



Want to explore teaching as a career?  
Interested in STEM Outreach?

*This Fall 2018 Take...*  
**Step 1: EDUC 2020 (1 credit)**

- Real experience teaching real kids, in Elementary school
  - Registration priority for math, science, engineering & open option majors
  - Scholarships, fellowships and internships available

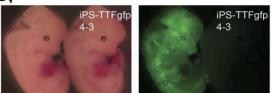


[www.colorado.edu/cuteach](http://www.colorado.edu/cuteach)

# MCDB4790: Oocytes, Stem Cells, Organisms, Experiments to Discoveries

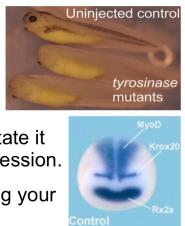
### Journal Club/Seminar style (TR 2-3:15pm)

Develop critical thinking, scientific reasoning & communication skills by reading and presenting primary research articles and Nobel Prize winning research on patterning, stem cells, cell death, genetic and epigenetic mechanisms that regulate embryonic development.



MCDB4101: Editing Genomes with CRISPR-Cas9,  
Discovering Gene Function

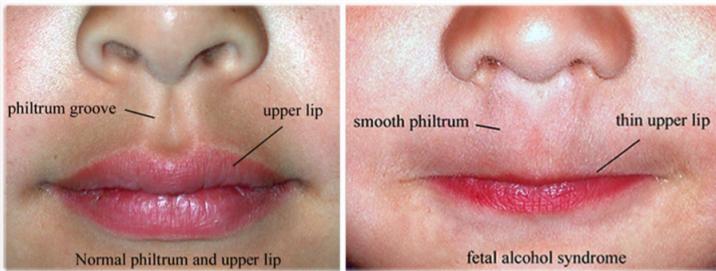
- Discovery Laboratory course
  - M 10am-12:50pm, W 11am-12:50pm
  - Pick a gene of unknown function, design the tools to mutate it and characterize the phenotype. Also analyze gene expression.
  - Use online databases to learn about genes and designing your experimental tools.



## Non-Mendelian patterns of inheritance

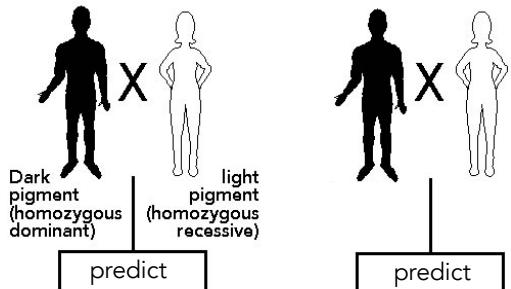
- imprinting
- maternal effects (cytoplasmic - mitochondrial)
- non-genetic

