IGFL@10

30th & 31st March 2023

10TH ANNIVERSARY
IGFL SYMPOSIUM:
Celebrating Research
at the Interface
of Evolution,
Development
and Physiology

Live drawing by Eleonora Nigro

A TALE OF MOUSE TAILS:

THE GENETIC AND DEVELOPMENTAL BASIS OF PARALLEL EVOLUTION

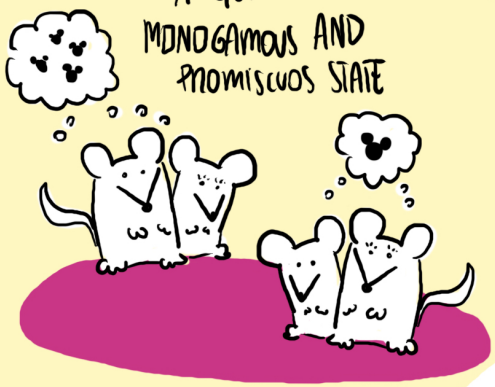
HOW DO ORGANISMS ADAPT TO DIFFERENT ENVIRONMENTS

GENE AND MUTATIONS

NOT EASY

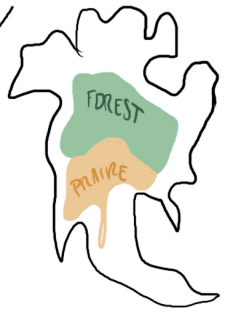
GENES ↓ CIRCUIT ↓ BEHAVIOR ↓ FITNESS

A GENE FOR MONOGAMOUS AND PROMISCUOS STATE



THE MAIN ACTOR

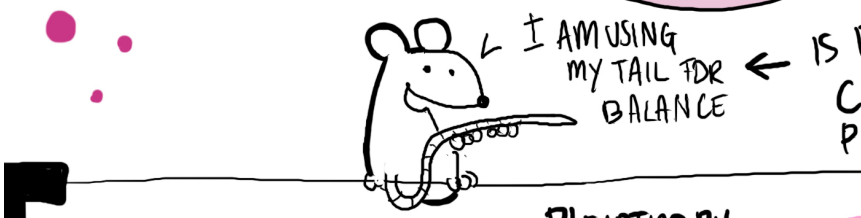
TWO ECOTYPES



@migrelex

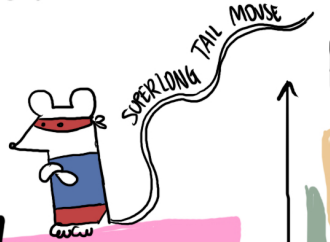
NOT FOREST

WHY STUDY TALES?

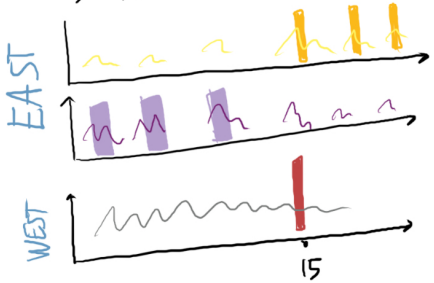


HOW THEY GET LONGER TAIL?

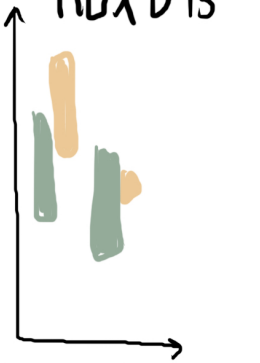
IS IT BECAUSE CLIMBING PERFORMANCE?



HOW GENETICALLY THEY GET LONGER TAIL



INVERSION



EMBRYONIC DEVELOPMENT

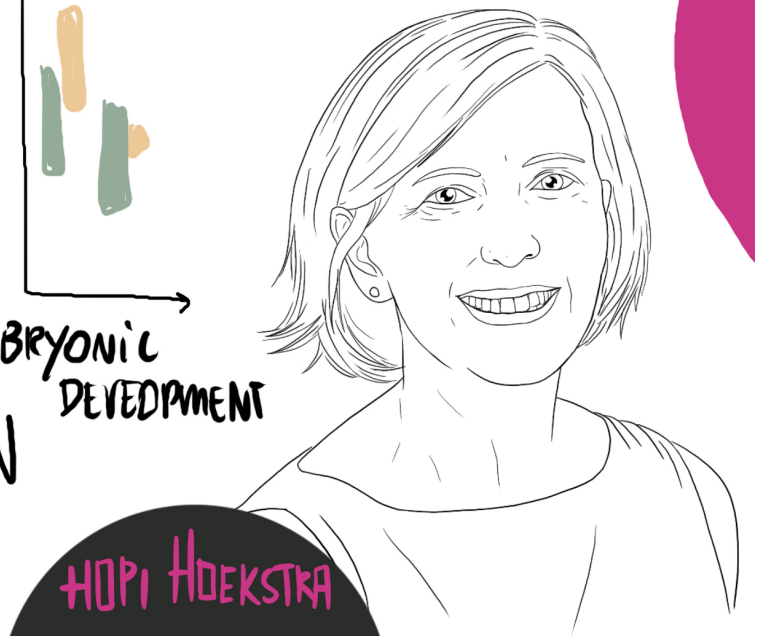
PLEIOTROPY

FUNCTIONS

3/4 MORE VERTEBRATES

CHANCES

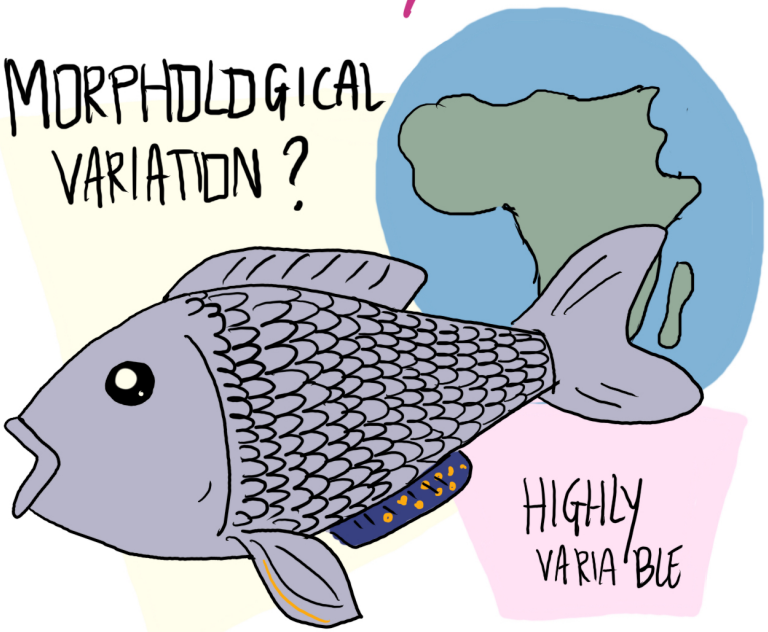
EDTL



HOPI HOEKSTRA

GENETIC AND DEVELOPMENTAL MECHANISMS UNDERLYING MORPHOLOGICAL VARIATION IN CICHLID FISHES

MORPHOLOGICAL VARIATION?



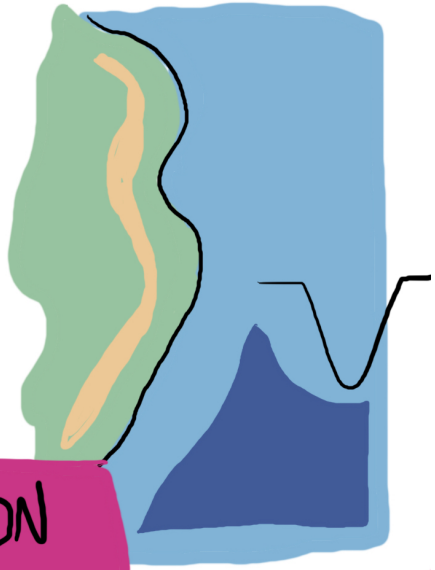
HIGHLY VARIABLE

PIGMENTATION

EVOLUTION

I AM AN ANIMAL MODEL!

