



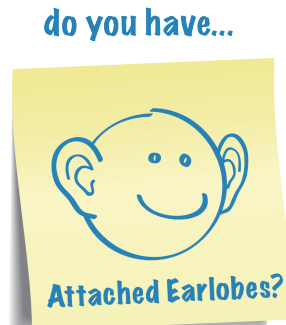
## Handout 1-2: Trait Mosaics

### Lesson 1 - Genomics and Human Identity

Photos and statistics were collected during a survey of 293 visitors to the exhibit *Genome: Unlocking Life's Code* at the Smithsonian's National Museum of Natural History in 2013.

Participants were divided into one of 16 groups based on their combination of four traits:

- Facial dimples
- Attached or hanging ear lobes
- Ability to roll/curl tongue into a U shape
- Peaked hairline



# Group 1: 6% of survey participants

*dimples, attached ear lobes, able to roll tongue, peaked hairline*



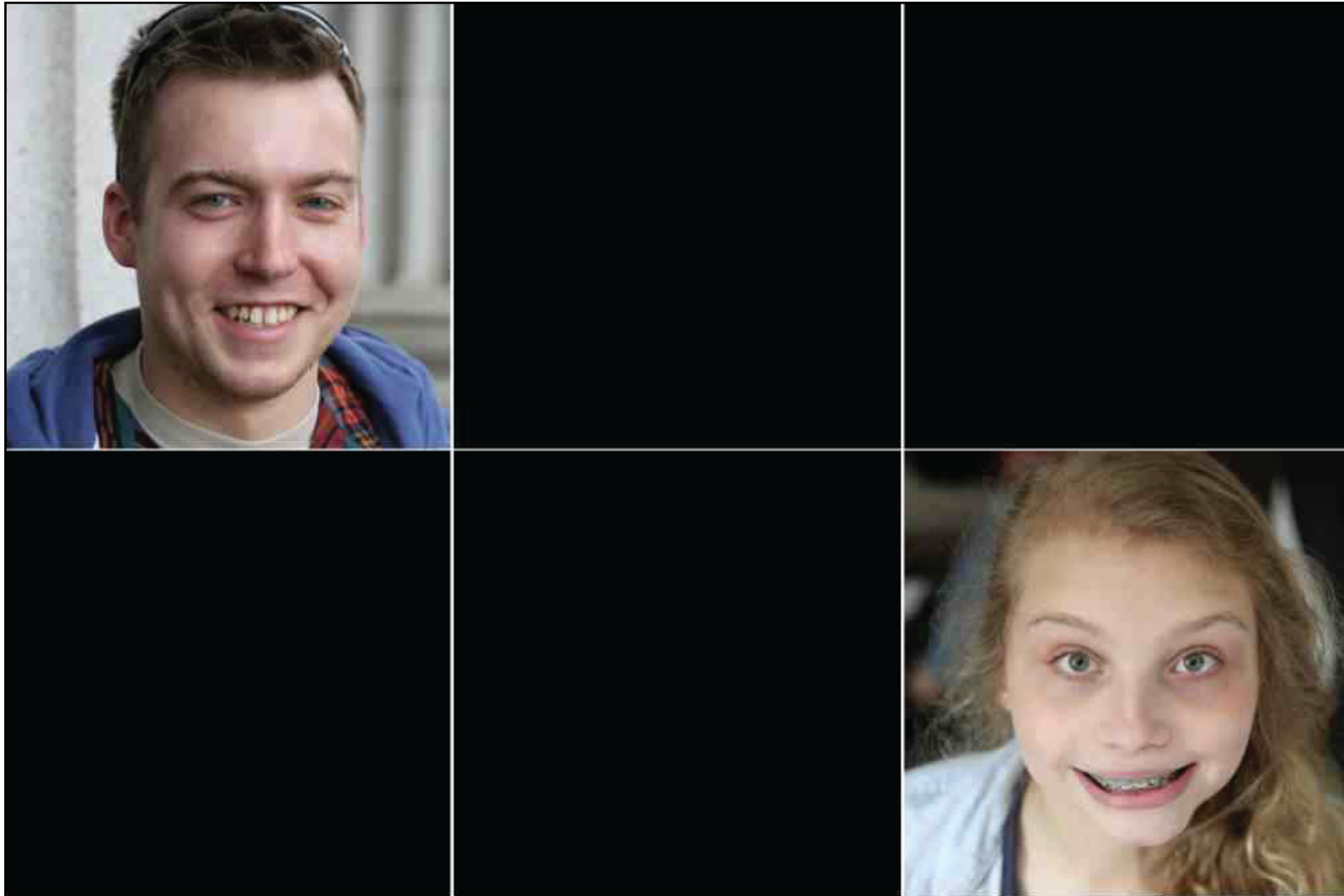
# Group 2: 7% of survey participants

*dimples, attached ear lobes, able to roll tongue, no peaked hairline*



# Group 3: 0.3% of survey participants

*dimples, attached ear lobes, unable to roll tongue, peaked hairline*



# Group 4: 3% of survey participants

*dimples, attached ear lobes, unable to roll tongue, no peaked hairline*



# Group 5: 9% of survey participants

*dimples, hanging ear lobes, able to roll tongue, peaked hairline*



# Group 6: 11% of survey participants

*dimples, hanging ear lobes, able to roll tongue, no peaked hairline*





# Group 7: 1% of survey participants

*dimples, hanging ear lobes, unable to roll tongue, peaked hairline*



# Group 8: 7% of survey participants

*dimples, hanging ear lobes, unable to roll tongue, no peaked hairline*



# Group 9: 7% of survey participants

*no dimples, attached ear lobes, able to roll tongue, peaked hairline*



# Group 10: 9% of survey participants

*no dimples, attached ear lobes, able to roll tongue, no peaked hairline*



# Group 11: 9% of survey participants

*no dimples, attached ear lobes, unable to roll tongue, peaked hairline*



# Group 12: 2% of survey participants

*no dimples, attached ear lobes, unable to roll tongue, no peaked hairline*



# Group 13: 11% of survey participants

*no dimples, hanging ear lobes, able to roll tongue, peaked hairline*



