National Human Genome Research Institute

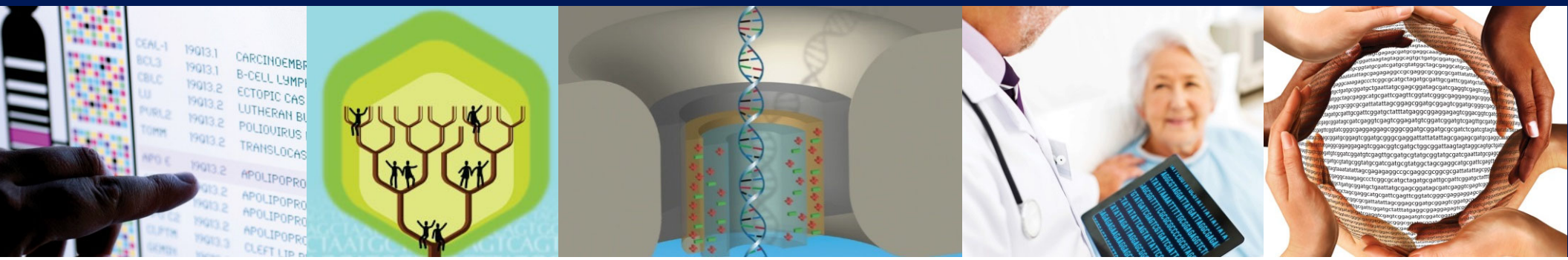
The Forefront of Genomics®

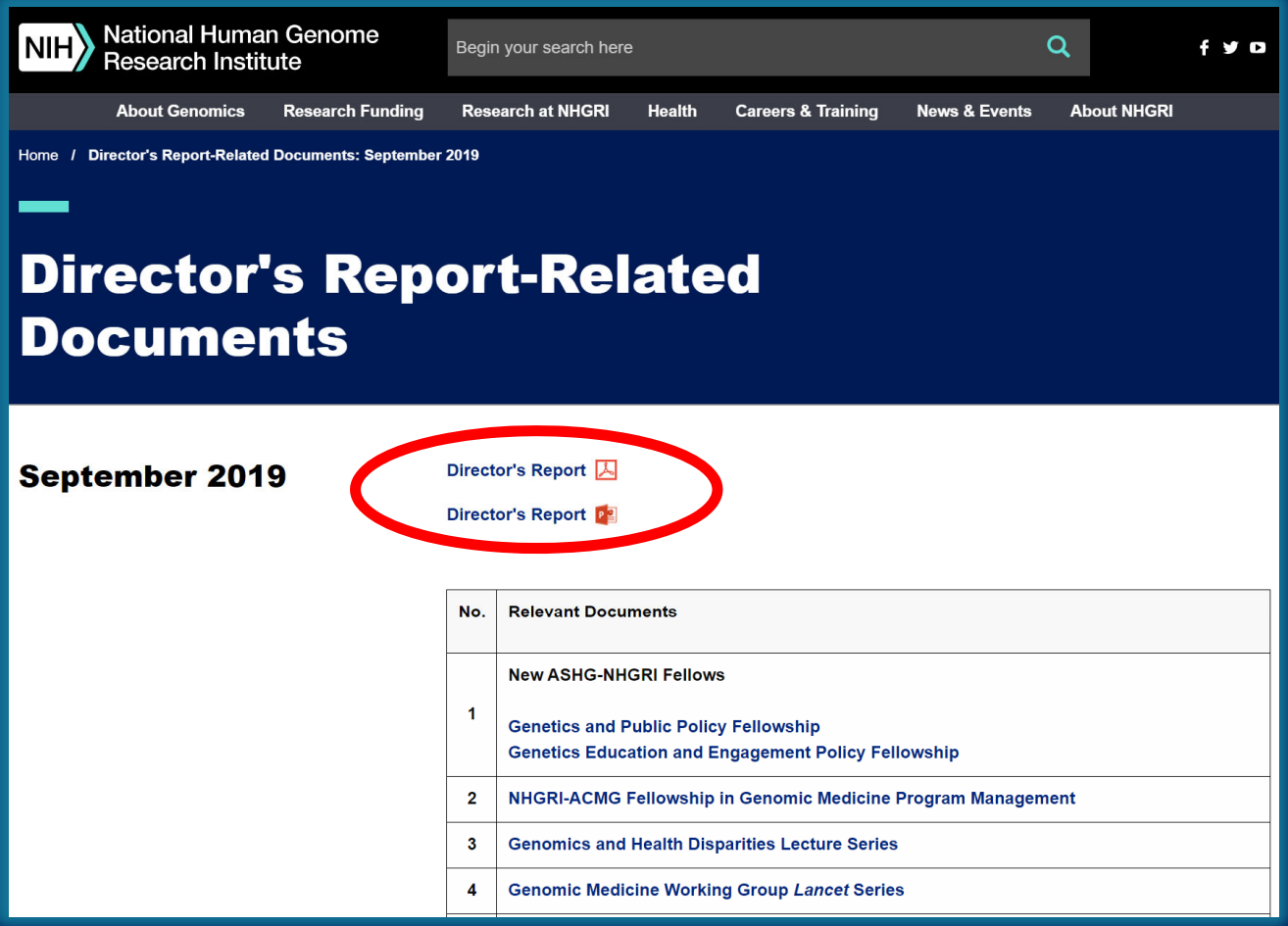
DIRECTOR'S REPORT

Eric Green, M.D., Ph.D.

Director, NHGRI

September 2019





genome.gov/DirectorsReport

Document #

Open Session Presentations

- **Presentation: Inter-Society Coordinating Committee for Practitioner Education in Genomics (ISCC-PEG) – Promoting Collaboration in Genomics Education**

  Richard Haspel

- **Concept Clearances:**

  Genomic Community Resources

  Chris Wellington

  ELSI Program Announcements for Unsolicited Applications

  Joy Boyer

Open Session Presentations

- **Concept Clearances:**

  Genomic Technology Development
  Michael Smith

  Technology Development
  Michael Smith

  Mendelian Genomics: Solving the Unsolved
  Lisa Chadwick

  Polygenic Risk Scores from Populations of Diverse Ancestry
  Lucia Hindorff

Director's Report Outline

I. General NHGRI Updates

II. General NIH Updates

III. General Genomics Updates

IV. NHGRI Extramural Research Program

V. NIH Common Fund/Trans-NIH

VI. NHGRI Division of Policy, Communications, and Education

VII. NHGRI Intramural Research Program

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VII. NHGRI Intramural Research Program

New ASHG-NHGRI Fellows

Samata Katta, Ph.D.
Genetics and Public Policy Fellow

Sarah Robbins, Ph.D.
Genetics Education and Engagement Fellow

NIH-ACMG Fellowship in Genomic Medicine Program Management

- Increase pool of physicians trained in managing research and implementation programs in genomic medicine
- Up to two qualified physicians selected annually to acquire credentials and experience at NIH and other organizations
- Applications for two-year fellowship due annually December 1

Marie-Luise Brennan, M.D., Ph.D.

Hwaida Hannoush, M.D.

Document 2

Genomics and Health Disparities Lecture Series

Minoli Perera, Pharm. D., Ph.D.

Associate Professor, Department of Pharmacology
Northwestern University
March 26, 2019

Katrina Armstrong, M.D.

