

# **North America Optical Genome Mapping Market Segmented By Product (Consumables, Instruments), By Application (Genome Assembly, Structural Variation Detection, Microbial Strain Typing, Haplotype Phasing, Others), By End-User (Research & Academic Institutions, Biotechnology & Pharmaceutical Companies, Clinical Laboratories, Others), By Country, Competition, Forecast, Opportunities, 2018-2028F**

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## **Abstracts**

North America Optical Genome Mapping Market has valued at USD 53.19 million in 2022 and is anticipated to project robust growth in the forecast period with a CAGR of 20.51% through 2028. The North America Optical Genome Mapping Market is a dynamic and rapidly evolving segment of the genomics and molecular biology industry. Optical genome mapping technology has gained prominence due to its ability to provide comprehensive insights into the structure and organization of DNA at the genome level.

The North America Optical Genome Mapping Market has experienced robust growth in recent years, driven by increasing applications in genomics research, clinical diagnostics, and biotechnology. The market's growth is attributed to advancements in technology, expanding research initiatives, and a growing awareness of the potential of optical genome mapping. The market size is substantial and is expected to continue expanding as the technology becomes more accessible and integrated into various scientific disciplines.

### **Key Market Drivers**

## Advancements in Genomic Research

Advancements in genomic research have emerged as a critical and compelling driver for the growth of the North America Optical Genome Mapping Market. Genomic research refers to the study of an organism's complete set of DNAs, encompassing its genes and non-coding sequences, to understand the genetic basis of various biological processes, diseases, and traits. Optical genome mapping is an advanced technology that plays a pivotal role in this domain by facilitating the high-resolution mapping of DNA molecules. Genomic research has evolved significantly in recent years, primarily driven by the introduction of high-throughput sequencing technologies, such as Next-Generation Sequencing (NGS). While NGS is excellent for sequencing DNA, it has limitations in accurately detecting structural variations in the genome. This is where optical genome mapping comes into play. It provides researchers with a complementary tool to investigate the structural complexities of genomes. As researchers strive to understand the full spectrum of genomic variations, optical genome mapping offers a unique advantage by revealing large-scale structural changes, such as copy number variations (CNVs), translocations, and inversions. These insights are crucial for deciphering the genetic basis of diseases and traits.

In cancer research, the importance of structural variations in the genome cannot be overstated. Many cancers are driven by specific genetic alterations, including chromosomal rearrangements and gene fusions. Optical genome mapping allows researchers to identify these alterations with precision. As the field of cancer genomics continues to expand, optical genome mapping technologies are increasingly adopted to study the genomes of cancer patients. This, in turn, fuels the demand for these tools in both research and clinical settings. Genome-wide association studies are instrumental in identifying genetic variations associated with complex diseases. While SNP (Single Nucleotide Polymorphism) arrays have been widely used in GWAS, they have limitations in detecting structural variations. Optical genome mapping supplements GWAS by enabling the identification of structural variations that may contribute to disease susceptibility. As the importance of structural variations in complex diseases becomes more evident, researchers are turning to optical genome mapping as an indispensable tool in their studies.

## Rising Demand for Precision Medicine

Precision medicine is an approach to medical treatment and healthcare that tailors interventions, therapies, and medical decisions to individual patients based on their

genetic makeup, environmental factors, and lifestyle. Optical genome mapping technology plays a pivotal role in enabling precision medicine by providing high-resolution insights into an individual's genome. Precision medicine relies on the accurate and comprehensive profiling of an individual's genome to identify genetic variations that may impact their response to specific treatments. Optical genome mapping allows for the detection of structural variations, copy number variations (CNVs), and other genomic alterations that may be associated with diseases or treatment outcomes. This information is crucial for tailoring treatment plans, selecting the most effective therapies, and minimizing adverse effects. As the adoption of precision medicine continues to expand across various medical specialties, the demand for accurate and high-throughput genomic profiling provided by optical genome mapping grows.

Precision medicine has gained significant traction in the field of oncology. Many cancer treatments are now designed to target specific genetic mutations and alterations driving the disease. Optical genome mapping helps identify these mutations, allowing oncologists to prescribe targeted therapies that are more likely to be effective. Additionally, it aids in monitoring disease progression and identifying resistance mechanisms, enabling clinicians to adjust treatment strategies in real-time. The growing prevalence of precision oncology is a major driver for the adoption of optical genome mapping in cancer research and clinical practice.

