Notebook #15

Composition

Property of _____

Subject _____

1948 - Bimini - Aug-Sep
cat Options N's

August

	Thu	Fri	Sat	Sun	Mon	Tu		Thun	Fri	Sun
R	E		E	E	✓	✓	✓	✓	✓	
L	E		E	✓	E	✓	✓	✓	✓	dead
L	✓		E	✓	✓	✓	✓	✓	E	
R	E		✓	E	✓	✓	✓	✓	✓	
L	E		✓	✓	✓	✓	✓	✓	✓	
R	E		E	✓	✓	✓	✓	✓	✓	
R	E		✓	✓	✓	✓	✓	✓	E	
R	E		✓	✓	✓	✓	✓	✓	E	
L	E		E	E	✓	✓	✓	✓	✓	
L	E		✓	✓	✓	✓	✓	✓	✓	
R	✓		✓	E	✓	✓	✓	✓	✓	
R	✓		✓	✓	✓	✓	✓	✓	✓	
L	E		✓	✓	✓	✓	✓	✓	✓	
R	✓		✓	E	✓	✓	✓	E	✓	
L	E		✓	✓	✓	✓	E	✓	✓	
L	✓		✓		✓	✓		✓		
L	✓		✓		✓	✓		✓		
R	✓				✓	✓		✓		
L	E				✓			✓		
R	E				✓			✓		
R	E				✓			E		
L	✓				✓			✓		
R	E							E		
L	E							✓		
L	E							✓		
L								✓		
R								✓		
L										
R										
L										
R										
L										
R										

① after left eye out – comes right over neck mainly w/out hesitation to correct half – clear retention

after 14 trials have impression that this one recalls.

②

	Fr	Lä	Sat.	Sun	Mon	Tu	W	Th 6th	Fri 27th	Sun 29	Sun 19th	M 20th	W 22d	Th 23
R	E	E	E	✓	✓	✓	✓	✓	O	O	E	E	E	E
L	✓	✓	E	E	E	E	✓	✓	O	O	E	E	E	✓
L	E ✓	✓	E	✓	E	✓	✓	✓	O	O	E	E	E	O
R	E	E	E	E	✓	✓	✓	✓	E	o	✓	E	E	O
L	✓	E	E	✓	✓	✓	✓	✓	O	O	E	E	E	O
R	✓	E	E	✓	E	✓	✓	✓	E	o	E	E	E	E
R	E	E	✓	✓	✓	E	E	E	O		E	E		E
R	E	✓	✓	E	E	✓	✓	✓	O		E	E		
L	✓	✓	✓	E	✓	✓	✓	✓	O		E	E		
L	E	✓	✓	E	✓	✓	✓	✓	O					
R	✓	E	✓	E	✓	✓	✓	E	✓					
R	✓	E	E	✓	✓	✓	E	✓						
L	E	E	✓	✓	E	✓	✓	✓						
R	E	✓	✓	✓	✓	✓	✓	✓						
L	E	✓	E	✓	✓	✓	✓	✓						
L	E	✓	✓		✓	✓		✓						
L	✓	F	E		✓	✓		✓						
R	✓	E			✓	✓		✓						
L	E	E			✓			✓						
R	E				✓			✓						
R	E				✓			E						
L	✓				✓			✓						
R	✓							✓						
L	✓							✓						
L								✓						
L								✓						
R								✓						
L														
R														
R														
L														
L														
R														
L														
R														

Cut 2nd op. n. an
the 29th app'tlly

Starts toward vegol, then
darts back (at 1st)
On 22nd color coming
back & goes readily 8/B.

Fri – just hangs in corner w/ out K.
Finally came out on 4th trial but to wrong

(3)

