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*Genomics special Issue*

# BIOTECH EXPRESS



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# Market Research

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## International Market of Genomics

by Kamal Pratap Singh

**Genomics market expands from cell culture to Data analysis, which include products and services at every step of a Genomics experiment. So the whole gamut of organizations comes into picture and we are going to summarize few of them which are on the top of list and atleast gains attention of every Genomic person or organization.**

**The worldwide Genomics Market is systematically categorized on the basis of products, applications and technologies. Instruments, services, and consumables are the three key product segments, with a nearly 60% share, consumables dominated the industry in 2013. The Genomics market comprises following categories, each category is connected to other category in many instances like you need consumables and softwares both for PCR and Microarray:**

Consumables & Reagents

Instruments Systems and their Software

Products and Services

Other technologies (genotyping, gene expression, gene editing etc.)

Statistical and Computational or Bioinformatics products and Services

### **Detailed Report of Products and services that are used in Genomics**

A researcher uses few or all of the products and services that are describe below. Some of them cannot be avoided to get best results either in research or in production, but the best results depend on what we are going to buy and use in our experiment or production. Some companies sell all of them whereas some are specializes in one of the category. After discussing the products and services we will see which company is pioneer in the segment and serving the very best. The necessary requirements of a good genomics experiment

require the following:

## **Cell, cell Culture and Molecular Biology products**

Cell Culture media and reagents, Transfection reagents, cloning kits, and enzymes, to western blotting technologies, Cellular, GeneArt Custom DNA Oligos and Gene Synthesis and detection service, etc.

## **Cell Analysis - Identification and Quantification**

Labeling and detection technologies, antibodies and immunoassays, cell imaging systems (including microscopy), Automated Cell Counter, , Flow Cytometer etc.

## **Nucleic acid isolation, Analysis and Cloning kits**

**Enzymes like** Reverse transcriptases, DNA Polymerases, Restriction and modifying enzymes etc.

## **Electrophoresis Instruments and reagents, etc.**

## **Lab Plasticware and Supplies**

like Pipettes Tips, Bottletop and Filter Units, Chamber Slides and Chambered Coverglass, Conical Tubes, Cryotubes, Laboratory Bottles PCR Tubes, Plates & Accessories, storage plates and plate sealers., Cell Culture Plastics etc.

## **Lab Equipment**

Cold storage, ovens and furnaces, centrifuges, incubators and safety cabinets, water baths, and stirrers and shakers etc.

## **Purification and Filtration etc.**

## **PCR Solutions**

PCR Instruments, Enzymes & Master Mixes, Real-Time PCR Assays, etc.

## **Sequencing:**

Instruments & Reagents for all type of sequencing i.e. from gold-standard Sanger sequencing technology and fragment analysis on the capillary electrophoresis (CE) platform to flexible and scalable next-generation sequencing (NGS) etc.

## **Microarray analysis**

The complete solution comprises genotyping arrays, reagent kits, a fully automated workflow, and easy-to-use free data analysis tools, Instruments. etc.

## **Data Analysis**

High-content screening (HCS), Lab Data Management & Analysis Software Software for Copy Number Analysis, Cytogenetics Analysis, Agrigenomics Solutions, miRNA Profiling, Transcriptome Profiling etc.

## **Software, and Services**

for Enterprise Solutions, Instrument Services etc.

## **Hotspots of Sequencing requirements**

Research Centers, Academic and Government Institutes

Hospitals and Clinics

Pharmaceutical and Biotechnology Companies

Other End Users (NGOs, and agri-genomics organizations among others)

## **Genomics Market, by application**

**Diagnostics** - For instance, genome editing is used in target gene modification in plants and eradication of vector borne diseases such as yellow fever, dengue, Zika, West Nile, Schistosomiasis, Leishmaniasis and Lyme disease which is the segment that is attracting major portion of investments in agricultural and healthcare sector.

## **Healthcare - Drug Discovery and Development and or Precision Medicine**

### **Agri-genomics Research**

### **Animal Research**

### **Other applications (Marine Research, biofuels, and coal mines among others)**

## Size of Genomics Market

As per the reports published by several Market research agencies Genomics market has been estimated at a current value of 17 Billion USD.

