**Extending AlleleSeq Analysis to miRNAs and RBPs**

We intend to apply and extend the AlleleSeq pipeline to the application of allele-specific expression (ASE) of miRNAs and RNA binding proteins. ASE of miRNA expression is in principal straight forward to measure for those miRNAs that contain heterozygous SNPs either within the mature miRNA or the miRNA hairpin precursor. However, due the short lengthes (21-22nts) of miRNAs care needs to be taken to correctly count RNA-Seq sequencing reads originating from each haplotype – to avoid miscounting reads that are not proportional to the expression of miRNA from each allele. One way this can be done is by incorporating barcodes into the sequencing library (to better measure library complexity for miRNAs). We also plan on investigating how ASE of miRNAs affects and correlates with ASE (from RNA-Seq data) of their target mRNAs.

We also plan on extending the AlleleSeq pipeline to the application of RNA-binding of RBPs using sequencing data from CLIP-Seq. Allele-specific binding (ASB) from CLIP-Seq can be analyzed in a similar manner to ChIP-Seq data where one can detect if there is preferential binding of a RBP to the mRNA (or any other ncRNA) that is expressed from one allele. As with ChIP-Seq we need the presence of a heterozygous SNP to differentiate between the sequences from the maternal or paternal haplotypes, however one key difference is unlike for DNA (ASB from ChIP-Seq data) where epigenetic effects are important – the difference in binding of a RBP to RNAs from either allele can either be due to the differences in ASE of the RNA itself or differential binding (the actual affinity of the RBP to the target RNA molecule) of the RBP to the different RNA molecules expressed from each allele. Care must be taken to construct maternal and paternal sets of transcript annotation – since different RBP can either bind to the mature spliced mRNA or the unspliced precursor. We also intend on correlating the ASB of RBPs from CLIP-Seq with ASE from RNA-Seq for the target mRNAs.