

# A closer look at your unique blueprint — the Personalized Medicine Initiative and PHEMI Central

Ever wonder what makes you, you? You on the inside. The molecular you. That question is at the core of the Personalized Medicine Initiative (PMI) at the University of British Columbia (UBC) in Vancouver, Canada. It operates under the auspices of the internationally respected UBC Life Sciences Institute, the technology driver behind personalized medicine in the province. The PMI objective is to introduce molecularly-based medicine into the front lines of healthcare, and PMI projects focus on an individual's unique molecular and genetic blueprint. As a preventive care endeavor, PMI will zero in on detecting early signs of health risk, in order to empower an individual in maintaining a healthy state.



## PROJECT

The Molecular You project focuses on preventive care solutions derived from an individual's genetic and molecular profiles. Molecular You is planning for 20,000 subscribers over the next few years.

## GOALS

- Collect, ingest, and analyze vast amounts and types of data that can lead to breakthroughs in treating diseases, such as diabetes, cancer, heart disease, and numerous other conditions
- Discover insights that can guide an individual's healthcare decisions to more precisely suit their unique molecular profile, leading to optimal health
- Streamline the process for generating a personalized dataset based on individualized molecular and clinical information
- Keep personal data private
- Create an environment that economically scales to support future clinical and omics data sets
- Allow secure sharing of data among authorized users

## Molecular You Corporation

The PMI is pursuing groundbreaking work through a spinoff initiative called Molecular You Corporation, a molecular profiling company that analyzes individuals' genomic, proteomic, metabolomic, and microbiomic data to deliver a comprehensive, personalized digital health guide. The key to Molecular You success is integrated analyses of 'omics'—the broad, large-scale studies of molecular information. With continuously updated information from Molecular You, informed by ongoing data collection, individuals gain specific insights into their personal health, allowing them to make informed decisions to optimize their health.

## Huge datasets, diverse sources

Though in its early stages, the Molecular You project is planning for 20,000 subscribers, each eventually equipped with a personal web-based dashboard to guide them through their health results, set and track health goals, and identify trends towards illness or disease.

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~ Rob Fraser, CEO of Molecular You

"Enormous amounts of data are collected and analyzed through Molecular You omics profiles. As this massive, diverse dataset accumulates, data storage becomes increasingly challenging," says Rob Fraser, CEO of Molecular You. "And because no one can predict which technologies will be responsible for delivering data in the future, or what future data volumes will be, we needed a solution to accommodate those unknowns."

Based on these requirements, Molecular You initially considered options from multiple technology vendors before choosing a solution from PHEMI Systems, a big data warehouse solution provider. "The PHEMI system can handle today's massive, varied datasets and promises virtually unlimited expandability for tomorrow's data structures," says Fraser. "PHEMI data systems are ideal for our needs."

## Health through innovation

Molecular You is developing a comprehensive data-intensive approach to detect early signs of potential illness or disease for early-stage intervention before serious consequences occur.

Molecular You participants will be extensively studied, using the most up-to-date and validated tools available. Their genomes will be analyzed to identify genetic risk factors for disease and therapeutic optimization.

