The what and where of operant self-learning mechanisms in *Drosophila*

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1. PKC activity is required specifically for self-learning

WT	cAMP	PKC	MB
OK	Impaired	OK	OK

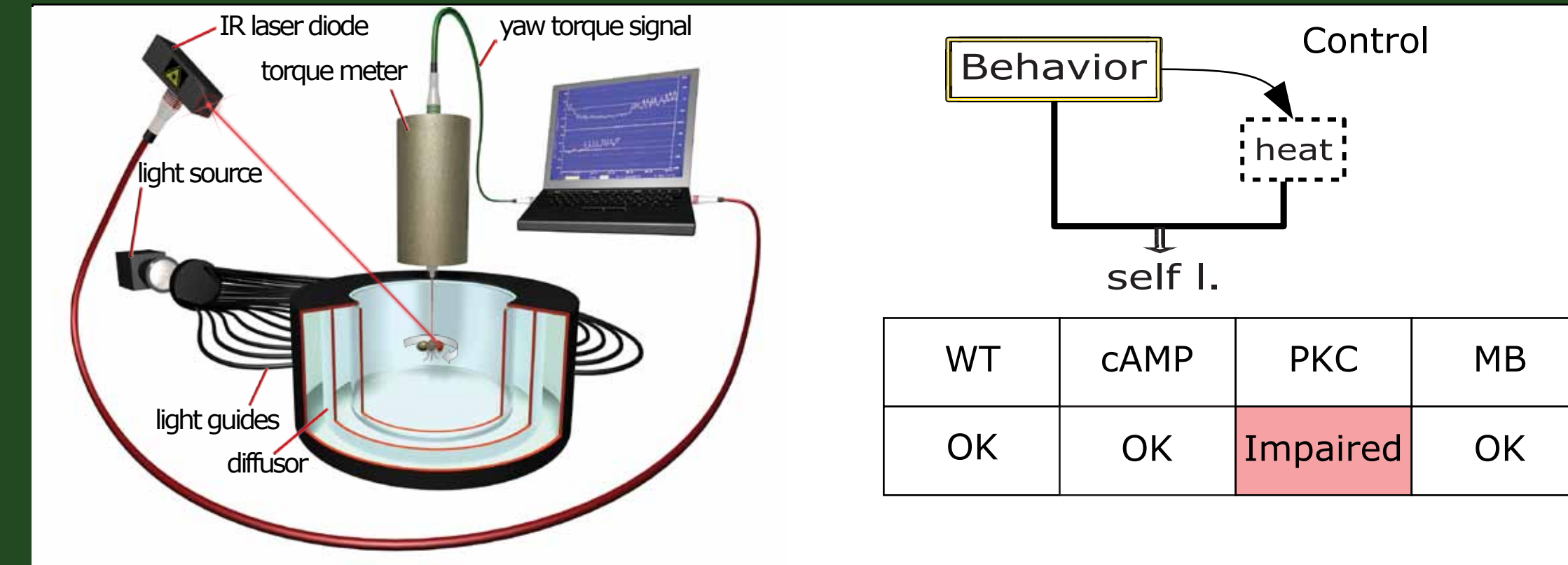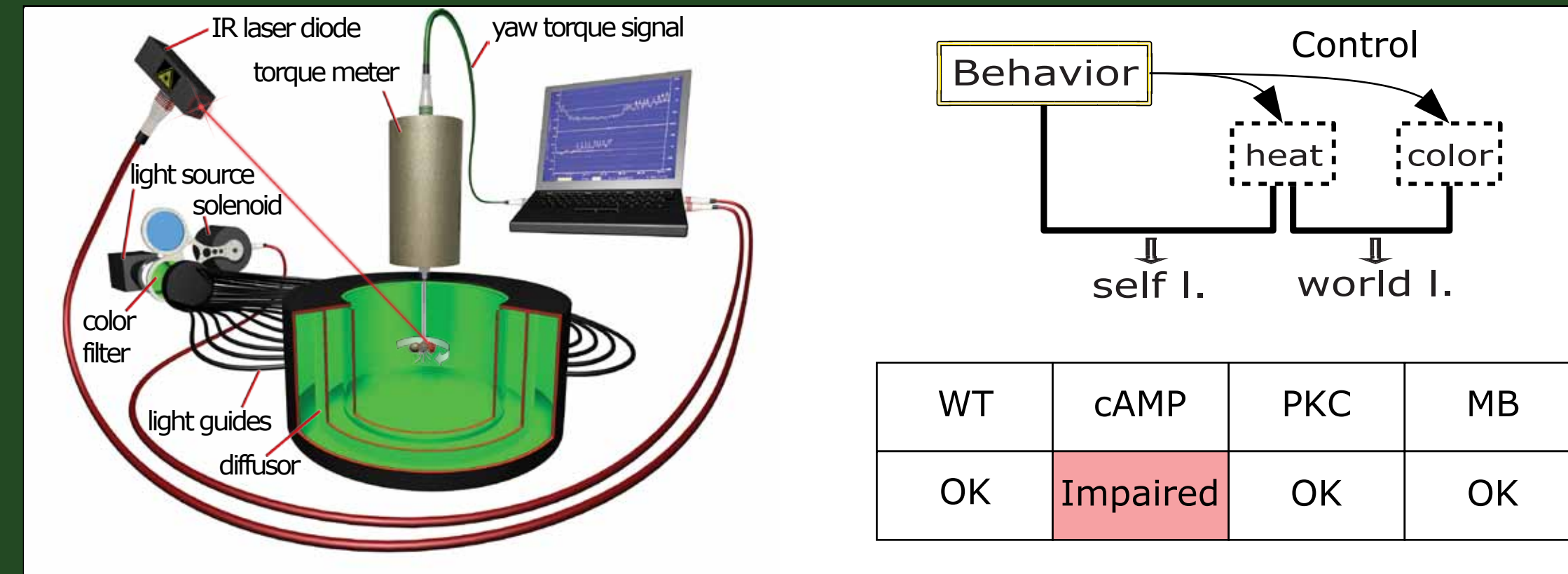| WT	cAMP	PKC	MB
OK	OK	Impaired	OK

