

Introduction to Next Generation Sequencing

▶ د. علي عماد محمد

▶ معهد الهندسة الوراثية والتقنيات الاحيائية للدراسات
العليا / جامعة بغداد

▶ ali@ige.uobaghdad.edu.iq

Next Generation Sequencing

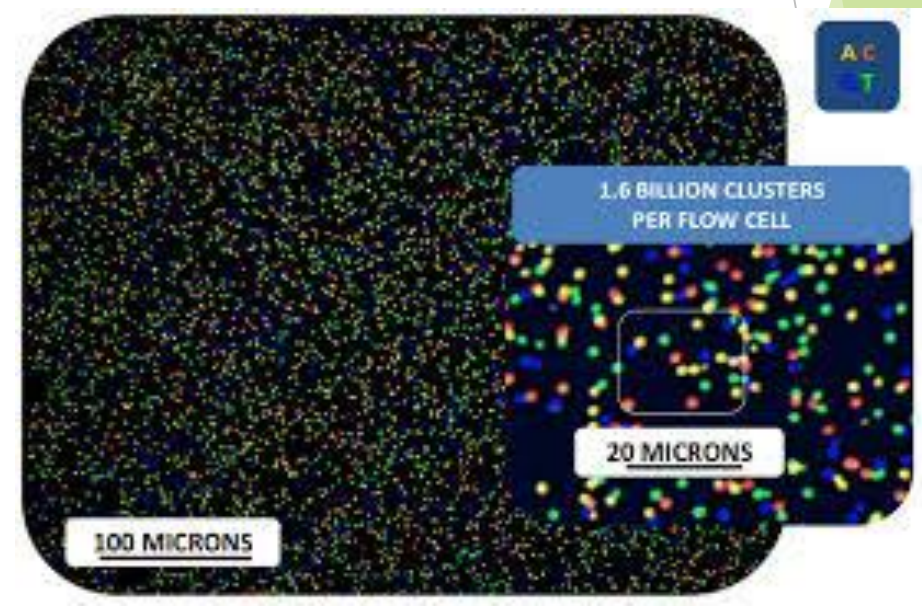
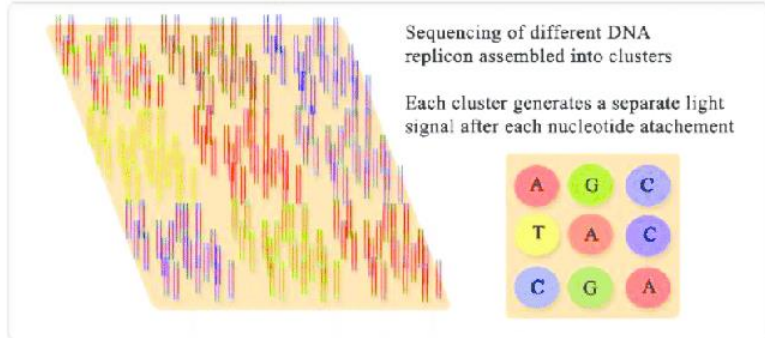