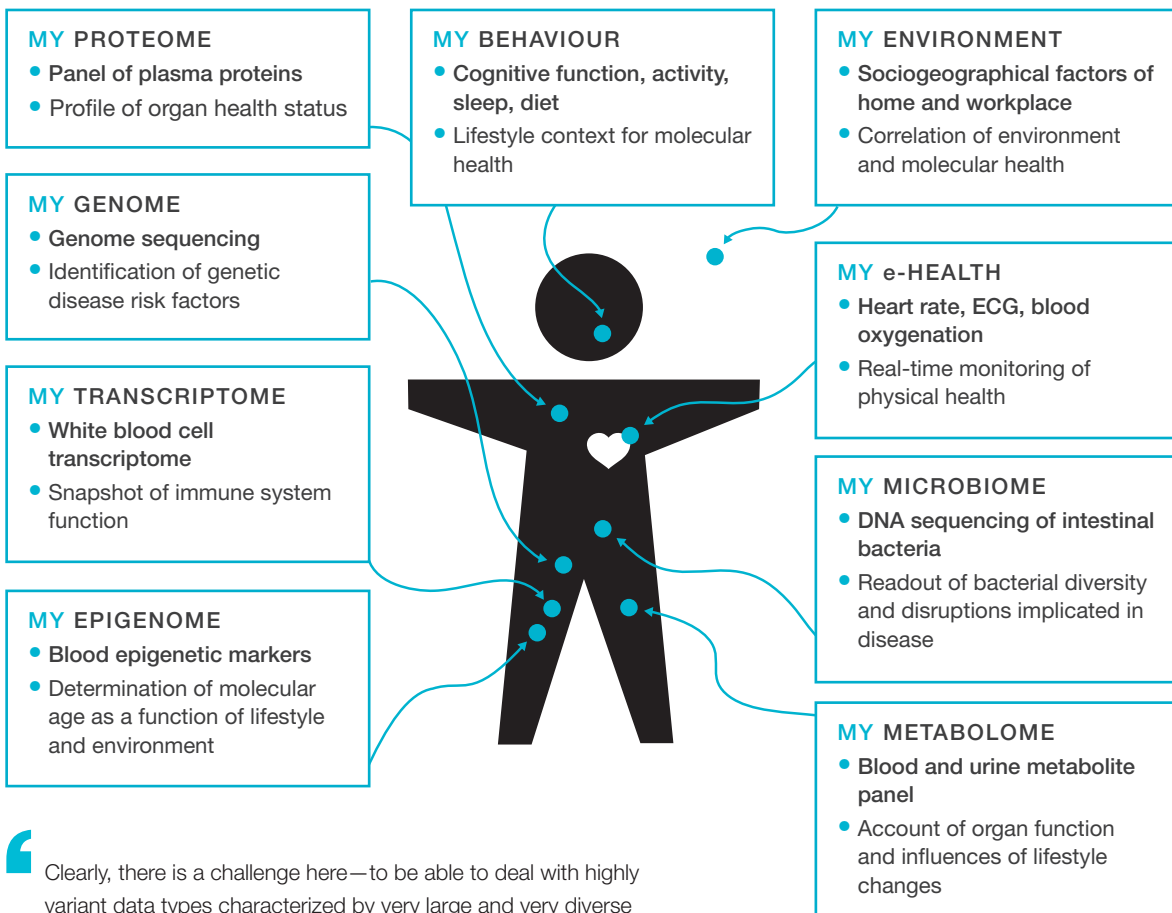
Over 200 plasma proteins and metabolites will be quantitated and evaluated using computational biology approaches.

The system is designed to capture physical activity and key clinical parameters such as heart rate and sleep patterns. Analysis of microbial species present in the gut and potentially other regions of the body will also be analyzed and monitored.

The complete set of data will be analyzed and compared to normal values to determine an individual's current health status and, over time, health transitions. Participants will receive consultation with a healthcare professional to interpret the information and discuss what actions will lead to a healthy trajectory. Data will be presented on an innovative web-based "dashboard for health."

Source: <http://lsi.ubc.ca/molecular-you/>

## Molecular You leverages big data technologies for personalized health.



“Clearly, there is a challenge here—to be able to deal with highly variant data types characterized by very large and very diverse datasets, and to be able to not only incrementally add new data, but also add new data sources as they emerge. That means scaling efficiently, cost-effectively, and with minimal complexity. Challenges can lead to opportunity, and there’s no doubt in my mind that we have the right opportunity in the PHEMI solution.”

~ Rob Fraser, CEO of Molecular You



### Molecular You challenges

The ultimate goal of Molecular You is to streamline the process for generating a personalized dataset based on individualized molecular and clinical information culled from a variety of data sources. These include data from existing systems, text notes from physicians, blood work, lab results, spreadsheets, and more. Of course, imaging data plays a huge role in today's medicine and includes everything from X-Rays, to MRIs, to ultrasounds, and even that phone camera shot of the weird-looking rash on your arm. Inputs from various sensors and wearables used to track your wellness — such as heart rate monitors, activity monitors, or those used to track physiological changes from chronic conditions — also need to be captured. Many of these inputs will likely be sourced from an individual's personal dashboard device.