Fig. 1: Two operant conditioning experiments, distinguished by the presence or absence of predictive stimuli. Above: Flies learn to avoid the heat associated with one of two colors and left or right turning, respectively. Manipulating cAMP levels abolishes learning in this task. Below: Removing the color stimuli leaves the animal with only its behavior as predictor of heat punishment. Manipulating PKC abolishes learning in this task. *Brembs & Plendl, Curr. Biol. 2008*

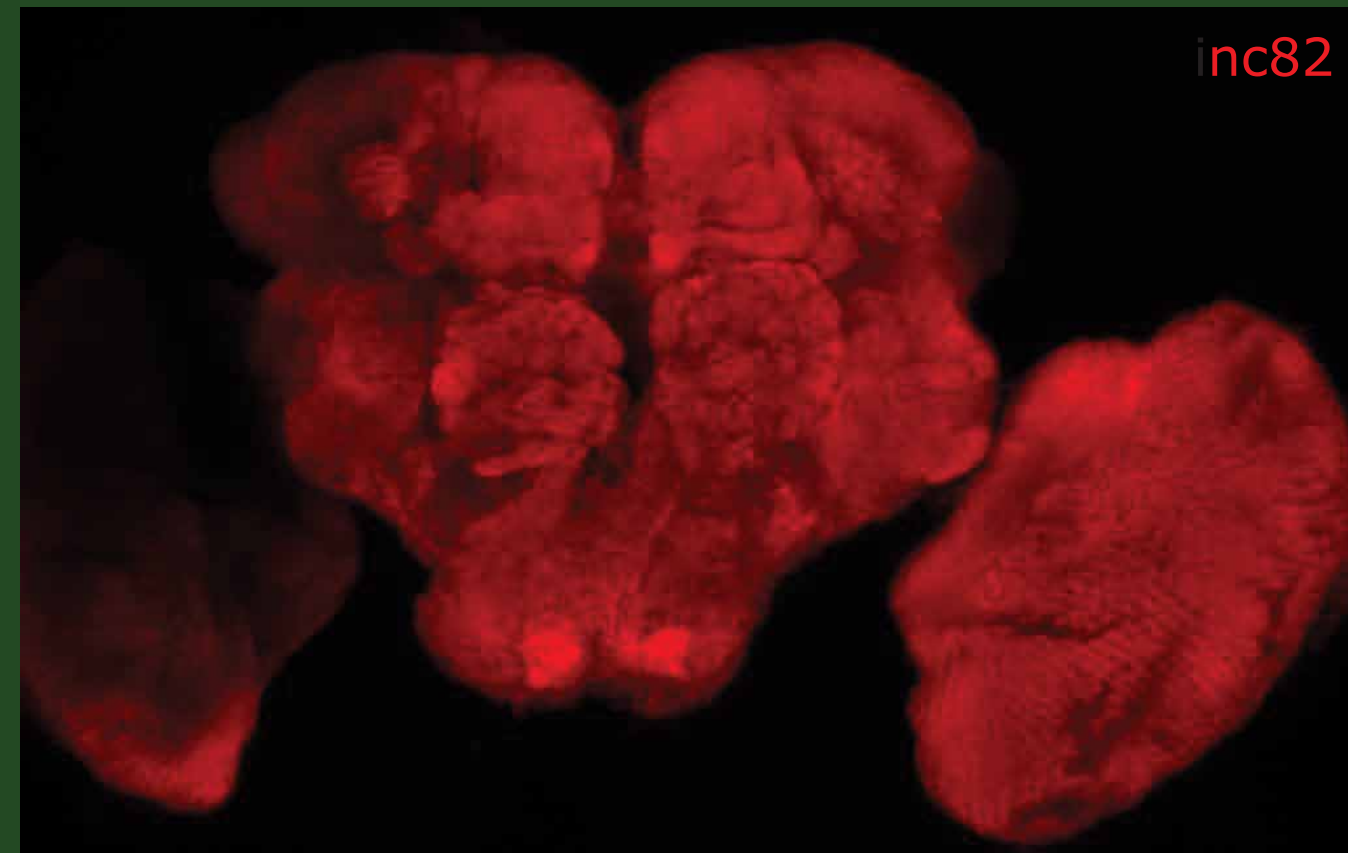## 6. No obvious brain defects in FoxP mutants