Chair, Department of Medicine
Physician-in-Chief, Massachusetts General Hospital
July 16, 2019

Ali Gharavi, Ph.D.

Chief, Division of Nephrology
Institute of Genomics Medicine, Columbia University
December 5, 2019

Document 3

Genomic Medicine Working Group *Lancet* Series

THE LANCET

Log in

Series from the Lancet journals View all Series

Genomic medicine

Published: August 5, 2019

Executive Summary

The acceleration of documenting genomic variation in disease states and health outcomes has led to an upswell of clinical insights and avenues of exploration. The exciting and maturing area of genomic medicine, encompassing the use of individuals' genetic information to guide clinical treatment, is featured in this Series. In these five, timely reviews, authors from the National Human Genome Research Institute at the National Institutes of Health (MD, USA) present an overview of efforts to implement genomic medicine, including contemporary tools and resources; the role of pharmacogenomics in drug safety and efficacy; the application of genomics to identifying rare and undiagnosed diseases; enhancing risk assessment through family health history records; and improving the collection of outcomes and evidence to better incorporate genomic techniques in clinical care.

Related Content

Mapping a route to Indigenous engagement in cancer genomic research

Kimiora I. Henare, Kate F. Parker, Helen

Document 4

‘Genomics2020’ Strategic Planning Process

- Community Town Hall at NIH
- Two ELSI Strategic Planning Webinars:

  Appropriate Use & Implementation of Genomics in Diverse Communities
  Genomic Decision-Making: Power and Identity

- Town Hall at Massachusetts General Hospital
- Workshop: Perspectives in Comparative Genomics and Evolution

Document 5

‘Genomics2020’ Strategic Planning Process

- **Workshop: Genomics in Medicine & Health**
- **ASHG Feature: Strategic Planning Update with Eric Green, NHGRI**

ASHG
American Society of Human Genetics

discover. educate. advocate.

ASHG / Membership / The Messenger / Strategic Planning Update with Eric Green, NHGRI

Overview
Web Portal
Membership Directory
Membership FAQ
Obituaries and Memorials
Member Newsletter
Requests to Contact Members

Strategic Planning Update with Eric Green, NHGRI

Outside Voices: National Human Genome Research Institute Director Eric Green, MD, PhD
September 2019

ASHG: You have reflected on how essential strategic planning has been to NHGRI’s achievements over the past three decades. What’s changed the most from the institute’s early plans to today’s? What are some exciting or thought-provoking questions so far from today’s community?

Dr. Green: The most significant difference between NHGRI’s early efforts in strategic planning and that being done today relates to *scope*. Until 2003, NHGRI’s strategic planning largely focused on achieving the relatively narrow goals of the Human Genome Project. But immediately following the completion of the Human Genome Project – now 16 years ago – the scope of NHGRI’s research mission began to expand. As featured in the Institute’s 2011 strategic plan and to be further emphasized in our 2020 strategic plan, the scope of NHGRI’s strategic vision is remarkably broad – it now spans from understanding the most basic aspects of genome structure and function to tackling the complexities of implementing genomic medicine, punctuated with multiple sub-niches of important research areas along the way (e.g., technology development, computational genomics, and bioethics).

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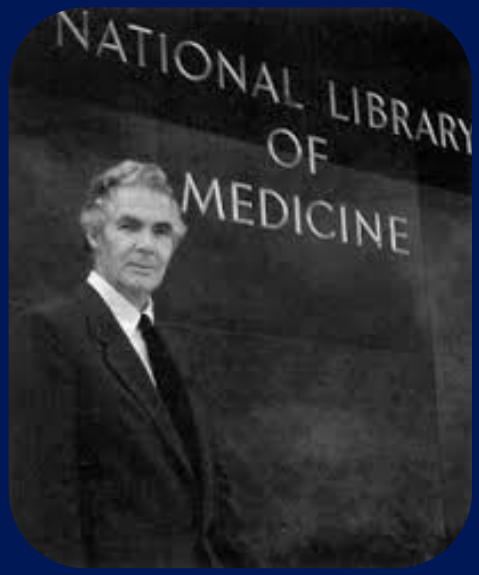
Mourning the Loss of James Wyngaarden

Document 6

Mourning the Loss of Donald Lindberg



Document 7

Paul Sieving Departs as Director, National Eye Institute

Paul Sieving, M.D., Ph.D.

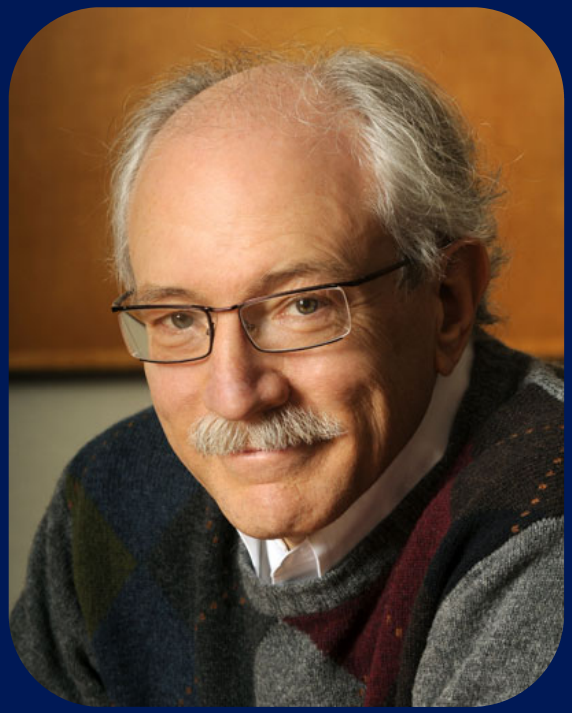
NIH

Santa Tumminia, Ph.D.

stitute
omorrow

Linda Birnbaum Departs as Director, National Institute of Environmental Health Sciences

Linda Birnbaum, Ph.D., D.A.B.T., A.T.S.



Richard Woychik, Ph.D.

Document 9

New NIH Associate Director for Data Science

Susan Gregurick, Ph.D.

NIH
Office of
Data Science Strategy

Fiscal Year 2020 Appropriations

	Actual FY 2019 Labor-HHS Appropriations	Proposed FY2020 Labor-HHS Appropriations			
		House	% Δ	Senate	% Δ
NIH	$39.1B	$41.1B	+5%	$42.1	+7.7%
NHGRI	$575M	$604M	+5%		

