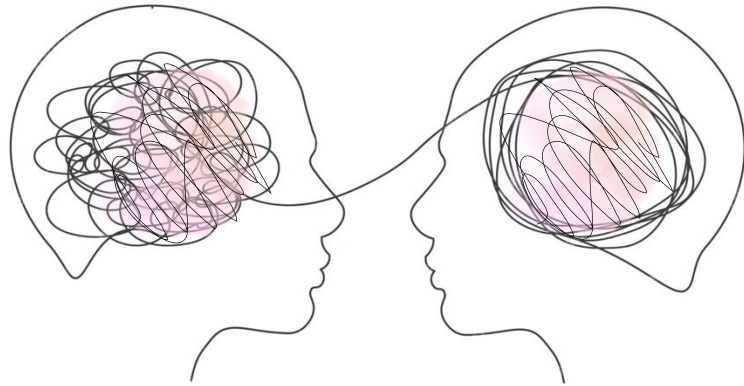




MECHANISMS OF EMPATHY ACROSS SPECIES

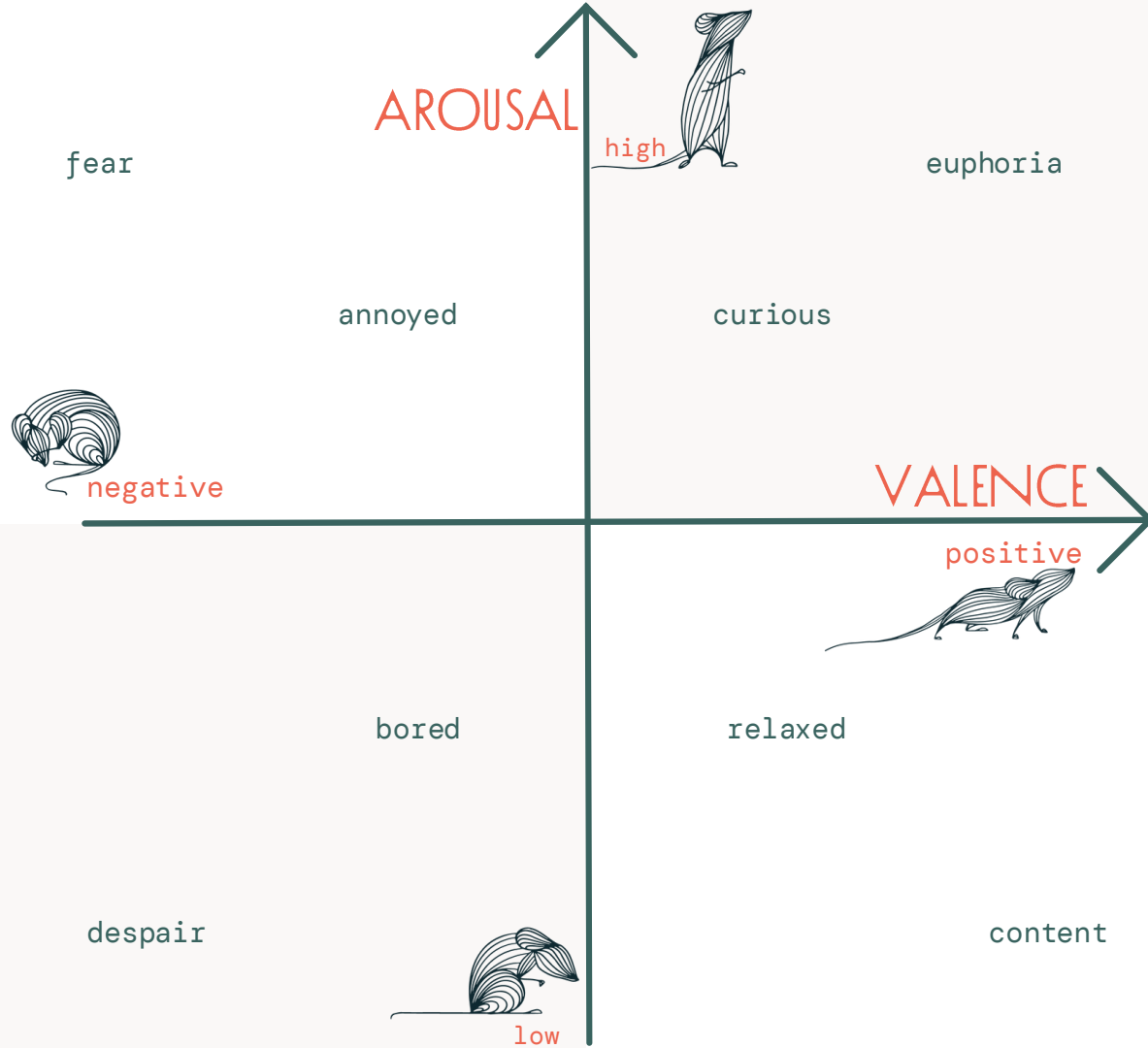
MONIQUE L SMITH, PHD

Sanford Institute for Empathy and Compassion Professor
Assistant Professor Departments of Neurobiology and Neurosciences
University of California, San Diego