nc82

Fig. 6: FoxP mutant brains do not seem to be obviously malformed. A quantitative anatomical analysis searching for more subtle defects is currently under way.

2. *Drosophila* FoxP is required specifically for self-learning

self- and world-learning

only self-learning
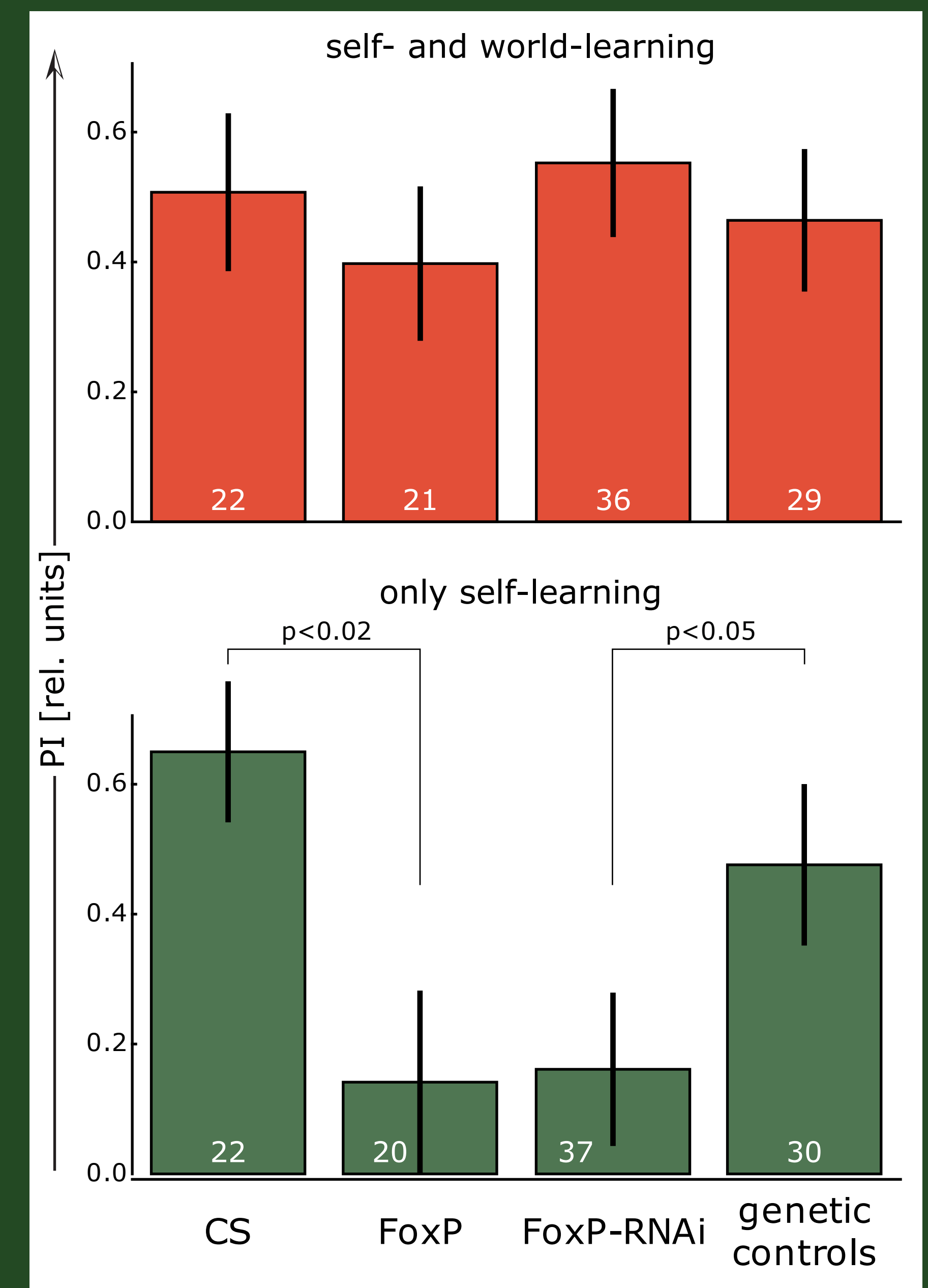
Fig. 2: FoxP function dissociates between self- and world-learning. Canton S and genetic control lines perform well in both learning situations, whereas a FoxP mutant line and a FoxP RNAi line show significantly reduced learning scores specifically in the self-learning task.