DNA → DEVELOPMENT → TRAIT VARIATION

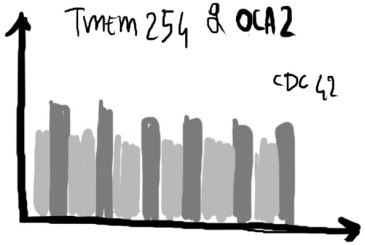


DIVERSIFICATION

WHAT MAXIMIZES VISIBILITY IN THE DEEP LOW LIGHT ENVIRONMENT

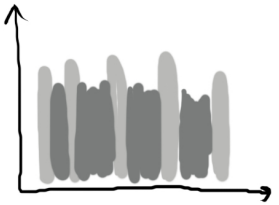
IRIDOPHORE AGGREGATION

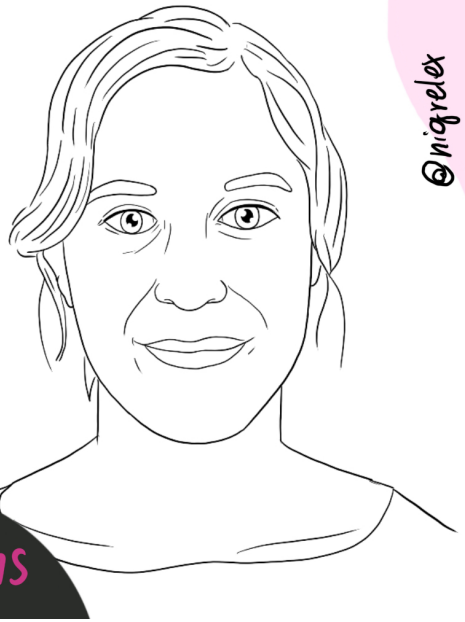
♀ ♂ BOTH HAVING IT



INTERSPECIFIC VARIATIONS

ORIGIN





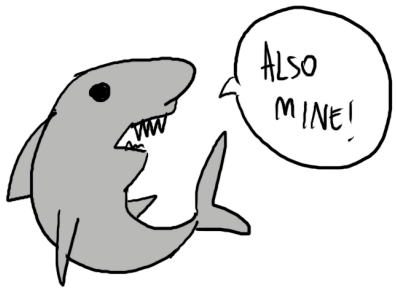
EMILIA SANTOS

@nigrelex

DENTAL MORPHOLOGICAL CHANGES AT INDIVIDUAL AND GEOLOGICAL TIME SCALES

BIOLOGICAL MODELS

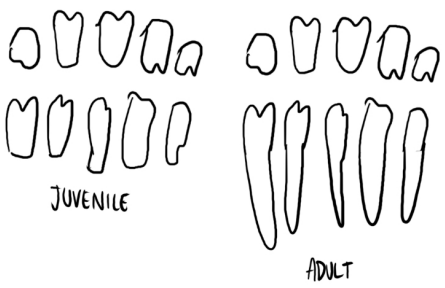
STUDYING TEETH

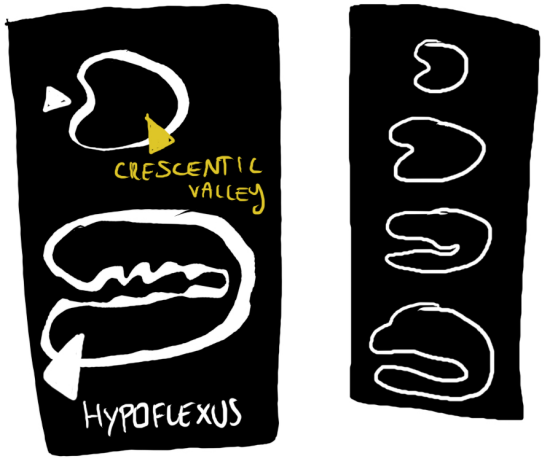


LAGOMORPHA

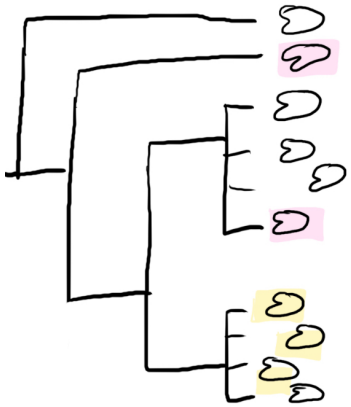
LEPORIDEA

TEETH

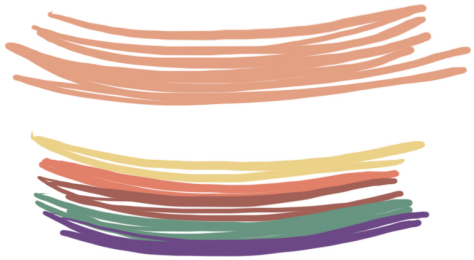




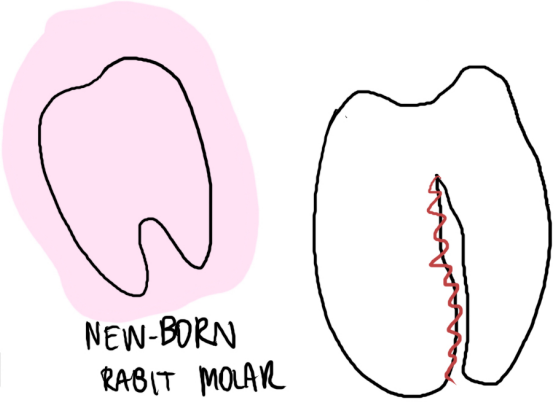
MOLAR EVOLUTION IN LAGOMORPHA



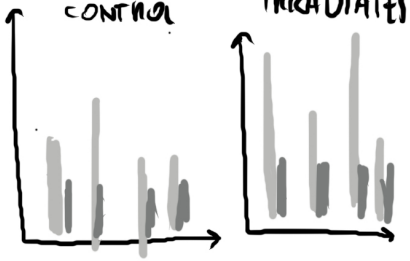
CRENULATIONS



APPEARANCE OF CRENULATIONS



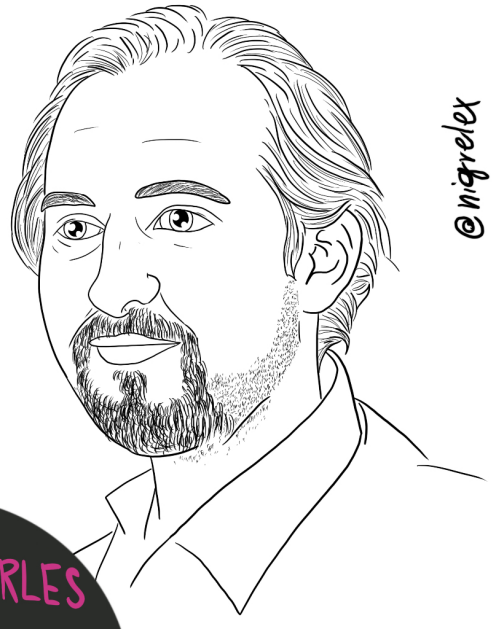
IN VIVO



DIET-INDUCED PLASTICITY

MODELIZATION

SIMULATION



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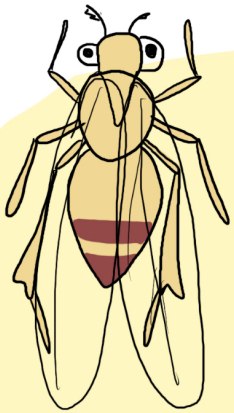
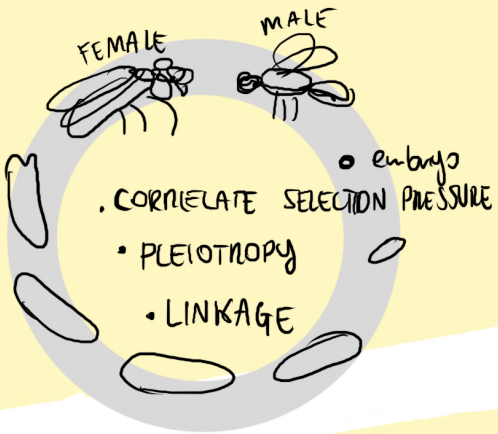
CYRIL CHARLES

