

Genetics bingo

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A *trait* is a measurable feature or behavior of an organism; it can have multiple *phenotypes*

“detached” earlobe



Wikimedia - David Benbennick

“attached” earlobe



Wikimedia - Covalent

Some traits are more discrete, others continuous

Discrete

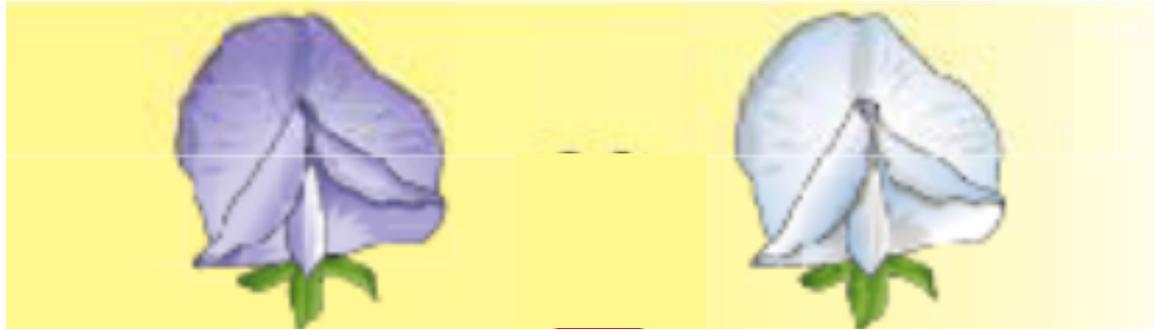
Trait	Phenotypes
handedness	left-handed; right-handed; ambidextrous
tongue curling	roller; non-roller; partial roller

Continuous

Trait	Phenotypes
height	a measured height for a person
resting blood pressure	a measured resting blood pressure level for a person

- Some traits are heritable (amount of heritability can vary by trait).
- Genetics is the study of *trait heritability*.

A trait with only two phenotypes is called “binary”