# Group 14: 15% of survey participants

*no dimples, hanging ear lobes, able to roll tongue, no peaked hairline*





# Group 15: 2% of survey participants

*no dimples, hanging ear lobes, unable to roll tongue, peaked hairline*



# Group 16: 5% of survey participants

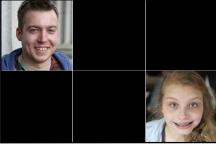




*no dimples, hanging ear lobes, able to roll tongue, no peaked hairline*







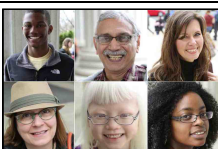


## Handout 1-3: Smithsonian Trait Survey Results

Photos and statistics were collected during a survey of 293 visitors to the exhibit *Genome: Unlocking Life's Code* at the Smithsonian's National Museum of Natural History in 2013.

Participants were divided into one of 16 groups based on their combination of four traits.

Group Number	Dimples?	Attached Ear Lobes?	Able to Curl Tongue?	Hairline Peak ?	Percentage of participants in group	Results from your class
1 	Yes	Yes	Yes	Yes	6%	
2 	Yes	Yes	Yes	No	7%	
3 	Yes	Yes	No	Yes	0.3%	
4 	Yes	Yes	No	No	3%	
5 	Yes	No	Yes	Yes	9%	
6 	Yes	No	Yes	No	11%	
7 	Yes	No	No	Yes	1%	
8 	Yes	No	No	No	7%	
9 	No	Yes	Yes	Yes	7%	

10		No	Yes	Yes	No	9%	
11		No	Yes	No	Yes	9%	
12		No	Yes	No	No	2%	
13		No	No	Yes	Yes	11%	
14		No	No	Yes	No	15%	
15		No	No	No	Yes	2%	
16		No	No	No	No	5%	

Why do some groups have many people while other have only a few?

How do the results from the Smithsonian survey compare with the results from your class?

## Handout 1-4: DNA Sequence Comparison

Find the differences in DNA sequence between Person A and Person B

### Person A

```
1   GGATGCGAAG GCTGCGGCGT CCTGGGGCGA GCGCTGACG TGAGCTCGGC GCACCTGGGC
61  TGGGCAGGTA AGGGCTGGTG CGGGACGGGG AGAGGAACCT GCAGTCCCTA CTTGGGTAGA
121 GCCAGGCGCC CCTTGGCTAA GACGTCGAGG AGCGTGGTAG CGACGGGTGA TCTTCGCTGC
181 GGACTTGGTT CGGAGGGACG TCCGCTTCTG GTGGACAGAT TGAGCAAAGG CCTGGGCTGT
241 AGAGACAGGG AAGTACCAGG AAGGGGTGGA TGACCCTGAC CCAGCTAAAT GGAAGGCCCA
301 TCTTATACTC ATGAAATCAA CAGAGGCTTG CATGTATCTA TCTGTCTATC TATCTATCTA
361 TCTATCTATC TATCTATCTA TCTATCTATC TATCTATCTA TGAGACAGGG TCTTGCTCTG
421 TCACCCAGAT TGGACTGCAG TGGGGGAATC A
```

