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‘SATIABLE CURIOSITY: MIX AND MATCH: DNA STORIES FROM AN ANCESTOR

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'SATIABLE CURIOSITY

Mix and Match:
DNA Stories from an Ancestor

'Satiabile Curiosity is a column dedicated to the proposition that genetic genealogists are an untapped resource for resolving questions about DNA behavior--how DNA changes over the course of a few or many generations and how DNA patterns are distributed around the world. Some questions are so broad that it could take decades to arrive at a conclusion, yet others are narrow enough to answer in a shorter time frame, perhaps even within a semester or two for a student research project. The results may nonetheless be of considerable genealogical utility and scientific interest, worthy of publication in a technical journal.

Genetic genealogists are beginning to explore the whole genome—we are no longer limited to the Y chromosome or mtDNA, which have served as the foundation of the field. Companies such as 23andMe and deCODEme scan hundreds of thousands of markers, which have come down to us from many ancestral lines.

Think of a family reunion where people are reminiscing about anecdotes their great-grandmother told them. One might say, "Do you remember the story about falling in the creek two times in the same day?" Some might nod their heads, but others might say, "No, I never heard about that, but how about the summer she made seventy-three pints of applesauce from the tree in the back yard?" It's sometimes a matter of chance which people were hanging around at the time the stories were told.

DNA operates in much the same way, as some of the stories are passed on to the next generation. Descendants will inherit different fragments of great-grandmother's DNA—sometimes a number of descendants might receive the same section, and sometimes only one descendant will carry a section, purely as a matter of chance.

A case study illustrates how a particular story might be tracked down to its genetic source by comparing DNA of descendants. A man and his second cousin both inherited a distinctive trait from their great-grandmother. The grandparents and parents from both lines were deceased, but the man had two siblings who did not possess the trait. Each of the siblings can be compared one at a time to the second cousin. Figure 1 (next page)

shows three diagrams from the Family Inheritance feature at 23andMe (deCODEme has a similar display), where sections of DNA found in both parties are color-coded blue.

Sibling 1 shares five segments of autosomal DNA (on chromosomes 1, 2, 7, and 18) with his second cousin. This is actually somewhat less than typical for second cousins, but it's handy for our purpose. Some of these could have come from their great-grandfather or be unconnected to the trait in question. How can we narrow down the choices? If Sibling 2 or Sibling 3 also share the segment, then we know the trait was not located on that segment (since they don't have the trait). These sections shared by all three siblings are outlined in red squares. That leaves two sections, outlined in red circles, which are found only in the sibling with the trait. The genes in these segments are good candidates for the mutation that caused the trait. Testing additional cousins with or without the trait could eliminate one of these.

Although the people in this case study already knew how they were related, the Family Inheritance diagrams show that second cousins can be easily detected by the amount of DNA they share. Their stories are not always passed on to the next generation, but even so, third cousins usually share a few segments. Fourth cousins may also demonstrate segments in common, although not as frequently. Even more distant cousins will share some DNA a small percentage of the time. This opens up a whole new way of detecting genealogical connections.

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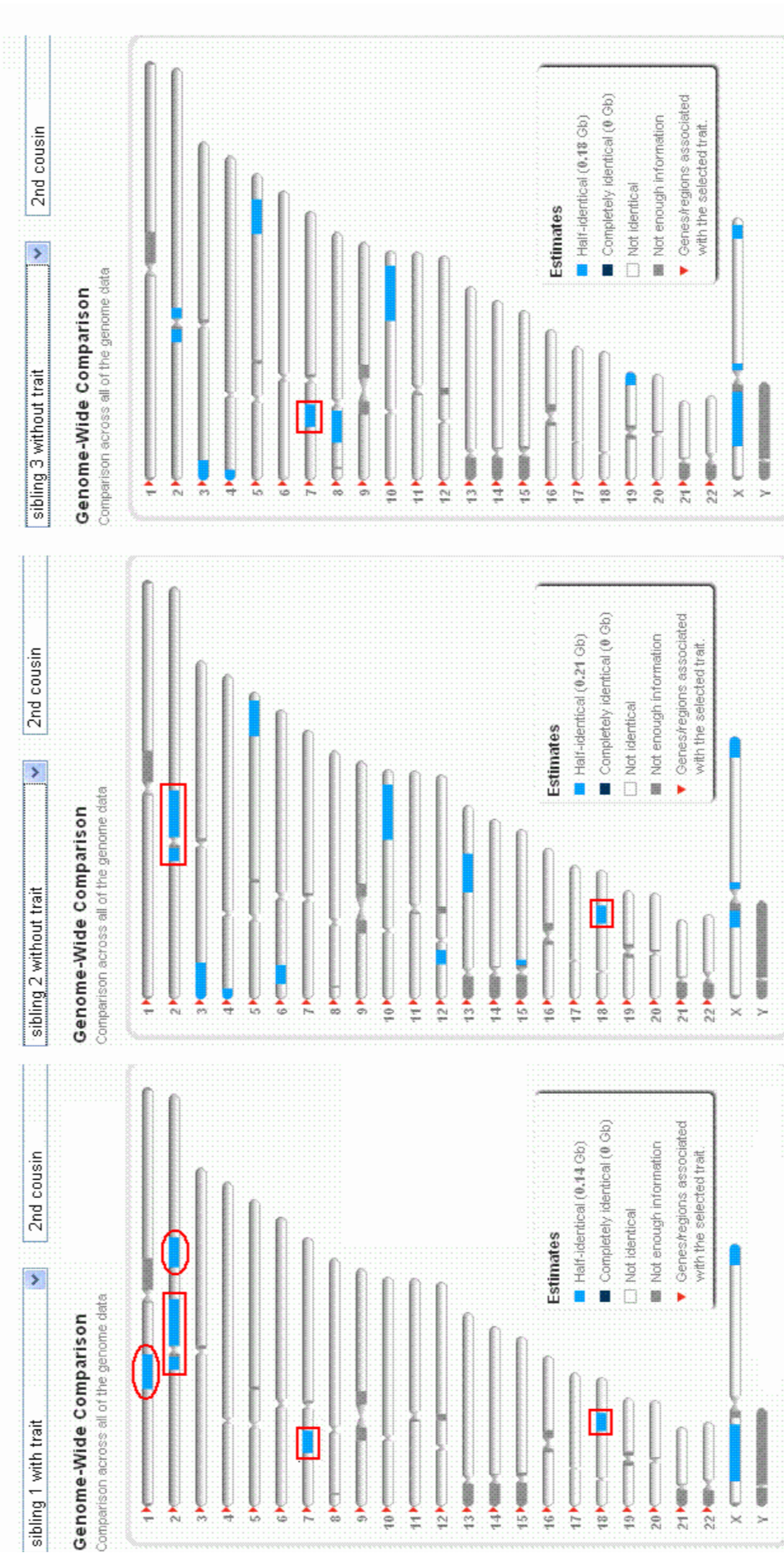


Figure 1. Family Inheritance diagrams from a comparison of three siblings with a known second cousin. Sibling 1 shares a particular trait with the second cousin, while siblings 2 and 3 do not.

Disclosure

Ann Turner has a consulting agreement with the company 23andMe, Inc. The opinions expressed in this article are entirely her own.

Web Resources

23andMe Web Site

<http://www.23andme.com>

DeCodeMe Web Site

<http://www.decodeme.com>