

Next Generation Sequencing

1.) **Next-Generation Sequencing** (This Illumina web page discusses Next Generation Sequencing and contains several additional links to understand the topic further including a detailed overview of Illumina sequencing in a pdf document **An Introduction to Next Generation Sequencing Technology**)

Links:

a.) <https://www.illumina.com/science/technology/next-generation-sequencing.html>

b.) https://www.illumina.com/content/dam/illumina-marketing/documents/products/illumina_sequencing_introduction.pdf

2.) **Next-Generation Sequencing Glossary/NGS terminology** (Illumina web page containing terminology definitions used in NGS)

<https://www.illumina.com/science/technology/next-generation-sequencing/beginners/glossary.html>

3.) **Sequencing: How to plan your first sequencing project** (34 minutes- This webinar discusses the comprehensive workflow for planning your sequencing project including upfront considerations, library preparation, sequencing, and analysis.)

https://www.youtube.com/watch?v=1yKx_AwtMJI&ab_channel=Illumina

4.) **Illumina Sequencing by Synthesis** (5 minutes- This animated video explains the four basic steps of the Illumina workflow: sample prep, cluster generation, sequencing, and data analysis.)

https://www.youtube.com/watch?v=fCd6B5HRaZ8&ab_channel=Illumina

5.) **Sequencing: Introduction to Sequencing By Synthesis (SBS)** (35 minutes- This webinar is a high level overview of SBS technology for anyone new to the technology or just needs a refresher. The video goes into more detail than some shorter videos about how SBS works.)

https://www.youtube.com/watch?v=olJaA6h2bFM&ab_channel=Illumina

6.) **How Do I Achieve Consistent Quantitation? Part 1** (6 minutes- This video uses a baseball analogy to compare three possible methods to quantify DNA: nanodrop, qubit/picogreen and bioanalyzer, and qPCR and discusses why qPCR is the gold standard.)

<https://www.youtube.com/embed/DuAEy9SoAtk?autoplay=1&rel=0>

7.) **Metagenomics Sequencing: Introduction** (36 minutes- This webinar is an overview of the comprehensive workflow for a metagenomics sequencing project. Topics covered are: What is metagenomic sequencing, resources for getting started, library preparation methods, sequencing, and data analysis.)

https://www.youtube.com/watch?v=K_xzDmuim8&ab_channel=Illumina

8.) **RNA Sequencing: Part I - Introduction** (45 minutes- The purpose of the webinar is to understand the workflow for RNA sequencing from RNA isolation to data analysis. In addition, the webinar covers the key considerations in planning mRNA and total RNA sequencing experiments.)

<https://www.youtube.com/watch?v=Qp6SjCO3Q1E>

9.) **TruSeq: Sample Purification Bead Size Selection and Best Practices** (20 minutes- This course was created to be an overview of how bead-based size selection works and the best practices associated

with using the Sample Purification Beads included in the kits. The following questions are addressed: What are Sample Purification Beads? How do Sample Purification Beads work? When are Sample Purification Bead used? What is the Size Selection Workflow? What are the best practices associated with using Sample Purification Beads?)

https://support.illumina.com/content/dam/illumina-support/courses/TruSeq_DNA_SPB_Handling_and_Best_Practices/story_html5.html

qPCR

1.) **What is real time PCR?** (Web page by Bio-Rad-Basic overview of real-time PCR, applications, how it works, RNA isolation, RT Quantification PCR, and Real-Time PCR instrumentation)

<https://www.bio-rad.com/en-us/applications-technologies/what-real-time-pcr-qpcr?ID=LUSO4W8UU>

2.) **Essentials of Real Time PCR** (web page by Thermo Fisher Scientific- General overview of Real-time PCR including a comparison of TaqMan and SYBR Chemistry).