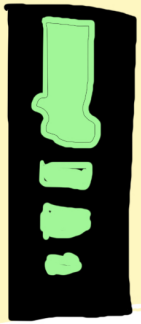
GENETIC LINKS BETWEEN PIGMENTATION AND MATING BEHAVIOR IN DROSOPHILA



DROSOPHILA :
GREAT MODEL SYSTEM

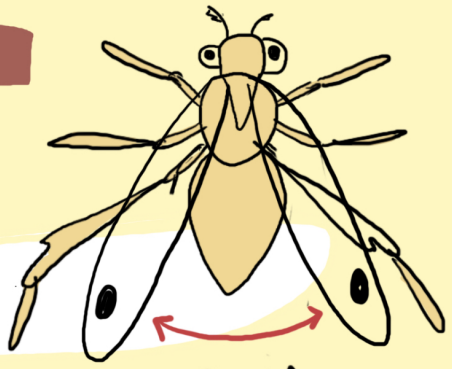
PIGMENTATION





DOPAMINE → → OVER EXPRESSING →

SUBSTRATE OF YELLOW



D. ELEGANS

YELLOW IS THE NEW BLACK?

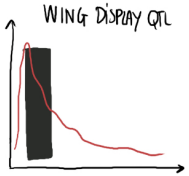
CO-EVOLVING TRAITS
(WING SPOT AND WING DISPLAY)

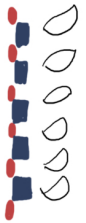
- CORRELATE SELECTION PRESSURE
- PLEIOTROPY
- LINKAGE

YELLOW
BOTH WING-SPOT
WING DISPLAY

?

NO SPOT





WING SPOT

WILD-TYPE

Y MUTANT

LACCASE

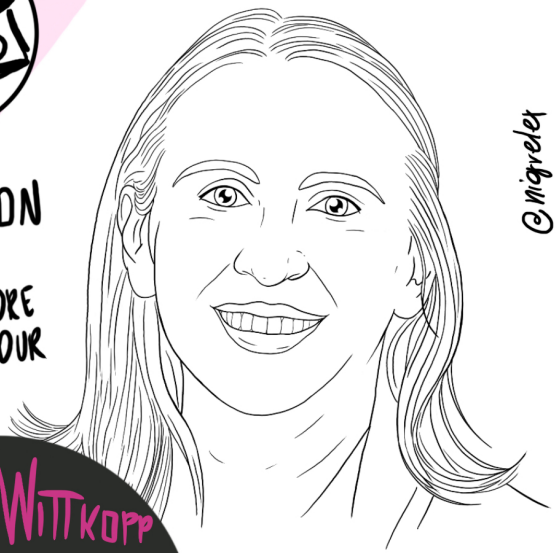
REGULATION OF YELLOW IN THE BRAIN

PIGMENTATION GENES AFFECT MORE THAN COLOUR

DOUBLE SEX (DSX)

DROSOPHILA WILLIGONI

DROSOPHILA WILLISTONI



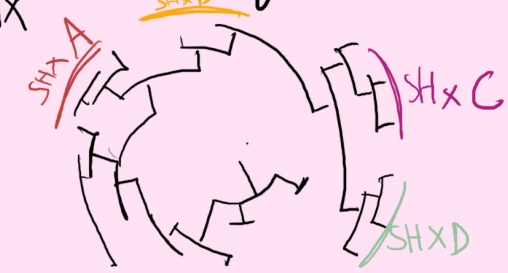
@nigredo

PATRICIA WITTKOPP

HOMEBOX GENES THAT BREAK THE RULES: A TALE OF MOTHS AND MAMMALS

UNIQUE TO BOMBYX

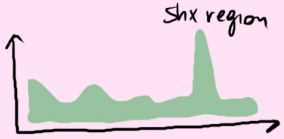
ZEN gene



MOTHS

165 SHX

Apamea monoglypha



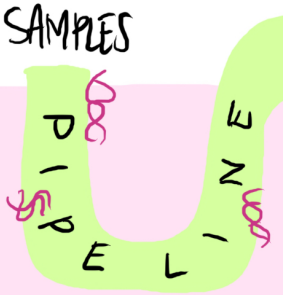
BEFORE

2018

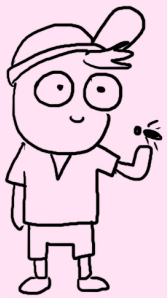
SEQUENCING LIFE

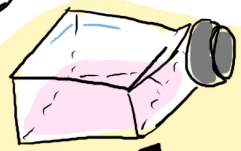
NOW

SAMPLES



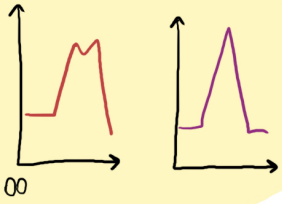
GENOME



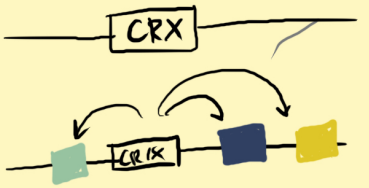


FUNCTIONAL OVERLAP

RNA-Seq



NOW ABOUT MAMMALS

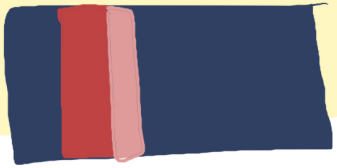


FOR 10 YEARS...

NO IDEA

TILL

NO EXPRESSION



YOU SWITCH THEM ON WHEN YOU ARE & CELLS OLD

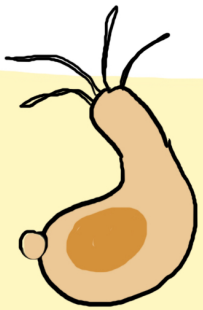
@nigrelex

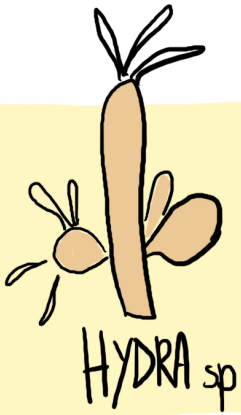
PETER HOLLAND

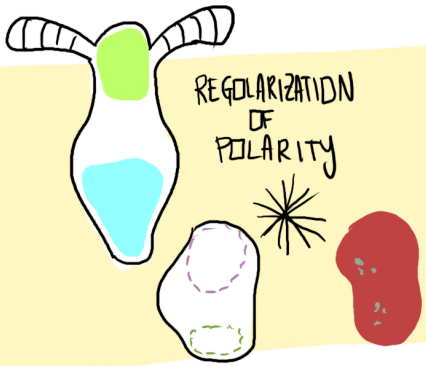
IGFL

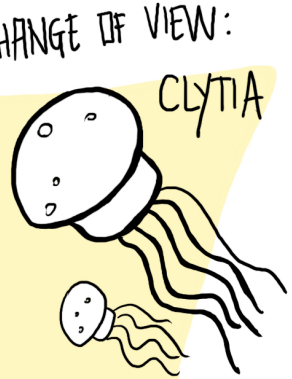
To regenerate or not to regenerate?