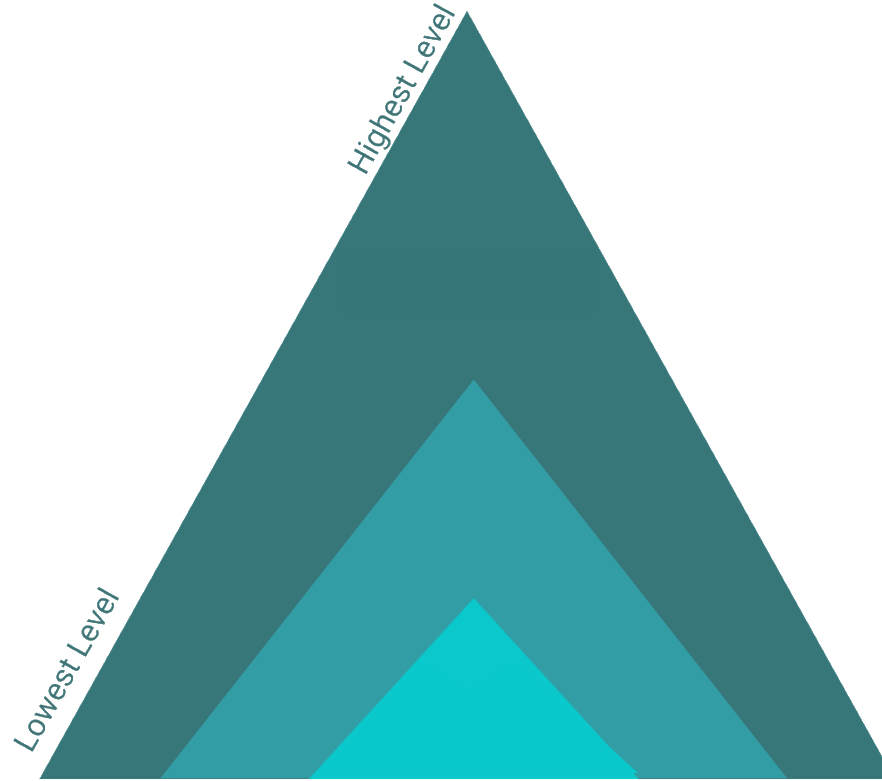


Empathy:
Sharing others'
emotional state

AFFECTIVE STATE



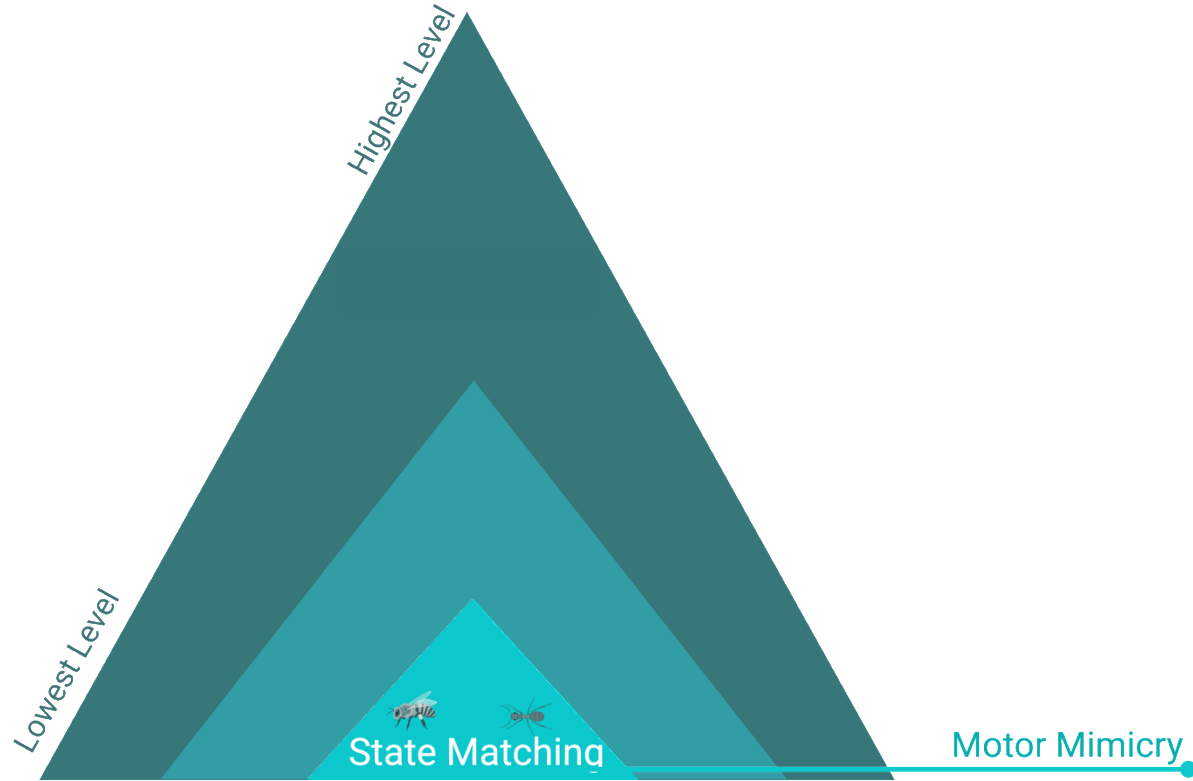
Evolutionarily conserved “levels” of Empathy



E M P A T H Y



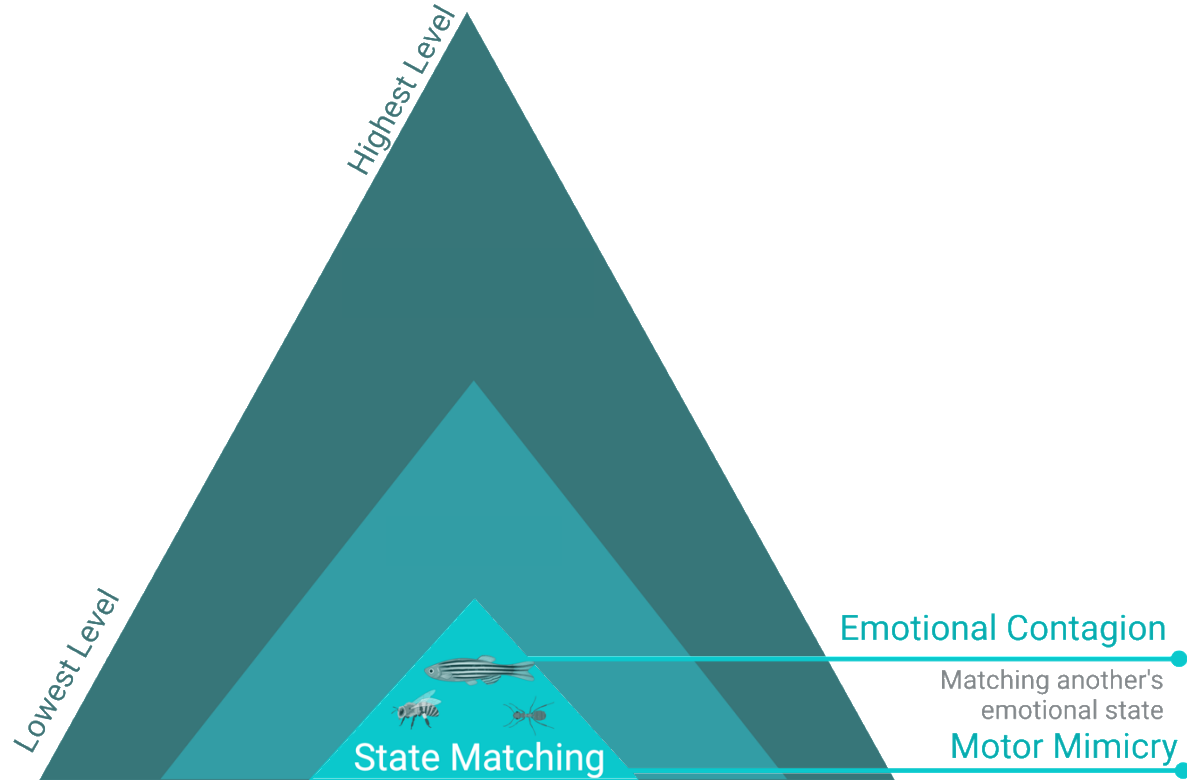
Evolutionarily conserved “levels” of Empathy



