

breakthrough  
thinking



# GenoLogics



## Geneus™ Next Gen

A LIMS & Data Management Software  
Solution for Next Generation Sequencing



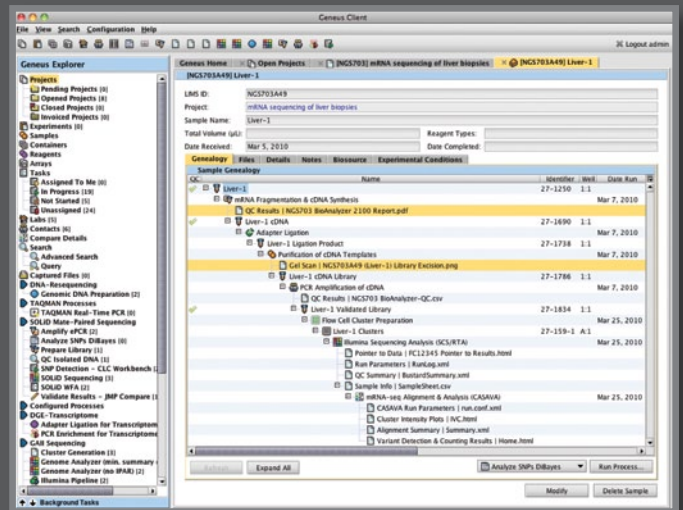


# Geneus™ Next Gen

## Scale-up your ever-changing Next Generation Sequencing workflows while ensuring integrity of results with end-to-end sample traceability

### Save Time & Increase Throughput

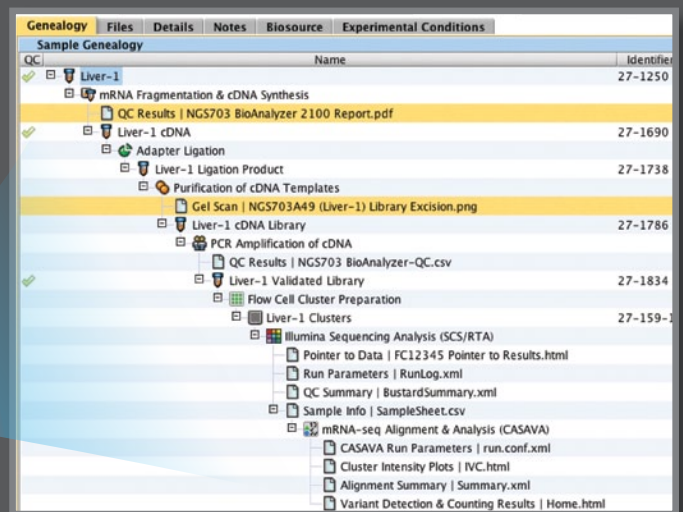
- Clear, centralized access to information
- Improve client service and communication with web based access to project information
- Auto-generate sample sheets to simplify instrument operation
- Reduce admin costs with powerful custom operational reports



Sample and experiment information becomes quickly accessible with experimental context, illustrated in Geneus' powerful sample genealogy view

### Rapidly Adapt to Changing Workflows

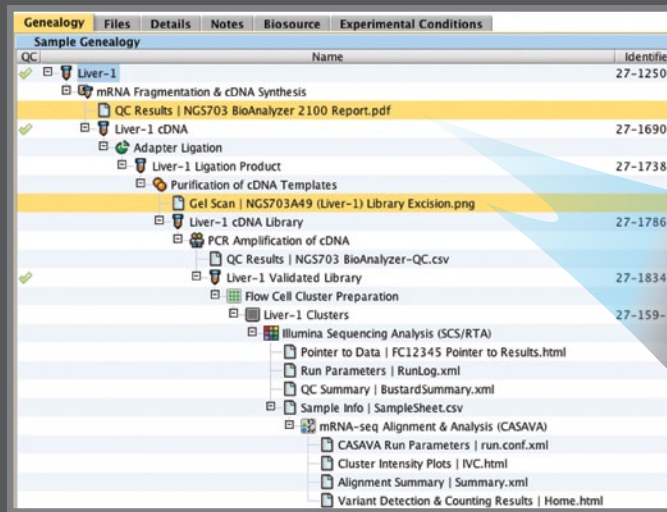
- Quickly configure Geneus to incorporate new workflows or change existing workflows
- Easily respond to advances in NGS instrumentation and data analysis