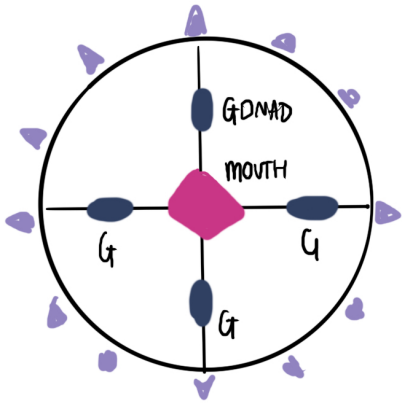
Recovering shape and function in damaged jellyfish

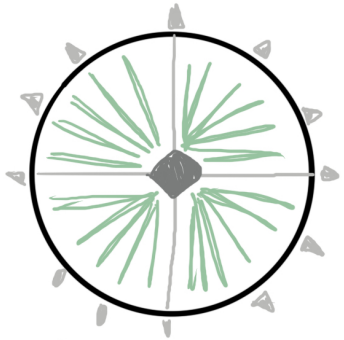


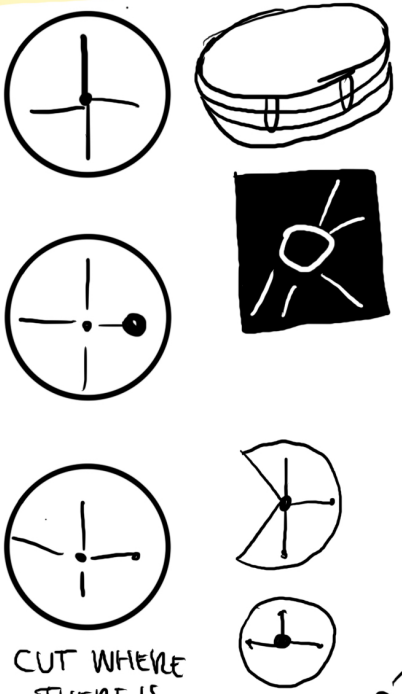


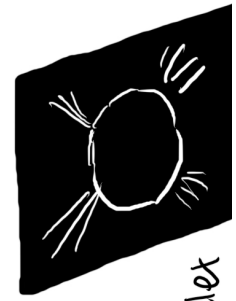


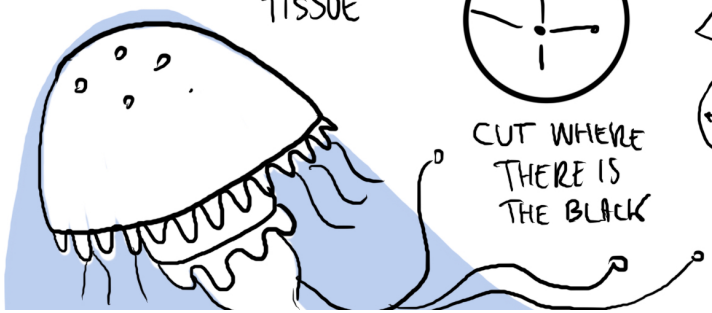




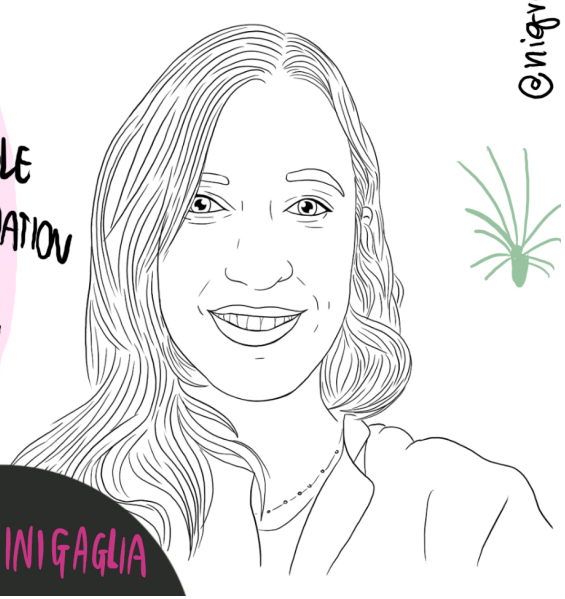








HUB SYSTEM PROVIDES STABLE SPATIAL INFORMATION LOCALIZING THE BLASTEMA IN A PERTURBED SYSTEM



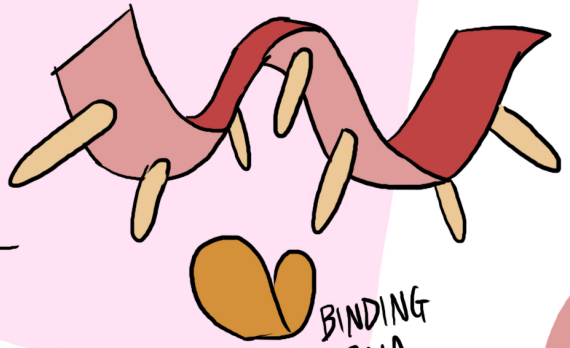
CHIARA SINIGAGLIA

IGFL

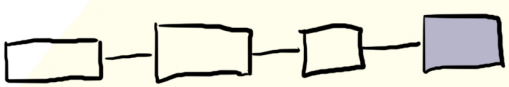
UNCOVERING CELL FATE DECISIONS BY INTEGRATING TRANSCRIPTION FACTORS INTO RNA-REGULATORY NETWORKS

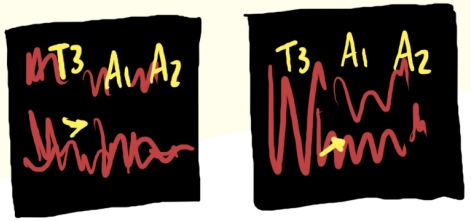
TARGETING TISSUE-SPECIFIC UBX NETWORKS

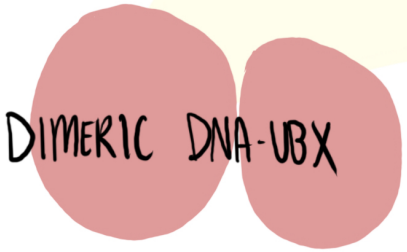
Hp: TF-RNA REGULATORY FACTOR



HOW DO TF-SPLICING NETWORK COORDINATE TISSUE DEVELOPMENT?



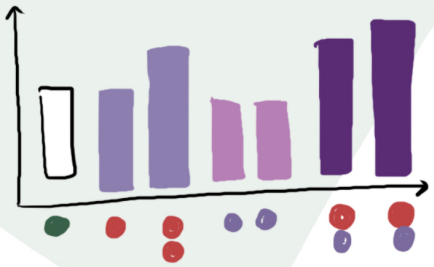




UBX HOMEODOMAIN MEDIATES FUNCTIONAL AND PHYSICAL INTERACTION

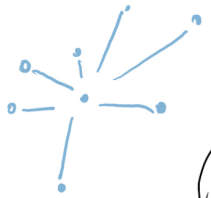
UBX/U1-70K ORCHESTRATE SPLICING?