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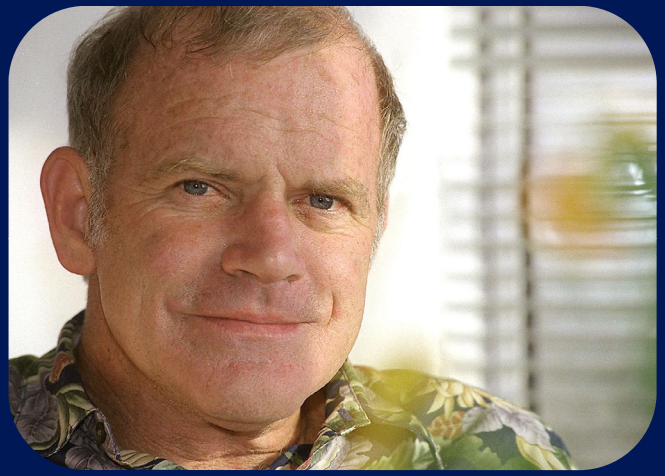
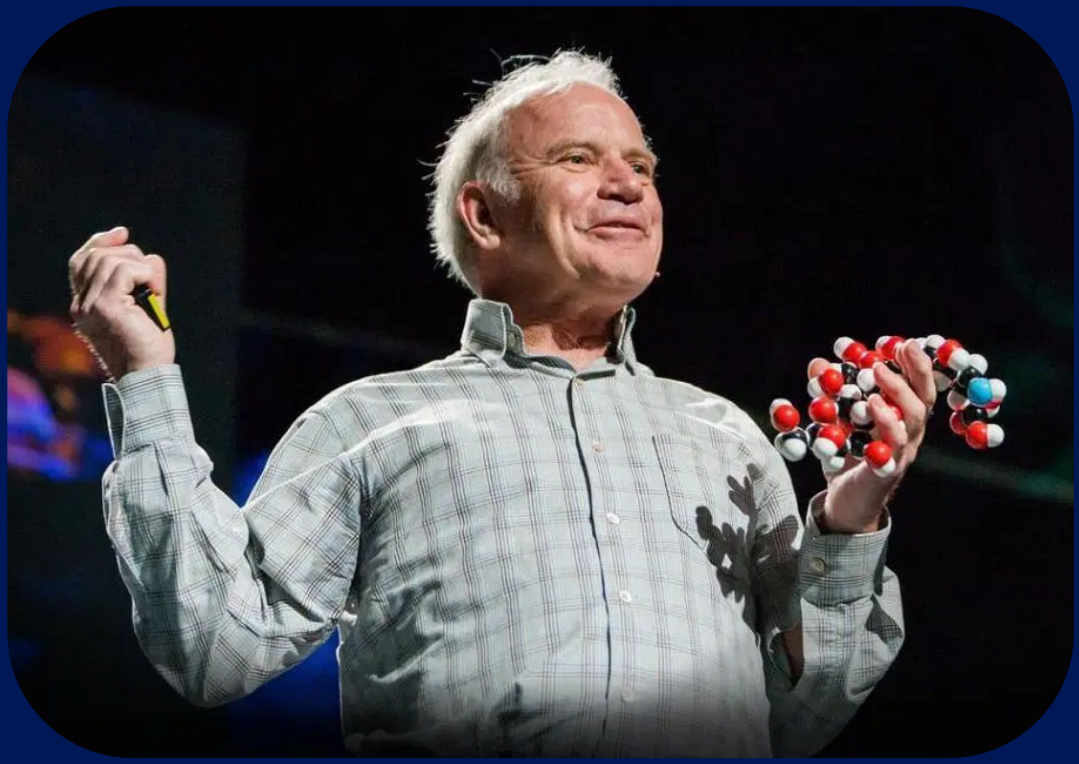
Mourning the Loss of Kary Mullis





Presidential Early Career Awards for Scientists and Engineers

Neville Sanjana, Ph.D.

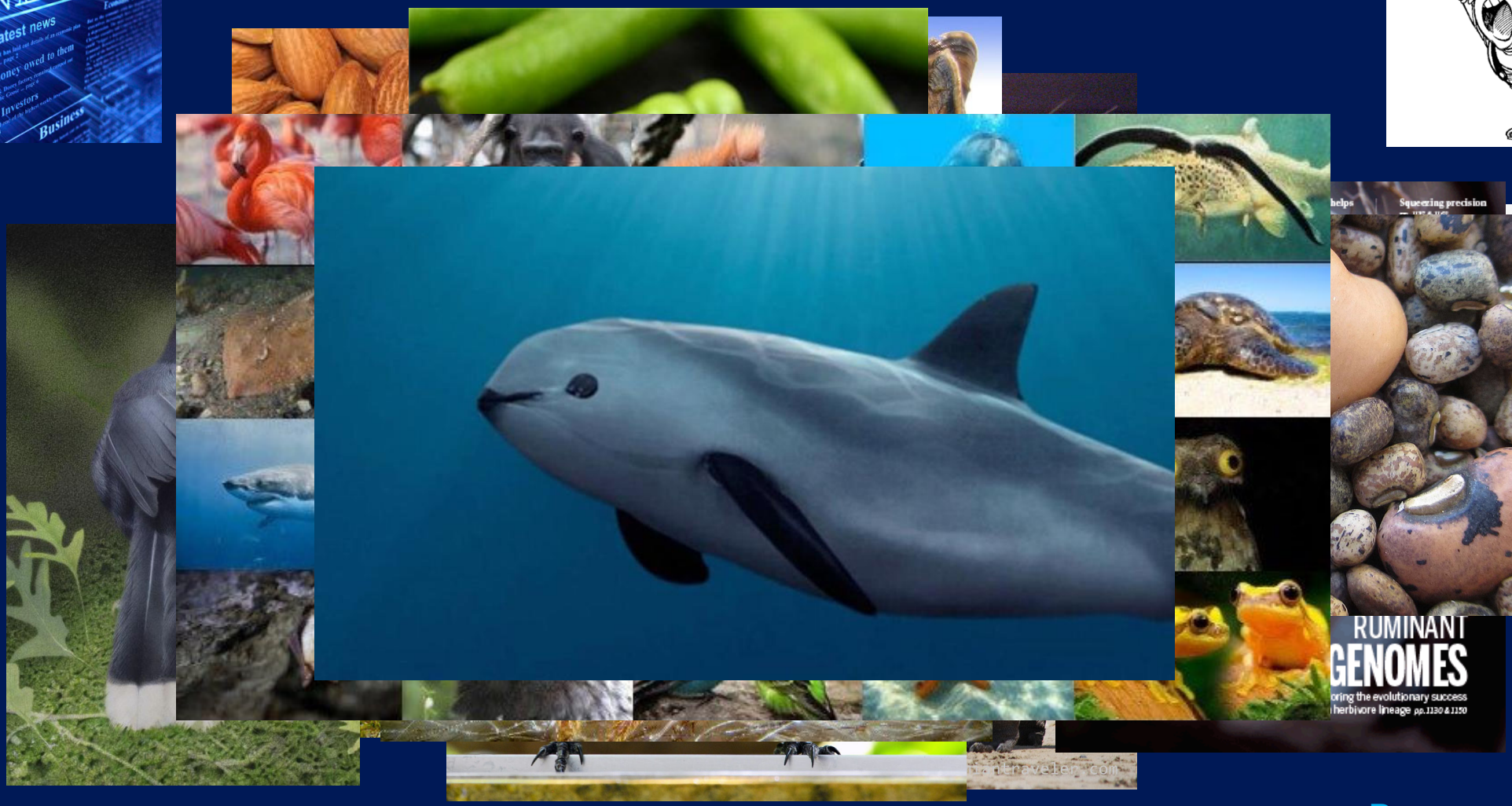
Adam Phillippy, Ph.D.

David Zhang, Ph.D.

Genomicist Receives British Knighthood

Peter Donnelly,
FRS FmedSci.