Geneus is a proven LIMS and data management software solution for next generation sequencing. Designed to improve lab efficiency, it provides robust sample traceability, streamlined communication, and simplified initiation of complex tasks like instrument operation and data analysis.

Next generation sequencing is redefining the types of biological questions that genomics technologies can be used to answer on an unprecedented scale. The types of

scientific questions that next gen can be used to address is continually growing. However, labs offering next gen services are constantly challenged with changing sample preparation protocols and increasing demands on bioinformatics infrastructure needed for analysis of datasets that are still exponentially increasing in size. Coupled with frequent changes to data analysis tools, advancements in next gen instrumentation, and added experimental complexity with multiplexing, next gen labs are finding it difficult to efficiently deliver high quality services and assure the integrity of results.



## Manage Your Data & Results

- Quickly access sample results in their experimental context
- Automate and simplify complex data analysis procedures
- Publish reports to clients

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We required a centralized lab and data management system for genomics and next generation sequencing research that would allow our facility to seamlessly track samples across many projects and automate data capture for integrated analysis. Geneus meets these requirements.”

*Dr. Peter W. Laird, Director of the USC Epigenome Center, and Associate Professor of Surgery and of Biochemistry and Molecular Biology*

## Ensure Reliable, High Quality, Traceable Results

- Track customized sample information and workflows
- Simplify the design and tracking of complicated multiplexed experiments

Geneus™ Next Gen



# Geneus - Best-in-Class Genomics LIMS for Next Generation Sequencing

Geneus is a LIMS and data management software solution that is built for genomics applications, unlike many other generic LIMS on the market.

Geneus allows next gen sequencing labs to rapidly model and track their experimental workflows to provide complete sample traceability from a submitted sample through to data analysis. Quickly and easily reconfigure Geneus to meet the needs of your lab as workflows change and throughput increases. Choose what data to collect with easily customizable fields that can be added to projects, samples and experimental processes and then report back on them using Geneus' reporting framework.

Attach result files and record quality control decisions as samples progress through your lab. While all sample and experiment information becomes quickly accessible with experimental context using Geneus' powerful sample genealogy view.

Increase lab efficiency by simplifying initiation of next gen sequencing runs and improving communication between lab personnel and clients. Clients can submit sample information using a web-based interface that you can publish results to. Pipeline complicated downstream data analyses so they can be initiated within Geneus by users with no programming expertise.

Keep your lab competitive by continuing to incorporate the latest advancements in sequencing and analysis technology knowing that GenoLogics is a preferred LIMS solutions provider of leading next gen sequencing platform vendors.

*"We had to feel confident that the system we chose for our next generation sequencing center could be deployed on an accelerated timeline, while maintaining the ability to adapt to constantly evolving next generation sequencing technology and workflows.*

*We chose Geneus from GenoLogics, and we have been processing samples for several months with no interruptions."*

*Dr. Mark Rieder, Principal Investigator, University of Washington, Genome Sciences – Genomics Resource Center*