EMPATHY



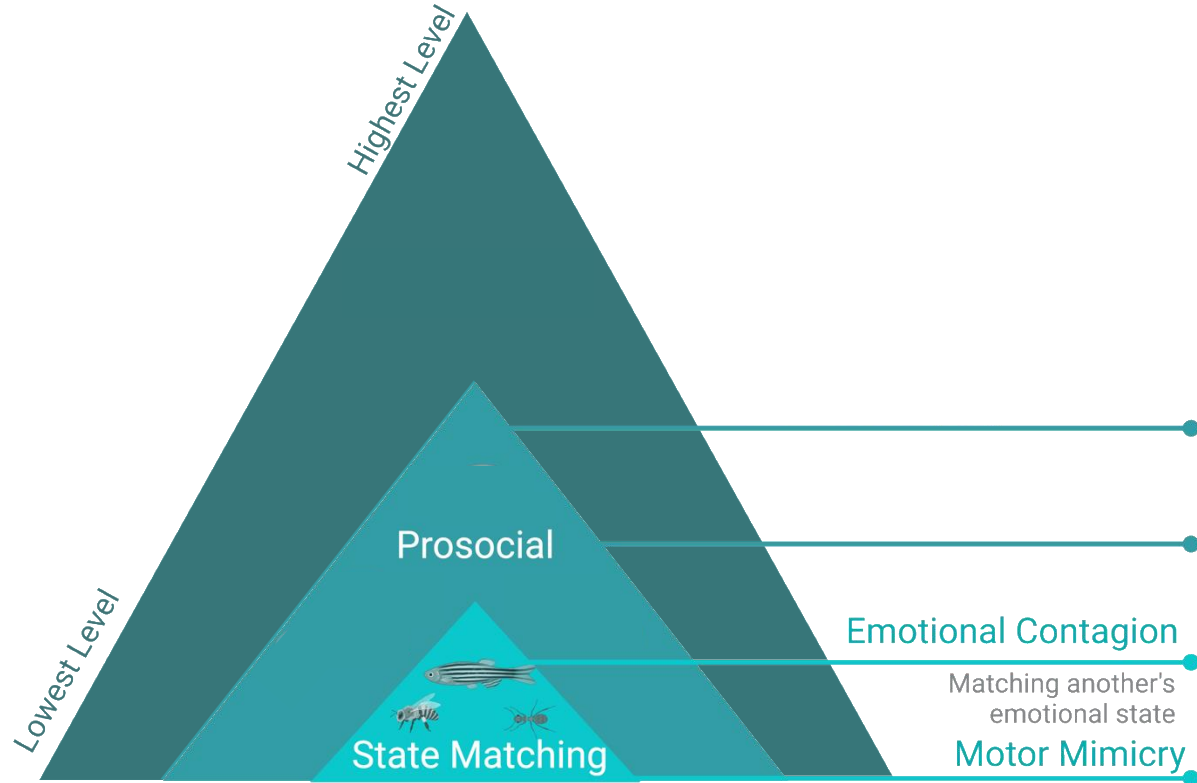
Evolutionarily conserved “levels” of Empathy



E M P A T H Y



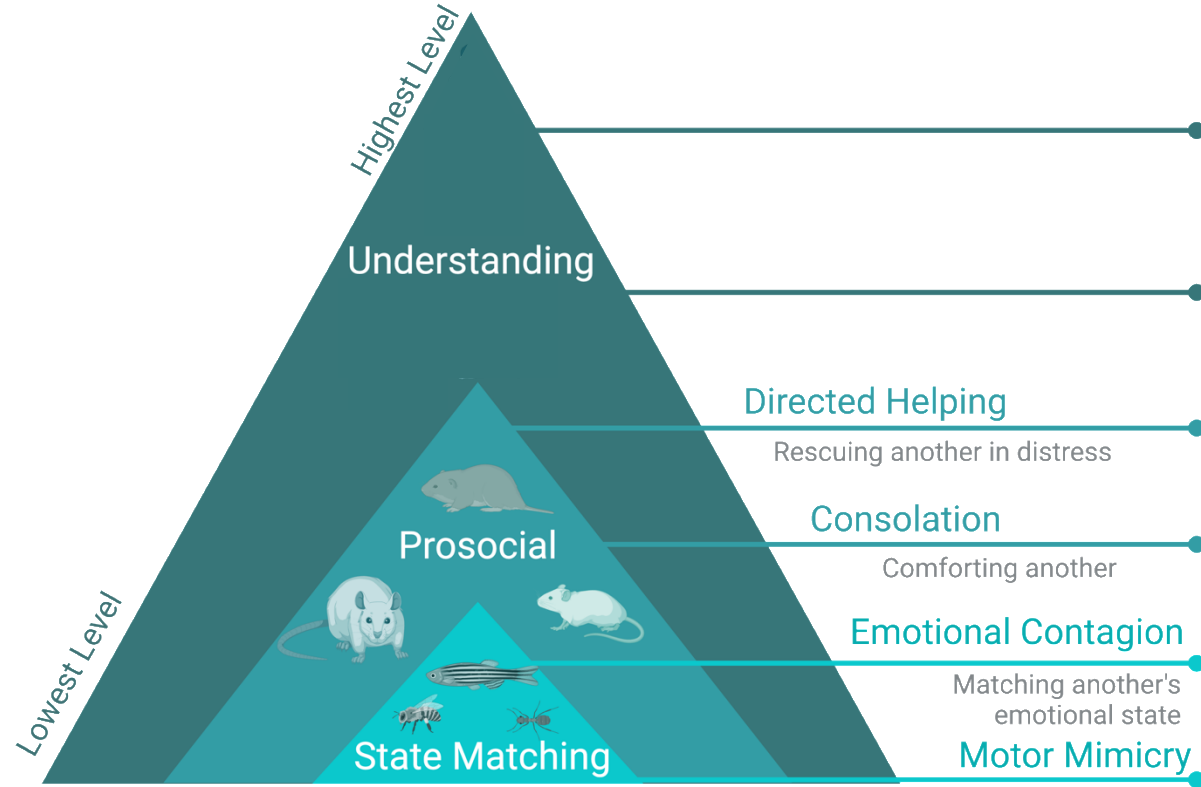
Evolutionarily conserved “levels” of Empathy



