The Precision Health and Integrated Diagnostics (PHIND) Center is the first center in the world focused on precision health and integrated diagnostics. The PHIND Center plays a critical role in mobilizing the components needed to advance this new vision of healthcare. It is developing, testing, and disseminating the next generation of healthcare mechanisms for precision health. Whereas precision medicine is focused on the treatment after the manifestation of disease, precision health is focused on early prediction and prevention of disease onset. The PHIND Center integrates diagnostic information collected from multiple sources both on the body, and in one’s home. It also studies the fundamental biology underlying early transitions from health to disease and the associated biomarkers (molecules) of health and early disease.

## Center Research Areas

The Center aims to fundamentally revolutionize healthcare leading to better and more productive lives for individuals by integrating several key areas including:

- Risk analytics to predict risk of specific disease(s) for a given individual
- Fundamental studies of the biology of disease initiation/progression to understand the earliest transitions from healthy humans, organs and cells to the disease state
- Biomarker research to study the molecules that indicate healthy states and early signs of disease
- Diagnostic technology and information to accurately monitor and detect health changes early, such as collecting and analyzing information from multiple sources on the body and in the home, office or wider community
- Health economic analyses for precision health strategies to show savings to the health care system for pursuing various precision health efforts

### Director, PHIND Center at Stanford
Sanjiv Sam Gambhir, MD, PhD
Chair, Department of Radiology
Virginia and D. K. Ludwig Professor of Cancer Research
Professor by courtesy, Departments of Bioengineering and Materials Science & Engineering
Division Chief, Canary Center at Stanford for Cancer Early Detection
Division Chief, Molecular Imaging Program at Stanford (MIPS)

### Deputy Director, PHIND Center at Stanford
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- **Garry Gold, MD**
  Professor, Radiology
- **Ian H. Gottlib, PhD**
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- **Michael Snyder, PhD**
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- **Joseph M. Hogan**
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  President & CEO, One Medical Group
Many different components of health care can contribute to precision health.

What is the difference between Precision Health and Precision Medicine?

Precision Health leverages the numerous assessments including omics, immune status, medical imaging, family history, physical condition and standard doctor visits to predict and prevent disease from occurring. Precision Medicine uses similar tools, but is primarily focused on patient treatment after the onset of disease. Both health areas have overlap and are complementary in improving patient care. Precision Health is a way of improving overall lifelong health (proactive), while Precision Medicine is generally not implemented until after an individual becomes ill (reactive).

Devices in the home or automobile are capable of passively monitoring biological fluids, human behavior, and physiological signs. Passive monitoring approaches permit high-frequency monitoring without requiring a change in user behavior.
Sponsored Dream Team Projects

Precision Diets for Diabetes Prevention

Project description: Prevent Type 2 Diabetes by Combining Omics Information & Continuous glucose monitoring (CGM) for dietary intervention.

Prevent Type 2 Diabetes by combining omics information and continuous glucose monitoring (CGM) for dietary intervention.

Project Leaders:
Michael Snyder, PhD, Professor, Genetics
Tracey McLaughlin, MD, MS, Associate Professor, Medicine
Justin Sonnenberg, PhD, Associate Professor, Microbiology
Manisha Desai, PhD, Professor, Medicine
Christopher Gardner, PhD, Professor, Medicine

Predicting Healthy vs. Pathological Aging: Multimodal Biomarkers of Age-Related Memory Change and Risk for Alzheimer’s Disease

The Predicting Health in Aging (PhIA) project is addressing two major health goals, leveraging a deeply characterized cohort of 200 healthy older individuals from whom baseline measures of brain structure, brain function, genetics, and cerebral spinal fluid (CSF) biomarkers of risk for Alzheimer’s disease (AD) are collected.

Project Leaders:
Anthony Wagner, PhD, Professor, Psychology
Elizabeth Mormino, PhD, Assistant Professor, Neurology & Neurological Science
Brian Rutt, PhD, Professor, Radiology
Carolyn Fredericks, MD, Clinical Assistant Professor, Neurology & Neurological Science
Jennifer McNab, PhD, Assistant Professor, Radiology
Frederick T. Chin, PhD, Assistant Professor, Radiology

Enabling Early Cancer Detection with Lower Costs and Improved Sensitivity from Non-Invasive Genome-wide Liquid Biopsy Tests through Novel Deep Learning Analytics and Improved Chemistry

Developing a novel cfDNA sequencing technology and deep learning analytical framework that achieves state-of-the-art accuracy in distinguishing normal versus pathological states and tissue-of-origin from clinical samples.

