

33. Deep dive into Tools for Genetic Engineering

1 unit, Junhong Choi, November 12th, 2025

Genome Editing: CRISPR and Beyond

Three generations of Genome Editors post-CRISPR

Finding CRISPR enzymes

Engineering CRISPR enzymes: BE and PE

Large genetic insertion, deletion, replacement

Mutation-specific, Mutation-agnostic, and Disease-agnostic therapeutic genome editing

Genome Editing for Biological Insights

Programmable genetic perturbations

Genomic recording

Practical considerations

Choosing genome editors and designing guide RNAs

Predicting and analyzing outcomes

Delivery options

Review Paper:

Wang JY & Doudna JA. CRISPR technology: A decade of genome editing is only the beginning.

Science. <https://www.science.org/doi/10.1126/science.add8643>. 2023. 379(6629). PMID: 36656942

Anzalone AV, Koblan LW & Liu DR. Genome editing with CRISPR-Cas nuclease, base editors, transposases and prime editors. **Nat. Biotech.** <https://www.nature.com/articles/s41587-020-0561-9>. 2020. 38, 824-844. PMID: 32572269

Discussion Paper:

Durrant, M.G., Perry, N.T., Pai, J.J. et al. Bridge RNAs direct programmable recombination of target and donor DNA. **Nature** 630, 984–993 (2024). <https://doi.org/10.1038/s41586-024-07552-4>