## environmental effect: Fetal Alcohol Syndrome

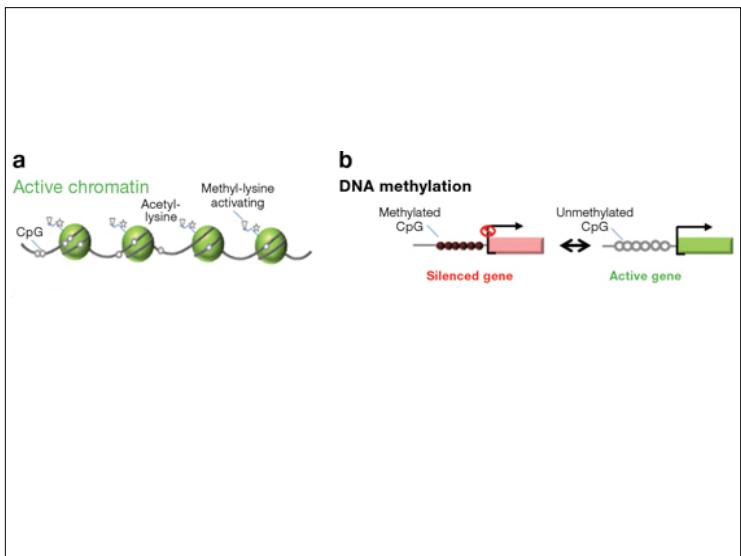
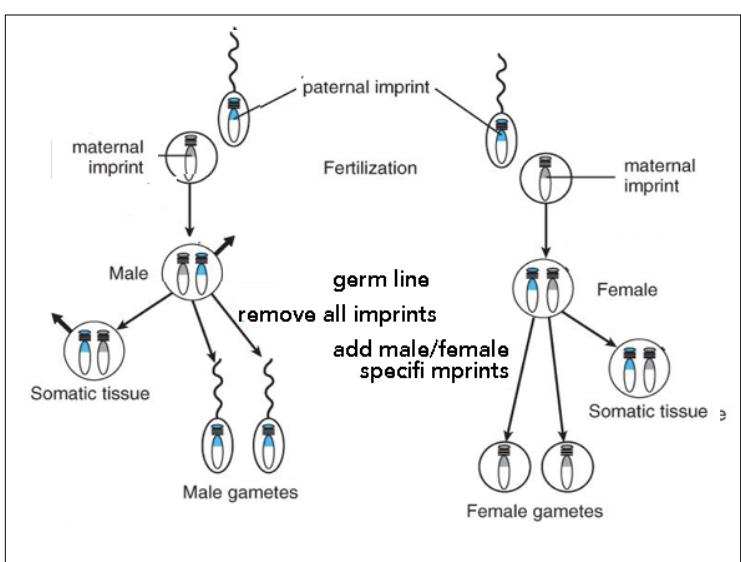
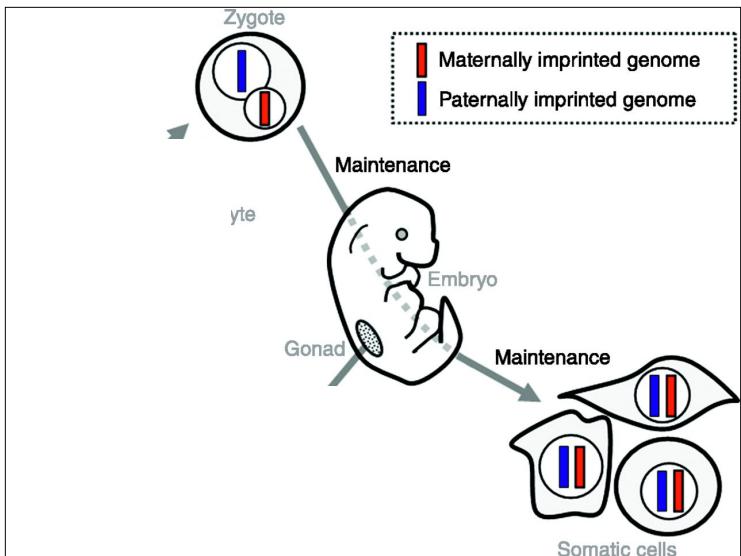


symptoms

## Previous we introduced male / female gamete imprinting



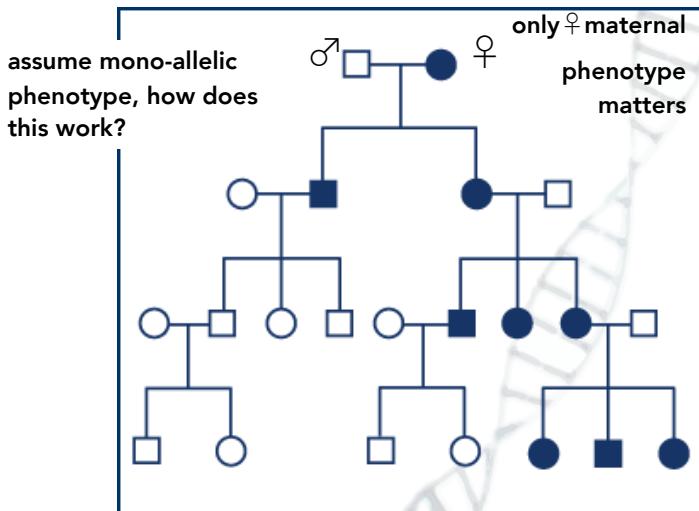
what happens ↑ if maternal allele is imprinted?



