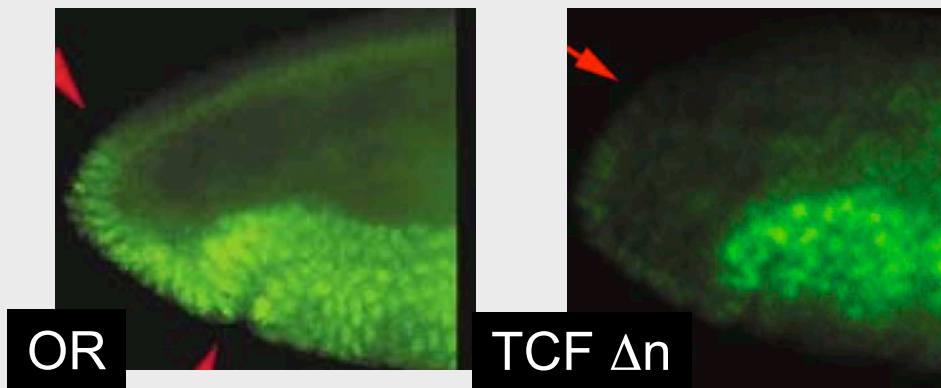
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4. Small peripheral projects...



Same effects on the  
ventral furrow?