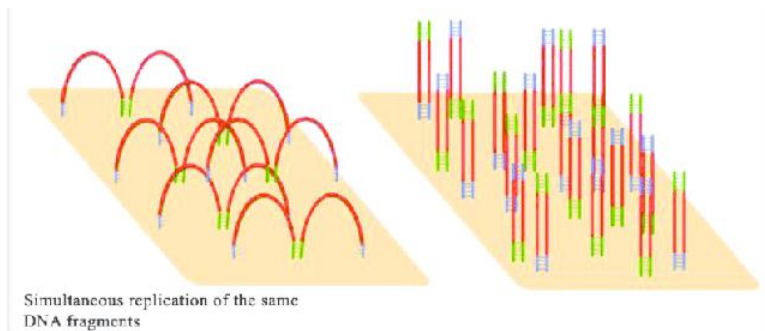
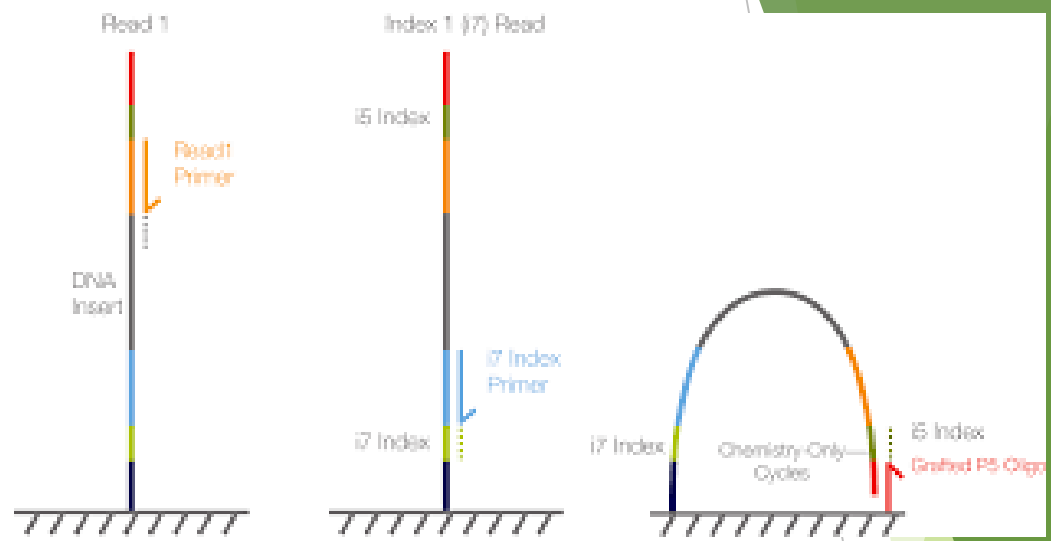
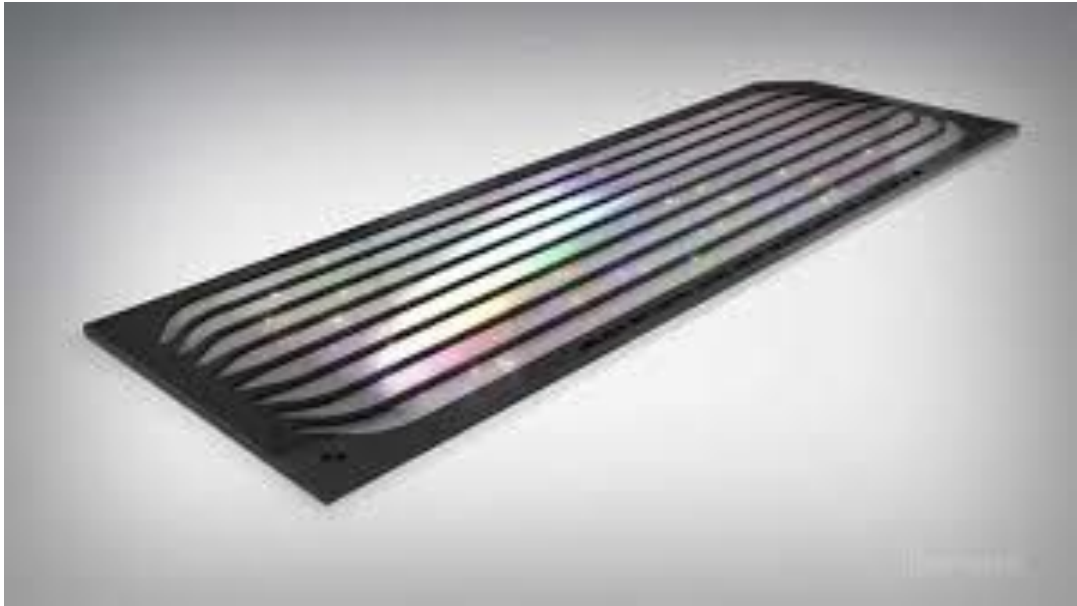
- ▶ What is NGS
- ▶ How many NGS technology
- ▶ What is NGS requirements
- ▶ NGS application
- ▶ What are NGS steps
- ▶ NGS data analysis