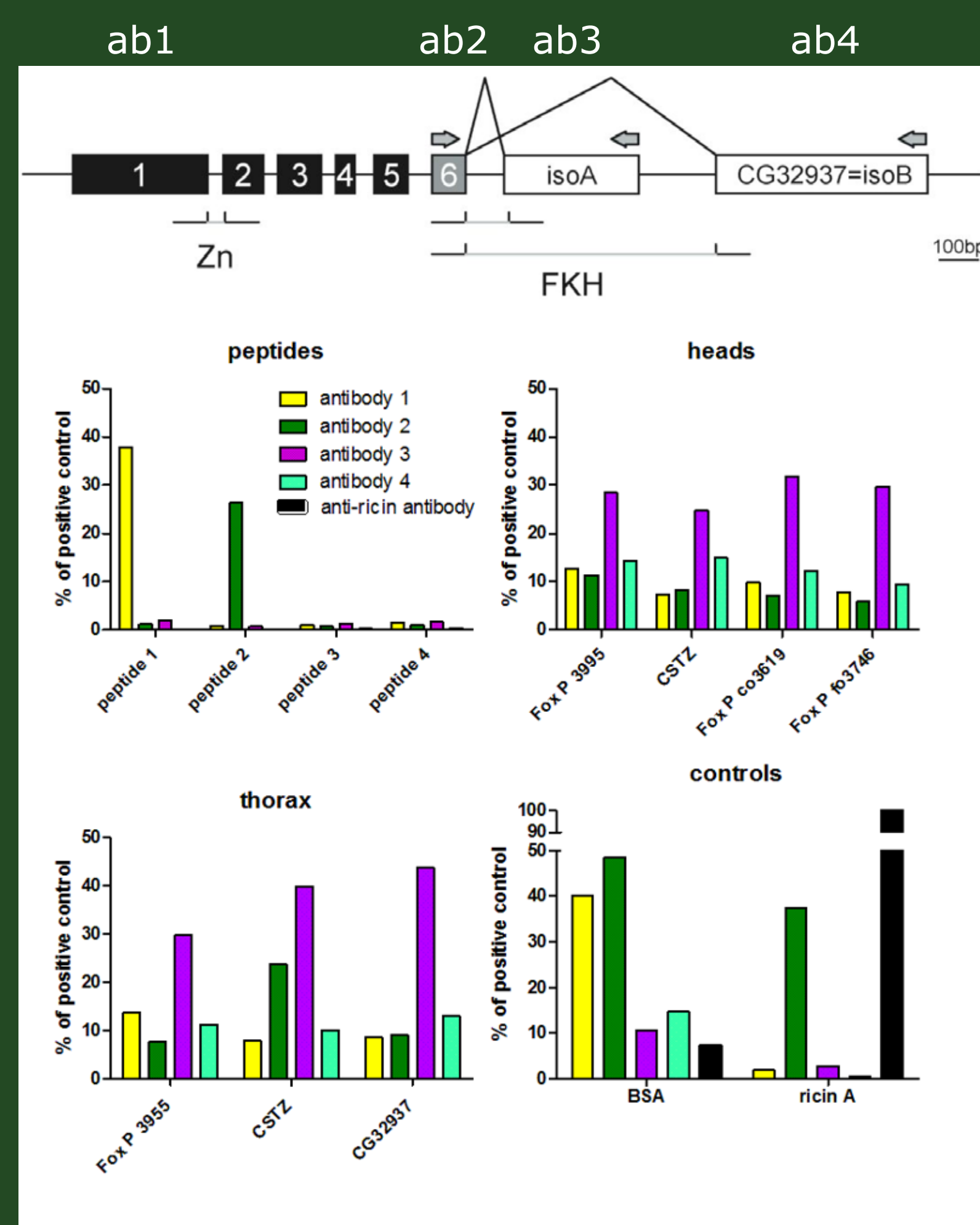## 5. Developing antibodies against *Drosophila* FoxP

