

## **Guardian of the Genome**

Kit Menlove, Jacob Biesinger

Department of Biology

Brigham Young University, Provo, Utah 84602

Called the “Guardian of the Genome,” the p53 transcription factor is a major contributor to our ability to suppress tumors. Presently, we know of at least 35 genes for which TP53 regulates transcription, in one direction or another. These genes, in turn, activate pathways that lead to cell cycle arrest and apoptosis. Mutations in the TP53 genes are present in approximately 55% of all cancers<sup>1</sup>. TP53 and proteins it has historically formed complexes with with have undergone significant evolutionary changes, and in doing so have co-evolved. We inspect some of these evolutionary changes in TP53 using the MM01 model, which inspects the effect on physio-chemical properties of non-synonymous substitutions. We used the program TreeSAAP, which provides an implementation of MM01, to compare TP53 and proteins in its complex in seven organisms. We found that there were significant changes in 13 of 31 studied properties. In particular, four regions of p53 display statistically significant evolutionary change in more than one property. We inspect these regions, looking for properties which have evolved jointly in TP53 and members of its complex.