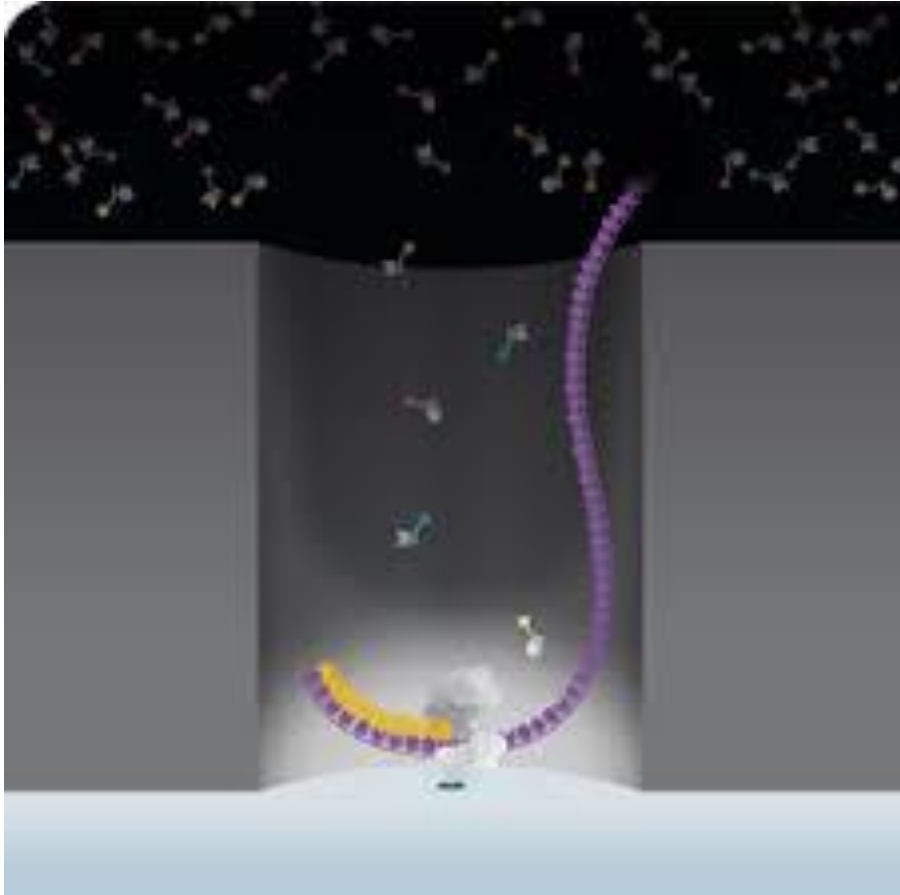
What is NGS

► Next-generation sequencing (NGS), also known as high-throughput sequencing, is the catch-all term used to describe a number of different modern sequencing technologies. These technologies allow for sequencing of DNA and RNA much more quickly and cheaply than the previously used Sanger sequencing