	Tu	W									Sun 19th	M 20th	W 21st	Th 22nd
R	✓	✓		E	E	E	✓	✓	E	✓ E	O	E	E	E	E
L	✓	E		E	E	✓	✓	E	E	✓ E	E	E	E	E	✓
L		E	✓	✓	E	E	✓	✓	E	✓ ✓	E	E ✓	E	E	E
R		E	E	✓	E	E	✓	✓	E	✓ E	E	E	E	✓	✓
L		✓	✓	✓	E	E	E	E	E	✓ ✓	E	E ✓	E	E ✓	E
R		✓	✓	E	✓	✓	E	E	✓	✓ ✓	✓	E	E		✓
R		E	E	✓	E	✓	✓	✓	✓	✓ ✓	E✓	E	E		E
R		E	E	E	✓	✓	E	✓	E	✓ ✓	✓	E	E		E
L		✓	E	E	✓	E	E	✓	✓	✓ ✓	✓	✓	E		E
L		E	E	E	✓	✓	✓	✓	E	O E	✓		✓		
R		E	✓	E	✓	E	E	E	✓	✓ E✓	E		✓		
R		E	✓	E	E	✓	✓	✓	✓	✓ ✓	E				
L		E	✓	E	✓	✓	✓	✓	✓	E ✓					
L		✓	✓	✓	✓	✓	✓	E	E	O					
L		✓		✓	✓	✓		✓	✓	✓					
L		E		✓	✓	E		✓	✓	✓					
R		✓		✓	E			✓	E	✓					
L		✓		E	E			✓		✓					
R		E		E				✓		✓					
R		✓		E				✓		E					
L		✓		✓				✓		F					
R		✓		✓						✓					
L		E		✓						✓					
L		✓		✓						✓					
L		E								✓					
R		E								✓					
L															
R															
L															
L															
R															
L															
R															

with plates (2d mo)

Gas & glass vessel from other end of aquar. series OK. (on 19th)

Searches about at all. S but hesitates to approach /s. & when does, goes off wrong.

H

Pinched left op. w. Aug. 30.

Mem. end.

	To	W	Wed	Sat 1st	Sun 2	M	T	W 4th	Th out	Fri out	Sun	M	Tu	Sat 18	Sun 19	M 20
R	✓	E	E	E	E	E	E	✓	✓	✓	O	E	✓	✓	E	E	E
L	✓	E	E	✓	✓	E	E	✓	✓	E	✓	✓	✓	E	E	E	✓
L	✓	E	E	✓	✓	✓	✓	✓	✓	✓	✓	✓	E	✓	✓	E	E
R	✓	E	E	E	E	E	F	E	✓	E	E	✓	✓	E	✓	✓	✓
L	E	✓	E	E	E	✓	✓	✓	✓	✓	E	✓	E	✓	E	E	E
R	E	✓	E	E	E	E	E	✓	✓	✓	O	E	E	✓	E	✓	E
R	O	E	E	E	✓	✓	E	✓	✓	✓	E	✓	E	✓	✓	E	✓
R	E	E	E	✓	✓	✓	✓	E	✓	✓	O	E	✓	E	E		E
L	E	✓	✓	E	✓	✓	✓	✓	✓	✓	O	✓	✓	E	✓		✓
L	✓	✓	✓	E	✓	✓	✓	✓	✓			✓	E	EV	E		
R	✓	E	E	E	✓	E	E	✓	✓			✓	✓	E	E		
R	✓	E	E	E	✓		✓	✓	✓			✓	✓	✓	E		
L	✓	✓	E	E			✓	✓	✓			✓	✓	E	E		
R	✓	✓	✓	E			E	✓	✓			E	E	✓	E		
L	E	E	E	✓			✓	✓	O			✓	✓	✓	E		
L	E	✓		E				✓	✓				✓	✓	E		
L	✓	✓						✓	✓				✓	✓	E		
R	✓	✓							✓					✓			
L	E	E							✓					✓			
R	E	✓							E								
R	O	E							E								
L	✓	✓							✓								
R	✓	✓							✓								
L	E	✓							E								
L	E								E								
L	✓								✓								
R	E								✓								
L	✓								E								
R	✓								E								
R									EV								
L																	
L																	
R																	
L																	
R																	

This & all other unit's show good specimen when tested Jan 18th.

5

Left op. n. entered Aug. 30

	Fri	Sun	M	T	W	Th	Fri	Sun	M	Tu	Sat 18	Sun 19	W 21	
R	E	✓	E	E	✓	✓	✓	✓	✓	✓	✓	O	E	✓	seems to know
L	E		E	E	O	E	E	E	✓	E	✓	O	✓	E	
L	E		✓	✓	E	✓	✓	E	E	✓	✓	O	E	E	
R	E		E	✓	E	✓	✓	E	✓	✓	O	E	O	E	E
L	E		E	✓	O	✓	E	✓	✓	✓	✓	O	✓	E	
R	E	✓	✓	✓	O	E	✓	✓	✓	✓	✓		✓	✓	
R	E		✓	✓	✓	E	E	✓	✓	✓					
R	✓		O	✓	E	E	E	✓	✓	✓					
L	E		✓	✓	E	✓	✓	✓	✓	✓					
L	E		E	✓	E	✓		✓	✓	E					
R	E		✓	E	✓	O		✓	✓	E					
R	✓			✓	✓	✓		E	E	✓					
L	E			✓		E		E	✓	✓					
R	E			✓	✓	✓		✓	✓	✓					
L	E			E	✓			✓	E	E					
L	E			E	✓			O		✓					
L				✓	✓			E		E					
R					✓			✓		✓					
L					✓			✓		O					
R					✓			E							
R					✓			✓							
L					O			✓							
R					✓										
L					✓										
L					E										
R					✓										
R					E										
R					E										
R					✓										
L					E										
L					E										
R					E										
L					✓										
R															