Genomes In The News…



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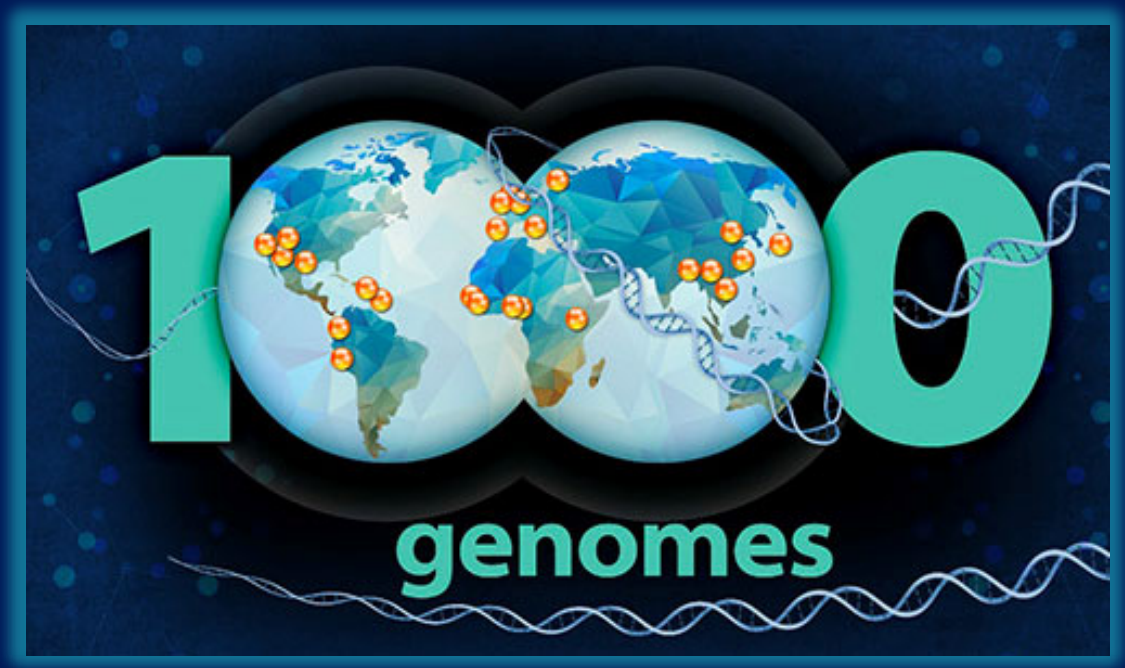
Genome Sequencing Program
Centers for Common Disease Genomics

Disease Category	Sample Type	Samples Sequenced	Samples Projected by End of Y5
Cardiovascular	Genomes	58,718	
	Exomes	61,799	
Immune-Mediated	Genomes	10,271	
	Exomes	15,135	
Neuropsychiatric	Genomes	21,728	
	Exomes	28,911	
TOTAL GENOMES		**~91,000**	**~141,000**
TOTAL EXOMES		**~105,000**	**~212,000**

Genome Sequencing Program

1000 Genomes High-Quality Sequences Available



IGSR

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Genome Sequencing Program

Centers for Mendelian Genomics

Tier 1	
Total	3,048
Novel	1,219 (40%)
Not Novel	1,829 (60%)

Tier 2	
Total	1,595
Novel	1,550 (97%)
Not Novel	45 (3%)