DROSOPHILA S2R+



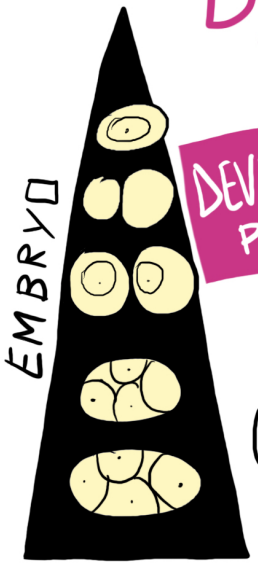
A REFINED MODEL FOR UBX SPLICING REGULATION

PROTEIN REGULATORY NETWORK



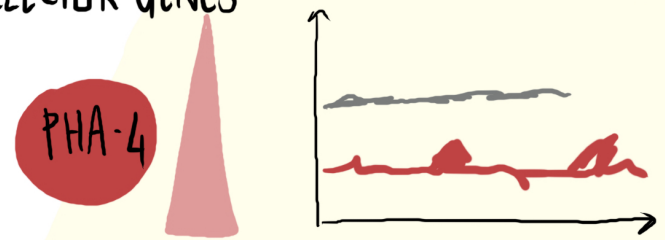
@nigrelax

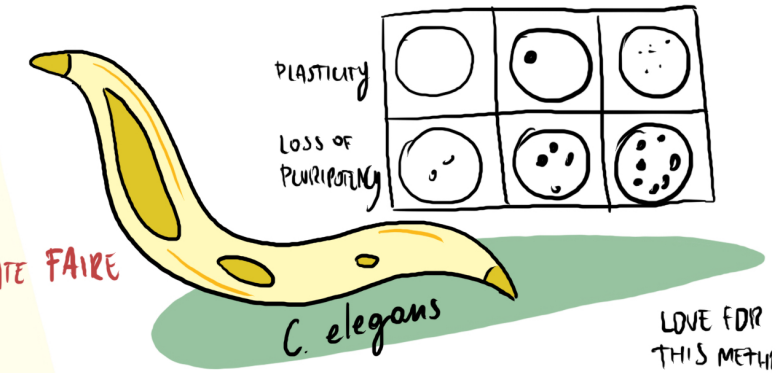
DYNAMIC CHROMATIN DURING PLURIPOTENCY AND GASTRULATION



DEVELOPMENTAL PLASTICITY FADES AWAY DURING GASTRULATION

SELECTOR GENES





LOVE FOR THIS METH

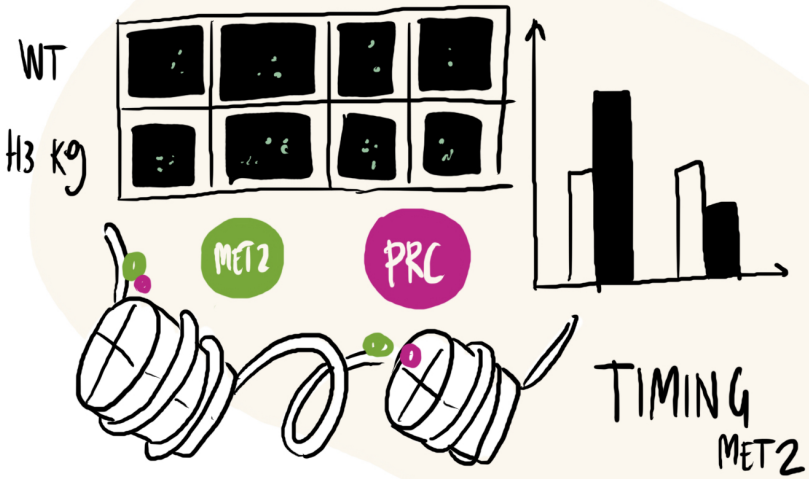
HOW IS CHROMOSOME FORMATION ESTABLISHED?

LAMINA ASSOCIATION COMPARTMENTS

TADs VS COMPARTMENTS

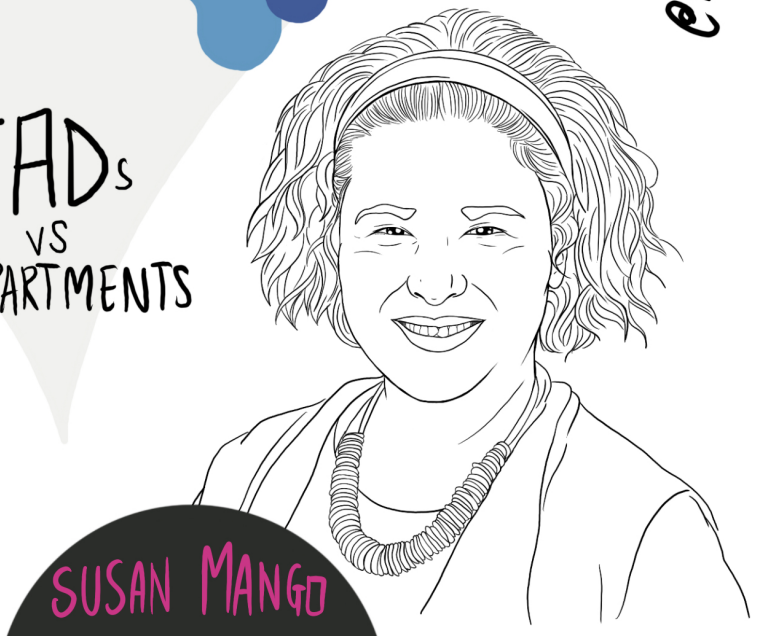
enigrelax

WHAT SET THE TIME FOR PLASTICITY?



TIMING

MET2 ACCUMULATE



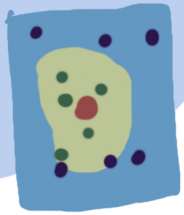
ENERGETICS OF BIOLOGICAL SYSTEMS

... WORK IN PROGRESS

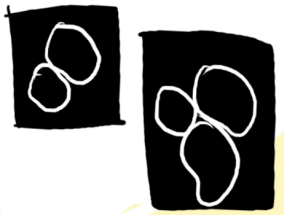
HOW FLOWS OF ENERGY MATTER

WHO SPEND MORE ENERGY?