Let's start as at beg. — start all over Sat. this one

6

left op. m. reversed Aug. 30

	Wed	Th	Fri	Sat	Sun	M	T	W	Th	F	Sun	M	Tu	Sat 15	Sun 19	M 20
R	E	✓	E	E	✓	✓	✓	E	✓	✓	✓	✓	✓	E ✓	E	✓
L	E	E	E	✓	✓	E	✓	E	E	✓	E	✓	✓	E	✓	✓
L	E	E	E	✓	✓ E	✓	✓	✓	E	E	✓	✓	✓	✓ ~~E~~	E	E
R	E	E	E	E	E	E	✓	E	E	✓	E	✓	✓	E	E	E
L	E	E	E	E	✓	✓	E	E	E	✓	✓	✓	✓	✓	✓	E
R	E	✓	✓	E	✓ E	E	✓	E	✓	✓	E	✓		E	E	E
R	✓		E	E	✓	E	E	E	✓	✓	✓	✓		E		✓
R			E	✓	✓	E		✓	✓	✓	✓	✓		E		
L			✓	E	E	E		E	✓	✓	✓	✓		E		
L			E	E	E	✓		✓	✓	✓	✓	✓		✓		
R			✓	E	✓	✓		✓	E	✓	✓	✓				
R			E	✓	✓	✓		✓		✓	✓	✓				
L			✓	E	E	E		E		✓	✓	✓				
R				✓		✓		✓		✓	✓	✓				
L				✓		✓		E		✓	✓	✓				
L						✓		E		✓	✓	✓				
L						✓		E		✓	E	✓				
R						✓		✓		✓		E				
L								E		✓						
R								✓		E						
L								✓		✓						
R								E		✓						
L								✓		E						
R								E		✓						
L								✓		E						
R								E		✓						
L								E		✓						
R								✓		E						
L								E								
R								E								
L								✓								
R								E								
L								E								
R								✓								
L																
R																

Turn from time

7

left op. w. removed Aug. 30

	Fri 5	Sun	T	W	Th	Fri	Sun	M	Tu	Sat 18	Sun 19	Mo
R	E	E	E	E	✓	E	E	✓	✓	✓	✓	E	E	E
L	✓	E	E	E	✓	✓	✓	✓	✓	E	✓	✓	E	E
L	E	✓	E	E	✓	✓	✓	✓	✓	✓	✓	E	✓	✓
R	✓	E	✓	E	O	✓	✓	✓	✓	✓	✓	✓	E	E
L	E	✓	E	✓	E	✓	✓	✓	✓	✓	✓	E	E	E
R	E	E	E	✓	✓	✓	E	✓	✓	✓		E	✓	E
R	E	E	E	✓	✓	✓	E	✓	✓	✓		E	E	E
R	✓	E	✓	✓		✓	✓	✓	✓	✓		E	✓	E
L	✓	E	E	E		E	✓	✓	✓	✓		✓	E	E
L	E	E	✓	✓		✓	E	✓	✓	E		E		✓
R	E	E	✓	E		✓	E	✓	E	✓		E		
R	F	E		✓		✓		✓	E	✓		F		
L	E	E		✓		E		✓	✓	✓		E		
R	✓	E		✓		✓		E	✓	✓		E		
L	E	E		✓		✓		✓		✓		E		
L	✓	E		✓		✓		✓				E		
L	E	E	✓	E		✓		✓				✓		
R	E	E		E		✓		✓				E		
L		✓		E		✓		✓				E		
R		E		E		✓		✓				✓		
R		E		✓		✓		✓						
L		E		✓		✓								
R		E				✓								
L		E				✓								
L		E				✓								
R		E				✓								
R		E	✓			✓								
L		✓				✓								
R		E												
R		✓												
L		✓												
L		✓												
R		✓												
L		✓												
R		✓												