Fig. 5: ELISA results after seven immunizations of four chicken immunized with peptides from different regions in the FoxP sequence. No specific immunoresponse, yet.

Self-learning and world-learning

operant behavior

Behavior → heat → color

PKC/FoxP | cAMP

self learning — MB dependent — world learning

Habits

4. FoxP is not transcribed in the mutant line
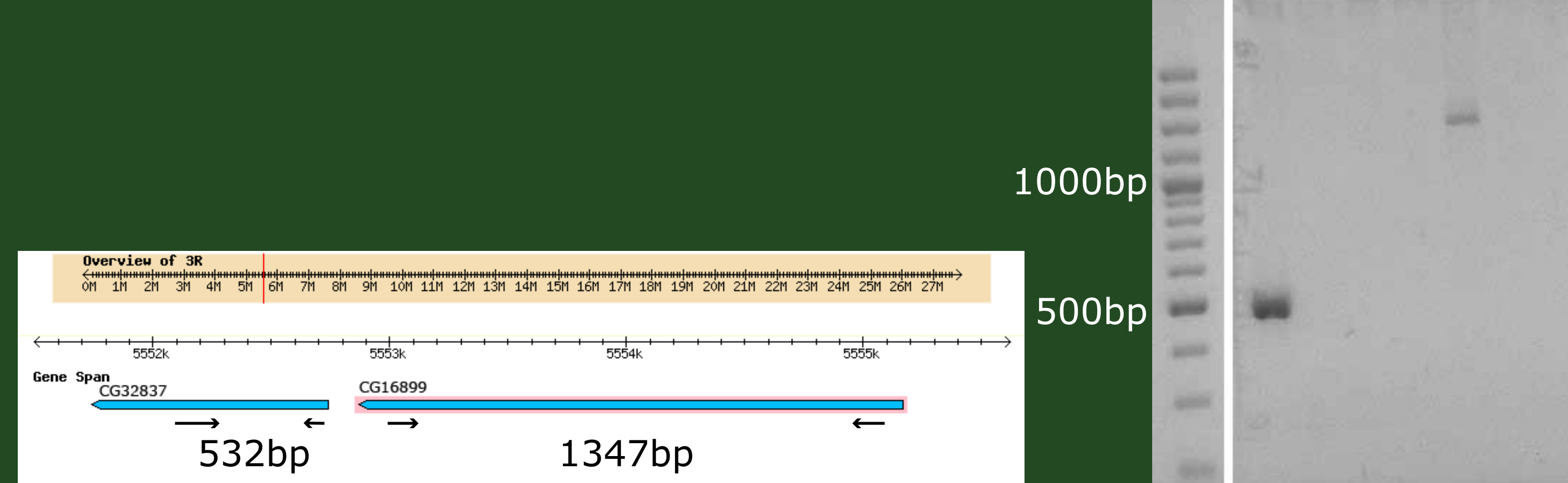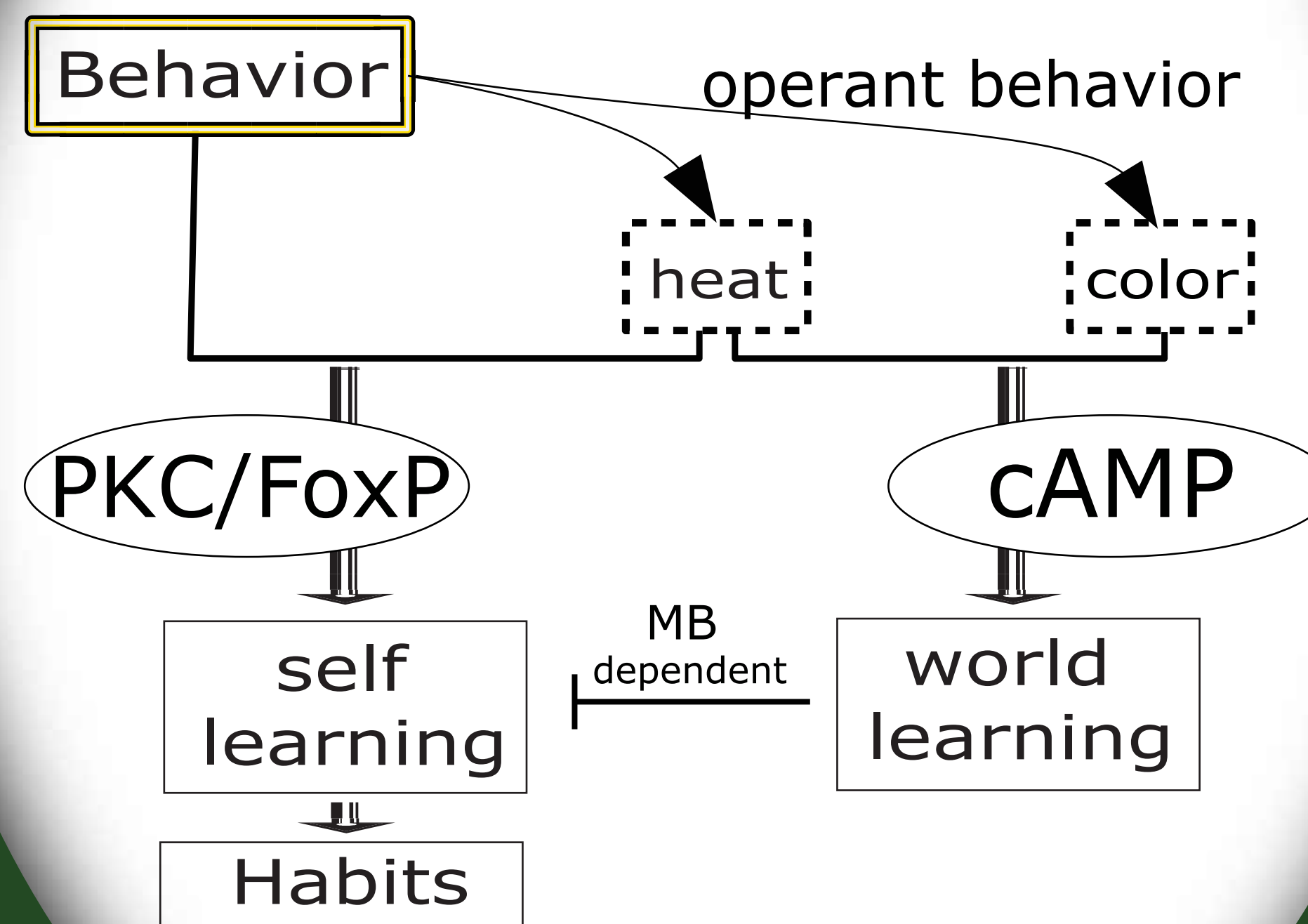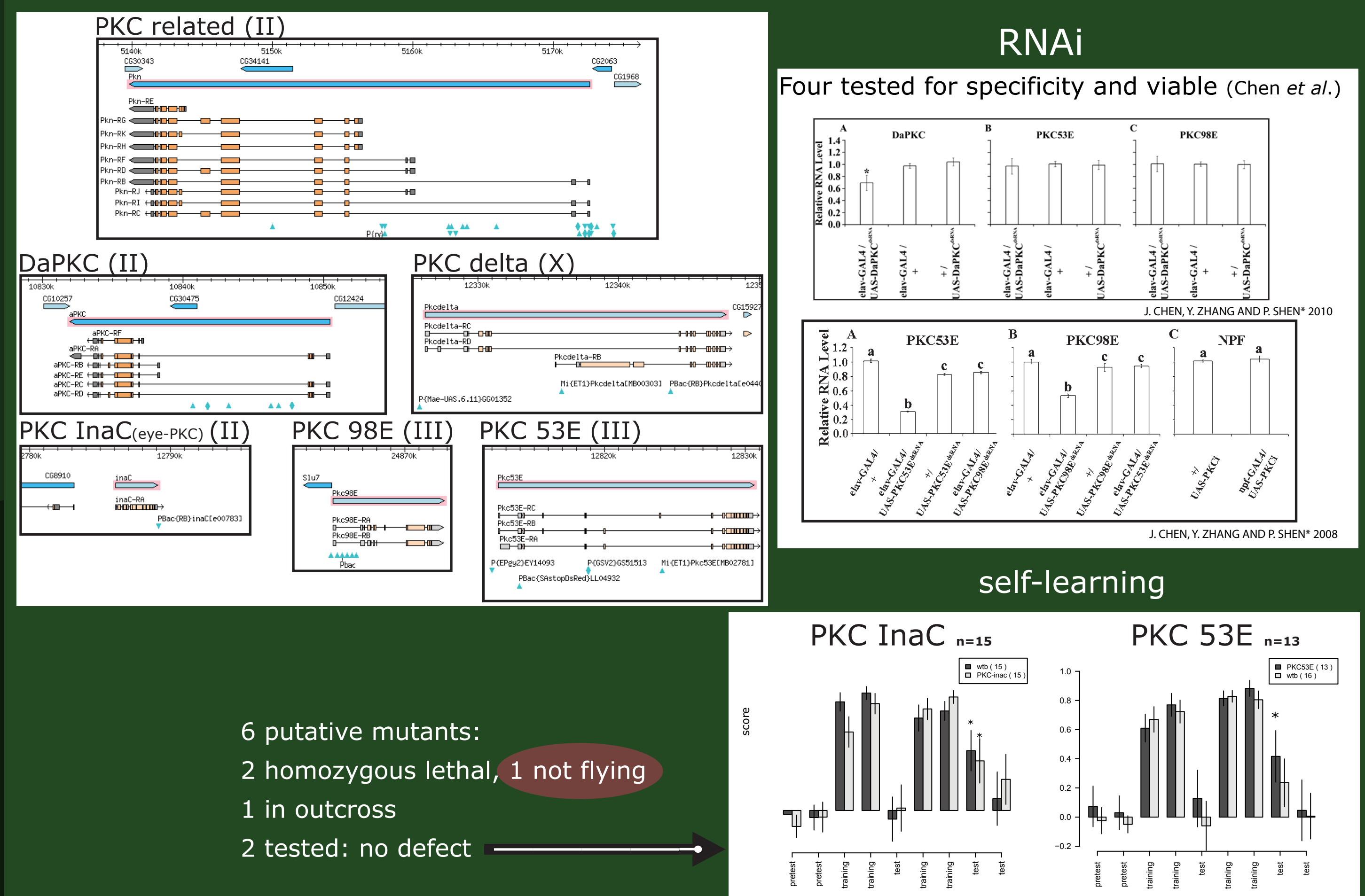
532bp | 1347bp

1000bp
500bp

Fig. 4: Primer pairs directed against each of the two FoxP isoforms (left) do not lead to any amplificate in the FoxP mutant line.

3. Screening PKC isoforms

Mutants

PKC related (II)

DaPKC (II) | PKC delta (X)

PKC InaC (eye-PKC) (II) | PKC 98E (III) | PKC 53E (III)

RNAi

Four tested for specificity and viable (Chen *et al.*)

DaPKC | PKC53E | PKC98E

J. CHEN, Y. ZHANG AND P. SHEN 2010*

PKC53E | PKC98E | NPF

J. CHEN, Y. ZHANG AND P. SHEN 2008*

self-learning

PKC InaC n=15 | PKC 53E n=13

6 putative mutants:
2 homozygous lethal, 1 not flying
1 in outcross
2 tested: no defect

Fig. 3: We are currently in the process of screening various mutant and RNAi lines affecting different PKC isoforms. Two viable, flying mutant lines have been tested in self-learning and are not impaired.