Data Sharing	
Matchmaker Exchange	125,000
VariantMatcher	5,796
ClinVar	3,986

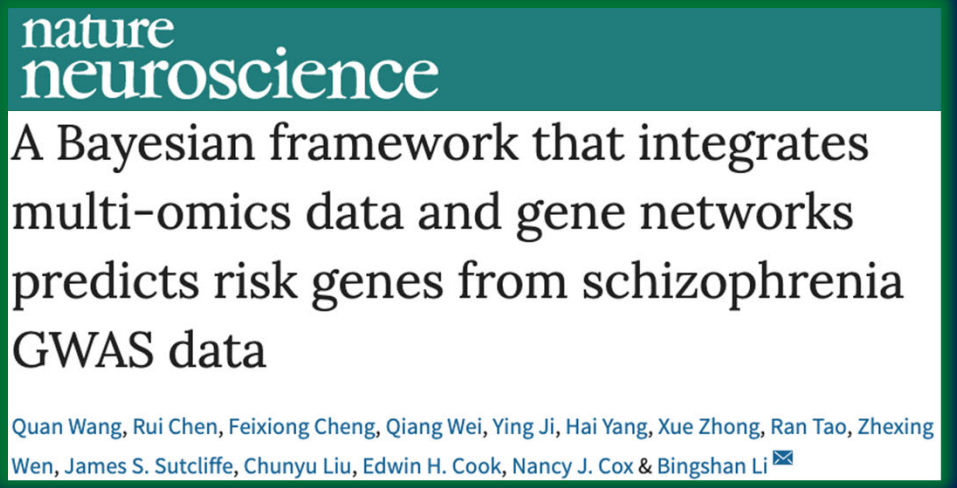
Matchmaker Exchange

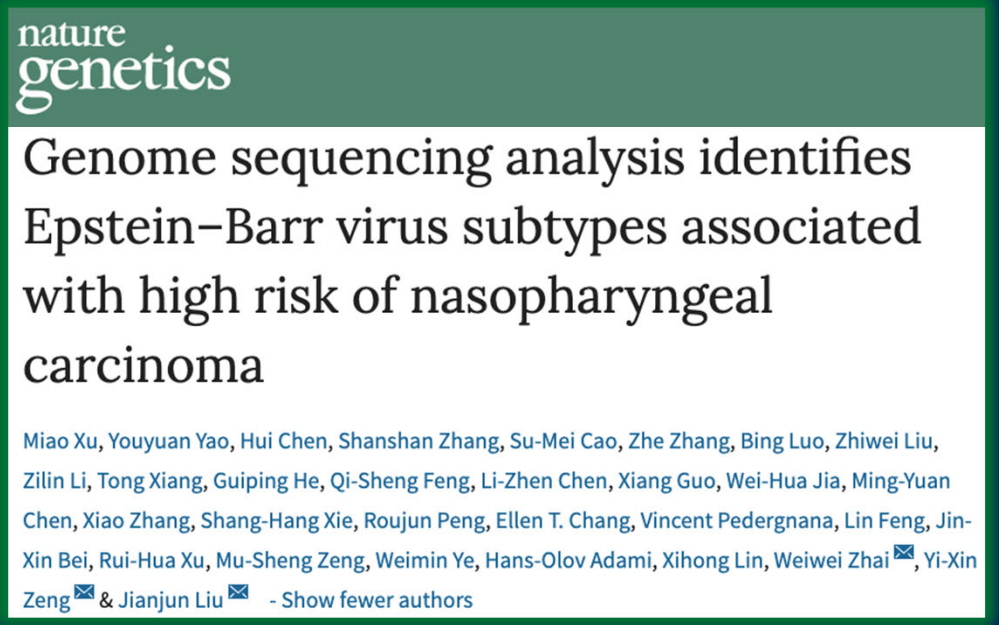
ClinVar
Clinically relevant variation

VariantMatcher

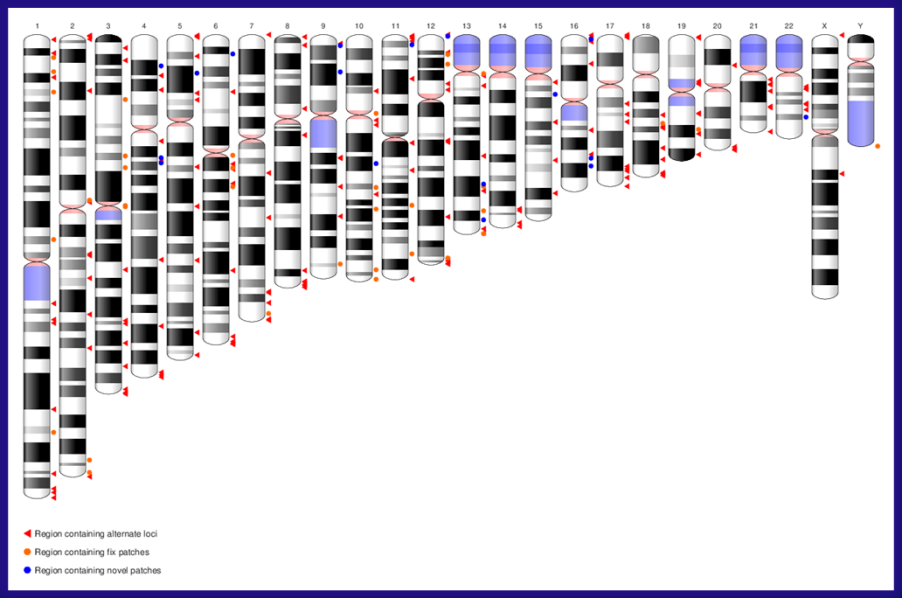
Genome Sequencing Program

Genome Sequencing Program Analysis Centers





Human Genome Reference Program



Two centers funded:

Human Genome Reference Center (HGRC)

THE GENOME INSTITUTE at Washington University

High-Quality Human Reference Genomes Center (HGRQ)

UNIVERSITY OF CALIFORNIA SANTA CRUZ Genomics Institute

Technology Development Program

Advanced Genomic Technology Development Meeting

- **Novel Genomic Technology Development Program Announcement**
  PAR-HG-18-777 (R01, also linked R21 and R43/44)
  Next application due date: October 2, 2019

Technology Development Program

Recent Papers

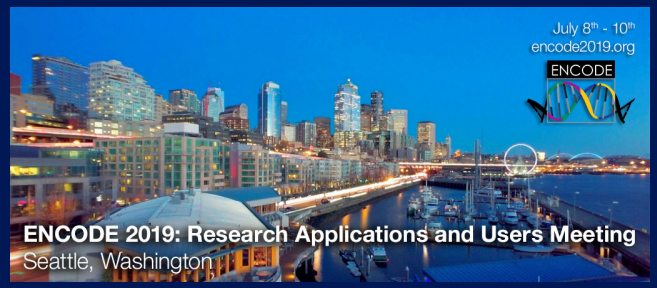
DNA Microscopy: Optics-free Spatio-genetic Imaging by a Stand-Alone Chemical Reaction

Joshua A. Weinstein,[1,8,*] Aviv Regev,[1,2,3,4,*] and Feng Zhang[1,3,5,6,7,*]

Increasing the accuracy of nanopore DNA sequencing using a time-varying cross membrane voltage

Matthew T. Noakes[1,2], Henry Brinkerhoff[1,2], Andrew H. Laszlo[1], Ian M. Derrington[1], Kyle W. Langford[1], Jonathan W. Mount[1], Jasmine L. Bowman[1], Katherine S. Baker[1], Kenji M. Doering[1], Benjamin I. Tickman[1] and Jens H. Gundlach[1*]

ENCyclopedia of DNA Elements (ENCODE)



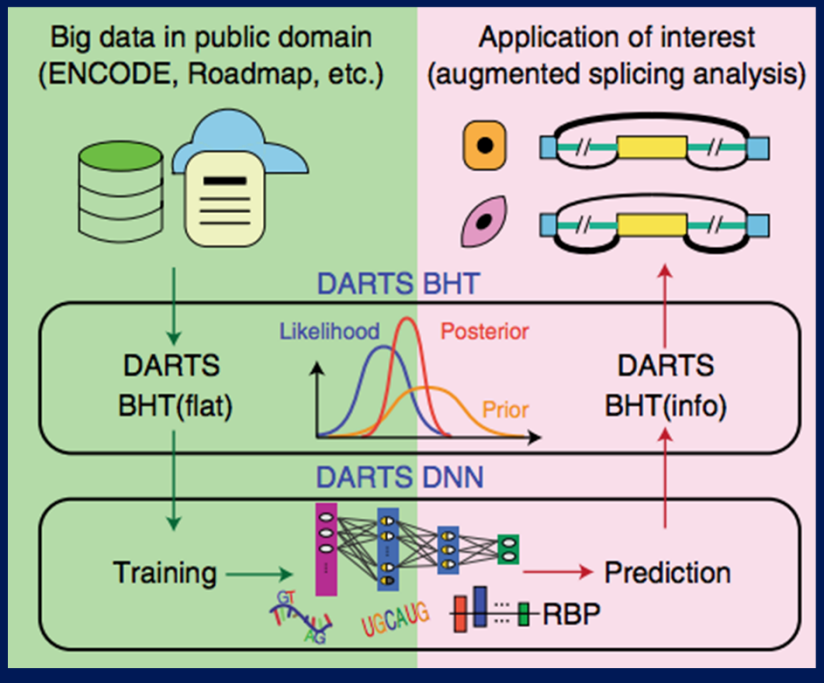
- **Research Applications & Users Meeting in Seattle, WA**
  - **Accessing ENCODE's 15,000+ Datasets**
  - **Using the GENCODE reference annotation of human and mouse genes and transcripts**
  - **Neural networks and deep learning: applications to genomics and gene regulation**

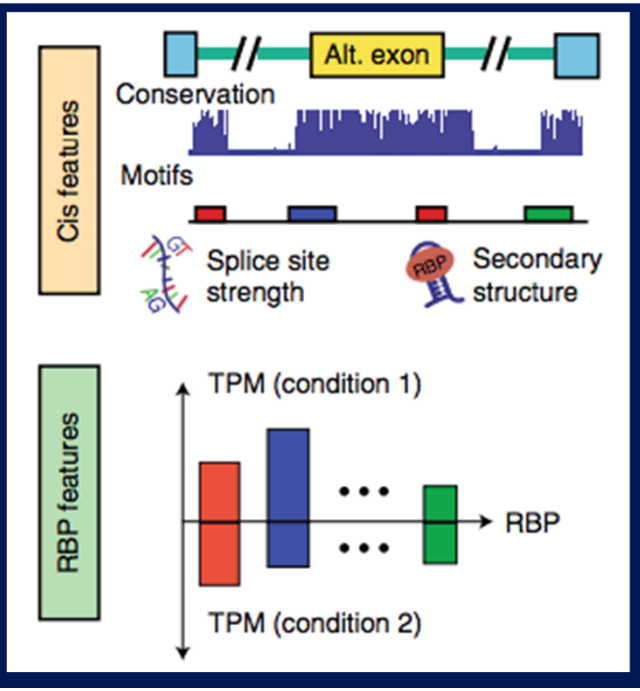
- **Next Users Meeting planned for Summer 2020 in Barcelona, Spain**

ENCyclopedia of DNA Elements (ENCODE)