EMPATHY



Evolutionarily conserved “levels” of Empathy

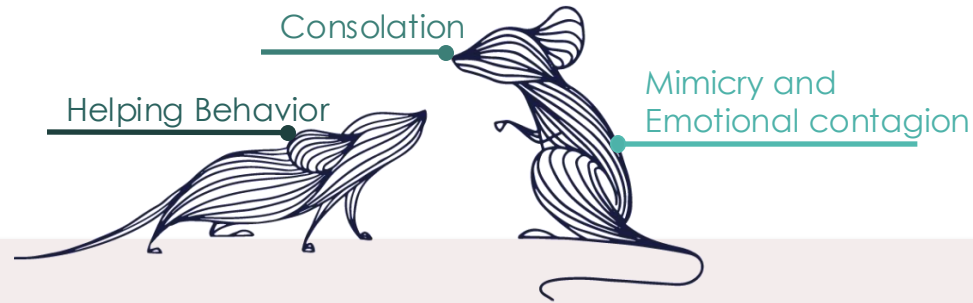


E M P A T H Y

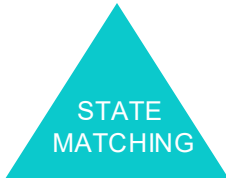


EMPATHY: NOT JUST FOR HUMANS

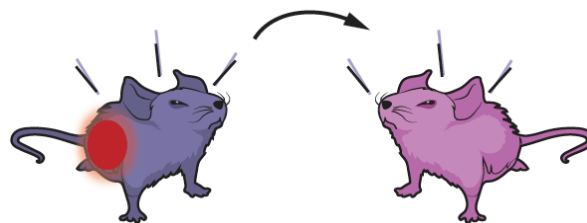
Emotional contagion, observational fear, behavior matching, social buffering, social transfer of sickness behavior, “Helping” behavior and consolation behavior