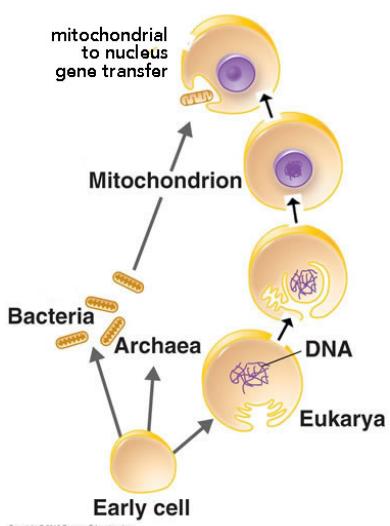
## Diseases of involving imprinted alleles: Angelman syndrome

- the syndrome is characterized by developmental deficiencies, mental retardation, sleep disorders, seizures, ataxia, hyperactivity and a happy disposition with outbursts of laughter
- Tatsuya Kishino et al. (1997) showed that Angelman syndrome is due to the loss of expression of a single maternally expressed gene in the region, called UBE3A.
- UBE3A gene encodes a protein called E3 ubiquitin ligase, which is involved in targeting proteins for degradation

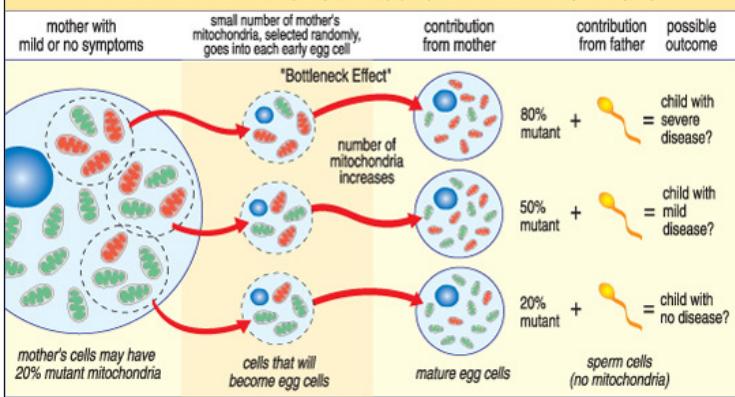
## Non-mendelian (maternal inheritance)



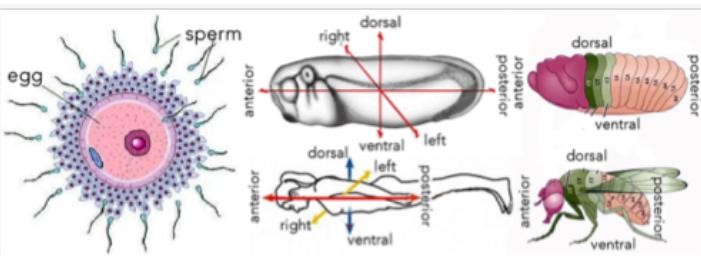
## Phenotype associated with mitochondrial dysfunction.



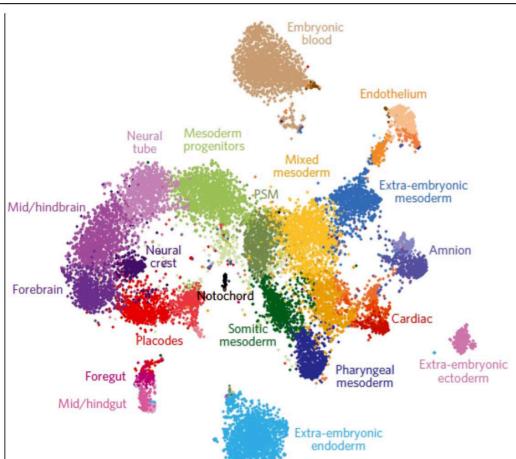
### MATERNAL INHERITANCE OF MITOCHONDRIAL DNA MUTATIONS



### Going from egg, to fertilized egg, to embryo, to adult.



**factors involved axis specification:**  
developmental environment (exposed / shielded)



Gene expression analysis identified 20 general cell types (in 33 different clusters, indicated by the different colors) in the 8 day mouse embryo. Clusters was identified based on the expression of marker genes. Several cell types are composed of two or more clusters. adapted from Ibarra-Soria et al., 2018