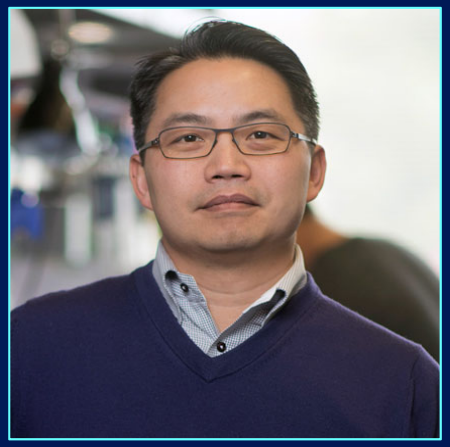
Deep-learning augmented RNA-seq analysis of transcript splicing

Zijun Zhang[1,8], Zhicheng Pan[1,8], Yi Ying[2], Zhijie Xie[2], Samir Adhikari[2,3], John Phillips[4], Russ P. Carstens[5], Douglas L. Black[2], Yingnian Wu[6] and Yi Xing[1,2,3,7*]

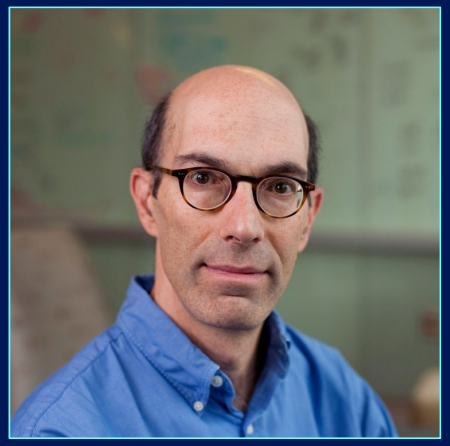




Centers of Excellence in Genomic Science (CEGS)



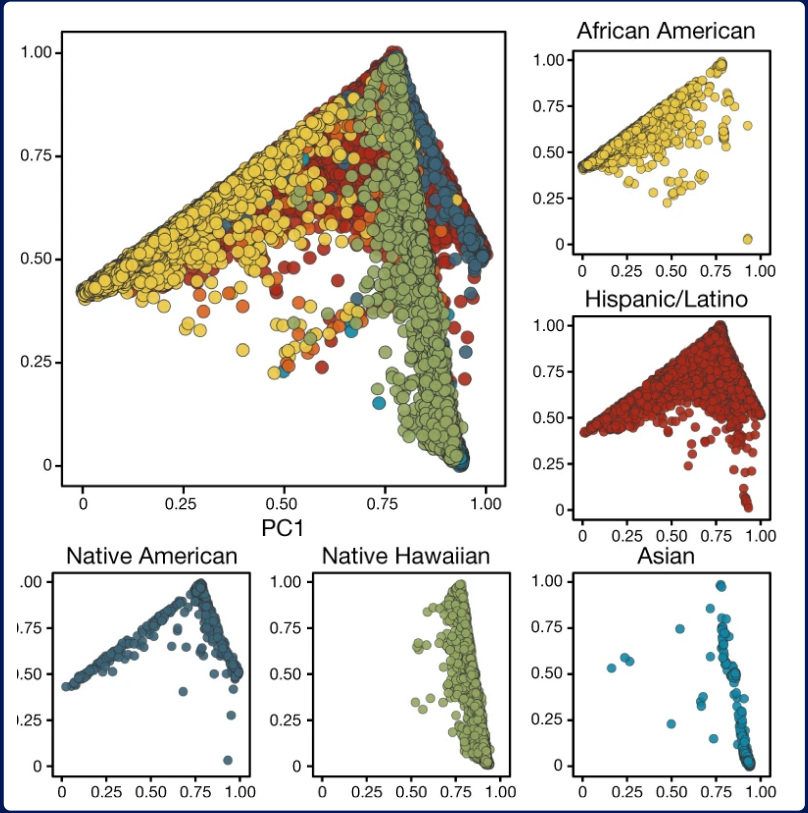
Center for Personal Dynamic Regulomes
Howard Chang
Stanford University



Center for the Multiplexed Assessment of Phenotype
Stanley Fields & Douglas Fowler
University of Washington

Population Architecture using Genomics and Epidemiology (PAGE)

Principal Component Analysis



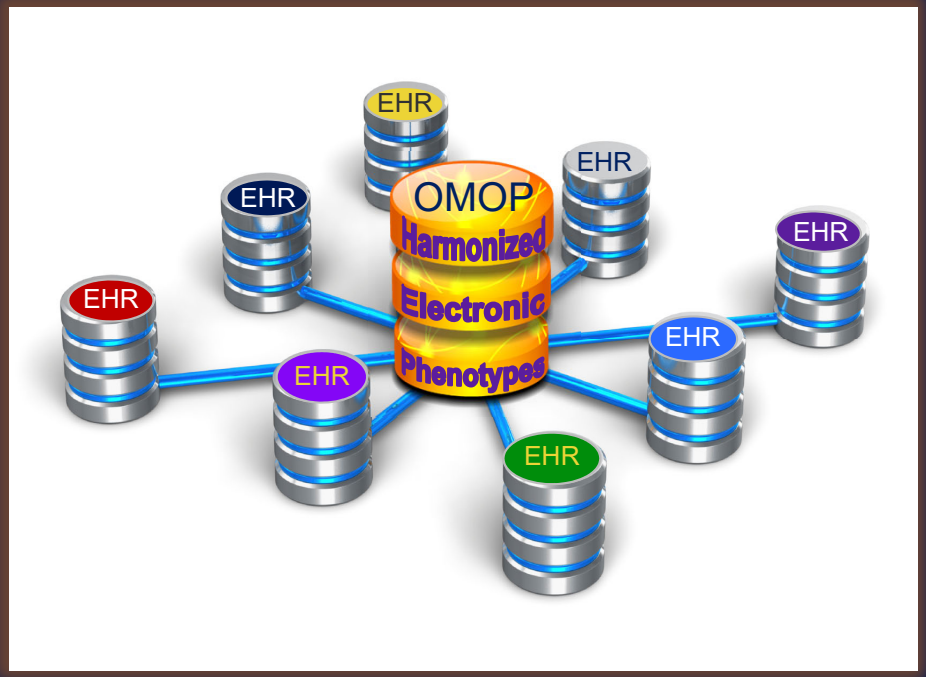
Wojcik et al. *Nature* (2019)

Added value of diversity in GWAS:

- Analysis of European ancestry (EA) height GWAS: more variation in height explained in EA vs. non-EA populations
- Adding 50K EA participants: widens gap
- Adding 50K non-EA participants: narrows gap
- Risk of exacerbating disparities in genetic knowledge

emerge network

ELECTRONIC MEDICAL RECORDS AND GENOMICS



Contents lists available at ScienceDirect

Journal of Biomedical Informatics

journal homepage: www.elsevier.com/locate/yjbin

Facilitating phenotype transfer using a common data model

George Hripcsak[a,b,*], Ning Shang[a], Peggy L. Peissig[c], Luke V. Rasmussen[d], Cong Liu[a], Barbara Benoit[e], Robert J. Carroll[f], David S. Carrell[g], Joshua C. Denny[f,h], Ozan Dikilitas[i], Vivian S. Gainer[e], Kayla Marie Howell[j], Jeffrey G. Klann[e], Iftikhar J. Kullo[i], Todd Lingren[k], Frank D. Mentch[l], Shawn N. Murphy[e], Karthik Natarajan[a,b], Jennifer A. Pacheco[d], Wei-Qi Wei[f], Ken Wiley[m], Chunhua Weng[a]