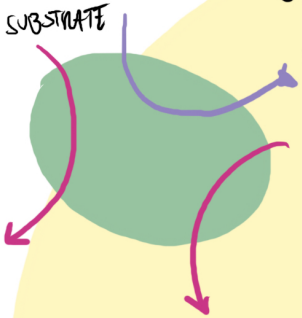
II LAW THERMODINAMICS

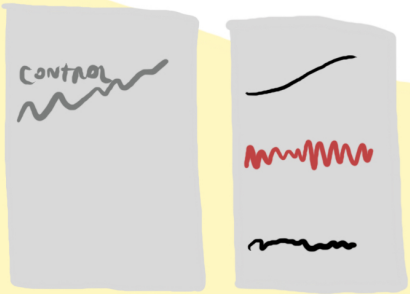


HP: MITONUCEAR COMMUNICATION FOR ZYGOTIC GENOME ACTIVATION



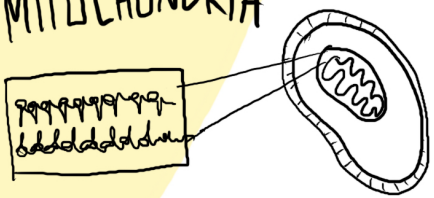
DEVELOPMENTAL ENERGETICS

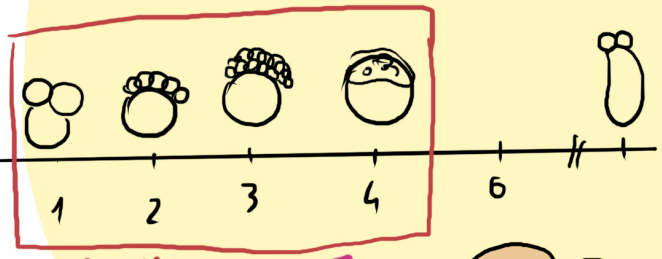




CELL PROLIFERATION DRIVES HEAT DISSIPATION

CAN WE SCALE THIS? MITOCHONDRIA



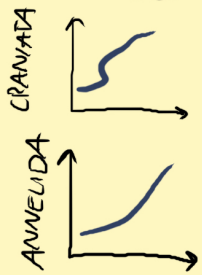


CLEVAGE

ALSO IN DISTANT SPECIES

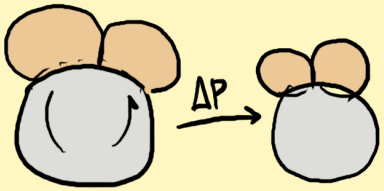
ENERGETIC COST OF SIGNALING

energy
more precise

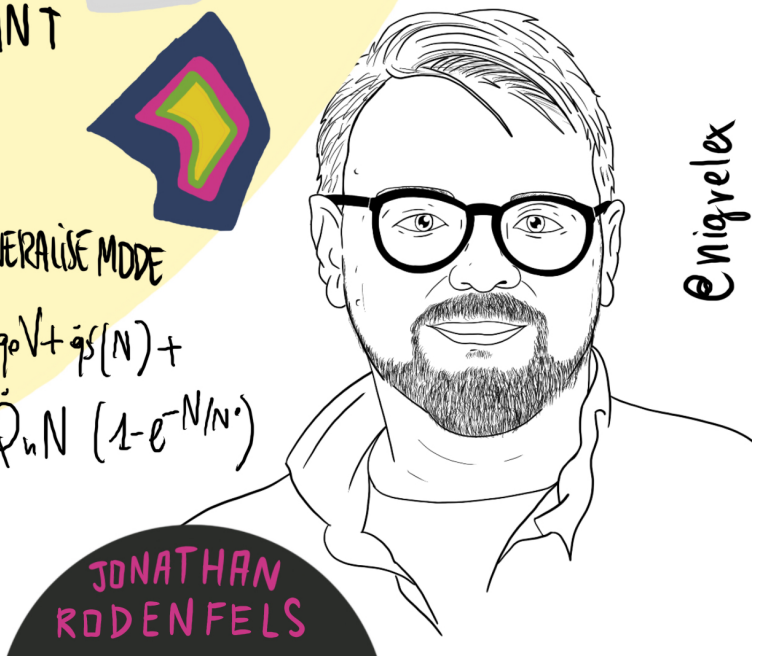


GENERALISE MODE

$$\dot{Q} = q_0 V + \dot{q}_s(N) + \dot{Q}_u N\,(1 - e^{-N/N^*})$$



CALORIMETRY TO MEASURE



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Intrinsic and Interorgan control of intestinal lipid handling

Intestinal physiology

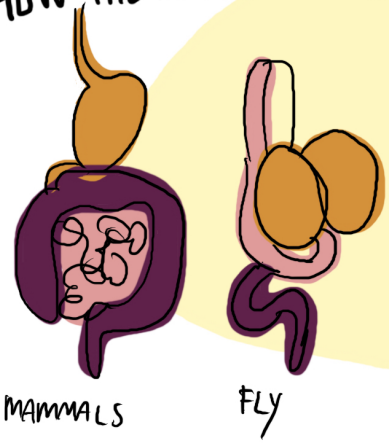
Inflammatory bowel disease

HNF4A

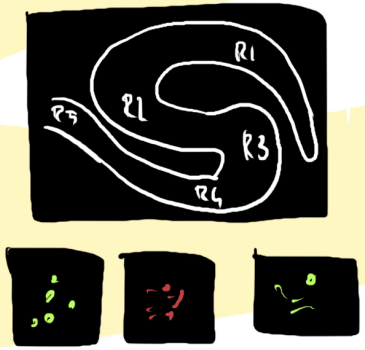
Binds fatty acid and regulates cell physiology

Using Drosophila to understand HNF4 ancestry

How the intestines look?

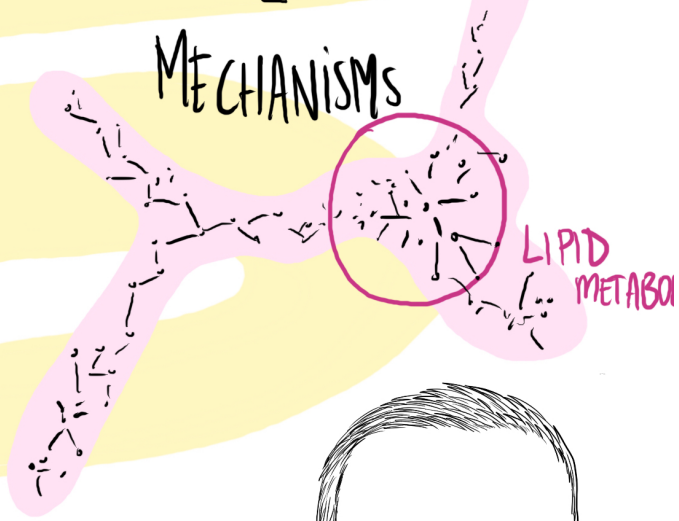


Where is HNF4?



HNF4 suppress inflamatory boweldisease?

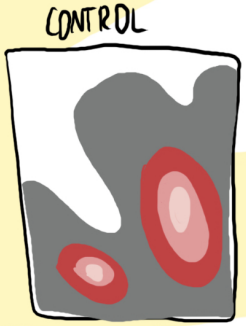
Mechanisms



Blocking lipid transport

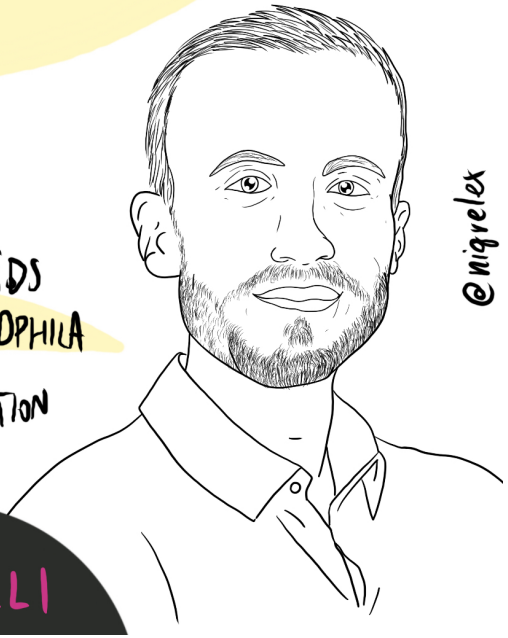
Specialized enterocytes absorb lipids in Drosophila

Lipid malabsorption as a cause



Lipid droplets accumulation

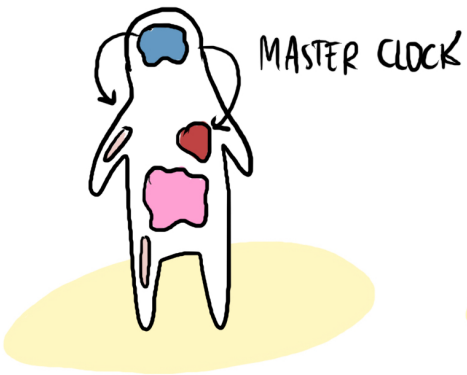
Lipid free diet rescues steatosis in dHNF4