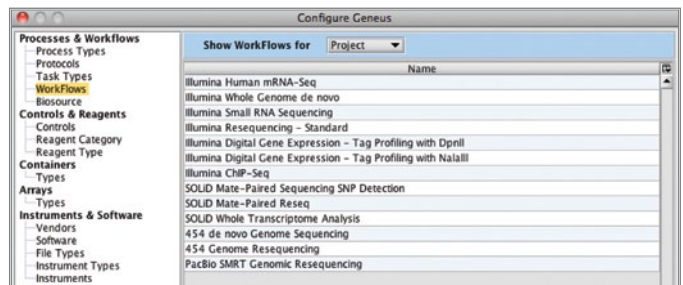


# Ensure Accurate Sample Traceability

To ensure integrity of results and scientific conclusions, clear and accurate sample traceability is an absolute requirement. Geneus LIMS enables labs to maintain data integrity and accelerate experiments without compromising results. Due to the increasing complexity of next generation sequencing applications and the vast amount of data generated in these experiments, a versatile LIMS becomes essential to maintain efficient operations and enable future growth.

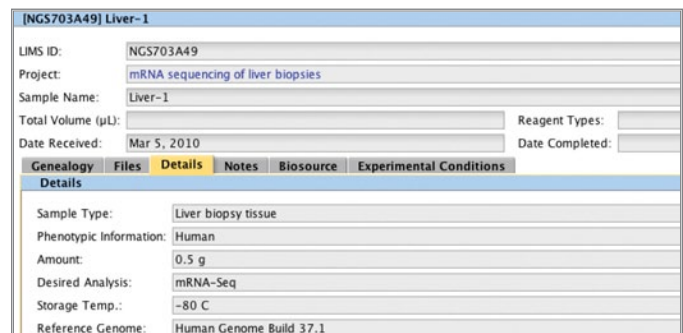
## Visualize Complete Experimental Context of Samples

Geneus is designed to keep up with dynamic next gen lab environments by providing flexible information management while ensuring robust sample traceability. With Geneus, complete sample annotations, data, and quality information can be tracked and accessed while maintaining experimental context. You can view everything done to a sample using the sample genealogy view. Customized next gen workflows tailored to the specific needs of your lab can rapidly be created and modified using a configuration view in Geneus that doesn't require programming expertise or interrupt your lab's throughput.



An example of how Geneus workflows can be configured to model any NGS experiment

Geneus supports the use of custom fields at the project, sample and process levels and in many other areas throughout Geneus. You can define and track custom sample annotation fields at sample submission to aid in downstream workflow and data analysis decisions. Track values of experimental parameters to aid in later protocol optimization, track reagent lot numbers for quality assurance and catalogue numbers to assist in re-ordering. Configuration changes in Geneus can be done on the fly while previous records maintain their original configuration.



Example of user definable sample annotation fields

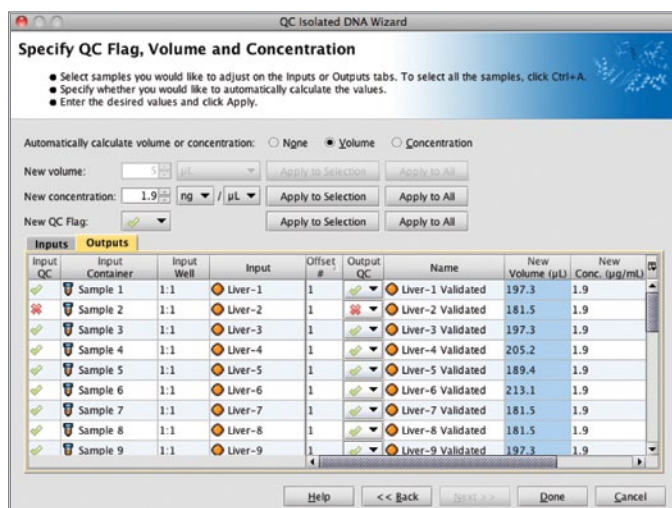
## Accurately Manage Multiplexing Workflows

Sequencing experiments that incorporate multiplexing workflows require superior sample and information management. Accurately and efficiently tracking results from multiplexed next gen experiments that contain numerous tagged DNA libraries is complex, error prone and time consuming. An efficient data and lab management solution is essential for maintaining accurate traceability and sample tracking when the needs of mapping DNA tags to samples, tracking sample QC steps during library preparation, and linking demultiplexed results back to starting samples are considered.

