1. How is the idea of Epigenetics different from our traditional view of inheritance? How does this complicate how scientists think about the Human Genome Project?
Our traditional view of inheritance is that our genes are permanent from the moment of contraception. Epigenetics says that our life experiences can affect our genes and we can also pass it on to future generations. This complicates the Human Genome Project because it meant that scientists could not find the cause for every genetic disease and cure for it. Since our genes can be turned on or off based on our experiences and parent experiences it makes finding diseases and cures more difficult.

2. How do Angelman Syndrome and Prada-Willi Syndrome demonstrate epigenetics?

Angelman Syndrome and Prada-Willi Syndrome are both caused by the same deletion in chromosome 15; however, they are two completely different diseases. The two diseases must come from either the chromosome from the mother or father. What is fascinating about this is that the chromosome must know if they derived from an egg or a sperm and that they function differently. “So although the DNA sequence is the same, the different sets of genes were being silenced on whether it came from the mother or father.” This is known as genomic imprinting. This means that the genomes have a memory of where they came from.

3. What can the ancestors of holocaust survivors and those that experienced stress during 911 tell us about epigenetics? What do the data suggest?

Many of the children and grandchildren of the survivors of the holocaust were themselves experiencing stress. It’s caused by the continual retelling of the stories leads to stress in the younger generations lives. This occurs in pregnant people and was tested in pregnant mice. It throws a switch on a gene which is then passed onto the offspring. When exposed to a stressful event the body produces a hormone called cortisol, helps regulate the body’s response to the event. If cortisol levels are low, a person has a high level of developing PTSD because they have a hard time coping with the event. After 9/11, a study was conducted on pregnant woman who were in the twin towers who developed PTSD, and their offspring also showed abnormal stress hormones. This tells us that epigenetics might be responsible for this passed on abnormal stress hormone level in the offspring.

4. What are the susceptible periods for males and females? Why are they different?

The susceptible periods for males and females are when the egg and the sperm form. For females, it’s when they are babies in the womb and for males it’s when they go through puberty.

5. Why might genes carry environmental memory into the next generation? What evolutionary advantage might this be? How does the case of famine help us answer these questions?

The diet in one generation and the life expectancy in another generation are directly related. What our grandparents eat, affects what we may eat. Famine can affect generations hundreds of years later even if they themselves were never affected by famine themselves. Diabetes also plays a role in this; the grandparents’ diet directly affects the life expectancy of the grandchildren. Also, the diet of the grandparents can affect whether or not the grandchildren get diabetes or not. The food supply of the grandparents during the ‘sensitive periods’ was tied in with the formation of the egg and the sperm.

6. How might pesticide exposure influence the health of subsequent generations via epigenetics?

Exposure to pesticides can lead to a whole bunch of other problems: tumors, prostate and kidney disease and immune dysfunction. In several repeats of this exposure, the same diseases were exposed to each generation. The environmental exposure doesn’t just affect the individual, but it affects two or three generations down the line in almost every individual in each generation.