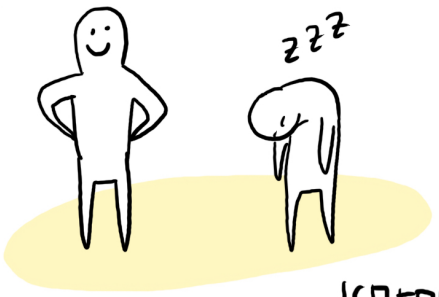
@niqrelex

CIRCADIAN PERIOD PROTEINS SCULPT THE MAMMALIAN ALTERNATIVE SPLICING LANDSCAPE

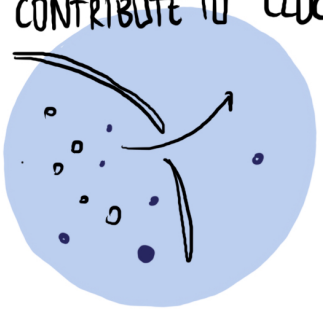
CIRCADIAN RHYTMES



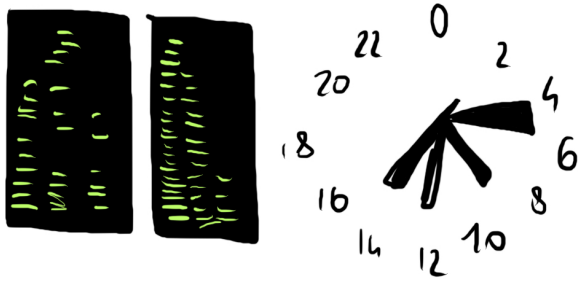
KEEP YOUR CLOCK WELL



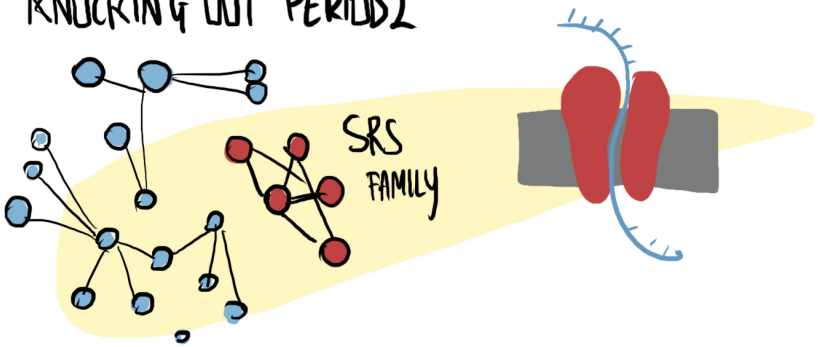
ALTERNATIVE SPLICING CONTRIBUTE TO CLOCK?



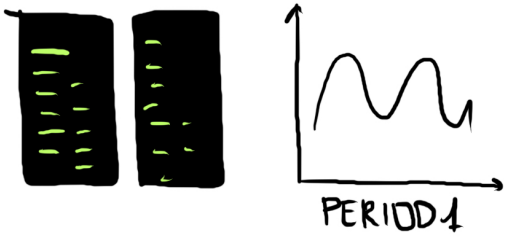
PROTEOMICS



KNOCKING OUT PERIOD2

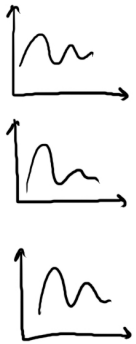


ISOFORM SPECIFIC DYNAMICS

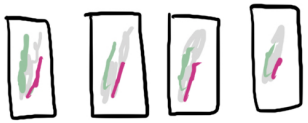


OVER 4000 ALTERNATIVE SPLICING EVENTS ARE CIRCADIAN

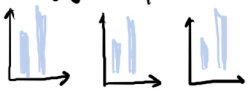
IDENTIFYING GENES WHICH DIFFERENT ISOFORM WORK DIFFERENTLY



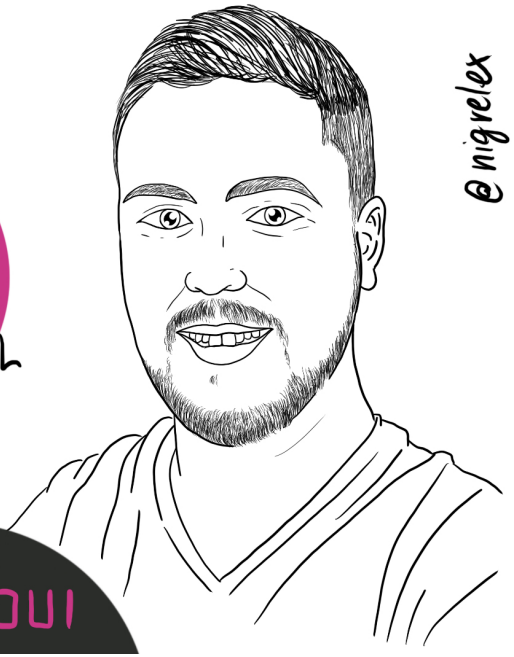
WHAT HAPPENED TO THE CLOCK WHEN SPLICE IS IMPAIRED



MORE DIVERSITY IN WT MICE



SPLICING FACTOR ARE UNDER CIRCADIAN CONTROL

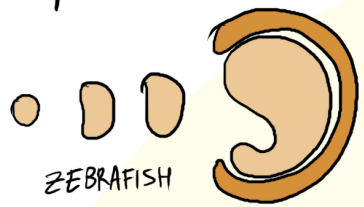


LIES CHIKHAOUI

@nigrelax

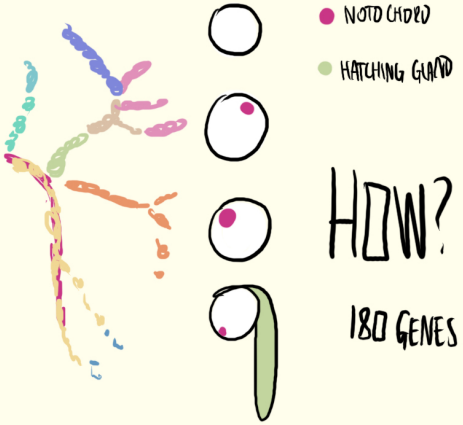
RECONSTRUCTING DIFFERENTIATION

EARLY DEVELOPMENT



HOW CELLS ARE RELATED

IT TELLS WHERE AND WHEN GENES ARE EXPRESSED



HOW?

180 GENES

EXPRESSION SIMILARITY

FUNCTIONAL SIMILARITY

GENES - MODULES

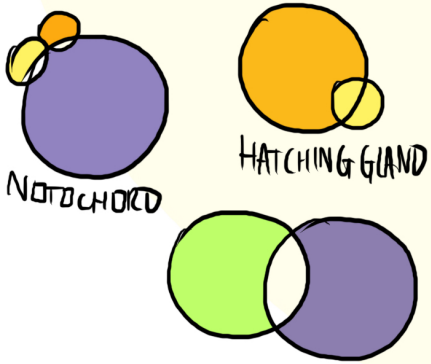
~60 FOR EAC CELL TYPES

WHAT TO DO WITH MODULES?

UNFOLDED PROTEIN RESPONSE

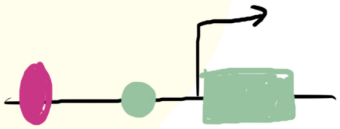
SPECIFIC UPR GENES IN EACH CELL TYPE?