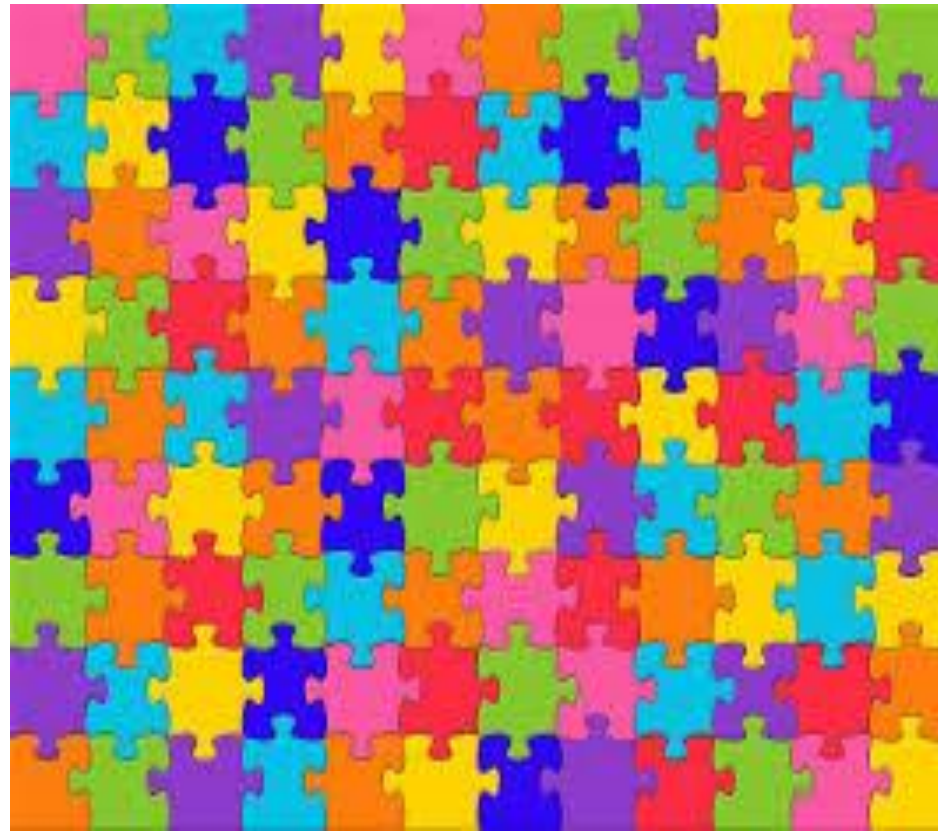
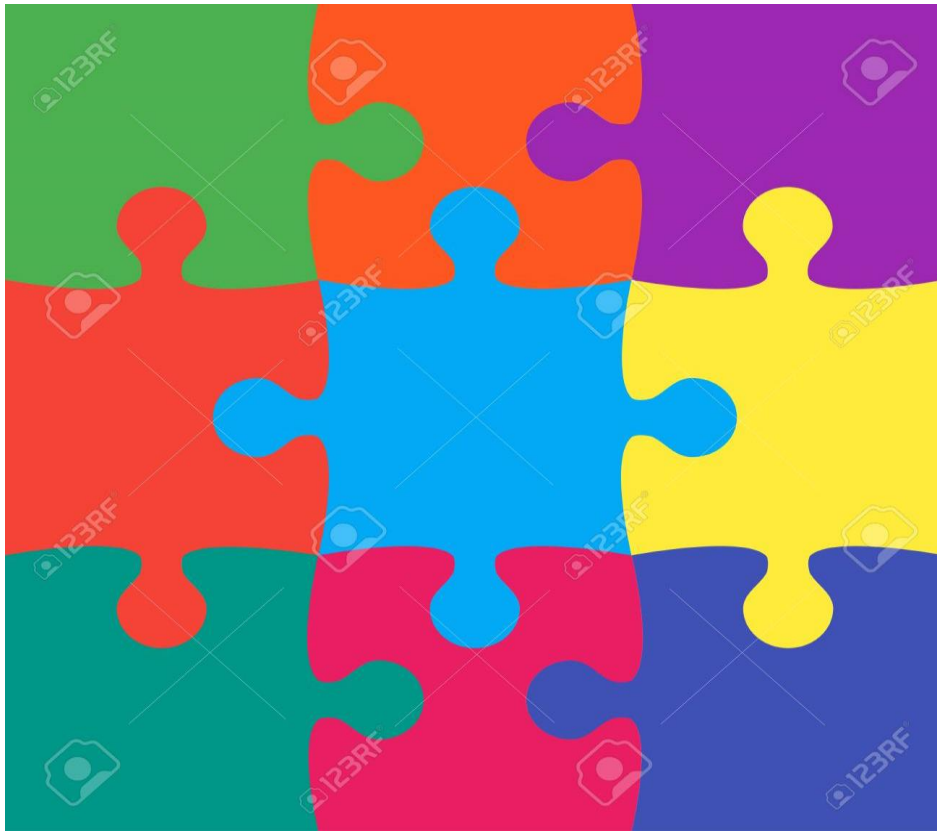
How many NGS technology