Project Leaders:
Christina Curtis, PhD, MSc, MS, Assistant Professor, Oncology & Genetics
Anshul Kundaje, PhD, Assistant Professor, Computer Science & Genetics
Allison Kurian, MD, Associate Professor, Oncology & Health Research and Policy
George Sledge, MD, Professor, Oncology
Irene Wapnir, MD, Professor, Surgery
Robert West, MD, PhD, Professor, Pathology

Multidimensional Predictors of Major Depressive Disorder and Suicidal Behaviors in High-Risk Adolescents

The goal of this longitudinal study is to leverage a well-characterized sample of healthy adolescents who experienced early life stress to integrate multi-system neurobiological and digital phenotypes with machine learning algorithms to identify risk factors and mechanistic targets involved in the onset of depression and engagement in suicidal behaviors. This project will facilitate the development of more timely and precise approaches to the prevention of these debilitating conditions and their devastating consequences.

Project Leaders:
Ian H. Gotlib, PhD, Professor, Psychology
Holden Maecker, PhD, Professor, Microbiology & Immunology
Rachel Manber, PhD, Professor, Psychiatry & Behavioral Sciences
Trevor Hastie, PhD, Professor, Statistics
Dennis Wall, PhD, Associate Professor, Pediatrics
Assessment of Early Knee Osteoarthritis Using a Low Cost, Rapid, and Multimodal Imaging and Biomechanics Approach
Project Leaders:
Brian Hargreaves, PhD, Professor, Radiology
Scott Delp, PhD, Professor, Bioengineering, and Mechanical Engineering, and, by courtesy, Orthopaedic Surgery
Garry Gold, MD, Professor, Radiology
Akshay Chaudhari, PhD, Postdoctoral Research Fellow, Radiology

Precision Diagnostics and Prediction of Food Allergy
Project Leaders:
Sindy Tang, PhD, Associate Professor, Mechanical Engineering
Kari Nadeau, MD, PhD, Professor, Medicine, and Pediatrics, and, by courtesy, Otolaryngology
Pablo Paredes, PhD, Instructor, Radiology

Detection and Prevention of Autism through Wearable Artificial Intelligence and Multimodal Data Integration
Project Leaders:
Dennis Wall, PhD, Associate Professor, Biomedical Data Science, and Pediatrics
James Landay, PhD, Professor, Computer Science
Trevor Hastie, PhD, Professor, Statistics
Thomas Robinson, MD, MPH, Professor, Pediatrics
Pablo Paredes, PhD, Instructor, Radiology
Michael Snyder, PhD, Professor, Genetics

Wearable Wireless Sleep Monitoring System for Precision Health
Project Leaders:
Ada Poon, PhD, Associate Professor, Electrical Engineering
Zhenan Bao, PhD, Professor, Chemical Engineering
Emmanuel Mignot, MD, PhD, Professor, Psychiatry and Behavioral Sciences

Utilizing the Immune Profile of Blood as a Biomarker for Transient Ischemic Attacks
Project Leaders:
Paul George, MD, PhD, Assistant Professor, Neurology & Neurological Sciences
Brice Gaudilliere, MD, PhD, Assistant Professor, Anesthesiology

Biomarkers and Biological Processes Associated with Future Cancer Development and Exposure to Food-based Carcinogens
Project Leader:
Andrew Gentles, PhD, Assistant Professor, Medicine, and, by courtesy, Biomedical Data Science

A Non-invasive Proteomics Platform for Non-invasively Monitoring Diet and Microbiome Influences on Human Immune Systems
Project Leader:
Joshua Elias-Merriman, PhD, Chemical and Systems Biology

Platform for At-home Urine Microscopy
Project Leader:
Audrey Bowden, PhD, Assistant Professor, Electrical Engineering

Noninvasive Impedance Spectroscopy of Blood using Adective Heat Transport
Project Leader:
Thomas Kenny, PhD, Professor, Mechanical Engineering

Progression of Clonal Hematopoiesis of Indeterminate Potential to Acute Myeloid Leukemia
Project Leader:
Ravi Majeti, MD, PhD, Professor, Medicine