Geneus solves these sample tracking challenges when multiplexing with a wizard that assists in placing and tracking multiple samples within flow cells, flow slides and PicoTiterPlate™. The Geneus wizard also simplifies tracking and addition of indexed DNA tags to samples, so Geneus users, whether preparing samples or analyzing data, can readily track samples by these details. Geneus tracks all information from sample submission to analysis, ensuring multiplexing workflows are manageable and results are accurate.

## Improve Quality of Results

Geneus also improves communication between lab personnel, clients, and collaborators in fast paced next gen labs by clearly predefining experimental goals at project initiation by allowing assignment of application specific next gen workflows to projects. With a Geneus workflow you can predefine experimental parameters and attach lab protocols for each task. Workflows clearly define next steps for samples, allowing lab personnel to confidently process samples in the lab while tracking quality measurements and attaching back result files. Use QC, volume and concentration features in Geneus to



Track QC decisions, and calculate concentration adjustments prior to loading a flow cell

accelerate and track pass/fail decisions as samples progress through workflows. Geneus can be flexibly configured to accommodate your QC processes.

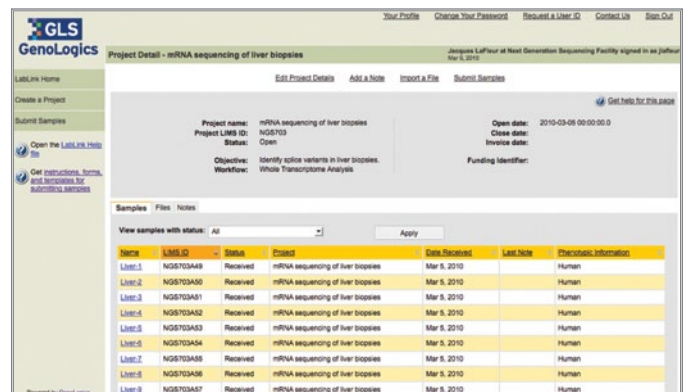
Well structured and easily accessible sample and experimental data in Geneus enables informed decisions that can accelerate your research. Clear sample traceability is always the first priority to getting accurate results, and the sample genealogy in Geneus clearly displays everything done to a sample.

## Improve Lab Efficiency

### Streamline Communication With Clients

Geneus allows clients to request lab services, initiate projects, and submit sample information via a web interface called LabLink. Using LabLink clients can submit sample information using a configurable Excel template containing customizable sample annotation fields.

Tailored to the needs of external investigators, LabLink provides project-based views that focus on samples and results. Your lab can control which result files and reports are published to the LabLink interface from within the Geneus client.



Sample information submitted via LabLink for an mRNA-Seq experiment

“The really key thing is that we have access to the data at many different levels, from external investigators who submit samples to us, to investigators within our center, and the lab technicians. Since we’re a core center we need pretty sophisticated tools to deal with our customers.”

*Dr. Benjamin Berman, Senior Research Associate, USC Epigenome Center*

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Geneus™ Next Gen



As your lab's services expand and experimental workflows change, Geneus ensures that both the web and lab based views are easy to update. With a couple of clicks, an administrator can quickly add new fields to samples and projects in either interface.

LabLink allows core services to be delivered efficiently. Web-based project initiation ensures that accurate and complete sample information is available from the outset of experiments. Workflow tracking is initiated with LabLink service requests allowing communication and collaboration to flourish between your lab and your clients.

## Simplify Operation of Next Gen Sequencing Instrumentation

GenoLogics has proven experience integrating Geneus to next gen sequencing platforms from industry leaders. These integrations can range from automated integrations that save technician time and ensure accuracy to manual integrations in which Geneus users attach data files resulting from an analysis to a process representing the instrument run in Geneus. As your lab expands and adds instruments, new instruments can rapidly be added using Geneus' administrative configuration interface.

