If I was a Developmental Biologist Assignment

1. Write down your two questions.

1) If I was a developmental biologist I would investigate the molecular factors present during spermatogenesis and oogenesis that are involved in epigenetically modifying imprinted genes. CTCF is a protein that has been associated with imprinted gene regulation. It is a non-histone protein that when bound to the unmethylated maternal chromosome 7 allele, protects the allele from being methylated. Although we have an idea of the mechanism that results in an unmethylated maternal chromosome 7 allele we do not know yet the mechanism by which the paternal chromosome 7 allele is methylated. I would like to study the paternal germline in order to characterize the mechanism that results in methylation of the paternal allele.

Delaval, K., & Feil, R. (2004). Epigenetic regulation of mammalian genomic imprinting. *Current opinion in genetics & development*, *14*(2), 188-195.

2) In mice, maternal products in the early embryo control development until the embryonic genome becomes active. *Mater* is a maternal effect gene that has been implicated in the transition from an active maternal to an active embryonic genome in mice. If I was a developmental biologist I would be interested in studying the molecular mechanism of *Mater* in early developing embryos in order to characterize the transition from an active maternal to the active embryonic genome in mice.

Tong, Z. B., Gold, L., Pfeifer, K. E., Dorward, H., Lee, E., Bondy, C. A., Dean, J., & Nelson, L. M. (2000). Mater, a maternal effect gene required for early embryonic development in mice. *Nature genetics*, *26*, 267.

2. Identify what it is that makes you interested in investigating one of your questions.

I am interested in investigating the mechanism behind the addition of epigenetic marks to imprinted genes during gametogenesis. When I first learned about imprinted genes I had a really hard time understanding how how it is that their expression is regulated based on which parent the allele was passed down from. By investigating this question I will be able to understand how imprinted genes are expressed from one parental allele.

3. Imagine that you solve this question: what impact would this have on developmental genetics/biology? What impact would this have on science? What impact would it have on the community at large?

There are many imprinted genes that have been identified in mice and their gene products are crucial in developing embryos. As of yet we do not fully understand why some genes are epigenetically modified during gametogenesis and therefore by answering this question we can

gain some insight on the mechanism that governs imprinting. Discovering the mechanism behind imprinted gene expression would have a large impact on developmental genetics/biology as imprinted genes have been strongly linked to important developmental pathways. Aberrant expression of imprinted genes has been associated with non-viable embryos and serious congenital and X-inactivation diseases.