8

	5/5	mon	W	Th	
R	E E E	E ✓	✓	✓ ✓	O
L	E E E	E E	E	✓ ✓	O
L	✓ E E	✓ ✓	E	✓ ✓	E
R	✓ E ✓	✓ ✓	✓	✓ ✓	E
L	E ✓ E	✓ ✓	✓	✓ ✓	E
R	E E ✓	✓ ✓	✓	✓ ✓	E
R	E ✓ ✓	✓ ✓	✓	✓ ✓	O
R	✓ ✓	✓ ✓	E	E ✓	E
L	E E ✓	E ✓	✓	E ✓	E
L	E ✓ E	O ✓	E	E E	E
R	E ✓ E	✓ ✓	✓	E ✓	·
R	E ✓ ✓	✓ ✓	✓	O ✓	
L	E E ✓	got lost	✓	O ✓	✓
R	✓ E ✓		✓	E ✓	E
L	E E E		✓	E ✓	
L	E E 3		E	✓ O	
L	✓ E		✓	✓	
R	E E		✓	✓	
L	✓ E		✓	E	
R	✓		✓	✓	
R	E		O	✓	
L	✓		✓	✓	
R	✓			✓	
L	E			✓	
L	E			✓	
L	✓			✓	
R					
L					
R					
R					
L					
L					
R					
L					
R					

Sun 19th

	M 20th	22 W	23 Th
E (present but scared)	E	E	✓
E	E	✓	✓
✓	E	E	✓
	E	E	E
	✓		✓
	✓		E
	E		E
	✓		
	E		

Goes for nylon line — see note for 7/10. They seem to go naturally for small dark objects in preference to larger white ones.

Leaches about on bottom, but hesitates & approaches to 3 when intruder & when it does, it goes to wrong one.

9

	Tu	W	(31) Sun	Mon	Tu	W	Th	F	19th Sun	20th M	23 W	Th
R	E	✓	E	✓	E	✓	✓	✓	✓	E	E	✓	⊗
L	✓	E	✓	E	E	✓	✓	✓	✓	E	E	E	✓
L	✓	✓	✓	✓	E	E	✓	✓	✓	✓	E	E	E
R	✓	E	✓	✓	E	E	✓	✓	✓	E	✓	E	✓
L	✓	✓	E	E	✓	E	✓	✓	E	E	E	✓	E
R	E	✓	E	✓	E	E	✓	✓	✓	E	✓		E
R	E	✓	E	E	✓	✓	✓	✓	E	E	✓		
R	E	✓	E	E	✓	✓	✓	○	✓	E	✓	seems to have caught on	
L	✓	✓	✓	✓	E	E	✓	✓	✓	✓	E		
L	E	✓	E	✓	✓	✓	✓	E	✓	✓	E		
R	E	✓	✓	✓	✓	✓	✓	E	E	✓	E		
R	✓	E	✓	E	E	✓	✓	✓	E	E	E		
L	✓	✓	E	✓	E	✓	E	✓	✓	✓	E		
R	E	✓	✓	E	R	✓	✓	E	E	✓	E		
L	E	✓	✓	✓	✓	✓	✓	E	✓		✓		
L	✓	✓		E	E	E	✓	E	✓		✓		
L	✓	✓		E	E	✓	✓	E	✓		E		
R	E	✓		✓	E		✓		✓		✓ upper level		
L	✓	✓		✓			✓		✓				
R	E	E		✓			✓		✓				
R	E	✓		E			✓		✓				
L	E	✓		✓			✓		E				
R	E	E		E					✓				
L	✓	E		E					✓				
L	E			✓					✓				
L	✓			✓					✓				
R	✓												
L	✓												
R	E												
R													
L													
L													
R													
L													
R													

This is only one seems to have carried over the genl aspects of habit (Only one that learned w. rt eye?)

Approaches w. little hesitation
after 5 trials here impression this one
needs O.K.

I (10)