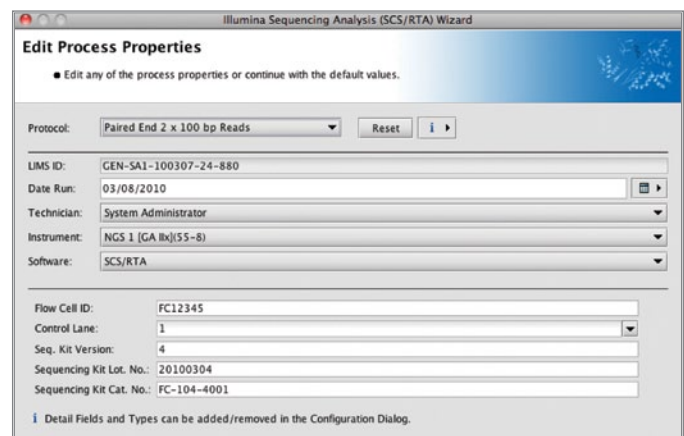
Processes in Geneus can be created to automatically generate sample sheets and batch files that contain sample names, annotations, unique identifiers, and other necessary run parameters in formats ready for import into next gen instrument controller software.

Custom fields can also be added to next gen processes to predefine required run parameters and allow users to modify any parameters that vary between analyses. You can also track which instruments in your lab were used to analyze samples to ensure both the quality and integrity of results.

At project initiation you can assign Geneus workflows containing tasks and protocols to predetermine experimental procedures for sequencing library preparation. Protocols allow

you to clearly communicate intended next gen run parameters to your technicians allowing them to proceed with confidence. The combination of tasks and protocols in Geneus aids in smoother hand-offs of samples between lab personnel involved in discrete aspects of your next gen experimental workflows.

When setting up sequencing runs, next gen instrument operators can retrieve all necessary run parameters from Geneus based on the identity of Illumina flow cells, ABI flow slides, and Roche 454 PicoTiterPlates™. The operator can confidently initiate runs knowing that the appropriate instrument parameters are being used to acquire the correct type of data needed for the experiment. Additionally, during data analysis Geneus provides bioinformaticians with complete transparency into the experimental processes that were used to generate libraries and data.



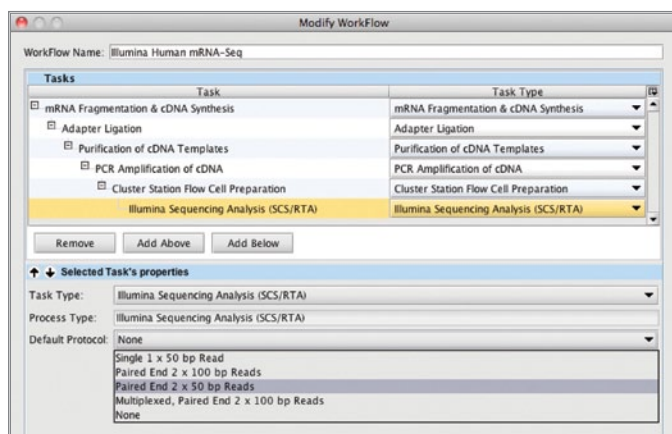
Instrument integrations allow you to predefine analysis protocols for samples and track custom parameters like flow cell ID and reagent lot numbers. In this example an Illumina Sequencing Analysis task is represented

With Geneus integrations to next gen instrumentation, you can ensure that the appropriate people are able to design next gen experiments for client projects while your skilled technicians benefit from clearly defined experimental goals and simplified setup and initiation of sequencing runs.