DOZEN OF UPR TF TARGET GENES



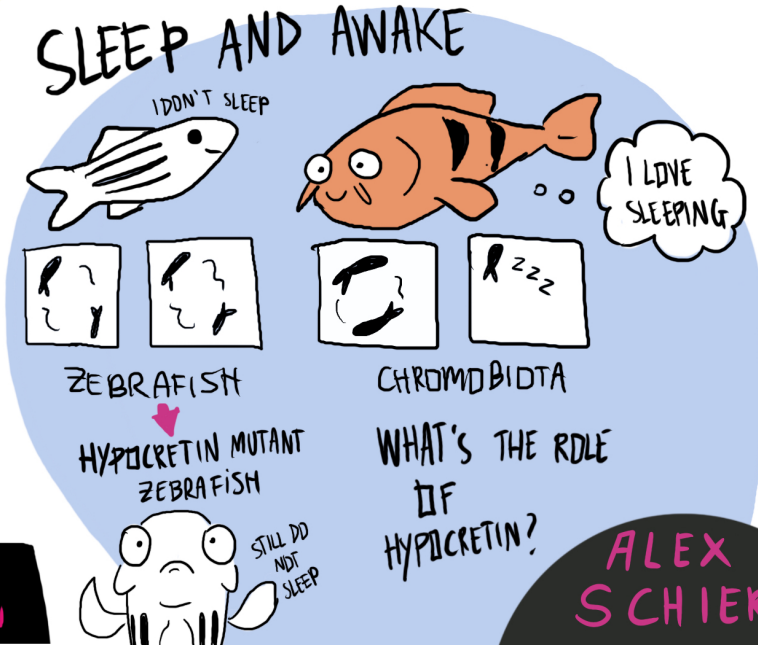
WHAT DETERMINES SPECIFICITY?

CREB3L1/2 XBP1 ARE SUFFICIENT



MIST 1 IS NECESSARY FOR HATCHING

SLEEP AND AWAKE



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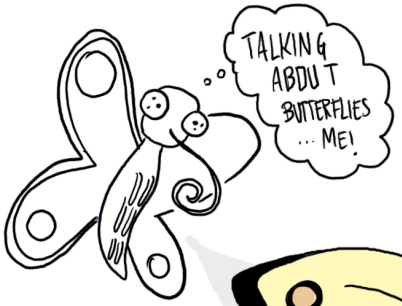
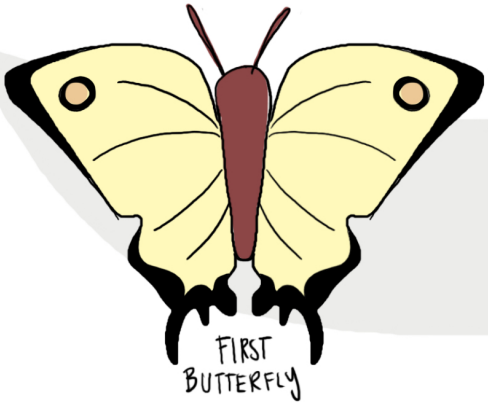
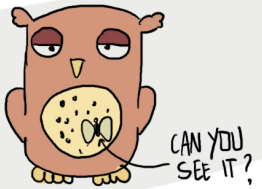
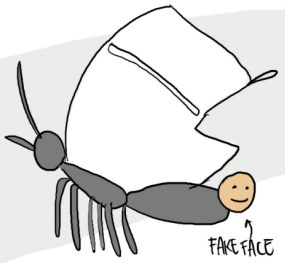
THE PHYSICS OF BEAUTY: STRUCTURAL COLOR IN BUTTERFLIES



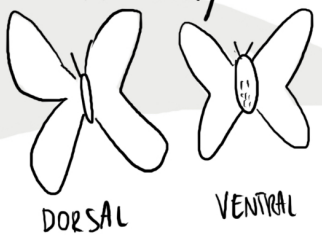


COLOUR AS CAMOUFFLAGE

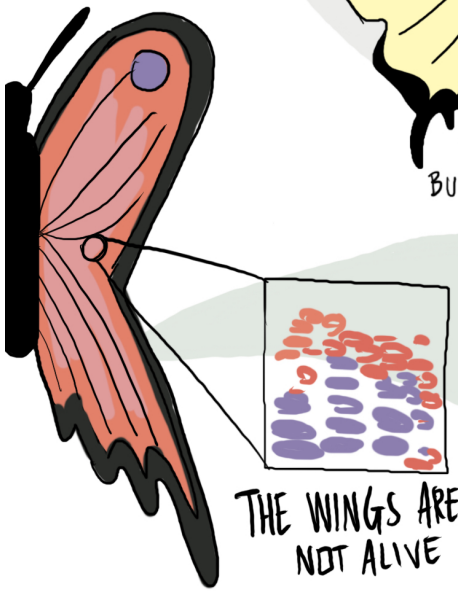




MIMICRY



WHERE DOES THE COLOR COME FROM?



THE WINGS ARE NOT ALIVE

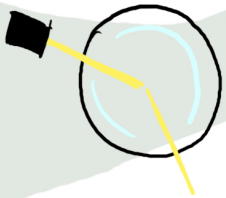
STRUCTURAL COLORATION

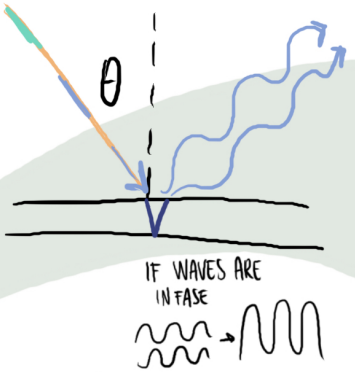
BLU PIGMENT?

↓

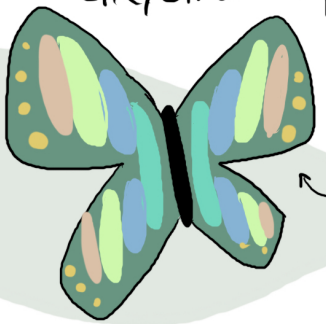
LIGHT REFLECTION

LIGHT CHANGES VELOCITY AND ANGLE BETWEEN MEDIA



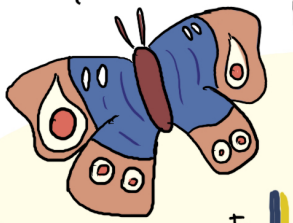


CHRYSIRIDIA THIPHEUS

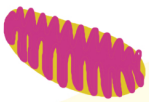


ONLY COLOR IS BLACK

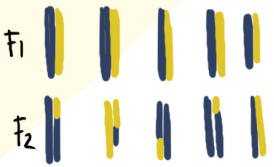
GENETIC APPROACH



DO YOU LIKE THEM? I MADE THEM!



LOOKING TO THE PIGMENTS (PUPIL)

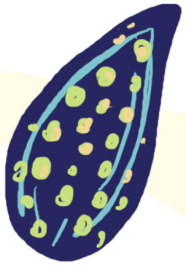


QTL

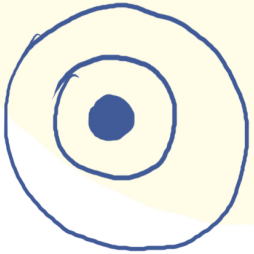
ACETONE ON IT

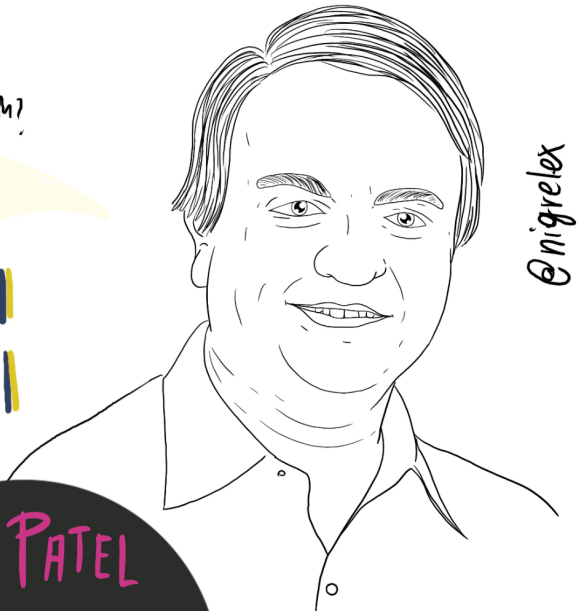
NOT COMMON

MAKING GREEN?



APPLICATIONS OF NANOPARTICLES





NIPAM PATEL

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