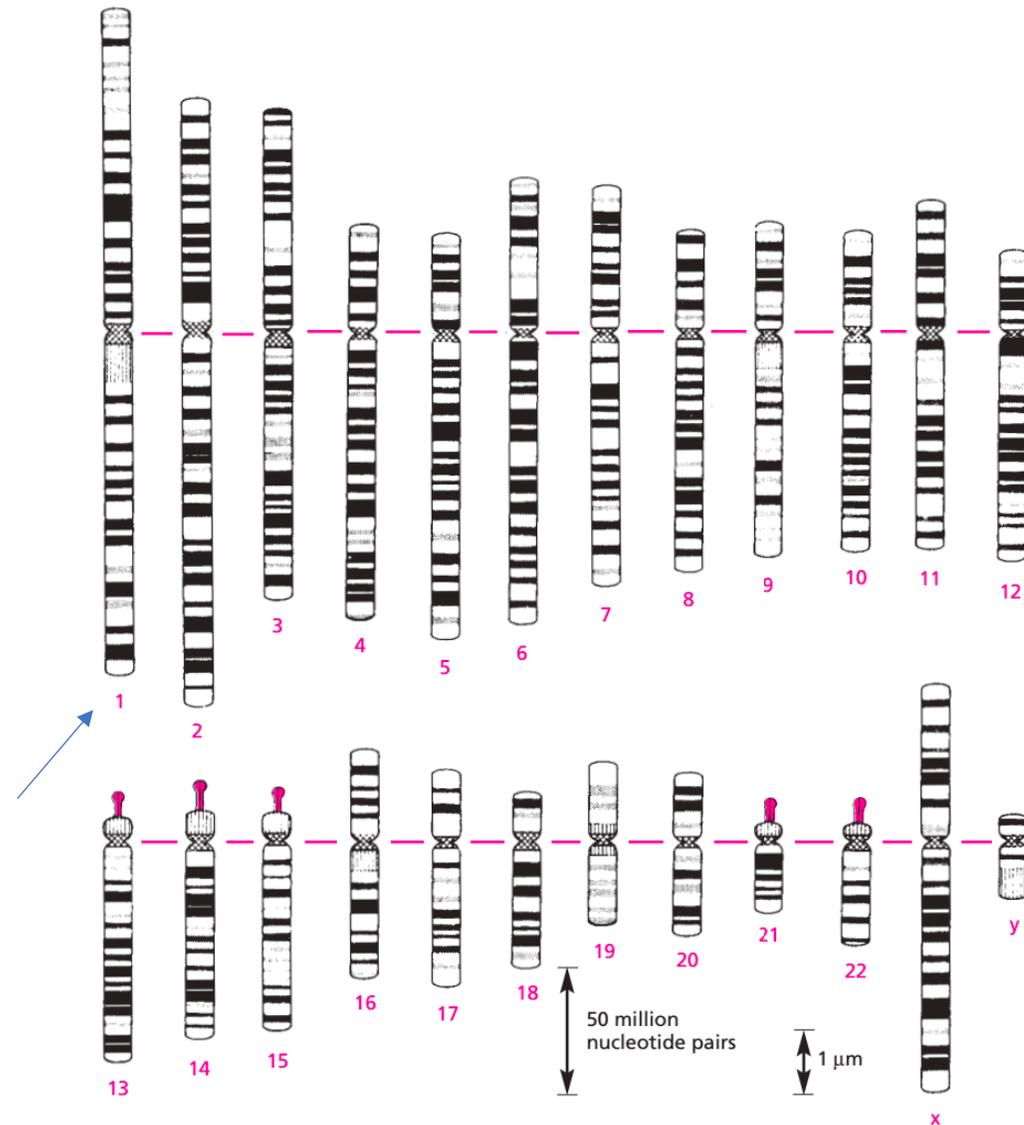
purple flower

white flower

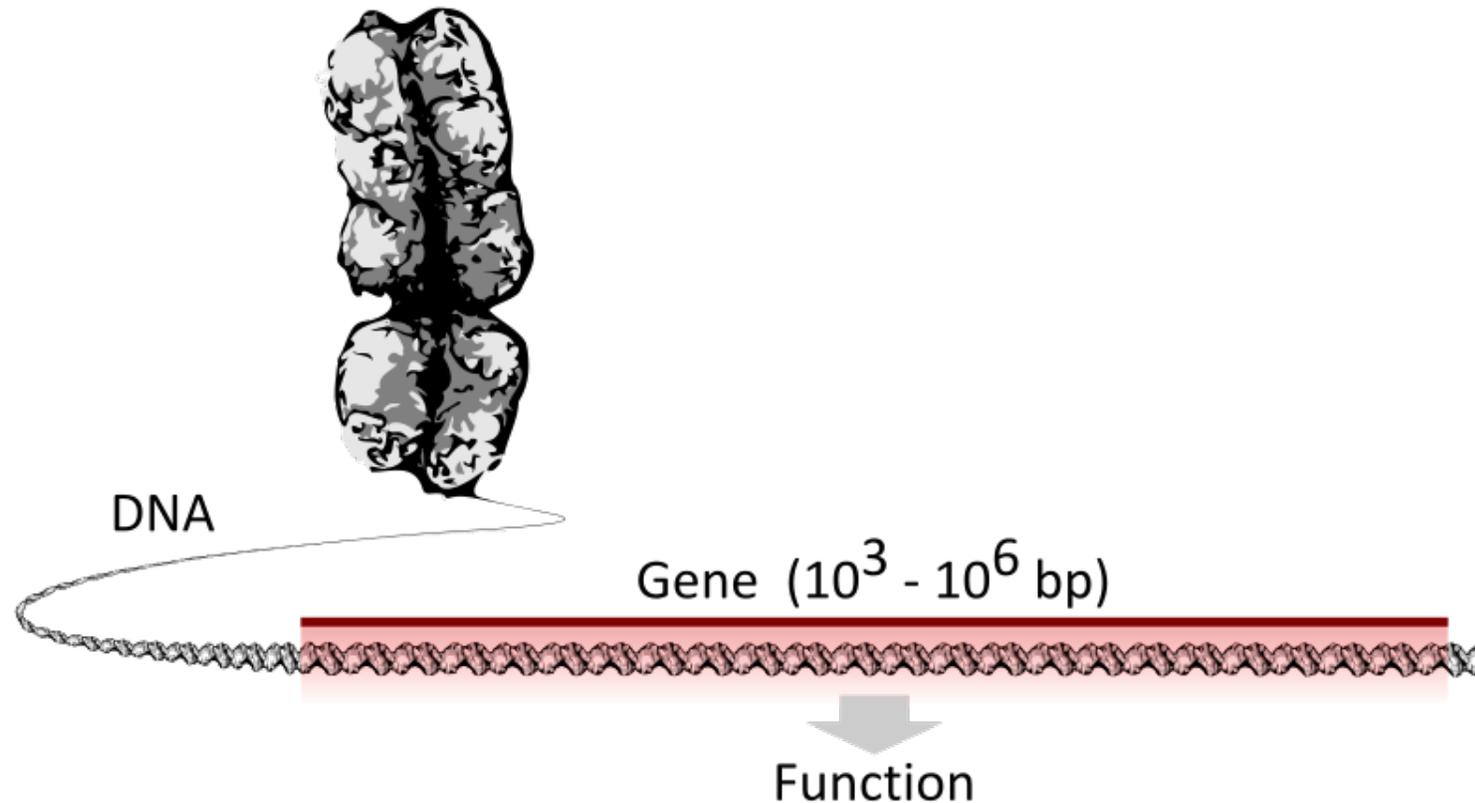
most human traits are not binary, though

