# Review of Fine-mapping of a gene

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This week, we have 2 papers from the same author. One paper talks about fine-mapping of a mutant gene using recombination and positional test and the other paper studies the genetic fine structure using recombination and topology knowledge. In the paper (Benzer, 1955), the author used rII mutants of T4 bacteriophage for the experiment since the wild-type phage produces plaques on either of two bacterial hosts, B or K, while a rII mutant produces plaques only on B. Therefore, if a cross is made between two different rII mutants, we could detect wild-type recombinants by their plating on K. The author used position-effect pseudo-allelism test to divide the rII region into two functionally distinguishable segments. He also used spot test to rough map the preliminary locations of various rII mutants with similar phenotypic effects to a bounded region. In the paper (Benzer, 1959), the author also used recombination test, in which two mutants are allowed to multiply within the same host cell and produce progeny which contains their genetic information from each parent. This experiment could let us know whether or not two mutations overlap. The author later examined the topology of the structure in phage T4 and showed that the within the genes, the structure is linear.

Although I don't fully understand the details in these two papers, I got a basic idea about how scientists did biological experiments to study the location and structure of gene in the early years. Recombination studies and positional test in bacteriophage are useful methods that could map the location of certain stable mutants. Similar as some statistical tests, there are some postulates the author mentioned that the analysis is based on. For example, one of the postulates is the assumption that each mutation is topologically "simple", which means that a mutant does not contain two or more alterations separated by an unchanged segment. Again, similar as my thoughts from last week, a lot of the statistical and experimental design knowledge is used in the biological studies. The key of doing a successful biological experiment is usually a well-designed experiment so that we could observe the phenomena that we hypothesized. With well-designed experiments, we could derive valid results more easily.

**Question**:

1. I don't fully understand the topology part in the Benzer (1959) paper and that would be great if anyone could give a brief overview of it?