

# Links between recombination and replication: Vital roles of recombination

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There has been a sea change in how we view genetic recombination. When germ cells are produced in higher organisms, genetic recombination assures the proper segregation of like chromosomes. In the course of that process, called meiosis, recombination not only assures segregation of one chromosome of each type to progeny germ cells, but also further shuffles the genetic deck, contributing to the unique inheritance of individuals. In a nutshell, that is the classical view of recombination. We have also known for many years that in bacteria recombination plays a role in horizontal gene transfer and in replication itself, the latter by establishing some of the replication forks that are the structural scaffolds for copying DNA. In recent years, however, we have become increasingly aware that replication, which normally starts without any help from recombination, is a vulnerable process that frequently leads to broken DNA. The enzymes of recombination play a vital role in the repair of those breaks. The recombination enzymes can function via several different pathways that mediate the repair of breaks, as well as restoration of replication forks that are stalled by other kinds of damage to DNA. Thus, to the classical view of recombination as an engine of inheritance we must add the view of recombination as a vital housekeeping function that repairs breaks suffered in the course of replication. We have also known for many years that genomic instability—including mutations, chromosomal rearrangements, and aneuploidy—is a hallmark of cancer cells.

Although genomic instability has many contributing causes, including faulty replication, there are many indications that recombination, faulty or not, contributes to genome instability and cancer as well.

The colloquium *Links Between Recombination and Replication: Vital Roles of Recombination* was convened to broaden awareness of this evolving area of research. Papers generated by this colloquium are published here. To encourage the desired interactions of specialists, we invited some contributions that deal only with recombination or replication in addition to contributions on the central thesis of functional links between recombination and replication. To aid the nonspecialist and specialist alike, we open the set of papers with a historical overview by Michael Cox and we close the set with a commentary on the meeting and the field by Andrei Kuzminov.

The organizing committee consisted of Nicolas Cozzarelli, James Haber, Kenneth Mariani, and me. I am grateful to them for valuable advice as well as yeoman's work in supervising the reviewing and editing of submitted papers. I also wish to acknowledge the invaluable assistance of staff at the National Academy of Sciences.

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