According to Goldstein Research analyst forecast the genomics market size is set to reach USD 24.5 billion by 2025, at a CAGR of 11.2%. Grand View Research, Inc. estimates the global genomics market size will reach USD 27.6 billion by 2025. MarketsandMarkets Research Private Ltd. valued global Genomics market at USD 13.45 Billion in 2016 and is expected to grow at a CAGR of 10.2% to reach to USD 23.88 Billion by 2022. Research and Markets' report The global Genomics market is expected to reach USD 23.88 Billion by 2022 from USD 14.71 Billion in 2017, at a CAGR of 10.2%.

According to Goldstein Research Based on geography, Europe accounted for the largest share of the overall genomics market in 2017 at over 37.25%. While APAC is expected to witness the most significant development owing to strengthening economies of developing countries such as India and China and the increased focus of the respective governments on encouraging research in the field of genomics, in addition, China hosts the world's largest genomic research institute, the Beijing Genomics Institute in order to sustain the growth of genomics market. North America genomics market will grow at the substantial rate due to the ample amount of funds and presence of companies undertaking research in the field of genomics.

## Profile of Top Genomics services provider worldwide

Because of our inability to include every organization we will talk about only those here which shares more than 60% global market share in their respective segments. Some of them are specialized and into only one domain but some have captured the whole supply chain. We will discuss those first which provides one stop solutions for all the needs of research and industry of Genomics.

## One stop Source

It is very difficult to find a one stop source for all your needs in Genomics or any other Biotechnology segment but in Genomics our research says that **Thermo Fisher Scientific** can be considered for all needs when you do Genomics. It includes all the categories we discussed and their sub categories like for

### Consumables & Reagents

### Instruments Systems and their Software

### Products and Services

**Other technologies** (genotyping, gene expression, gene editing etc.)

### Statistical and Computational or Bioinformatics products and Services

## Top manufacturers of Genome sequencers

Sequencers gain special attention because the instrument is sophisticated and costly and only few companies in world have dared to develop DNA Sequencers. These companies in alphabetic order are:

**ILLUMINA** Illumina, Inc. is an American company incorporated in April 1998 that develops, manufactures and markets integrated systems for the analysis of genetic variation and biological function. The company provides a line of products and services that serve the sequencing, genotyping and gene expression and proteomics markets. Its headquarters are located in San Diego, California. Illumina's technology had purportedly by 2013 reduced the cost of sequencing a human genome to US\$4,000, down from a price of US\$1 million in 2007.[2] Customers include genomic research centers, pharmaceutical companies, academic institutions, clinical research organizations and biotechnology companies.

**LI-COR** LI-COR biotechnology instruments and reagents, which are based on near-infrared fluorescent and chemiluminescent detection, are used in a large variety of assays, such as western blot assays and cell-based assays, as well as in vivo imaging and DNA analysis. Primary applications include cancer re-



search, drug discovery, genomics research, neuroscience, cell biology, and education. LI-COR automated DNA sequencers were the primary systems used by Genoscope, the French National Sequencing Center to sequence chromosome 14 of the Human Genome Project.

## Oxford Nanopore Technologies

Oxford Nanopore Technologies Limited is a U.K.-based company which is developing and selling nanopore sequencing products (including the portable DNA sequencer, MinION) for the direct, electronic analysis of single molecules. In July 2016, a MinION nanopore sequencer was included on the ninth NASA/SpaceX commercial cargo resupply services mission to the International Space Station

## Pacific Biosciences

Pacific Biosciences of California, Inc. is a biotechnology company founded in 2004 that develops and manufactures systems for gene sequencing and some novel real time biological observation. In 2010, *The Scientist* named the company and their first product the top life science innovation of the year, and the company received the 2010 Advanced Sequencing Technology Award from the National Human Genome Research Institute. *Technology Review* magazine included them in their list of the top 50 most innovative companies for both 2010 and 2011. Founder and Chief Technical Officer Dr. Stephen Turner was awarded the 2010 Ewing Marion Kauffman Foundation Outstanding Postdoctoral Entrepreneur award for his work at the company.