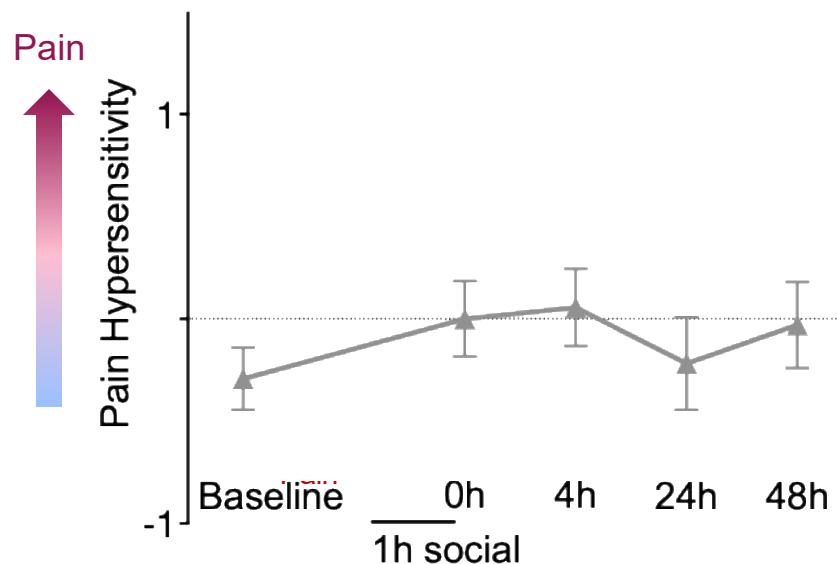
Pain State Matching



Pain State Matching

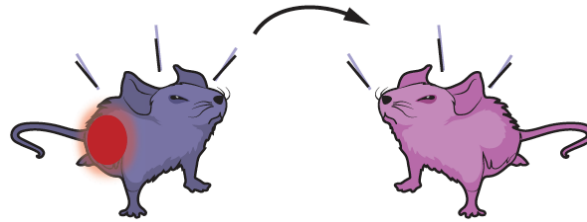


▲ Control ● Pain □ Bystander

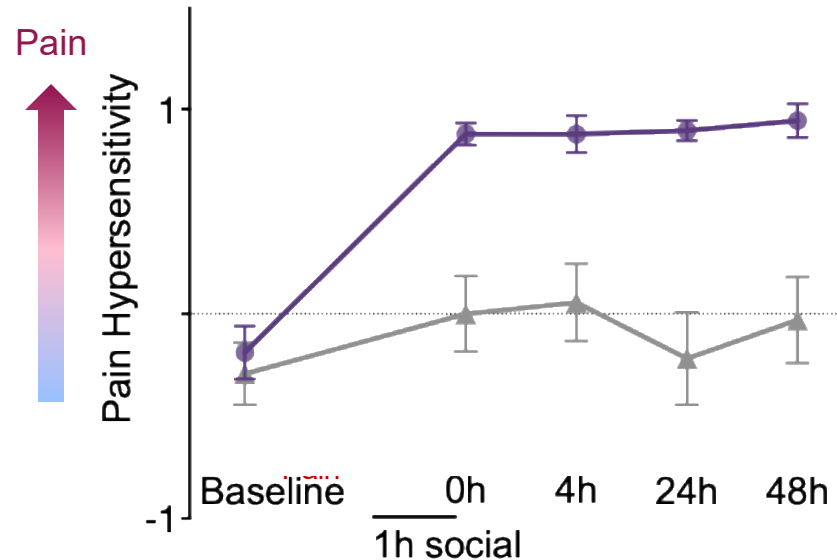


STATE
MATCHING

Pain State Matching

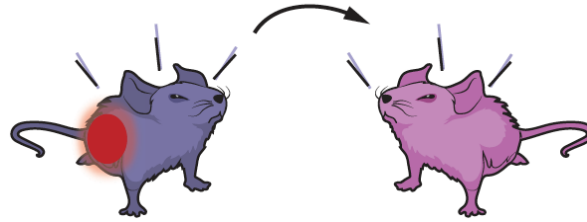


▲ Control ● Pain □ Bystander

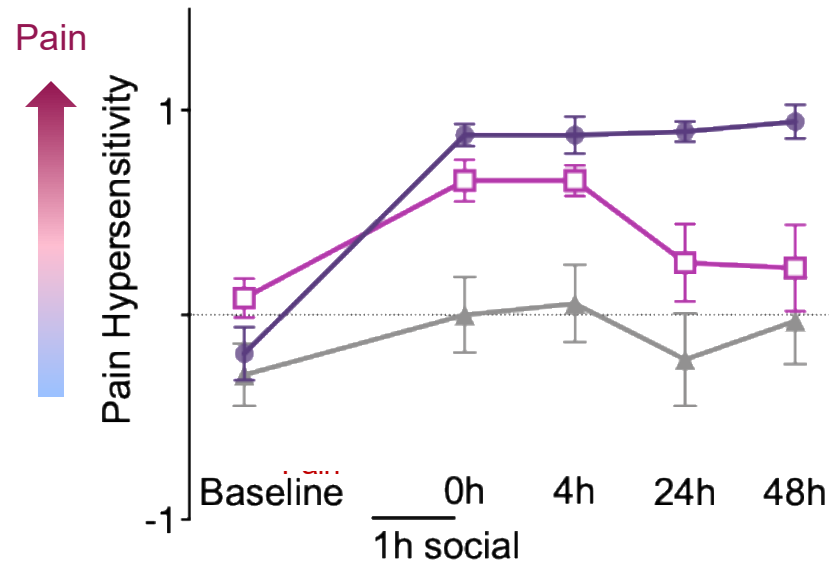


STATE
MATCHING

Pain State Matching



▲ Control ● Pain □ Bystander

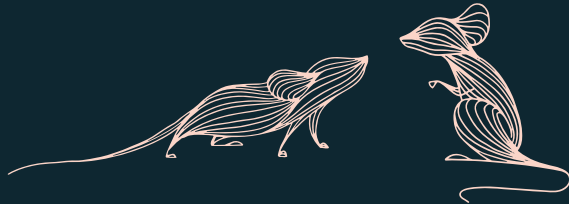


- Negative Affect
- Thermal Aversion
- Hyperalgesia
- Facial Grimace
- Behavioral Despair
- Anhedonia
- Anxiety
- Stress Responsivity
- Auditory Reactivity
- HPA Axis Activation
- Inflammation
- Gut Microbiome

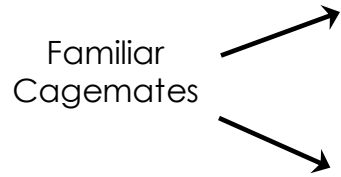
...Rats, Prairie Voles

STATE
MATCHING

WHAT ABOUT PAIN RELIEF?