- ▶ Illumina short reads
- ▶ PacBio long reads
- ▶ Roche/454's GS FLX Titanium
- ▶ Helicos BioSciences HeliScope
- ▶ Life/APG's SOLiD 3





Long reads vs Short reads



What is NGS requirements



Hardware for bioinformatics

- ▶ HPC CPU, RAM
- ▶ Storage local or cloud
- ▶ Fast communication



NGS Application

- ▶ Novel Genome sequencing or resequencing
- ▶ Transcriptome analysis
- ▶ SNP identification
- ▶ Trait's markers

What are NGS steps:

- ▶ 1- DNA extraction
 - ▶ QC HMW DNA
 - ▶ Quality : chemical and protein free
 - ▶ Quantity : depend on technique
- ▶ 2- Library preparation
 - ▶ DNA fragmentation
 - ▶ Adding adapters
- ▶ 3- Sequencing
 - ▶ Cluster generation
 - ▶ Sequencing by synthesis
- ▶ 4- Data analysis

NGS data analysis

- ▶ Raw reads
- ▶ QC and coverage estimation
- ▶ Mapping to reference
- ▶ Denovo
- ▶ Local realignment
- ▶ SNV call
- ▶ InDel call
- ▶ Annotation



User-friendly sequence analysis

QIAGEN CLC Main Workbench is used by tens of thousands of researchers all over the world for DNA, RNA and protein sequence data analysis. Its wide variety of features are presented in an intuitive graphical user-interface, for which advanced computer skills are not required. QIAGEN CLC Main Workbench is available on Windows, Mac OS X and Linux platforms. For the latest improvements click [here](#).

