

**Trans-layer omics analysis, disease biology, and drug discovery**Yukinori Okada*Dept. Stat Genet, Grad. Scho. Med., Osaka Univ.*

Statistical genetics is a research field that evaluates causality of human genetic variations on diseases, using statistical and bioinformatics approaches. Recent developments of sequencing technologies have provided human disease genome data of hundreds of thousands of the subjects, and successfully identified comprehensive catalogues of genetic susceptible loci. However, little is known regarding how to develop methodology to integrate large-scale human omics data with diverse biological resources, to which statistical genetics should contribute. We propose trans-layer omics analysis as a key to solve this challenging task. We have developed such methods and applied to a pioneering example of large-scale genetic association studies on a variety of human complex traits, including immune-related diseases. We demonstrated that the disease risk genes were significantly enriched in overlap with the target genes of the drugs currently used for treatment of the diseases, and that network analysis between the disease risk genes and the drug target genes could identify candidates of drug repositioning (e.g. CDK4/6 inhibitors for rheumatoid arthritis). These results should empirically show the value of statistical genetics to dissect disease biology and novel drug discovery.