	T	W			Sun	Mon	Tue	W	Th	1st	19th	T 20	22 W	23 Th
R	E	✓	E	✓	E	E	E	✓	✓	E	O	E	E	E	E
L	✓	E	E	E	✓	✓	✓	✓	✓	✓	O	E		E	E
L	E	F	E	✓	E	E	E	✓	E	E	O	E		E	E
R	✓	E	E	E	E	✓	✓	E	✓	✓	O	E		✓	E
L	E	✓	E	E	✓	✓	✓	✓	✓	✓	O			E	E
R	✓	E	E	E	✓	✓	E	E	✓	E	E			✓	E
R	E	✓	E	✓	E	E	✓	✓	✓	E	E				
R	E	✓	E	✓	✓	E	✓	✓	✓	E	E				
L	✓	✓	✓	E	✓	✓	✓	✓	✓	✓	E				
L	E	✓	E	E	E	E	✓	E	✓	E	E				
R	E	E	✓	E	E	✓	F	✓	✓	✓	E				
R	✓	✓	✓	✓	✓	E	E	✓	E	E	O				
L	E	✓	✓	E	✓	F	E	✓	E	✓	E				
R	✓	✓	✓	E	✓	✓		✓	✓	✓	O				
L	E	✓	✓	E	E	E		✓	✓	O					
L	✓	E	E	✓	E	E		✓	E	E					
L	E	✓		E	E			E	E	E					
R	E	✓		E	E			E	✓	✓					
L	E	✓		E	E			✓		✓					
R	✓	✓		✓				✓		E					
R	✓	✓		✓				✓		E					
L	✓	✓		✓						✓					
L	✓	E		E						✓					
L	✓	E		✓						✓					
L	✓	E		E						E					
L	✓			✓											
R	✓			E											
L	✓			✓											
R	E														
R	E														
L															
L															
R															
L															
R															

On 19th goes up to left & takes end of nylon & thread like — so can see OK & can see that sharply — same for #8

#10 gets scary and acts as if did it remember very well – I remember that the appear has grad & approaches but rest is dim.

11

Left op. w. severed Aug. 30.

	Tu	W	Th.	Fri.	Sat	Sun	M.	T	W	Th	Fri	Sun	M	Tu	Sat 18	Sun 19	20 M
R	E	E	E	E	E	E	E	✓	E	✓	✓	✓	✓	✓	E	E	E✓
L	✓	E	E	E	E	✓	✓	E	✓	E	✓	✓	✓	✓	E✓	✓	E
L	E	E	E	E	E	✓	E	E	✓	✓	✓	✓	✓	✓	E	✓	✓
A	E	E	✓	✓	E	E	✓	E✓	✓	E	✓	✓	✓		✓	✓	✓
L	✓	E	✓	E	E	✓	E	E	✓	✓	✓	✓	✓		✓	✓	✓
R	✓	E		E	E	E	E	✓	✓	✓	✓	✓	✓		E	E	✓
R	E	✓		E	E	✓	✓		✓	E	✓	✓	✓		E	E	E
R	✓	✓		✓	✓	✓	✓		✓	E	✓	✓	✓		E		✓
L	✓	E		E✓	E	✓	✓		✓	✓	✓	✓	✓		✓		
L	E	E		E	E	E	E		E	✓	✓	✓	✓		E✓		
R	F	✓		✓	E	E	✓		✓		✓	✓	✓		E		
R		E		✓	E	E	✓		E		✓	✓	E		E		
L		E		E	E	✓	E		✓		✓		✓		E		
R		E		E	E	✓	E		✓		✓		✓		E		
L		E		✓	E	E	E		✓		✓				E		
L				E	✓	✓	✓		✓		✓				✓		
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On Wednes. started w. very small piece of bait and this caused tremendous increase in errors. They then went for the larger piece of gum more than chance. — Gave up on this —

Apptly they were not paying much heed to the backgrd they were either recognizing the bait itself or else were using / alfactran.

They crawled all over S plate so no charge apptly.

Decided ∴ to △ to diff't type of thing. Using a large wad of cotton for the negative S and a small piece of fish or conch for the positive.

The positive is higher and more easily reach than the negative

With this set-up, reversed the no.s of the animals 11 — 1.

Have to rule out lateral line cues? If blind and they cannot find — is that enough?

When trying out this method on Wed Aug. 24 half of the fish went first to the larger (cotton) S. and then over to the bait — did it repeat more than twice for fear they wid learn.

Can use rt-left alternation w. ref to the position of the animal. Can simply turn the handle w'out D's the bait for most of training & then switch a few at end to check out any such position effect.

Have to be all set up ready to go from very 1st in order to get thru the early incorrect trials.

New animals can be taught on a single +S for while & then introduce the negative one.

14 days, at least, for recovery

Better get started on the one-eye cases.

The position diff'l is a good thing to use, cause know it is reversed.

On Sun. the 30th after 3 R's in a row & w. good scores before all 1st 4 made errors when shifted to left — showing predominance of here & after vertical components & lower edge factor. They darted right into glass wall w'out much looking.

At this pt. correct choices being reinforced by allowing feed for pecks several times at figure but withdrawing after peck at glass so they don't get a chance to go on over to the bait.

They're still making bad errors as late as Tues. the 30th lunging at into glass & almost crapping at it.

Trials given at intervals of 1 min. and up. A series in morning of about 10 and another series of 5-10 in afternoon.