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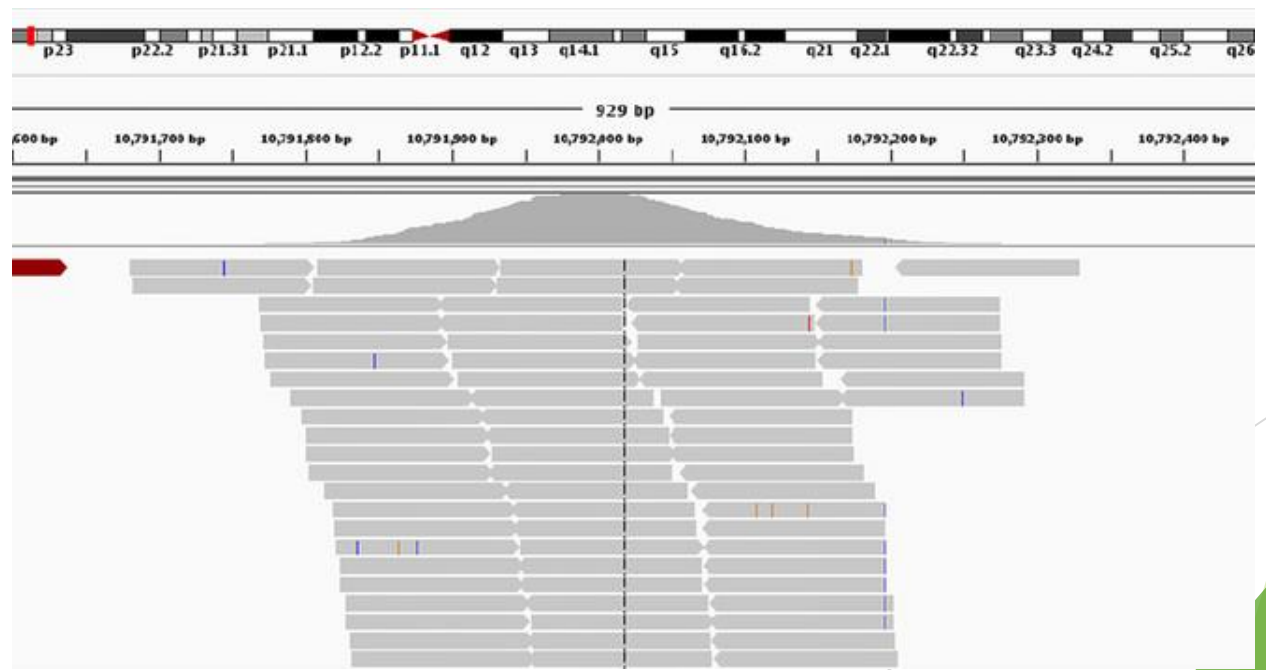
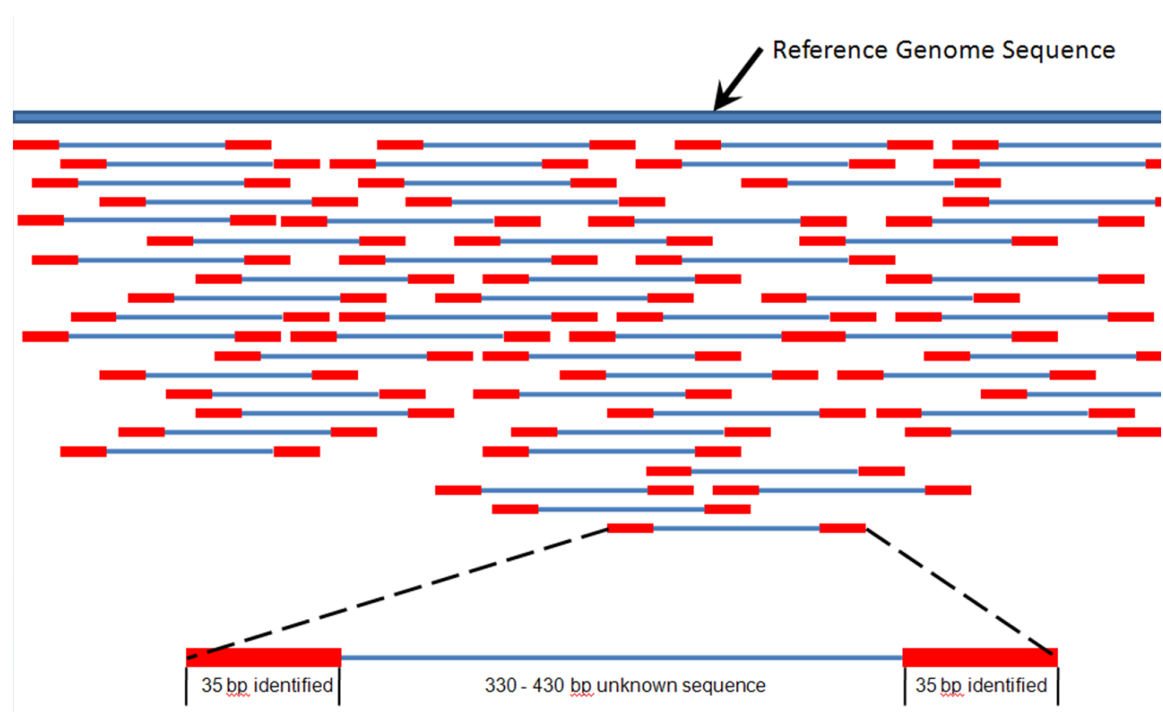
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: Ver. 4.30.0018 / 30.05.2005
: SN. 000590300080
: Copyright (c) LANCOM Systems
Connection No.: 002 <LAN>

root@:/
> readscript
# Head
lang English
flash No

cd /Setup/WAN/Dialup-Remote-Peers
del *
add "DEFAULT" "" 20 20 ""
add "ARCOR" "0192070" 90 90 "ARCOR"
cd /Setup/WAN/Layer
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add 10.0.0.0 255.0.0.0 0 "0.0.0.0" 0 No
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set /Setup/Mail/Send-Again-(min.) 0
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set /Setup/Mail/Buffers 0
flash Yes

# done
exit

root@:/
>
```



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The NGS, how it works

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https://www.youtube.com/watch?v=_lD8JyAbwEo

<https://www.youtube.com/watch?v=NHCJ8PtYCFc>