<https://www.thermofisher.com/us/en/home/life-science/pcr/real-time-pcr/real-time-pcr-learning-center/real-time-pcr-basics/essentials-real-time-pcr.html>

3.) **TaqMan versus SYBR Chemistry in Real-Time PCR** (web page by Thermo Fisher Scientific explaining advantages and disadvantages of TaqMan and SYBR Chemistry in Real-Time PCR)

<https://www.thermofisher.com/us/en/home/life-science/pcr/real-time-pcr/real-time-pcr-learning-center/real-time-pcr-basics/taqman-vs-sybr-chemistry-real-time-pcr.html>

4.) **Real Time PCR Troubleshooting** (Web page by Bio-Rad providing possible explanations for problems seen with qPCR data.)

<https://www.bio-rad.com/en-us/applications-technologies/real-time-pcr-troubleshooting?ID=LUSOBDHYP>

5.) **Real-Time PCR: Understanding Ct** (Web page by Thermo Fisher Scientific- This page highlights the factors that must be considered when setting up and evaluating a real-time PCR reaction.)

<https://www.thermofisher.com/us/en/home/life-science/pcr/real-time-pcr/real-time-pcr-learning-center/real-time-pcr-basics/real-time-pcr-understanding-ct.html>

6.) **Overview of qPCR** (2 minute video By New England BioLabs- This video discusses the difference between regular PCR and qPCR, SYBR green versus taqman, and the qPCR curve.)

<https://www.youtube.com/watch?v=1kvy17ugl4w>

7.) **SYBR Green qPCR** (3 minute video by Sigma Aldrich- This video goes through the steps of the PCR reaction explaining how SYBR green binds to DNA and is measured.)

<https://www.youtube.com/watch?v=GCzH2Wcvd8E>

8.) **Using Standard Curve to Estimate DNA Quantity-Forensic Focus #4** (3 minute video by Thermo Fisher Scientific- The video covers defining a standard curve, Ct value, slope, y intercept, and R² value.)

<https://www.youtube.com/watch?v=uyvfijFiXjk>

9.) **How Taqman Works--Ask TaqMan Episode 13** (4 minute animation by Life technologies- This video shows how the reporter and quencher work using Taqman in qPCR)
<https://www.youtube.com/watch?v=fkUDu042xic>

Third generation Sequencing (PacBio)

1.) **PacBio support training web page** (Web page by PacBio- Additional in-depth videos about third generation sequencing for more education)

https://www.pacb.com/support/training/?fwp_paged=2&fwp_sort=preserve

2.) **Introduction to SMRT Sequencing** (2 minutes by PacBio- A brief animated introduction to Pacific Biosciences' Single Molecule, Real-Time (SMRT) Sequencing, including the SMRT Cell and zero mode waveguide (ZMW).)

<https://youtu.be/NHCJ8PtYCFc>

3.) **PacBio Sequencing-How It Works** (1 minute by PacBio-PacBio sequencing instruments are powered by Single Molecule, Real-Time (SMRT) Sequencing technology and this video briefly explains that process.)

https://youtu.be/_ID8JyAbwEo

4.) **From sample to sequencing data for de novo assembly with PacBio long-read sequencing (Step 1)** (11 minutes by PacBio- This video provides an overview of the techniques and steps of preparing samples, DNA, and libraries for PacBio Single Molecule, Real-Time (SMRT) Sequencing to be used in de novo assembly projects. In this video, a PacBio scientist covers how to assess DNA quantity and purity, size-selection of DNA libraries, and provides an introduction to SMRT Sequencing, including the benefits of long-reads when generation high-quality genome assemblies.)

<https://www.youtube.com/watch?v=aJCGo2WT1bE&feature=youtu.be>

5.) **De novo assembly of a genome with PacBio long-read sequencing data (step 2)** (21 minutes by PacBio- This video provides an overview of the techniques and steps of generating a de novo genome assembly with long-read sequencing data generated using PacBio Single Molecules, Real-Time (SMRT) Sequencing. In this video, a PacBio scientist covers the benefits of long reads when generating high-quality genome assemblies, the latest tools for creating assemblies, including HGAP, FALCON, and FALCON-Unzip, how to polish and assess the quality of a genome assembly, and how to submit an assembly to NCBI.)