Precision medicine is particularly valuable in the diagnosis and management of rare diseases, which often have a genetic basis. Optical genome mapping can uncover structural variations and genetic mutations responsible for rare diseases, facilitating quicker and more accurate diagnoses. As awareness of rare diseases and the importance of genetic testing increase, the demand for technologies like optical genome mapping is on the rise. Pharmaceutical companies are increasingly integrating precision medicine principles into drug development processes. By identifying genetic factors that influence drug responses, pharmacogenomics aims to develop medications that are tailored to an individual's genetic profile. Optical genome mapping contributes to pharmacogenomic research by providing comprehensive genetic information for clinical trial participants. This accelerates the development of personalized therapies and enhances drug safety and efficacy assessments.

### Increasing Incidence of Genetic Disorders

The North America Optical Genome Mapping Market is experiencing significant growth, and one of the key drivers behind this growth is the increasing incidence of genetic

disorders. Genetic disorders are conditions caused by abnormalities or mutations in an individual's DNA, and they can have a profound impact on health and quality of life. Optical genome mapping technology is becoming crucial in diagnosing and understanding these disorders, which is why the rising prevalence of genetic disorders is a driving force behind the market's expansion. The incidence of genetic disorders rises, there is a growing need for accurate and precise diagnostic tools. Optical genome mapping offers high-resolution mapping of an individual's DNA, allowing for the detection of various structural variations and genetic mutations associated with genetic disorders. This level of precision is essential for confirming diagnoses, understanding the genetic basis of the disorders, and providing patients with appropriate treatment and management strategies.

Early detection and intervention are critical in managing genetic disorders effectively. Optical genome mapping can identify genetic abnormalities in newborns, children, and adults. Timely diagnosis enables healthcare providers to implement interventions and therapies early in a patient's life, potentially improving outcomes and quality of life. As more parents and healthcare professionals recognize the importance of early detection, the demand for optical genome mapping in neonatal and pediatric care is on the rise. A significant portion of genetic disorders consists of rare and undiagnosed diseases. These conditions are often challenging to diagnose using traditional methods, such as karyotyping or DNA sequencing. Optical genome mapping is particularly valuable in these cases, as it can uncover rare structural variations that may be missed by other diagnostic tools. This has led to an increasing reliance on optical genome mapping in the pursuit of answers for individuals with undiagnosed genetic conditions.

### Technological Advancements and Cost Reduction

The North America Optical Genome Mapping Market has experienced significant growth, driven in large part by technological advancements and cost reductions associated with optical genome mapping technology. These advancements have enhanced the accuracy, speed, and affordability of genome mapping, making it more accessible to a broader range of applications and users. Technological advancements have significantly improved the resolution and accuracy of optical genome mapping. Early iterations of this technology faced limitations in detecting smaller structural variations in the genome. However, ongoing research and development efforts have led to innovations that enable the identification of increasingly precise details in the genome's structure. These improvements are crucial for applications such as cancer research, where subtle genetic alterations can have a profound impact on diagnosis and treatment. The development of high-throughput platforms for optical genome mapping

has accelerated the mapping process. These platforms allow researchers and clinical laboratories to process a larger volume of samples in a shorter amount of time, increasing efficiency and throughput. As a result, optical genome mapping has become a practical tool for large-scale genomics projects, such as population-scale studies and clinical trials, further expanding its market potential.

User-friendly interfaces and automation have made optical genome mapping more accessible to researchers and clinicians with varying levels of expertise. The simplification of data acquisition and analysis processes reduces the barriers to entry, enabling a wider range of professionals to incorporate optical genome mapping into their work. This ease of use has contributed to the technology's growing adoption across diverse fields, including genetics research, clinical diagnostics, and drug development. One of the most significant drivers of market growth is the reduction in the cost of optical genome mapping. Early in its development, optical genome mapping was prohibitively expensive for many research and clinical applications. However, continuous innovation and economies of scale have driven down the cost of the technology. This cost reduction makes optical genome mapping more accessible to research institutions, healthcare providers, and pharmaceutical companies, fostering its widespread adoption.

## Key Market Challenges

### High Initial Capital Investment

The adoption of optical genome mapping technology often requires a significant initial capital investment. The cost of acquiring the necessary equipment, setting up a laboratory infrastructure, and training personnel can be substantial. Many research institutions, clinical laboratories, and smaller companies may find it financially challenging to make such investments. This barrier to entry can limit the market's growth, particularly among smaller organizations with limited budgets.