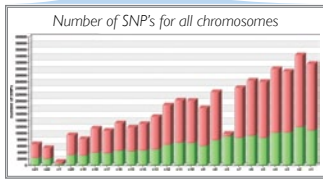
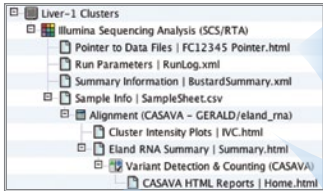
## Automate Data Analysis

The data analysis tools and algorithms available for analyzing next gen data are changing rapidly. Whether you are using the tools provided by Illumina, ABI, or Roche, open source tools or internally developed tools, the rate of change and the number of tools available are evolving at a pace that is difficult to keep up with.

With Geneus, you can automate routine data analysis steps so that they can be kicked off by technicians, freeing your bioinformaticians to focus on understanding the best algorithms to use, and accomplishing further analysis and interpretation of results. Since the analysis is kicked off within Geneus, the algorithms, parameters, and result files are captured providing total transparency into what analysis has been done and what parameters were used. Using Geneus you can attach or link



An mRNA-Seq workflow highlighting predefined protocols for an Illumina Sequencing Analysis task



Attach summary files that point to HTML reports for large NGS data sets and results

to raw results from analysis, or attach and publish a summary of the results to provide access to your customers through LabLink. This capability means that you can always quickly find the results for any given sample.

Geneus has a simple but effective plug-in interface that simplifies running external software tools and collecting results. This plug-in interface allows a bioinformatician to run any analysis application that can be run from the command line including specifying any parameters that need to be included. This provides a powerful capability to automate analysis using the data and tools that are important to your science and allows your bioinformaticians to make the changes needed to keep up with the latest advances in next gen data analysis.

### Report on Lab Operations

As labs continue to scale and modify experimental parameters and protocols, the reporting interface in Geneus makes experimental data available for analysis. Analysts and bioinformaticians have access to experimental parameters, QC results, and data from customized fields. When the ability to export data using reporting is leveraged, downstream analysis tools can be used to correlate experimental data with sample preparation parameters or sample annotation data.

Whether sophisticated statistical analysis, or spreadsheet models are required, Geneus' reporting interfaces allow access to data in a consistent manner. Analysts can concentrate on analysis rather than spending their valuable time locating and gathering data.

*“The decision we made was to free up our in-house software developers for specialized analysis and data processing problems, and to purchase the lab information management software system.”*

*Dr. Benjamin Berman, Senior Research Associate, USC Epigenome Center*



## Strong Partner Relationships

By working closely with our customers, GenoLogics understands the dynamic challenges that researchers are continually facing when using next gen sequencing technologies.

To ensure that GenoLogics is able to continually provide the most complete end to end laboratory data management solution for next gen sequencing labs, we have developed strong business relationships with some of the industry's leading instrumentation vendors and data analysis providers. In 2009, GenoLogics was chosen by **Illumina** as a 'preferred' next gen informatics partner.

GenoLogics has proven experience integrating to next gen instrumentation and strong relationships with industry leading next gen sequencing platform and tools vendors such as **Illumina, Applied Biosystems, Roche, Pacific Biosystems, CLC bio** and **JMP Genomics**. GenoLogics is the LIMS vendor of choice for leading next gen sequencing labs.

As a Geneus user, you can continue to incorporate the latest sequencing and analysis technology advancements to keep your lab competitive, all the while knowing that Geneus will continue to keep step with your lab's evolving needs.

## Summary

Geneus is a versatile LIMS that is a welcome addition to any next gen lab that needs to increase lab efficiency while facing increasing sample throughput, increasing experimental complexity, and increasing data volumes with associated informatics challenges.

Once you realize you need a flexible LIMS to help your facility to reach its full potential your facility will often face a choice between building one or buying a commercial solution. Building a system in-house is a complex and time-consuming task that will continually tax your informatics team. If your lab needs to get up and running quickly, building a system is often not a viable option.

Free up your precious bioinformatics personnel to focus on solving the next gen informatics bottleneck so your lab and your clients can publish their research sooner.

**Geneus is the industry's best next gen sequencing/genomics LIMS, from a life sciences software company with a strong track record in providing robust information and data management solutions to 'omics' research sectors.**





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