Gene expression is essential to every living organism. What genes are expressed and at what time are determined by how available the specific DNA sequence is to be replicated/expressed in the cell. Through understanding how this happens we need to know what is going on within the cell during these times when gene expression is occurring. Although most do not fully understand what goes on within the cell as far as gene expression goes, in simplicity, the region being read is the gene that is “on” and the genes not being read are considered to be “off”. This doesn’t mean that they will always be on or always be off, but whenever the cell needs a certain gene or genes to be expressed it will turn them “on” and when they aren’t in use they will be turned “off” this is the cells way to save resources if they are present within the cell or the environment. So naturally DNA is highly conserved in the cell; this means that the cell is going to take precautions to make sure that the DNA isn’t exposed to foreign substances. The main way that it does this is by keeping the DNA tightly bound together in the form of something called a Nucleosome. Nucleosomes are DNA and histones tightly bound together (2). The tight binding inhibits the gene expression which is in turn silencing it or in other words the gene is turned “off”. On the other side of it, when these nucleosomes are not tightly wound together, this allows the DNA to be read and the gene needing expressed to be turned “on”. This function within the cell is one of the most important functions in the cell. The next part to all of this is something called enhancers. “Enhancers influence which genes are "on" or "off" in each type of cell and also control how much each the gene is activated. This level of control ultimately dictates the quantity of an encoded protein that is made in response to particular physiological conditions.”(1) This study that was done at the Zaret labs was doing research on new nucleosome mapping techniques and prior to this it was assumed that nucleosomes were absent during gene expression. Makiko Iwafuchi-Doi found out otherwise. “…she demonstrated that nucleosomes are present, at least in part, at enhancer sites, when gene regulatory proteins called pioneer factors are attached to them. This information provides a new view of how enhancer sequences and nucleosomes interact.”(1) The goal of the study/research is to understand how the mechanisms of these pioneer factors work to regulate the enhancer functions in gene expression. In doing this they hope to be able to convert one cell type into another cell type. This would allow for new ways to fight diseases to come about in the near future. Being able to understand gene expression has been on the plate of the scientific community for a while and these pioneer factors are one of many stepping stones in the right direction.

1. Zaret, Ken. "New Understanding on How Fundamental DNA Sequences Govern Gene Activity." *ScienceDaily*. ScienceDaily, n.d. Web. 08 Apr. 2016.
2. Alberts, Bruce. *Essential Cell Biology*. New York, NY: Garland Science, 2014. Print.