<https://www.youtube.com/watch?v=poHozFha7ml>

6.) **An Introduction to PacBio's Long Read Sequencing** (49 minutes by PacBio- This webinar is an introduction to Pacific Biosciences' single molecule, real-time (SMRT) Sequencing. After showing how the system works, PacBio discusses the main features of the technology with an emphasis on the difference between systematic error and random error and how SMRT Sequencing produces better consensus accuracy than other systems. Following this, the scientist discusses several ground-breaking discoveries in medical science that were made possible by the long reads and high accuracy of SMRT Sequencing.)

<https://www.youtube.com/watch?v=y30OUhQGFEE>

Third Generation Sequencing (Oxford Nanopore Technologies)

1.) **Nanopore Sequencing** (6 minute video by Oxford Nanopore Technologies- This video discusses the basics of nanopore sequencing technology and the main features which make nanopore sequencing suitable and appealing for many applications.)

<https://www.youtube.com/watch?v=sv9fFeSd3kE&t=29s>

2.) **Introduction to nanopore sequencing** (3 minutes by Oxford Nanopore Technologies- Oxford Nanopore Technologies has developed nanopore-based DNA and RNA sequencing technology designed to provide on-demand biological information, to any person, in any environment. The video describes the process for how the sequencing works.)

<https://www.youtube.com/watch?v=qzusVw4Dp8w>

3.) **Flow Cell Introduction** (6 minutes by Oxford Nanopore Technologies- The video covers the anatomy of the minION and gridION flow cell and its various components.)

https://www.youtube.com/watch?v=zC6lAtzqi_k

4.) **Priming and Loading of Flow Cell** (6 minutes by Oxford Nanopore Technologies- This video contains flow cell priming and sample loading demonstration. Content covered is good practices for priming and loading the flow cell, how to effectively remove air pockets within the flow cell, the dangers of incorrectly loading the flow cell, and how to correctly load the flow cell.)

<https://www.youtube.com/watch?v=Pt-iaemrM88>

5. **Nanopore DNA Sequencing** (Oxford Nanopore Technologies web page for DNA Sequencing)

<https://nanoporetech.com/applications/dna-nanopore-sequencing>

6.) **Nanopore Technologies- How It Works-** (Oxford Nanopore Technologies web page explaining the science behind their sequencing technique.)

<https://nanoporetech.com/how-it-works>

7.) **Resource Centre-** (Oxford Nanopore Technologies web page containing additional videos and publications for further study)

https://nanoporetech.com/resource-centre#resource-centre-panel-0=%7B%22currentPage%22%3A0%2C%22totalPages%22%3A99%2C%22searchIndex%22%3A%22cws_english_resources_en_featured_desc%22%7D

CRISPR Gene Editing

1.) **CRISPR Explained** (1 minute by Mayo Clinic- CRISPR-Cas9 editing explained.)

<https://www.youtube.com/watch?v=UKbrwPL3wXE>

2.) **CRISPR: Gene Editing and Beyond** (4 minutes by Nature Video- The CRISPR-Cas9 system has revolutionized gene-editing, but cutting DNA isn't all it can do. From turning gene expression on and off to fluorescently tagging particular sequences, this animation explores some of the exciting possibilities of CRISPR.)

<https://www.youtube.com/watch?v=4YKFw2KZA5o>

3.) **What are genome editing and CRISPR-Cas9?** (NIH webpage- A short article explaining genome editing, what CRIPR-Cas9 is, and functions for use in research. This page also has several additional links to published papers on the topic.)

<https://ghr.nlm.nih.gov/primer/genomicresearch/genomeediting>

4.) **Genome Editing with CRISPR-Cas9** (4 minutes by McGovern Institute for Brain Research at MIT- This animation depicts the CRISPR-Cas9 method for genome editing- a powerful technology with many applications in biomedical research, including the potential to treat human genetic disease.)

<https://www.youtube.com/watch?v=2pp17E4E-O8>

5.) **Questions and Answers about CRISPR** (Broad Institute at MIT and Harvard- This web page contains a short video as well as questions and answers about CRISPR gene editing.)

<https://www.broadinstitute.org/what-broad/areas-focus/project-spotlight/questions-and-answers-about-crispr>