- **Clinical sites converted local data model to the Observational Medical Outcomes Partnership (OMOP) Common Data Model (CDM)**
- **Conversion helped identify errors**
- **Value of using the OMOP data model when generating e-phenotypes**

Clinical Genome (ClinGen) Resource

NEW **Variant Curation Panels**

- Very Long-Chain Acyl-CoA Dehydrogenase Deficiency
- Hereditary Hemorrhagic Telangiectasia
- *FBN1* for Marfan & Hereditary Thoracic Aortic Aneurysm and Dissection
- Coagulation Factor Deficiency
- Cerebral Creatine Deficiency Syndromes

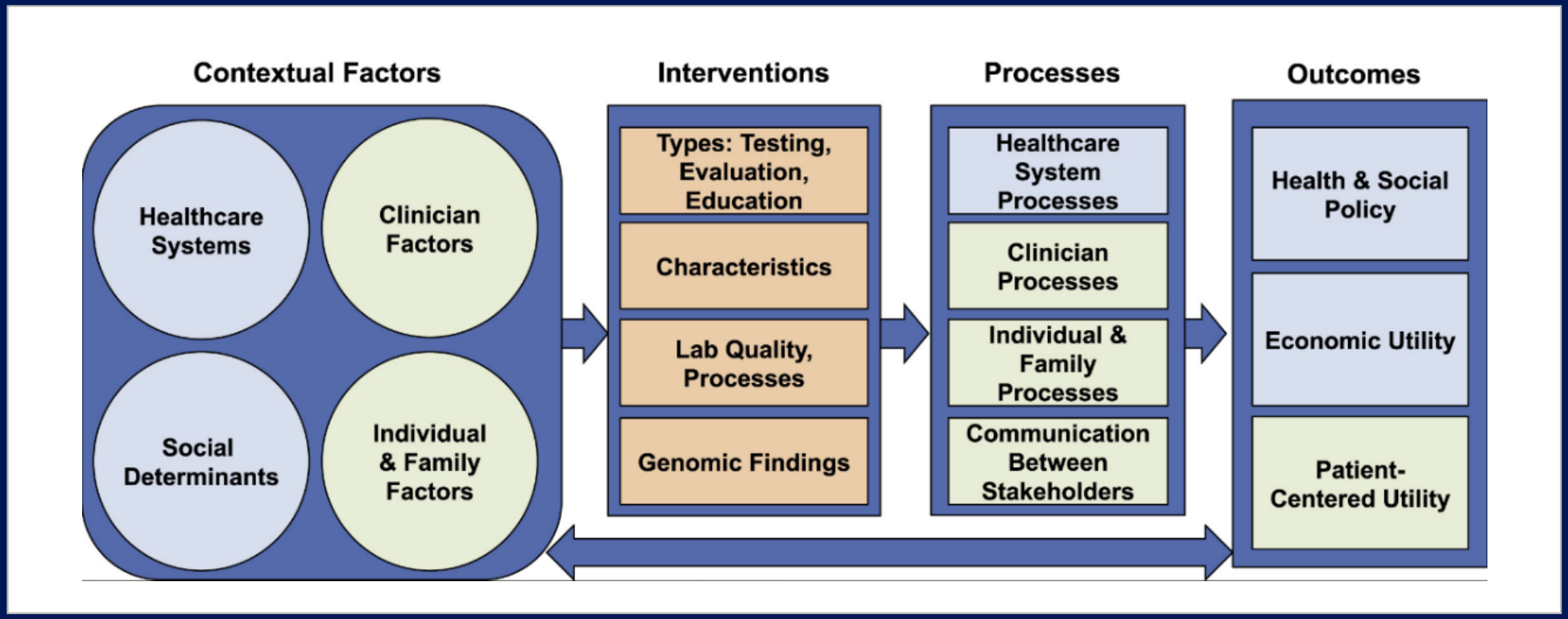
Volunteer to Curate

- 248 people completed the survey
- 116 volunteers completed training

Document 20

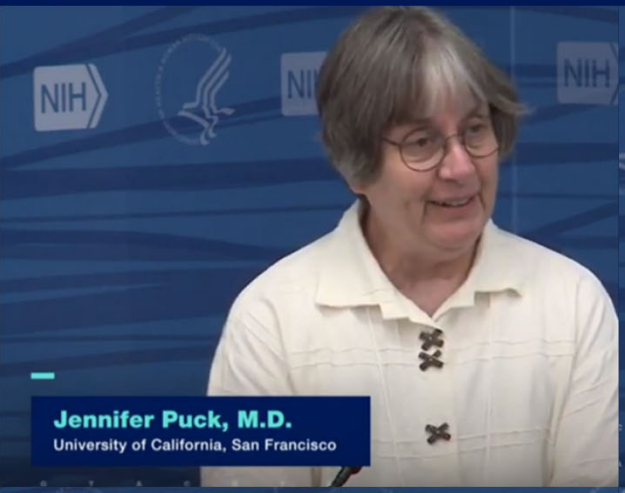
Clinical Sequencing Evidence-Generating Research Program

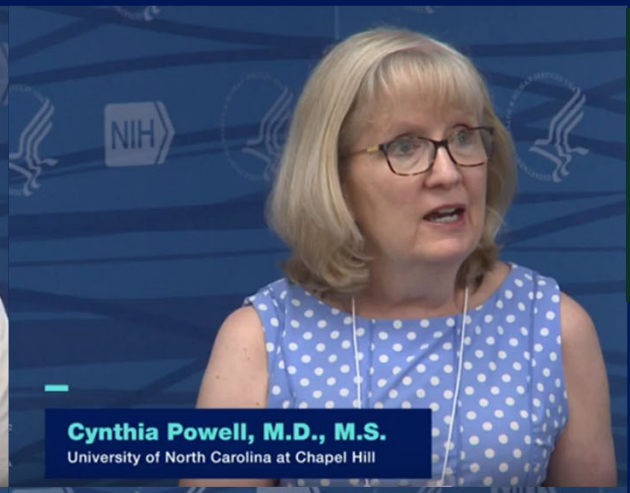
The Genomic Medicine Integrative Research Framework: A Conceptual Framework for Conducting Genomic Medicine Research

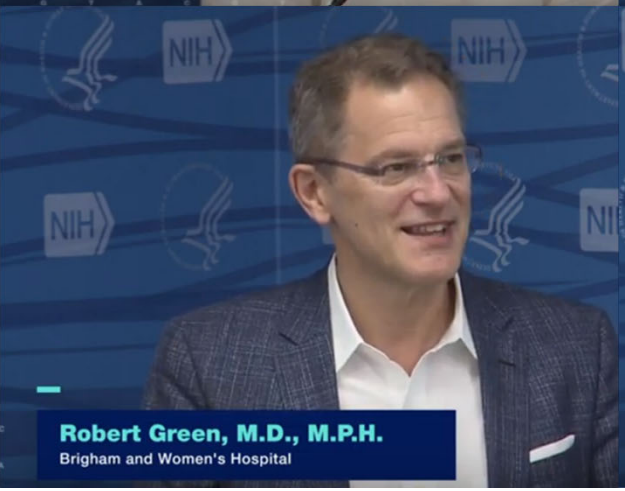


Horowitz et al. *Am J Hum Genet* (2019)