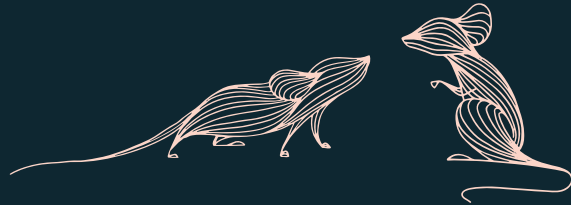


Pain Relief State Matching



STATE
MATCHING

Neural Mechanisms

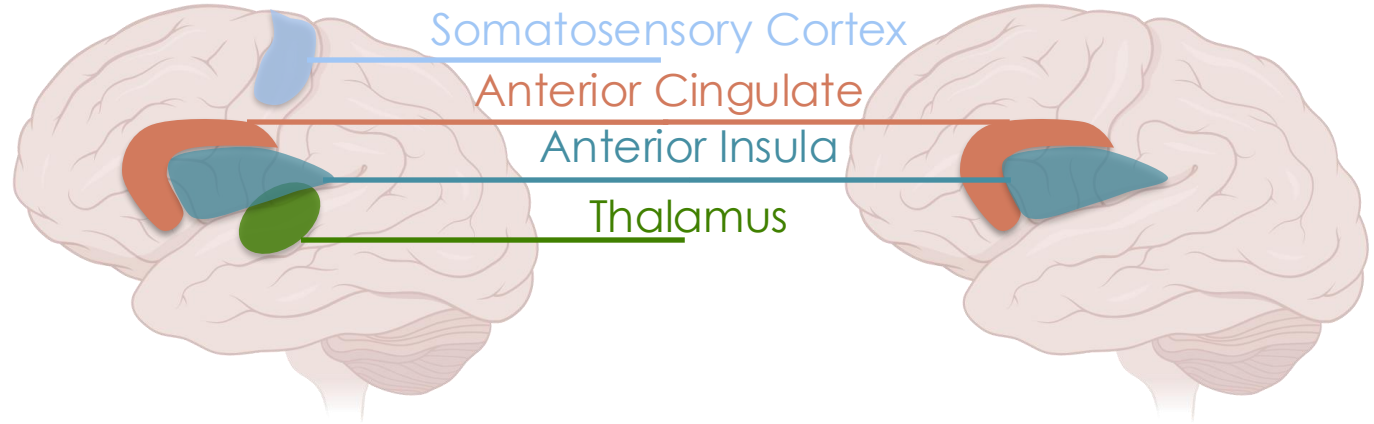


PART 2: NEURAL MECHANISMS

Of pain and empathy

Receive electric
shock

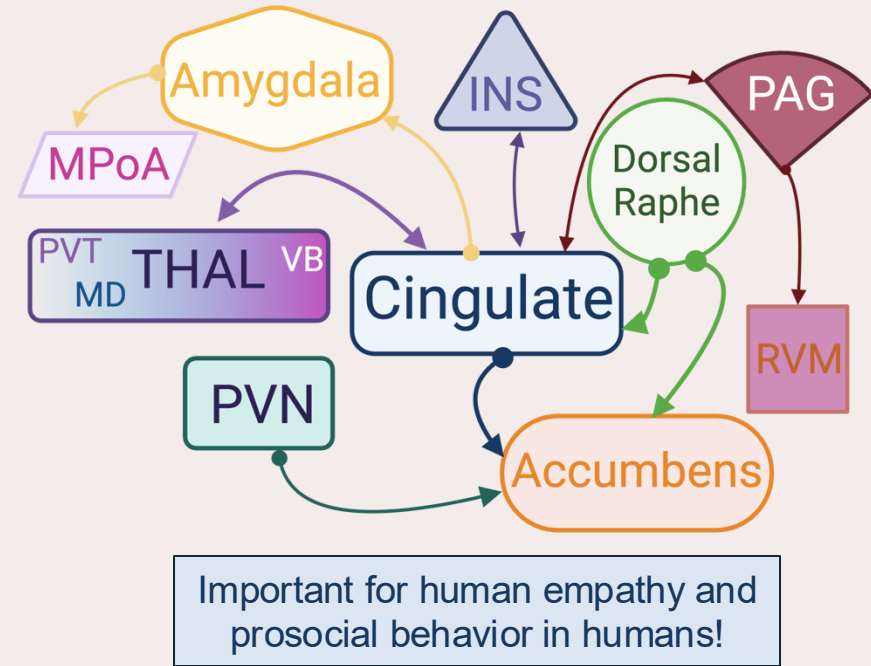
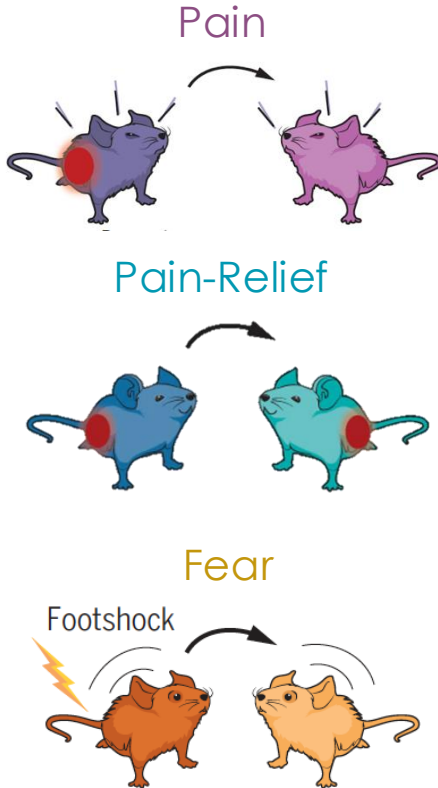
Watching loved one
receive electric shock



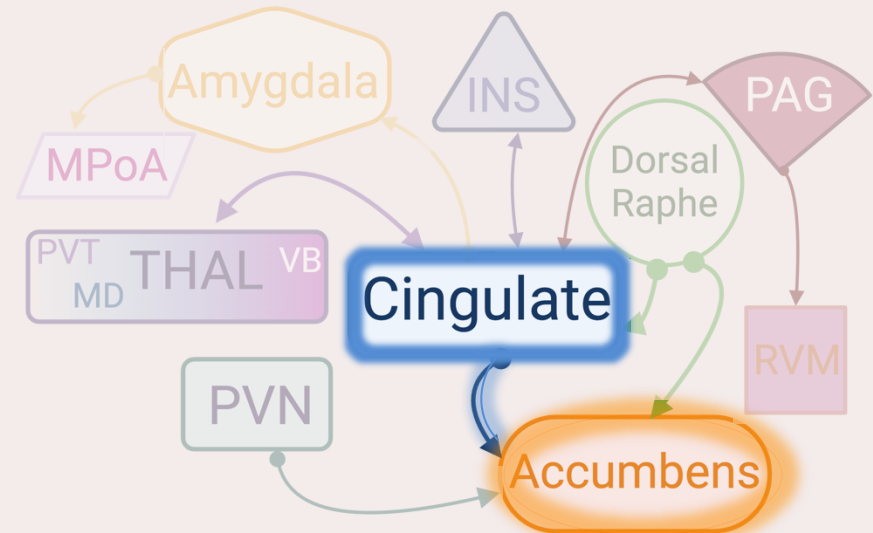
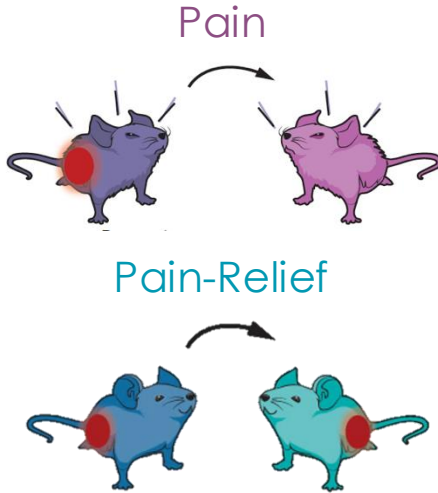
Singer et. al (2004)



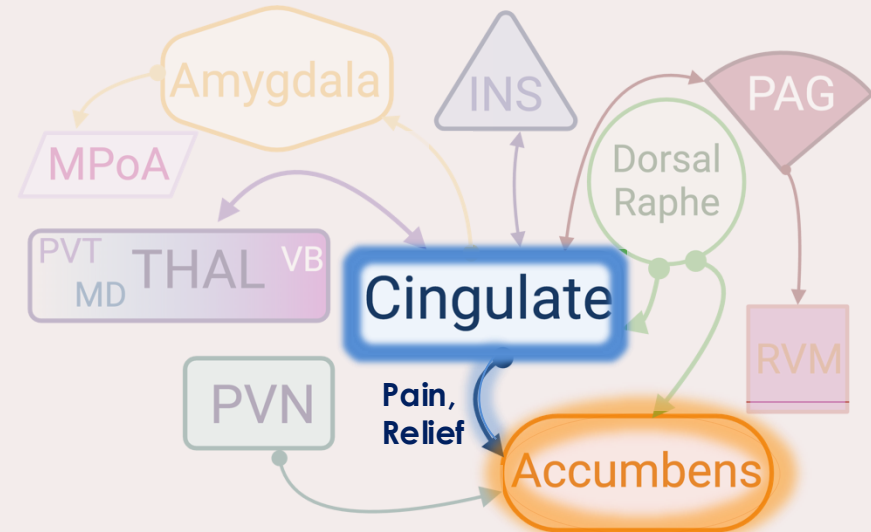
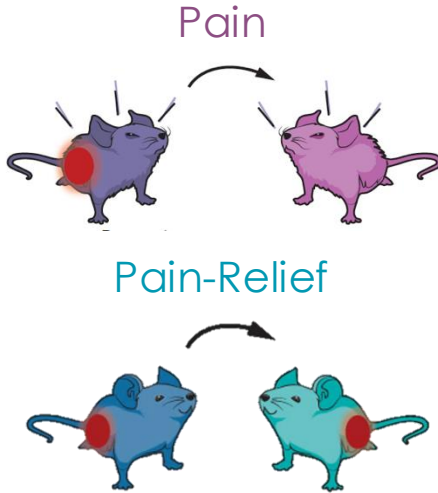
State Matching Activates Regions Important for Pain and Empathy