## Roche Diagnostics

is a diagnostic division of Hoffmann-La Roche which manufactures equipment and reagents for research and medical diagnostic applications. Internally, it is organized into five major business areas: Roche Applied Science, Roche Professional Diagnostics, Roche Diabetes Care, Roche Molecular Diagnostics and Roche Tissue Diagnostics (Ventana).

## Thermo Fisher Scientific

Thermo Fisher Scientific is the world leader in serving science, with revenues of more than \$20 billion and approximately 70,000 employees globally. Our mission is to enable our customers to make the world healthier, cleaner

and safer. We help our customers accelerate life sciences research, solve complex analytical challenges, improve patient diagnostics, deliver medicines to market and increase laboratory productivity. Through our premier brands – Thermo Scientific, Applied Biosystems, Invitrogen, Fisher Scientific and Unity Lab Services – we offer an unmatched combination of innovative technologies, purchasing convenience and comprehensive services. From whole genome sequencing to targeted sequencing of specific genomic regions, sequencing portfolio supports a wide range of throughput and research application needs for DNA sequencing.

## Multiple products and services providers:

The following companies provides other instruments and accesories required for Genomics research:

- Agilent Technologies
- Bio-Rad Laboratories
- Danaher
- Eurofins Scientific
- Merck
- PerkinElmer Inc
- Qiagen
- Thermo Fisher Scientific
- Waters

## Some others known in category:

- Cepheid
- 23andMe
- Bayer
- Affymetrix (Thermo Fisher)
- Myriad Genetics
- Shimadzu Analyticals
- Corning India
- Sartorius AG
- BD Biosciences
- Eppendorf
- GE Healthcare

## Some of the best International Genomics Research Centers

### **The National Institute of Biomedical Genomics (NIBMG)**

NIBMG has been established as an autonomous institution by the Government of India, under the aegis of the Department of Biotechnology. This is the first institution in India explicitly devoted to research, training, translation & service and capacity-building in biomedical genomics. The Institute operates from its huge 30-acre campus with academic blocks, student and faculty housing, guest houses, conference centre and other facilities. The Institute started to function in the year 1998 with the mandate to undertake, promote and co-ordinate research, train workers and to serve as information resource in identified aspects of plant genomics to build a frontline institution. NIPGR is poised to contribute towards frontier areas of Plant Biology such as, Computational Biology, Genome Analysis and Molecular Mapping, Molecular Mechanism of Abiotic Stress Responses, Nutritional Genomics, Plant Development and Architecture, Plant Immunity, Molecular Breeding, Transgenics for crop improvement and other emerging areas based on plant genomics.

### **The National Human Genome Research Institute (NHGRI)**

NHGRI began as the National Center for Human Genome Research (NCHGR), which was established in 1989 to carry out the role of the National Institutes of Health (NIH) in the International Human Genome Project (HGP). The HGP was developed in collaboration with the United States Department of Energy and begun in 1990 to map the human genome. In 1997 the United States Department of Health and Human Services renamed NCHGR the National Human Genome Research Institute (NHGRI), officially elevating it to the status of research institute - one of 27 institutes and centers that make up the NIH. With the human genome sequence complete since April 2003, scientists around the world have access to a database that greatly facilitates and accelerates the pace of biomedical research.

### **Sanger Institute**

The Wellcome Sanger Institute is one of the premier centres of genomic discovery and understanding in the world. It leads ambitious collaborations across the globe to provide the foundations for further research and transformative healthcare innovations. Its success is founded on the expertise and knowledge of its people and the Institute seeks to share its discoveries and techniques with the next generation of genomics scientists and researchers worldwide.

### **Broad Genomics**

has a 25-year track record of delivering on transformative projects in the field of genomics. From the Human Genome Project onward, the group has led the execution of major resource projects including the HapMap, the 1000 Genomes Project, The Cancer Genome Atlas, Comparative Reference Genomes, the ENCODE Project, NIH Roadmap Epigenomics Mapping Consortium, the Genotype-tissue Expression Project, and the Human Microbiome Project.