Last, at least for the time being, is the huge body of data that will be collected from multiple omics types. Omics refers to the collective technologies used to explore the roles, relationships, and actions of the various types of molecules that make up the cells of an organism. These technologies include,

among many others, genomics, the study of DNA/genes; proteomics, the study of proteins; and microbiomics, the study of microbes, including bacteria and viruses.

"Clearly, there is a challenge here. A challenge to deal with highly variant data types characterized by very large and very diverse data sets. A challenge to not only incrementally add new data, but also to add new data sources as they evolve. Not to mention a challenge to scale efficiently, cost effectively, and with minimal complexity," says Fraser. "Challenges can lead to opportunity, and there is no doubt in my mind that we are on the right path with the PHEMI solution."

### The PHEMI Central solution

PHEMI Central is a big data warehouse with data sharing, data governance, and built-in privacy. It is designed to ingest and tag all types and any size of data. PHEMI Central can curate what it collects in order to extract the greatest possible value from the data with processing, indexing, cataloging, and linking. And when it's time to consume data, datasets can be generated on demand at sub-second speeds.

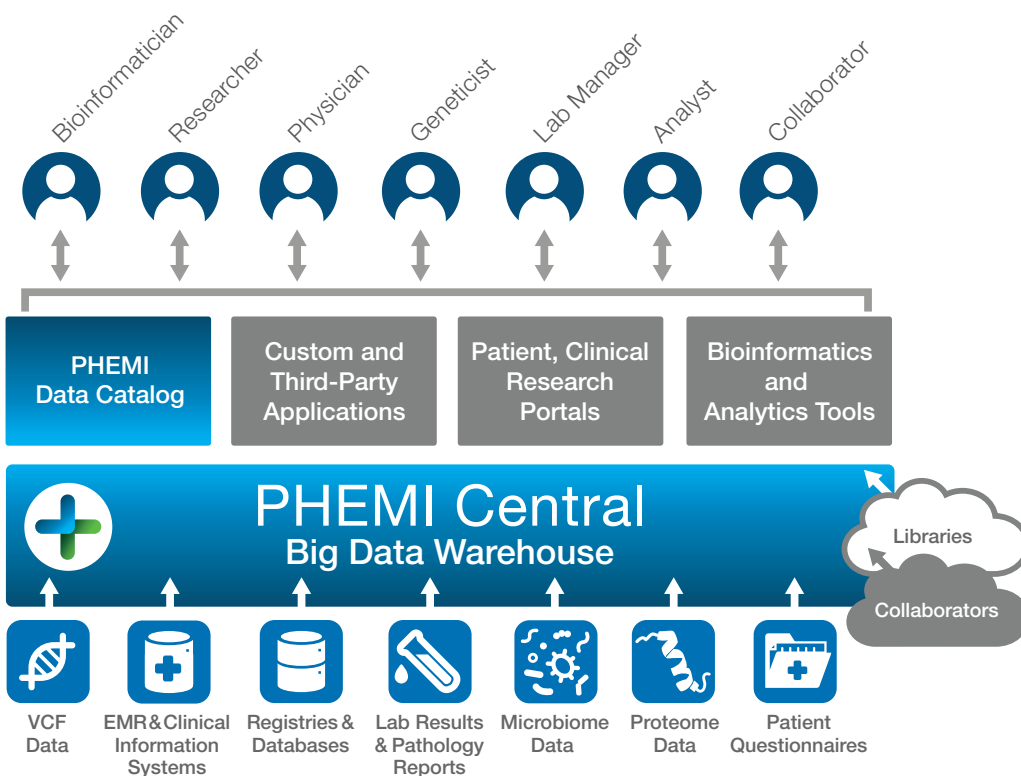
PHEMI Central's distributed big data system allows efficient computation over large datasets in-situ, without transferring large amounts of data.