Neural Circuit for Pain State Matching



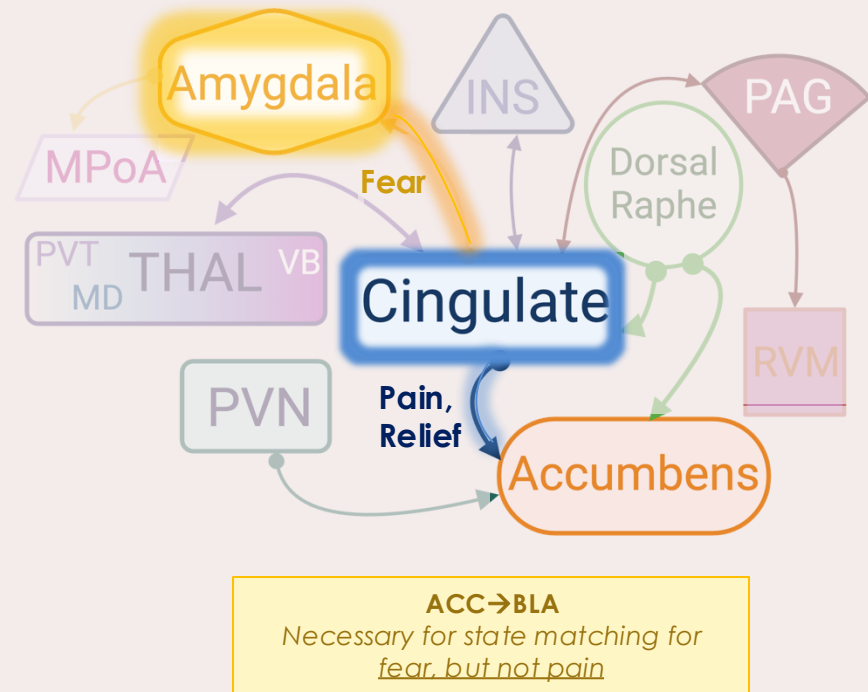
Neural Circuit for Pain State Matching



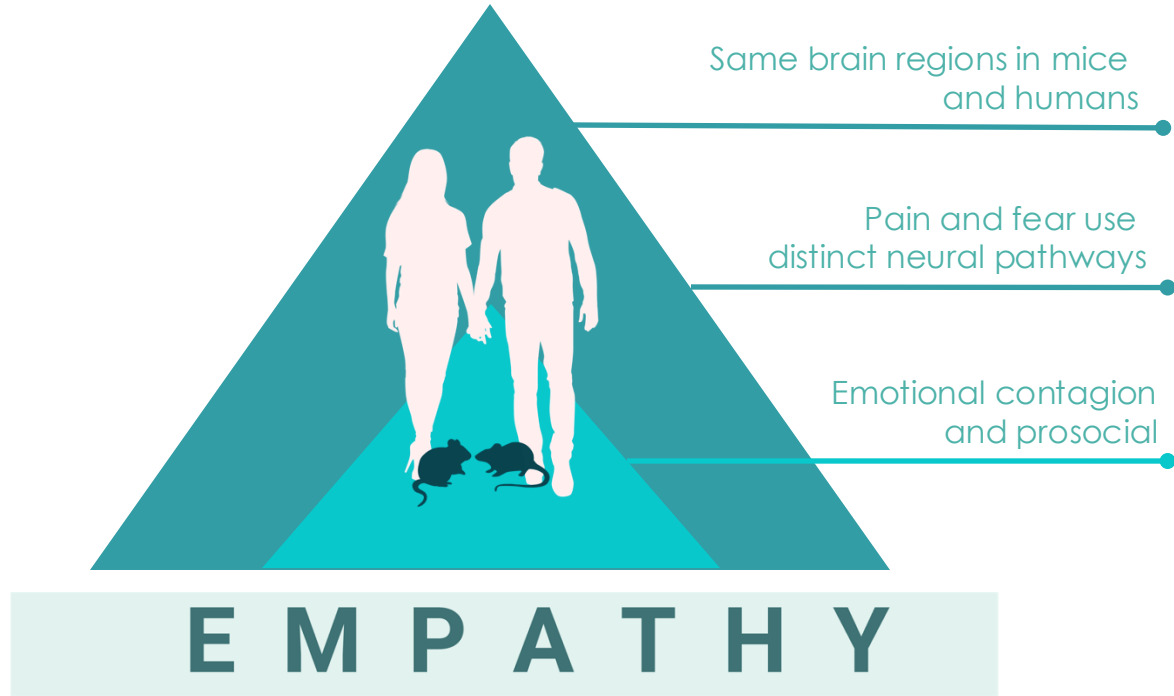
Cingulate → Accumbens

Necessary and sufficient for state matching for pain and pain relief

Neural Circuit for State Matching Depends on the Type of Social Information



SUMMARY & TAKE HOME



THANK YOU



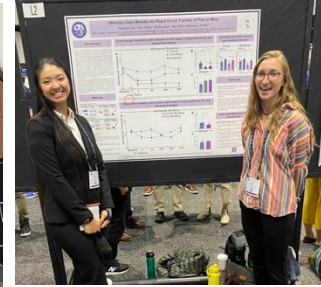
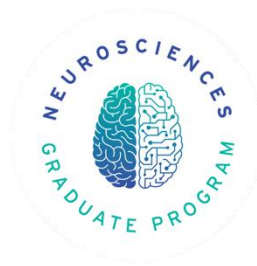
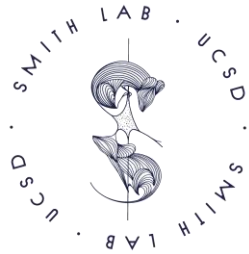
 ALFRED P. SLOAN
FOUNDATION



www.smithlab.ucsd.edu



THANK YOU



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ONGOING PROJECTS

Neural mechanisms of empathy

- behavioral and molecular characterization
- serotonin, oxytocin & neuromodulators
- disordered empathy (ASD, dementia)

