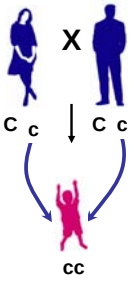
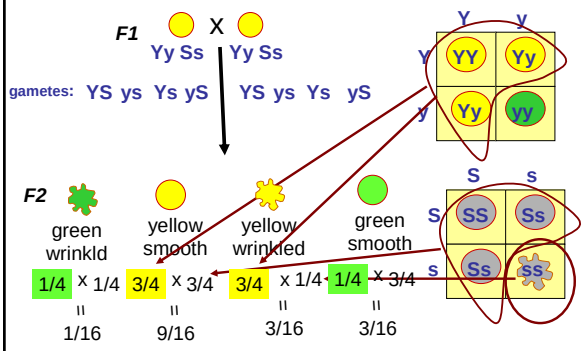
Finding genotypes of the parents

Celiac disease is a recessive autosomal disorder. It develops in recessive homozygous children (cc-genotype) only. 2 parents that do not have celiac disease had a child with celiac disease.
What are their genotypes*?*

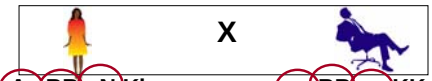


Alternative solution to the multiple locus problem



Multiple genes

How many different types of gametes do they produce?



Aa BB nN Kk pp rr gametes

2 x 1 x 2 x 2 x 1 x 1 = 8

A/a	B	N/n	K/k	p	r

aa BB nn KK pp rr

1 x 1 x 1 x 1 x 1 x 1 = 1

a	B	n	K	p	r

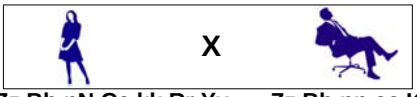
Aa x aa **nN x nn**

	a	n
A	Aa	nn
a	aa	Nn

aa BB nn
½ x 1 x ½ = 1/4

Multiple genes

How many different types of gametes do they produce?



Zz Bb nN Cc kk Rr Yy **Zz Bb nn cc Kk Rr Yy**

gametes:

2 x 2 x 2 x 2 x 2 x 1 x 2 x 2 = 64

Z/z	B/b	N/n	C/c	k	R/r	Y/y

2 x 2 x 1 x 1 x 2 x 2 x 2 = 32

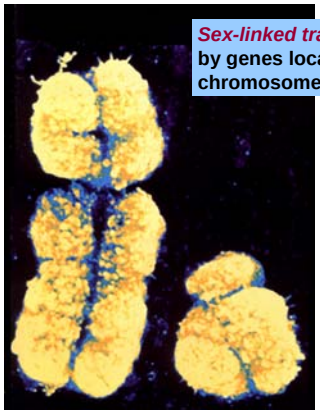
Z/z	B/b	n	c	K/k	R/r	Y/y

Zz BB nn cc yy
½ 1/4 ½ ½ 1/4 = 1/128

Extensions and Complications

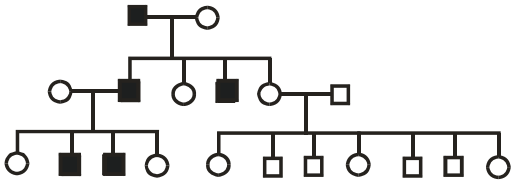
Factors that can Alter Simple Mendelian Ratios

- ***Lethal Alleles***
- ***Multiple Alleles***
- ***Codominance***
- ***Incomplete Dominance***
- ***Epistasis***
- ***Variable Penetrance and Expressivity***
- ***Pleiotropy***
- ***Sex-Linked and Sex-Influenced Traits***

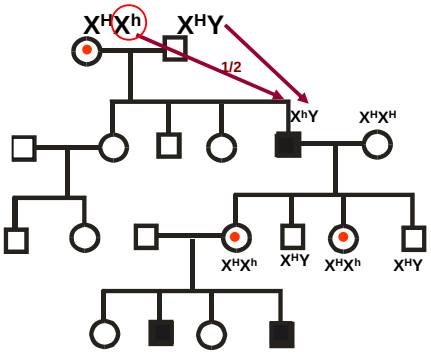


Sex-linked traits **– traits determined by genes located on sex chromosomes [X and Y] or mtDNA**

Y-linked trait



X- linked traits (hemophilia, color blindness)



Color Vision in *Ateles*

Opsins - light-sensitive protein receptors

Three opsins:
1) blue sensitive (B)
2) red sensitive (R)
3) green sensitive (G)

In *Ateles* R and G are alleles of the same gene located on the X chromosome

Color Vision in Spider Monkeys

a color blind for green male (RY –genotype) mates with a color blind for red female (GG –genotype). Can they have a baby that can distinguish green and red?

R Y x GG

gametes: R; Y G

	G
Y	**GY** male, cannot see red
R	**RG** female, can see color