Human heredity comes via 23 *pairs* of chromosomes

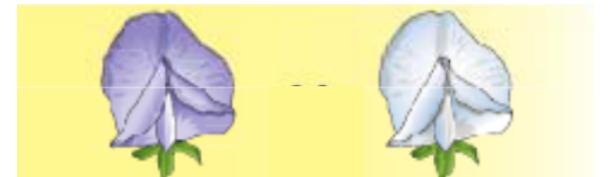
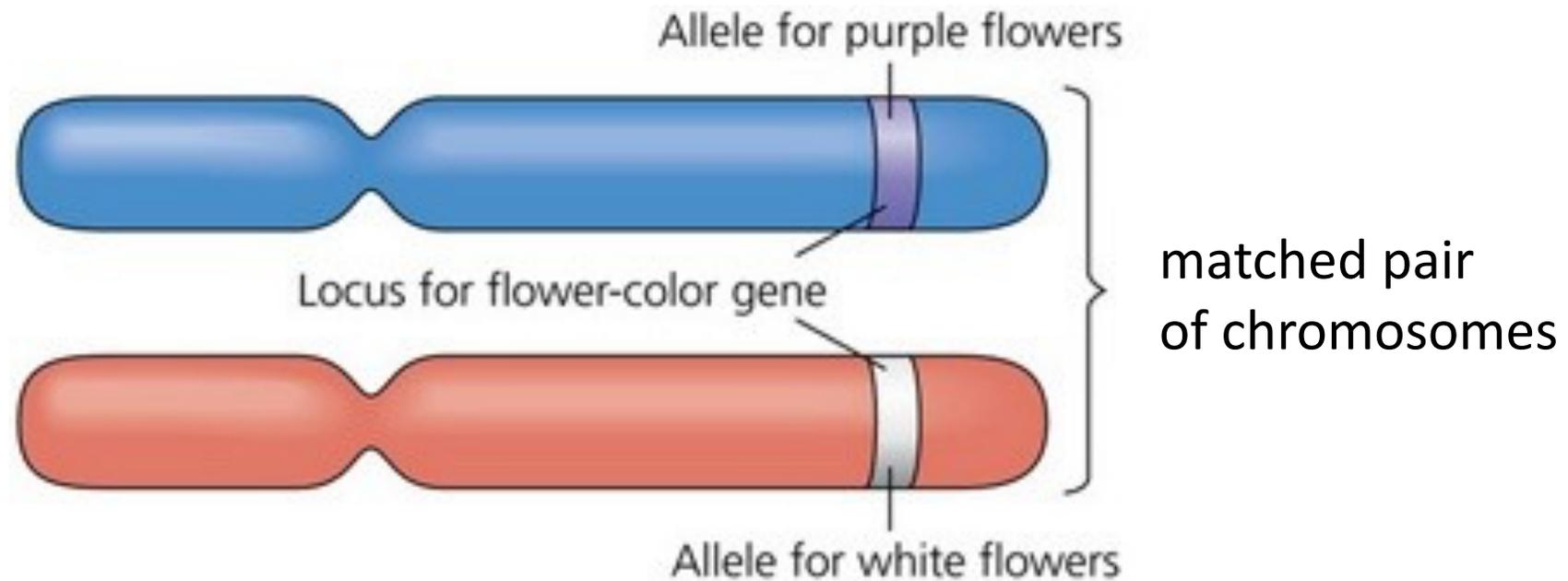
we have two copies of each numbered chromosome