PHEMI Central, which is based on Hadoop and other open-source distributed computing technologies, economically scales to petabytes. PHEMI Central software is fully integrated and enterprise-ready so the Molecular You team didn't need to hire a team of Hadoop engineers to build and maintain the system. PHEMI Central is built on top of the Hortonworks HDP and handles data collection, management, privacy, and data sharing, streamlining big data collection, management, and analysis, as well as application development. PHEMI partnered with Dell, a leader in healthcare and life sciences, to build the hardware components of the Molecular You solution.

### The PHEMI Central advantage

PHEMI's flagship product, PHEMI Central gives Molecular You the flexibility needed to consolidate the wide variety of omic and clinical data and conceive new applications. Whether deployed on premise (as was the case for Molecular You) or in the cloud, PHEMI Central is a flexible, agile repository for multi-structured data, designed to support advanced analytics, data science, and new services. And to protect highly personal, confidential data, it can govern, manage, and control access to protect privacy and manage data sharing.

### PHEMI Central deployed for Molecular You



## Commitment to privacy

Collecting, curating, and consuming digital assets is a huge endeavor with an equally huge associated responsibility: privacy.

“Personalized medicine is all about enabling a much closer look at what makes you, you,” states Fraser, “and genetic data is about as personal as you can get. So we had to assume a ‘we take no prisoners’ position when it comes to privacy, data sharing, and governance.” In other words, a privacy-ensured data solution is an absolute must.

With this in mind, PHEMI has implemented a privacy management strategy that embeds end-to-end security in the design itself, ensuring that privacy becomes the default setting for each and every piece of data, raw and derived.

This design commitment was informed by two well-respected approaches to privacy management: Privacy by Design and Zero Trust Networking. Both approaches believe privacy must be a core feature designed right into the product from the beginning. In fact, the Zero Trust networking mantra is “never trust, always verify.” So embedding privacy and security into the network itself, rather than bolting it on later, usually after a data breach, means that there are no “trusted” zones in the network.

PHEMI’s privacy management strategy ensures that only the right data is provided to the right user at the right time. So now researchers, clinicians, physicians, and health organizations needing to protect and govern the use of their information can take advantage of big data technology to access, catalog, and analyze their digital assets at speed and scale. This assurance will ultimately extend to the true end users—the patients—enabling them to securely access their own personal data via a web-based connection.

## Moving forward

Although Molecular You is still in the early stages of its research, Rob Fraser and the entire PMI team have high expectations for the future. “To improve healthcare, healthcare groups need to embrace the concept that each human is different and that early detection and early prevention will dramatically improve health and decrease costs,” says Fraser. “Molecular You will depend on PHEMI Central to simplify and scale the problem—and the promise—of precision health. That’s what will revolutionize effective prevention and optimize our population’s health during their entire lifetimes. It’s all about staying on the path to wellness—and we’ll have big data to thank for that.”

“Molecular You will depend on PHEMI Central to simplify and scale the problem—and the promise—of genetically based medicine. That’s what will revolutionize effective prevention and optimize our population’s health during their entire lifetimes. It’s all about staying on the path to wellness—and we’ll have big data to thank for that.”

~ Rob Fraser, CEO of Molecular You

## PHEMI Central for Molecular You

### ADVANTAGES

- Economically grows as the Molecular You project evolves
- Offers enterprise-grade reliability and availability with cluster economics
- Enables comprehensive analysis of structured, semi-structured, and unstructured data
- Protects information at the field level while ensuring rightful access at scale

### TECHNOLOGY

- Built on Hortonworks HDP
- Fully integrated and enterprise-ready software
- Supports third-party applications using PHEMI API’s
- Economically scales to petabytes
- On premises application or available as a cloud solution.

Contact us at [info@phemi.com](mailto:info@phemi.com) for a demo or to discuss our solutions for Personalized Medicine.