Size of bait gradually decreased. Final tried off & bait changing so they could fall up.

((On Thurs. the 1st they are making snaps at the wires & rarely at glass rods))

In early training they often repeatedly go to same glass rod even tho the things are not moved.

((Sun. after Fri. when rb op. m. was severed — none of fish fed to the S altho the aquar. had been smelled up w. fresh conch and the gobies were searching around an open book

They search around bottom & sides w'out going up in middle as used to.

They seem to prefer & do better on fish than conch — at least after long series of trials on conch.

The conch m. near the liver etc. when soft = very good bait.

The gobies are very tiny pieces of stuff sinking in 1 to 2 ft but have trouble seeing piece of fish still on bottom & have to search about for it.

How about training w. thread & allowing the lure to sink slowly in the H2O?

Use  large vs. small and snatch lure away when they approach larger first.

Could test for position by arrang so larger falls first, etc.

For final tests - need some critical trials on those that do remember.

Would be much better if could get some means of covering eyes for a couple days. Try the tantalum caps & see what they do.

After 1st 10 trials or so on the unifocular cases — get impression that the transfer, if any, is very poor and negligible in same cases.

These animals however do carry over certain aspects of their training such as readiness to go boldly to the S as soon as it is presented (except S) and their tendency to approach in same way as before i.e. at certain level near surface, etc.

They appear to carry over about as much of habit as of non-visual

In the case of S — it used to sit on bottom & look over the S before approaching it — unlike the others which should swim right over & then begin to decide whether to approach — vision for orientation of R.

Except for S all cases worked very well. Dipped the same S into neighboring tank where training other goldfish & it goes correctly to the punch — so rule out effects w. the S.

Results warrant conclusion that there is not transfer of the usual aspects of the habit — the goldies ignore toward the untrained S. Otherwise rewards.

(Remember that the other op. n. had reg'd & that there was some over lap — this might acc't for such transfer as there was.

Next time train unilat. w. cap over one eye, after they learn crush op. n. and remove cap. Test for transfer at this point. Then test for recall after begin of 1st verse.

AM. On 19th the bilat. as a group act as if the S object is foreign & to be avoided. #9 may just naturally be bolder than others. #10 obviously saw S & was obviously hesitant to approach it. — Just as if starting in all over from scratch.

PM. They see it all right — turn & start toward it but are afraid — act entirely as if were a foreign object introd'd into aquar. for the 1st time.

(The uniocular all R. OK when S placed outside the glass.)

Finally on 20th started w. S lowered ½ to bottom as at 1st so they wouldn't be so scared & this helped considerably.

The dark color of these cases fits in w. their scariness

Interocular Shift

Rt. morn. after section of left op. n. nite before began introd. glass wall & a large piece of conch, to break down fear.

Appt'ly there is going to be ocular independence.

If so, then the present series should forget all they have learned with the first eye. Would expect even with further training that the same eye would predominate & get complete loss of habit.

To make a stronger case, train to greater perfection - state no. of correct trials in last 50 or so & the contrast will look better.

If get complete lack of transfer in this series & a large no. fr. either complete retention or severe loss, - then have good case for lack of interocular transfer.

Then need extra cases of bilateral regeneration w. controls to test for retention after optic nerve regen'n.

Conclusions

✓ Looks as tho a high degree of ocular independence with little if transfer of the higher intellectual processes — or the possibly same general transfer. — or else both eyes are used for general aspects of problem & only one for more highly specialized.

✓ Ld for looks as if a visual habit is lost by sectioning the op. n.s & regen. This would really be sumpin, if so.

First, however, must run controls with mock ops to see if the anesthesia & surgical shock, or period for regen will cause loss of memory w/out op. n. section.

Doesn't look as if it is a matter of anes. or surg. shock inasmuch as got complete retention in #1 & partial in #9 after visual section.

A marked diff. between the visuals & lids. The lids have lost everything. They have to be started all over again right from scratch whereas the visuals seem to go up to S very readily. Only diff. is that the n.s were cut sharply & there probably was some overlap of training vs. 1st eye functioning during last few days.

To Do

✓ Cf. effects of op. lobe lesions w. those of op. n. section. Should get same flaterality.

✓ Run controls on the op. n. regen cases.

Use equal size & make it a matter of position. Keep the fish on bottom same way when they start trials — a couple stakes as ramps to nestle between but w/o plant, obstruct upward vision.
Vary the Hab depth & the S depth to prevent their learning food is at a certain level.