### Person B

```
1   GGATGCGATG GCTGCGGCGT CCTGGGGCGA GCGCTGACG TGAGCTCGGC GCACCTGGGC
61  TGGGCAGGTA AGGGCTGGTG CCGAACGGGG AGAGGAACCT GCAGTCCCTA CTTGGGTAGA
121 GCCAGGCGCC CCTTGGCTAA GACGTCGAGG AGCGTGGTAG CGACGGGTGA TCTTCGCTGC
181 GGACTTGGTT CGGAGGGACG TCCGCTTCTG GTGGACACAT TGAGCAAAGG CCTGGGCTGT
241 AGAGACAGGG TTGTACCAGG AAGGGGTGGA TGACCCTGAC CCAGCTAAAT GGAAGGCCCA
301 TCTTATACTC ATGAAATCAA CAGAGGCTTG CATGTATCTA TCTGTCTGTC TATCTATCTA
361 TCTATCTATC TATCTATCTA TGAGACAGGG TCTTGCTCTG TCACCCAGAT TGGACTGCAG
421 TGGGGGAATC A
```

## Handout 1-5: Sequence Comparison Key

Differences are highlighted on Person B's sequence:

- **Single nucleotide changes** are highlighted in yellow
- **Insertion:** The short sequence TCTG is inserted into the B sequence at position 345, denoted in green box
- **Deletion:** Sequence B is missing 20 nucleotides (five TCTA repeats) that are in A, denoted in blue box.
- Both sequences contain a **short tandem repeat** (underlined). Person A has 15 copies of TCTA, Person B has 8.

### Person A

```

1   GGATGCGAAG GCTGCGGCGT CCTGGGGCGA GCGCTGACG TGAGCTCGGC GCACCTGGGC
61  TGGGCAGGTA AGGGCTGGTG CGGGACGGGG AGAGGAACCT GCAGTCCCTA CTTGGGTAGA
121 GCCAGGCGCC CCTTGGCTAA GACGTCGAGG AGCGTGGTAG CGACGGGTGA TCTTCGCTGC
181 GGACTTGGTT CGGAGGGACG TCCGCTTCTG GTGGACAGAT TGAGCAAAGG CCTGGGCTGT
241 AGAGACAGGG AAGTACCAGG AAGGGGTGGA TGACCCTGAC CCAGCTAAAT GGAAGGCCCA
301 TCTTATACTC ATGAAATCAA CAGAGGCTTG CATGTATCTA TCTGTCTATC TATCTATCTA
361 TCTATCTATC TATCTATCTA TCTATCTATC TATCTATCTA TGAGACAGGG TCTTGCTCTG
421 TCACCCAGAT TGGACTGCAG TGGGGGAATC A
  
```

### Person B

```

1   GGATGCGATG GCTGCGGCGT CCTGGGGCGA GCGCTGACG TGAGCTCGGC GCACCTGGGC
61  TGGGCAGGTA AGGGCTGGTG CGGAACGGGG AGAGGAACCT GCAGTCCCTA CTTGGGTAGA
121 GCCAGGCGCC CCTTGGCTAA GACGTCGAGG AGCGTGGTAG CGACGGGTGA TCTTCGCTGC
181 GGACTTGGTT CGGAGGGACG TCCGCTTCTG GTGGACACAT TGAGCAAAGG CCTGGGCTGT
241 AGAGACAGGG TTGTACCAGG AAGGGGTGGA TGACCCTGAC CCAGCTAAAT GGAAGGCCCA
301 TCTTATACTC ATGAAATCAA CAGAGGCTTG CATGTATCTA TCTGTCTGTC TATCTATCTA
361 TCTATCTATC TATCTATCTA TGAGACAGGG TCTTGCTCTG TCACCCAGAT TGGACTGCAG
421 TGGGGGAATC A
  
```