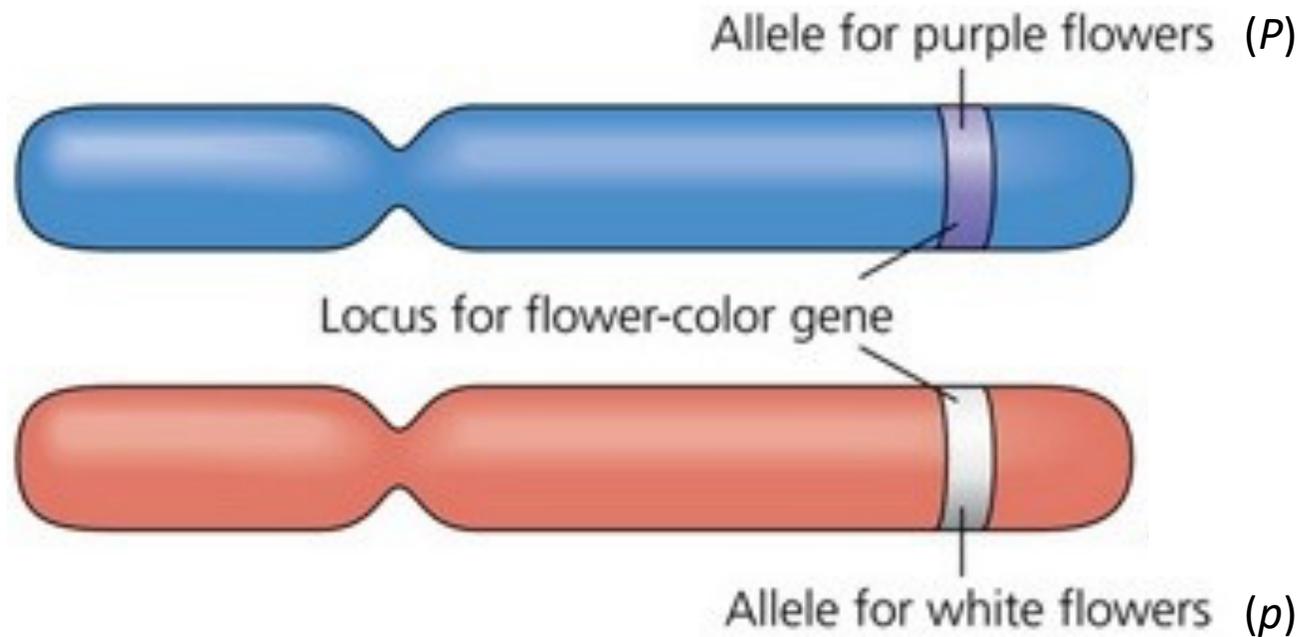
Within a chromosome, a gene encodes a functional protein or RNA