### **Beijing Institute of Genomics (BIG)**

Founded in 2003, Beijing Institute of Genomics, Chinese Academy of Sciences (CAS) is located in the Olympic Science and Technology Park since 2013. Since its establishment, BIG has accomplished several major research projects with remarkable success, especially the Chinese Superhybrid Rice Genome Project. The institute also actively participated in the Human Genome Project (HGP) and HapMap Project. BIG has established “CAS Key Laboratory of Genome Sciences & Information”, “CAS Key Laboratory of Genomic and Precision Medicine”, and “Big Data Center” (BIGD), as well as a state-of-the-art Core Genomic Facility, together with public safety

### **CSIR-Institute of Genomics & Integrative Biology (IGIB)**

IGIB is a premier Institute of Council of Scientific and Industrial Research (CSIR), engaged in research of national importance in the areas of genomics, molecular medicine, bioinformatics and proteomics.

## The Genomics Institute of the Novartis Research Foundation (GNF)

GNF serves as a bridge between basic science and pre-clinical drug discovery for Novartis' global research organization, the Novartis Institutes for BioMedical Research (NIBR). GNF's nearly 600 scientists and engineers are committed to pushing the boundaries of science in pursuit of new medicines. Multi-disciplinary teams are focused on making advances in the areas of oncology, autoimmunity, cardiovascular disease, diabetes, musculoskeletal disorders, and infectious disease.

## The Innovative Genomics

The IGI began in 2014 through the Li Ka Shing Center for Genetic Engineering, which was created thanks to a generous donation from the Li Ka Shing Foundation. The Innovative Genomics Initiative formed as a partnership between the University of California,

Berkeley and the University of California, San Francisco. Combining the fundamental research expertise and the biomedical talent at UCB and UCSF, the Innovative Genomics Initiative focused on unraveling the mechanisms underlying CRISPR-based genome editing and applying this technology to improve human health.

## The Arizona Genomics Institute (AGI)

AGI was formed in 2002 when Dr. Rod A. Wing joined the School of Plant Sciences at the University of Arizona in Tucson. The primary focus of AGI is in the area of structural, evolutionary and functional genomics of crop plants where it has played significant roles in over 30 plant and animal genome projects.



## Table: List of Genomics companies in India

1.	3B BlackBio Biotech	24.	Dr. Surapaneni's Genomic	47.	Jenome Technologies
2.	ABC Genomics	25.	EasyDNA	48.	Kyvor Genomics
3.	Acme Progen Biotech	26.	Eminent Biosciences	49.	LeucineRichBio
4.	Advanced Healthcare	27.	Excel Biosolution	50.	Life code technologies
5.	Agile Lab assure	28.	Ganit Labs	51.	Mapmygenome
6.	AgriGenome	29.	Genavali	52.	Medgenome
7.	ArrayGen Technologies	30.	GeneOmbio	53.	Nucleome Informatics
8.	Artivatic Data Labs	31.	Genes N Life Health Care	54.	Nutritional Genomix
9.	Bengaluru Genomics	32.	Genetech	55.	Oncogenomics Lifesciences
10.	Bio Discovery Group	33.	Genetic Healing	56.	Positive Bioscience
11.	Bio Globus	34.	GeneXpert	57.	Pramukh Health
12.	BioAxis DNA	35.	Genome Diagnostics	58.	Premas Life Sciences
13.	BioBeams	36.	Genome Life Sciences	59.	Redcliffe Life sciences
14.	BioInnovations	37.	Genomics Central	60.	Rishi Biotech
15.	Bionivid Technology	38.	Genotypic Technology	61.	Saibiosystems
16.	Bioserve Biotechnologies	39.	Global Genecorp	62.	Sciegenom Labs
17.	Cancer Genetics	40.	Helix Genomics	63.	Scientific Bio-Minds
18.	Clevergene	41.	Hemogenomics	64.	Shodhaka Life Sciences
19.	Dhiti Omics	42.	iGenetic	65.	Strand Life Sciences
20.	DNA Diagnostics Centre	43.	Igenomix	66.	Synteny Life Sciences
21.	DNA Forensics Laboratory	44.	Indian Biosciences	67.	Xcelris Genomics
22.	DNA labs India	45.	inDNA Research Labs	68.	Xcode Life
23.	Dr. Shruti Bajaj	46.	InterpretOmics	69.	Yaazh Xenomics