Perhaps best to start out w. one nerve cut completely. Train the remaining nerve, then cut it and while it is reg'g feed by same method w. the other nerve while main nerve is reg'g. Then again cut the extra nerve & test retention.

Set up another series of bilat. cases w. an accompanying series of controls.
Train both thoroly —
cut n's in exp'ls
mock opns on controls put ½ of these in dark room or in light-proof boxes.

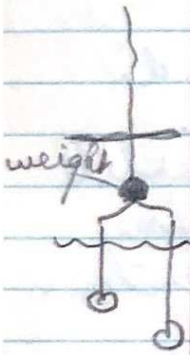
The color Δ might be important. After reg in the gabids looked / dark as in frightened / phase. & they acted it. Hope to acc't for fright in this case.

The foregoing would take a bit more than one month or just about a month. with an assistant also training on the fish - need more aquaria?

This would ~~such~~ decide where the forgetting lies.

If due to section of optic nerve, what does it mean?
Reads could be within the primary system, but probably not. Loss of impulses — loss of all visual meaning? physiolgic effect on centers

Improve apparatus so that under water the only 2 objects hung by very thin wire that will not attract att'n.



18 bilateral learned   Feb 7 → 22nd
6 = except cut one n. then other   March 17th
6 go into dark   shift about in aquaria toward end
6 kept in light

4 -

Ser. A { 10 days – 14 days train / shift about during last few days
cut nerves
21 days wait = 5 weeks }
retraining to learning criterion 1 week
& cut olfaction some 3 & dark test others till these have relearned.

Ser B starting on Feb. 23rd
① train 9 bilat. & blind temporarily
② " 9 w. 1 eye blinded
train to crit. w. other eye.
test effects of op. lobe lesions

~~Effect on~~ Visual memory of after ~~[illegible]~~
& Op. n. regeneration ~~[illegible]~~ in ~~[illegible]~~

Failure of Interocular Transfer of Visual Memory in Teleosts

Group I

1949 - Feb-Mar. Bimini. Eye implants Also - Torsion Modulations - fins

Eye Reimplants

2-6-49 Removed the left eye and reimplanted the right in 22 gobies. (Bilateral in 2 of these). Put all but 3 in the dark room.
(14 – 28 mm in overall length.)

Fri-11-49 – Noticed eye movements in smallest ones not necessarily normal. Eyes look good in these, little or no shrinkage & normal color apptly.

Sat – 19th of Feb. – Couple of larger ones show good escape & fleeing as if they can see.

Sun 20th With only a couple of exceptions the ability of the fish in dark room tank to avoid a net in catching them indicated they had normal vision, but cannot say for sure. Transferred all cases to light in 2 large finger bowls.

16
5
11
27
38

3-5-49 Unmistakable evidence of visual recovery. One of them comes up off bottom for capch. = <u>27 days</u>
Medium sized & a bit under have recovered – about 3 of them, at least 2.

28
6
22

3-9-49 One goby got away down sink in shifting tanks – looked about size of one that saw best.
3-13-49 4 of em see & R. thru the glass walls for it. Seven can see out of 16 still alive.

3-15-49 Lengths of 4 g wh. had recovered vision + cornea fixed in Bouin's diluted w. 1/3 + more alcohol (95%).

24 mm
29 mm.
18 mm.
22 mm.

No abnormalities noted in eyes - looked normal — but r eye muscle began running up.

3-16-49 Fixed 2 more which clearly have recd — K correctly thru glass.

16 mm
16 mm.

9 other cases wh. have not responded = 6 recd out of 15 (+ ~~probably~~ 7 out 16 before it washed down drain). Rec'd were put in w. others + had lower jaw intact +.

3-30-49 In dissection after fixation found thin patches (usually only 1 or 2 per eye) in the retina of those which did not recover (+ slides for this on those that did on whole specimens). Also found good sets of eye mvts in one or 2 + rest looked running.

The thin spots are not as so in the cases which recovered altho there are 1 or 2 in some of these

Elmer E. Mills Corp. – Chicago

Plastic Saran tubing wall thickness 1/32
= still plastic

Pelvic fin modulation

2-25-49 Brake n's to left pectoral fin in 6 Largasso fish.
It makes no mark on 4th day even at proximal most joint.

3-3-49 The fin is moving already in 2 of 3 remaining cases (largest). The proximal joint and also the fin rays.

2-3, 1949 Bimini.
Nerve modulation
Pectoral fin nerves

2-14-49
2-28-
3-7-

Retinal lesions

Set up series w. reg'd op. n. on right. 2 weeks +.
After 3 weeks make lesion in ventral quadrant on both reg'd & intact side.
Just before leaving fix for symtrl comparisons.