A particular "variant" (i.e., form) of a gene is called an allele

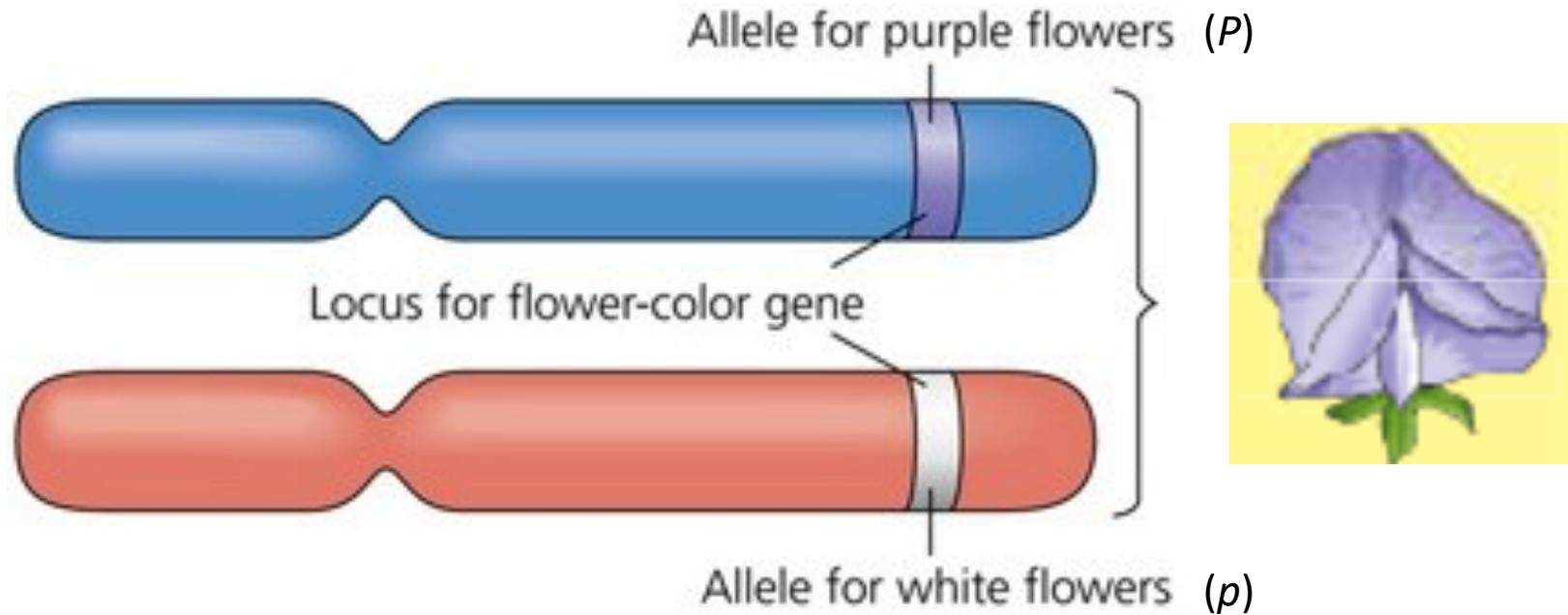


Alleles are often abbreviated



We call the combination of the two alleles, the person's genotype: Pp

A "Mendelian" trait is a binary trait determined by the combination of two alleles of a single gene

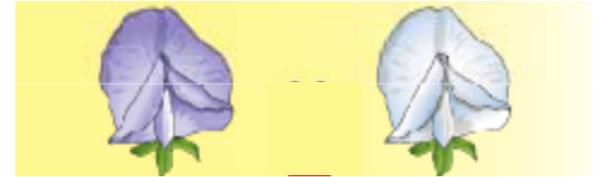


For a Mendelian trait, one allele is dominant; the other is recessive

Pea plant flower trait:

"*P*" (purple) allele: *dominant*

"*p*" (white) allele: *recessive*



"dominant
phenotype"

"recessive
phenotype"

Pair of alleles	in English	Phenotype
PP	homozygous dominant	purple
Pp	heterozygous	purple
pp	homozygous recessive	white

Are these traits Mendelian (simple genetic inheritance)?

Trait	Binary?	Heritable?	Single gene (monogenic)?	Mendelian?
<i>Pea plant flower color</i>	yes	yes	yes	yes
thumb crossing (R/L)	yes (mostly)	probably partial	probably not	no
earlobe attachment (or not)	no (continuous)	possibly partial	no	no
cheek dimples	no (variably expressed; can change over time)	partial; irregular	probably not (chr 16?)	no
tongue rolling	no	partial	unknown	no
PTC tasting	no	partial	no (but <i>TAS2R38</i> is the main gene)	no
Cleft chin	no (continuous)	partial	probably not	no
Freckles	no	partial	no (two genes)	no
Handedness	no (ambidextrous; can change over time)	partial	no (polygenic; at least 4 chromosomes)	no
Arm folding (R/L)	no	no	n/a	no
Eye color	no	yes	no; up to 16 genes	no

Discussing common human traits in a genetics curriculum

- Avoid presenting traits with non-simple inheritance (e.g., cleft chin, earlobe attachment, tongue rolling, cheek dimples, etc.) as examples of “simple (classical Mendelian)” inheritance.
 - *Consider: A student who has the dominant phenotype and both of whose parents have the recessive phenotype may jump to conclusions that are not warranted, and be confused or feel that something is wrong with them*
- Self-study of accurate genetic markers (such as blood type) as a classroom activity can also lead to discoveries by students that—while scientifically valid—are really not the kind of thing to be revealed in the classroom.
- An alternative to using human traits to discuss classical Mendelian inheritance is to discuss the genetics of cat fur coloration, density, etc.
 - See the U. Delaware site: <http://udel.edu/~mcdonald/mythintro.html>