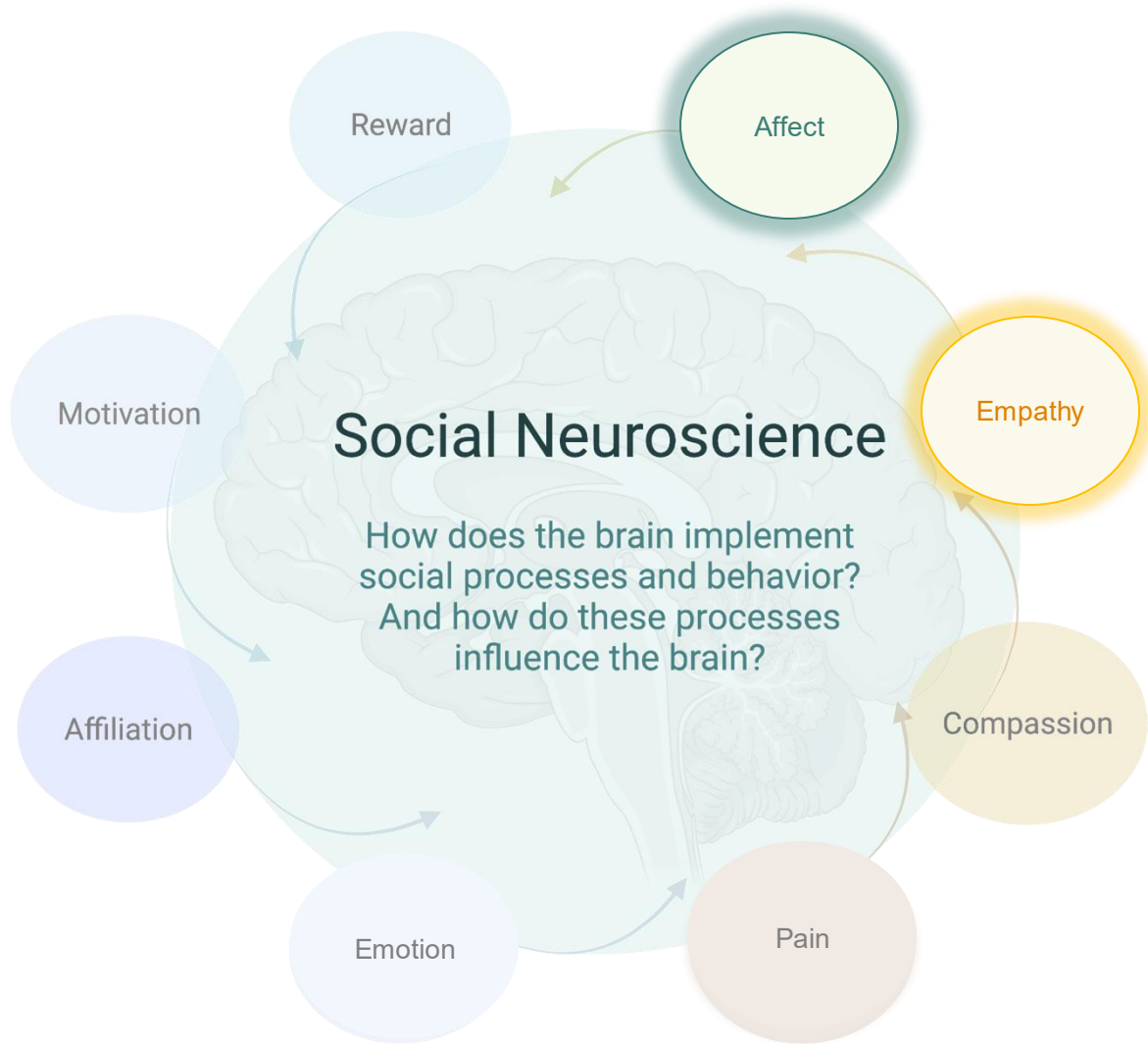
Brain-body interactions during social communication

- cardiac respiratory synchrony, microbiome changes (Gilbert Lab)

Social influences on Birth Injury

- maternal, social partner and offspring outcomes following maternal birth injury (Burnett Lab)
- models of caregiver burden and early life adversity

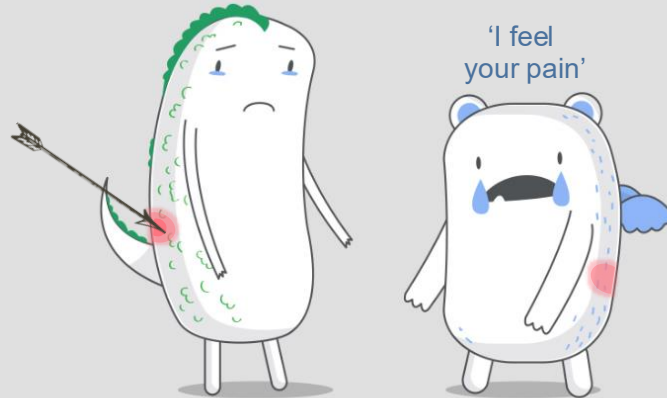




Empathy

Adopting a sensory or emotional state that is more appropriate to another's situation than one's own.

(Hoffman, 1975, Preston & De Waal, 2002; Panksepp & Lahvis)



Thank you

Smith Lab

Cali Boustani
Erin Jones
Sabrena Tuy
Julia Johnson
Ben Rein
Elysee Veilma
Mychaela Thomas
Andre Batthika
Isabella Lekander



Rob Malenka
Nao Asada
Ben Rein
Max Lenail
Neir Eshel
Justin Trotter
William Giardino
-
Andrey Ryabinin
Mary Heinricher
Andre Walcott
Emily Young