ETH zürich | University of Zurich[UZH] | functional genomics center zurich | f·g·c·z

NGS at the Functional Genomics Center Zurich (FGCZ)

The Functional Genomics Center Zurich (FGCZ) is a joint state-of-the-art research and training facility of the ETH Zurich and the University of Zurich. With latest technologies and expert support for Omics research, the FGCZ carries out research projects and technology development in collaboration with the Zurich Life Science research community.

State of the Art Portfolio

Next Generation Sequencing (NGS) has become one of the major technologies at the FGCZ. The impressive throughput and read lengths of the current high-end systems enable research groups to de novo sequence genomes of small to complex organisms. They allow for the analysis of genome alterations, gene expression and DNA modifications, as well as a constantly growing number of other applications.

Within our portfolio, short read technologies **(3X Illumina HiSeq)** for the generation of very large numbers of short reads, medium length read technologies **(1X Illumina MiSeq, 1X Illumina NextSeq 500)** for the generation of medium to large numbers of longer reads, plus technologies focusing on the very rapid generation of sequencing data **(1X Ion Torrent PGM)** and very long reads and novel applications at the single molecule level **(2X Pacific Biosciences RSII).**

Figure 1. NGS equipment at FGCZ

NGS@FGCZ **Applications and Technologies**

De novo sequencing of genomes and metagenomes	Emphasis on longer reads, medium to high throughput * * * Pacific Biosciences RS * * Illumina HiSeq (** in combination with PacBio) * * Illumina MiSeq, Ion Torrent PGM (for smaller genomes)
De novo sequencing of transcriptomes	Emphasis on medium to longer reads, high to very high throughput * * * Illumina HiSeq / MiSeq * * PacBio RS (** in combination with Illumina) * * Illumina MiSeq, Ion Torrent PGM
Genome-wide SNP discovery and variant detection	Emphasis on high to ultra-high throughput, short to medium read lengths * * * Illumina HiSeq (max. throughput) * * * Illumina MiSeq (max. flexibility) * * Ion Torrent PGM (max. speed)
Transcriptome analysis	Emphasis on high to ultra-high throughput, short to medium read lengths * * * Illumina HiSeq (max. throughput) * * Illumina MiSeq & Ion Torrent PGM (max. speed)
Small RNAs	Emphasis on high to ultra-high throughput, short read lengths * * * Illumina HiSeq & MiSeq * * Ion Torrent PGM (max. speed)
ChIP-seq	Emphasis on high to ultra-high throughput, short to medium read lengths * * * Illumina HiSeq (max. throughput) * * Illumina MiSeq & Ion Torrent PGM (max. speed)
Amplicon sequencing	Emphasis on longer reads, medium to high throughput * * Illumina HiSeq & MiSeq * * Ion Torrent PGM
DNA Methylation analysis	Emphasis on flexibility and protocols * * * Pacific Biosciences RS * * * Illumina HiSeq & MiSeq

The list of applications and suitable technologies is not exhaustive nor does it exclude the use of a specific analytical technology for applications mentioned.The purpose of the list is to provide an initial overview that is always refined based on individual needs during the setup phase of an FGCZ project. Technologies of equal suitability are listed in alphabetical order.

Figure 2. NGS applications/technology table

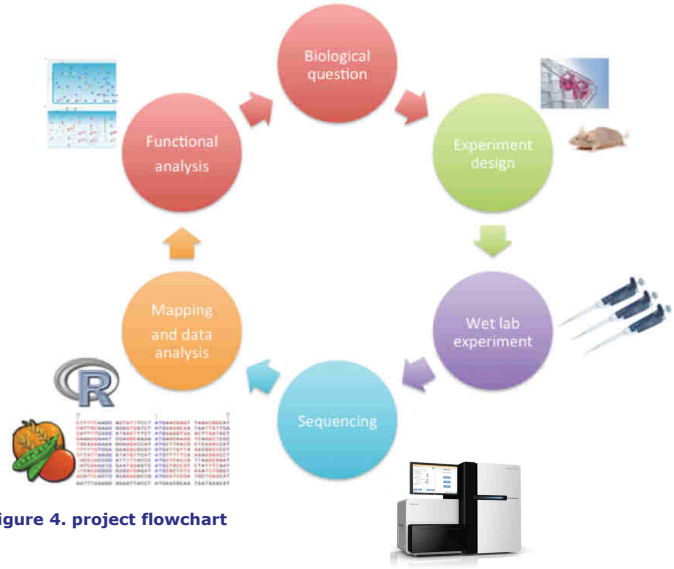

Figure 4. project flowchart

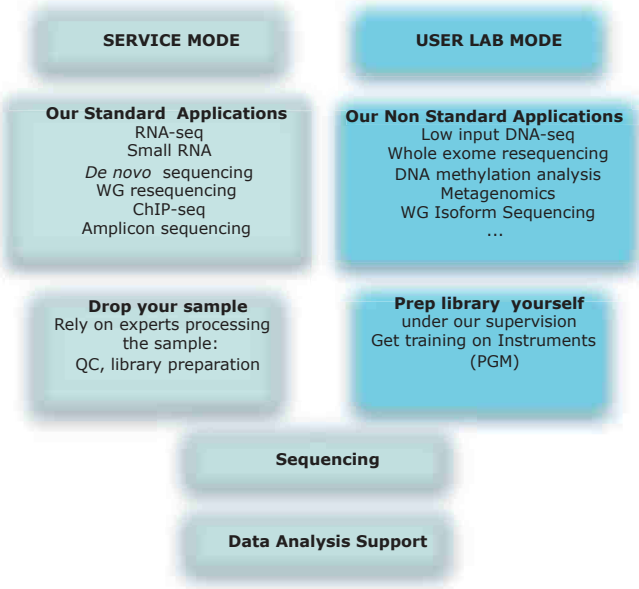

Figure 3. FGCZ access modes depending on desired application

NGS Bioinformatics

NGS technology and the resulting data are uniquely suited for answering a wide range of biological questions by overcoming limitations that so far existed using classical sequencing or alternative microarray approaches. Due to the massive amount of data involved, the management and analysis of the data requires dedicated software and high- performance and capacity computing resources.

The FGCZ has developed and productively implemented data processing pipelines for standard data analysis workflows, which can be readily applied to analyze the sequencing data generated at the center. In addition to standard tools and workflows, the bioinformatics team provides access to its expertise and the optional development of customized solutions via the FGCZ User Lab. As for the experimental analysis part, the analysis and interpretation of the resulting data relies on the close interaction of FGCZ staff with the users that is essential to generate scientifically relevant results

NGS Pratical Courses

We offer block courses where we provide hands-on training and applied lectures on the latest technologies and analysis methods.
http://www.fgcz.ch/education/ngscourses

• • • http://www.fgcz.ch/applications/gt

• • • **sequencing@fgcz.ethz.ch**