Novel EEG Biomarkers of Sleep Health: A Machine Learning Study
Project Leaders:
Jamie Zeitzer, PhD, Associate Professor, Psychiatry and Behavioral Sciences
Mykel Kochenderfer, PhD, Assistant Professor, Aeronautics and Astronautics

VascTrac: Passive Mobile Screening for Peripheral Artery Disease as Biomarker and Risk Assessment Tool for Cardiovascular Disease
Project Leader:
Oliver O. Aalami, MD, Clinical Associate Professor, Surgery

Breath Acetone Sensor towards Non-invasive Diabetic Monitoring
Project Leader:
Xiaolin Zheng, PhD, Associate Professor, Mechanical Engineering

In vivo Real-time Biosensing using Aptamers on mm-sized Implants
Project Leaders:
Amin Arbabian, PhD, Assistant Professor, Electrical Engineering
H. Tom Soh, PhD, Professor, Radiology, and Electrical Engineering
Stephen Felt, DVM, MPH, Associate Professor, Comparative Medicine
Identifying Microbiome Markers of Progression of Alzheimer’s Disease
Project Leaders:
Ami S. Bhatt, MD, PhD, Assistant Professor, Medicine
Gavin Sherlock, PhD, Associate Professor, Genetics

Finding Novel Biomarkers in Human Sweat to Non-invasively Assess Risk and Progression of Metabolic Diseases
Project Leaders:
Richard N. Zare, PhD, Professor, Chemistry
Robert J. Tibshirani, PhD, Professor, Biomedical Data Science, and Statistics
Michael Snyder, PhD, Professor, Genetics

Determining Sepsis Marker Levels in Pregnant Women During the Peripartum Period
Project Leaders:
Natali Aziz, MD, MS, Clinical Associate Professor, Obstetrics & Gynecology
Samantha Do, MD, Fellow, Medicine
Ronald S. Gibbs, MD, Clinical Professor, Obstetrics & Gynecology
Shanthi Kappagoda, MD, MS, Clinical Assistant Professor, Medicine

Identifying Fibroblast Subtypes Contributing to the Progression of Preinvasive to Invasive Lung Adenocarcinoma
Project Leaders:
Sylvia K. Plevritis, PhD, Professor, Radiology, and Biomedical Data Science
Gerlinde Wernig, MD, Assistant Professor, Pathology
Joseph Shrager, MD, Professor, Cardiothoracic Surgery
Ann Leung, MD, Professor, Radiology

IgG Glycosylation as a Scalable Biomarker of Insulin Resistance and Metabolic Health
Project Leaders:
Michael Snyder, PhD, Professor, Genetics
Andrew Lipchik, PhD, Postdoctoral Fellow, Genetics
Fahim Abbasi, MD, Clinical Assistant Professor, Medicine
Joshua W. Knowles, MD, PhD, Assistant Professor, Medicine

Molecularly Selective Membranes for Electronic Sensing of Hormones
Project Leaders:
Alberto Salite, PhD, Associate Professor, Materials Science and Engineering

Automated Detection of Cerebral Ischemia to Reduce Disability and Mortality
Project Leaders:
Paul Yock, MD, Professor, Bioengineering, and Medicine
Jaime Lopez, MD, Associate Professor, Neurology & Neurological Sciences
Ross Venook, PhD, Lecturer, Bioengineering

Infant Epigenetic Markers of Maternal Attachment Style
Project Leaders:
Thalia K. Robakis, MD, PhD, Clinical Assistant Professor, Psychiatry and Behavioral Sciences
Alex E. Urban, PhD, Assistant Professor, Psychiatry and Behavioral Sciences
Ian H. Gotlib, PhD, Professor, Psychology

Male infertility and the Future Risk of Metabolic and Vascular Diseases
Project Leaders:
Michael L. Eisenberg, MD, Associate Professor, Urology
Gary M. Shaw, DrPH, Professor, Pediatrics, and, by courtesy, Health Research & Policy

Research
PHIND Events

PHIND Monthly Seminar Series
Covering a range of Precision Health Research topics

Annual PHIND Symposium
A collection of world-renowned scientists sharing their latest Precision Health discoveries.

Related Press

New Center Sets out to Stop Disease Before it Starts

5 Questions: Sam Gambhir on Progress in Precision Health

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