2-15-49 Broke right optic n. on a series of 8-10 gobies (1st tkp tank). The nerve was well pinched, but w. sheath left intact in some while in others the fr. was broken completely.

3-8-49 Made ventral lesions in retina on both sides in 9 remaining. Made some effort to make lesions symmetrl Punched hole in retina. Then crushed in both directions.

3-16-49 Fixed the 6 remaining clins in Bouins diluted w. 95% alc.

Possible Problems in Fish

① Vestibular nerve can be cut – electrical regen to M.'s cell – maybe see selectivity

② Remove forebrain before & after learning, & other brain lesions.

③ Regen of motor n's to limbs (Xenopus fish) or to reflexmotor m.s. & limbs = eyes.

④ Set up series w. ventral quad. lesions before & after regen.

⑤ Parts of retina to other

Grant Public Health

Travel & exps $300 = 225 + 75
to & from Lerner Lab rail & air $350
Salary ass't $3000/year

Apparatus – mov'g picture camera 350
" " + + 200
Animals, rhesus monks $150

Send in bibliog. & refees 550
350
3000
3900
150
4050

Work on chap.s after this and lectures. Let research ride for a while — or else do only opening & depend upon advice for rest.

How about the monkey mice & tantalum – exp't? Could get this going w. an assistant.

Get going on the psych. app't.

Black Asphaltum (Benjamin Moore & Co. Cleveland, St. Louis, Chicago?)
for varnishing or painting aquarium fixtures etc. It dries quickly and does not have any toxic action on fish.

The gaff. topsail catfish (& maybe others) have oral gestation with large eggs (20 mm in diam) and ought to make beautiful material for embryological operations. The fish is all exposed without membranes apathy — tho it does lie on one side so damn eye covered — See Gudger in Papers from Dept Marine Biol vol. 252 of Carnegie Inst
The ♂s carry the eggs in June

Sutton home ph - 3-5829
office 3-4104

Mica.

Cut optic nerve training - Bimini, 1948

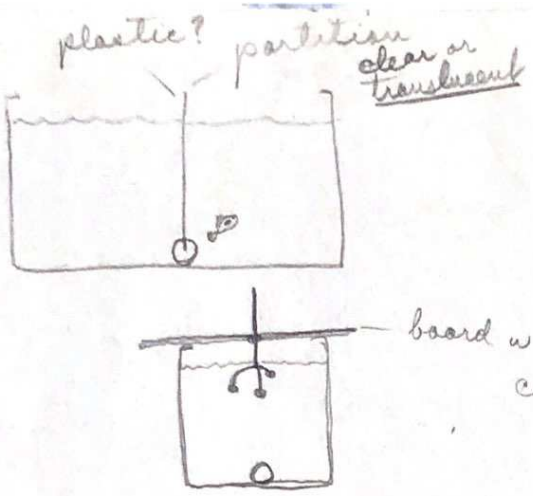
Bimini 1949 - eye removal data

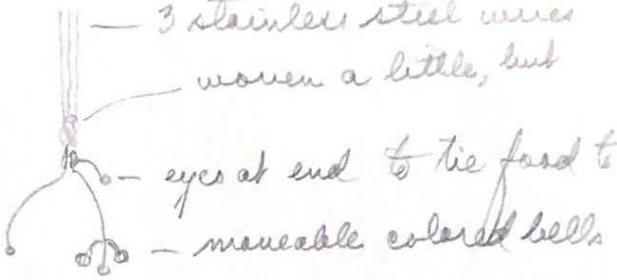
" " Restored fin nerves cut

List of possible fish expts. #15

Misc. refs.

① Cut one nerve
② Train
③ Test with other nerve cut
   Ⓐ If get transfer —
      Prone
         ① can see color after regen of optic nerve
         ② intraocular transfer
   Ⓑ Resection 1st nerve after regeneration of 1st.
      If get retention —
      Prone (?)
         ① Memory after regen of n.





① Teach fish to discriminate color
Transect one optic nerve, & then other. see if recalls

② Transect optic n. & allow regen.
Train to see if can teach color discrim.

③ Train w. one eye blinded by transection
Test w. opposite eye after cutting trained n.

Train to criterion of 17 correct out of 20.

Checks – shift intensity relations of colors but keep same 3 colors (?)

blue-red (−) orange (+) yellow green (−)

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call for instruments + tantalum foil
" " plastic
" " micros.
" " old notes