### Competition from Established Genomic Technologies

The optical genome mapping market faces competition from well-established genomic technologies, such as Next-Generation Sequencing (NGS) and polymerase chain reaction (PCR). These technologies have been widely adopted and have a proven track record in genomics research and clinical diagnostics. Convincing researchers and clinicians to switch to optical genome mapping from these established methods can be challenging. The technology needs to demonstrate clear advantages in terms of

accuracy, cost-effectiveness, or additional capabilities to gain wider acceptance.

### Data Analysis and Interpretation Challenges

Optical genome mapping generates large volumes of complex genomic data, and the analysis and interpretation of this data can be a significant challenge. Researchers and clinicians must have the expertise and tools to effectively analyze and extract meaningful insights from the data. Additionally, the lack of standardized data analysis protocols can lead to variability in results and hinder the technology's widespread adoption. Addressing these data analysis challenges, including the development of user-friendly software and standardized analysis pipelines, is crucial for the continued growth of the optical genome mapping market.

### Key Market Trends

#### Integration with Multi-Omics Approaches

A notable trend in the optical genome mapping market is the integration of optical genome mapping data with other 'omics' data types, such as genomics, transcriptomics, proteomics, and epigenomics. This trend aligns with the broader shift toward multi-omics approaches in life sciences research. Researchers are increasingly recognizing the value of combining multiple layers of biological information to gain a more comprehensive understanding of complex biological systems and diseases.

Optical genome mapping provides structural insights into DNA, which can be integrated with other omics data to uncover connections between genomic alterations and gene expression, protein function, and epigenetic modifications. This holistic approach enhances researchers' ability to identify causal relationships, biomarkers, and therapeutic targets. As a result, the integration of optical genome mapping with multi-omics strategies is expected to drive its adoption in genomics research and personalized medicine.

#### Expanding Applications in Clinical Diagnostics

Another prominent trend is the expanding use of optical genome mapping in clinical diagnostics. While the technology has historically been primarily utilized in research settings, its potential for diagnosing genetic disorders and guiding clinical decision-making is gaining recognition. Optical genome mapping's ability to detect large structural variations, copy number variations, and other genomic abnormalities makes it

valuable in diagnosing rare diseases, cancer, and neurodevelopmental disorders.

As more clinical laboratories adopt optical genome mapping for diagnostic purposes, the technology is becoming an integral part of the diagnostic workflow. Furthermore, regulatory approvals and clinical validation studies are contributing to its acceptance as a clinically valuable tool. This trend is expected to drive the integration of optical genome mapping into routine clinical practice, especially in genetics clinics and oncology centers.

### Partnerships and Collaborations

Collaboration and partnerships between companies specializing in optical genome mapping technology and other players in the genomics and biotechnology sectors are on the rise. These collaborations aim to leverage complementary technologies and expertise to advance genomics research and accelerate the adoption of optical genome mapping in various applications.

For example, partnerships between optical genome mapping companies and NGS providers can offer customers integrated solutions for comprehensive genomic analysis. Additionally, collaborations with pharmaceutical companies can lead to the development of new therapies and the identification of potential drug targets through in-depth genomic profiling. Such partnerships enable companies to offer more comprehensive and competitive solutions to the market, expand their customer base, and enhance the utility of optical genome mapping technology. They also facilitate the development of standardized protocols and data analysis pipelines, which can address some of the challenges associated with adopting optical genome mapping.

### Segmental Insights

#### Product Insights

Based on the category of Product, the Consumables segment emerged as the dominant player in the North America market for Optical Genome Mapping in 2022. Optical genome mapping is a data-intensive process that requires a continuous supply of consumables, such as reagents, chemicals, and assay kits. Researchers and clinical laboratories performing optical genome mapping experiments must regularly purchase these consumables to ensure the seamless operation of their instruments and maintain data quality. As a result, there is a consistent and recurring demand for consumables in this market.

Sample preparation is a critical step in the optical genome mapping workflow. Consumables like DNA extraction kits, purification columns, and labeling reagents are essential for converting biological samples, such as blood, tissue, or cultured cells, into a format suitable for optical genome mapping. Researchers and diagnostic labs must consistently invest in these consumables to prepare and process samples for analysis. Maintaining the accuracy and reliability of optical genome mapping instruments is paramount. Consumables like calibration standards, control samples, and quality control reagents are routinely used to validate instrument performance and ensure the consistency of results. These consumables are integral to maintaining data integrity and instrument reliability, prompting regular purchases. These factors are expected to drive the growth of this segment.

### Application Insight

Based on the category of Application, the genome assembly segment emerged as the dominant player in the North America market for Optical Genome Mapping in 2022. Genome assembly is a critical component of de novo genome sequencing, where the complete genome of an organism is sequenced without the need for a reference genome. Optical genome mapping is well-suited for de novo sequencing because it provides information about the organization and arrangement of DNA molecules. Researchers can use optical maps to guide the assembly of DNA fragments into a contiguous and accurate representation of the entire genome.

Optical genome mapping is particularly valuable when working with complex or non-model organisms, which may have large, repetitive genomes or structural complexities that challenge traditional sequencing methods. Researchers studying such organisms rely on optical genome mapping to obtain comprehensive genome assemblies that are difficult to achieve with short-read sequencing alone. This is especially relevant in areas like environmental genomics and biodiversity studies. Genome assembly is essential for comparative genomics, where researchers compare the genomes of different species to understand evolutionary relationships, gene function, and adaptations. Optical genome mapping aids in the accurate alignment and comparison of genomes, allowing researchers to identify structural differences, gene duplications, and other evolutionary events. This capability is crucial for a wide range of applications, including evolutionary biology and conservation genetics. These factors are expected to drive the growth of this segment.

### End-User Insights



The research & academic institutions segment is projected to experience rapid growth during the forecast period. Research and academic institutions are inherently research-focused entities. Genomic research, in particular, is a prominent area of study in these institutions. Optical genome mapping offers a powerful tool for investigating genomic structures, variations, and complexities. Researchers in these institutions utilize optical genome mapping technology to advance their understanding of genetics, study model organisms, and address complex scientific questions.

Research and academic institutions engage in a wide variety of genomic research applications. Optical genome mapping's versatility makes it suitable for a range of research areas, including genomics, epigenomics, metagenomics, and structural genomics. It is used to study diverse topics such as cancer genomics, evolutionary biology, population genetics, and genome evolution. The technology's applicability to various research fields aligns well with the multidisciplinary nature of research institutions. Research and academic institutions not only conduct research but also play a pivotal role in educating the next generation of scientists and professionals. Optical genome mapping technology is integrated into educational programs, providing students with hands-on experience in genomics and molecular biology. This educational component contributes to the sustained use of optical genome mapping within research and academic institutions. These factors collectively contribute to the growth of this segment.

## Regional Insights

United States emerged as the dominant player in the North America Optical Genome Mapping market in 2022, holding the largest market share in terms of value. The United States, with its robust research and development infrastructure, leads the North America Optical Genome Mapping Market. The country hosts numerous research institutions, universities, and biotechnology companies at the forefront of genomics research. These entities leverage optical genome mapping technology for a wide range of applications, including cancer genomics, rare disease diagnosis, and precision medicine. The United States is also home to key optical genome mapping technology providers, contributing to its dominance in the market.

The Canada market is poised to be the fastest-growing market, offering lucrative growth opportunities for Optical Genome Mapping players during the forecast period. Factors such as Canada has been steadily increasing its investments in genomics research, fostering collaborations between research institutions and industry partners. The

Canadian genomics community is expanding its expertise in areas like structural genomics, metagenomics, and environmental genomics, where optical genome mapping technology is highly relevant. The Canadian government has demonstrated strong support for genomics research and technology adoption. Funding initiatives and research grants have encouraged the adoption of advanced genomics technologies like optical genome mapping. Canada's biotechnology and healthcare sectors are experiencing significant growth, providing a conducive environment for the adoption of genomics technologies in clinical and research settings. The country's biotechnology companies are increasingly utilizing optical genome mapping for applications such as drug discovery and precision medicine.

### Key Market Players

Bionano Genomics, Inc., US

NabSys Inc., US

Nucleome Informatics Pvt Ltd

France Genomique

Praxis Genomics

PerkinElmer

OpGen, Inc

### Report Scope:

In this report, the North America Optical Genome Mapping Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

#### Optical Genome Mapping Market, By Product:

Consumables

Instruments

### Optical Genome Mapping Market, By Application:

- Genome Assembly
- Structural Variation Detection
- Microbial Strain Typing
- Haplotype Phasing
- Others

### Optical Genome Mapping Market, By End-User:

- Synthetic
- Natural
- Plant
- Animal
- Others

### Optical Genome Mapping Market, By Region:

- United States
- Canada
- Mexico

### Competitive Landscape

Company Profiles: Detailed analysis of the major companies presents in the North America Optical Genome Mapping Market.

### Available Customizations:

*North America Optical Genome Mapping Market Segmented By Product (Consumables, Instruments), By Application (G...*

North America Optical Genome Mapping market report with the given market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

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