Newborn Sequencing In Genomic medicine and public HealTh (NSIGHT)







NSIGHT Final Public Session

June 24, 2019

YOUR HEALTH

The Promises And Pitfalls Of Gene Sequencing For Newborns

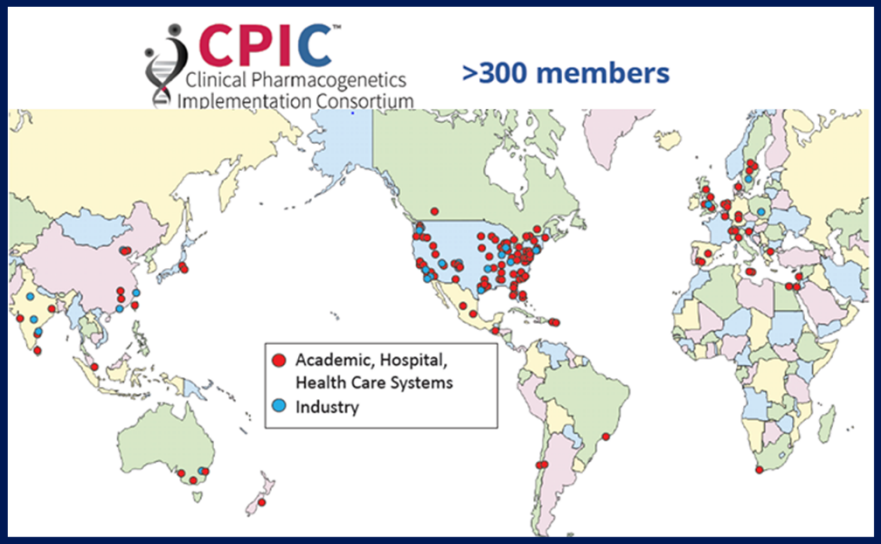
July 8, 2019 · 5:00 AM ET
Heard on Morning Edition

RICHARD HARRIS

Shots HEALTH NEWS FROM NPR

Document 22

Clinical Pharmacogenetics Implementation Consortium (CPIC®)



June 2019 Meeting:

- Identify practical considerations for choosing a genetic testing platform and clinical laboratory
- Summarize the risks and benefits of returning pharmacogenetic test results
- Describe barriers to implementation of pharmacogenetics
- Define successful implementation of pharmacogenetics and associated improvements

genomeweb

Menu

Clinical PGx Consortium Taking Aim at Non-Actionable Genes, Countering 'Inappropriate' Marketing

Jun 17, 2019 | Turna Ray

Document 23

ELSI Research Program

Center for ELSI Resource and Analysis (CERA)

- **Co-PIs:**
  - Mildred Cho (Stanford University)
  - Sandra Lee (Columbia University)
- **Goals:**
  - Resource Sharing and Coordination
  - Data Curation and Synthesis
  - Increase availability and visibility of ELSI resources

ELSI Research Program

5th ELSI Congress

COLUMBIA DIVISION OF ETHICS
DEPARTMENT OF MEDICAL HUMANITIES AND ETHICS

- June 15-17, 2020
- Hosted by Columbia Division of Ethics (New York City)
- Abstracts due in late fall

Research Training and Career Development

- **New DAP Awards:**

  Stanford University
  PI: Michael Snyder

  Baylor College of Medicine
  PIs: Richard Gibbs & Debra Murray

- **New T32 Training Award:**

  Massachusetts General Hospital
  PIs: Jordan Smoller & Heidi Rehm

Genomic Innovator Awards

2019 Awardees

PI	Institution
Eric Gamazon	Vanderbilt University Medical Center
Stacy Gray	Beckman Research Institute/City Of Hope
Channabasavaiah Gurumurthy	University Of Nebraska Medical Center
Timothy O'Connor	University of Maryland Baltimore
Luca Pinello	Massachusetts General Hospital
Jason Vassy	Harvard Medical School

- Supports early-career researchers to do highly innovative work on important problems in genomics
- Annual receipt date October 30

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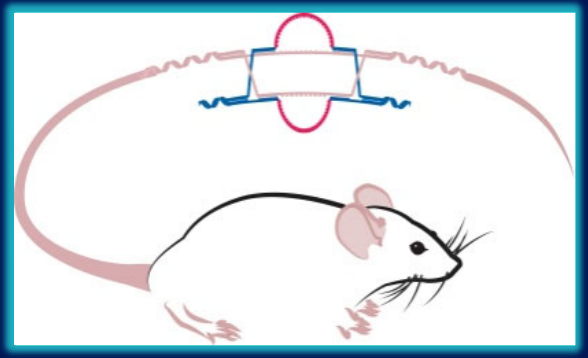
Human Microbiome Project (HMP)

- **HMP Phase 2 Collection:**
  ***Nature* May 29, 2019**
- **Four flagship papers, 20+ companion papers, & perspective**
- **All HMP data, tools, & protocols at HMP Data Coordination Center**

Knockout Mouse Phenotyping Project (KOMP2)



IMPC
International Mouse Phenotyping Consortium

- **KOMP2 Community Workshop – June 2019**
  - Prioritize completing mouse protein-coding genome
  - Strong support for generating conditional alleles
  - Valuable to the rare disease community
  - Increase outreach and interaction with research community
- **KOMP2 Annual Meeting – November 2019**
  - Focus on collaborations with human disease gene discovery programs

Genotype-Tissue Expression Project (GTEx)

GTEx Portal

dbGaP GENOTYPES and PHENOTYPES

Version 8 Data Release:

- **SNP/CNV genotypes: 900 subjects**
- **RNA-Seq expression: 17,000 samples**
- **Allele-specific expression: 16,000 samples**

Analysis, Visualization and Informatics Lab-space (AnVIL)

Human Heredity and Health in Africa (H3Africa)

48 projects, 34 countries

14th Consortium Meeting in Accra, Ghana

25 Trainee Travel Fellowships

ASHG 2019 ANNUAL MEETING
HOUSTON • OCTOBER 15-19

Document 30

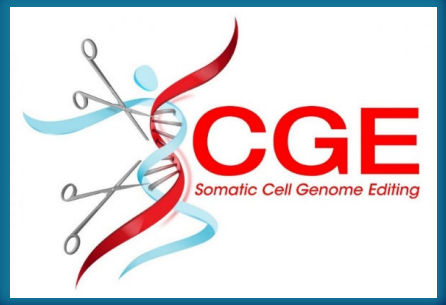
Human Heredity and Health in Africa (H3Africa)

H3Africa Biorepositories Renewed for Phase II

- Kampala, Uganda
- Abuja, Nigeria
- Johannesburg, South Africa

H3Africa Biorepository Website Launching Soon

Somatic Cell Genome Editing



- **Six components:**
  - New Delivery Systems
  - *In Vivo* Tracking
  - Animal Reporters
  - Novel Genome Editors
  - Tissue Platforms
  - Data Coordination Center
- **Second round of awards now in process**
- **Annual Program Meeting in December 2019**

All of Us
RESEARCH PROGRAM

SPECIAL REPORT

The "All of Us" Research Program

The All of Us Research Program Investigators

color

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All of Us
RESEARCH PROGRAM

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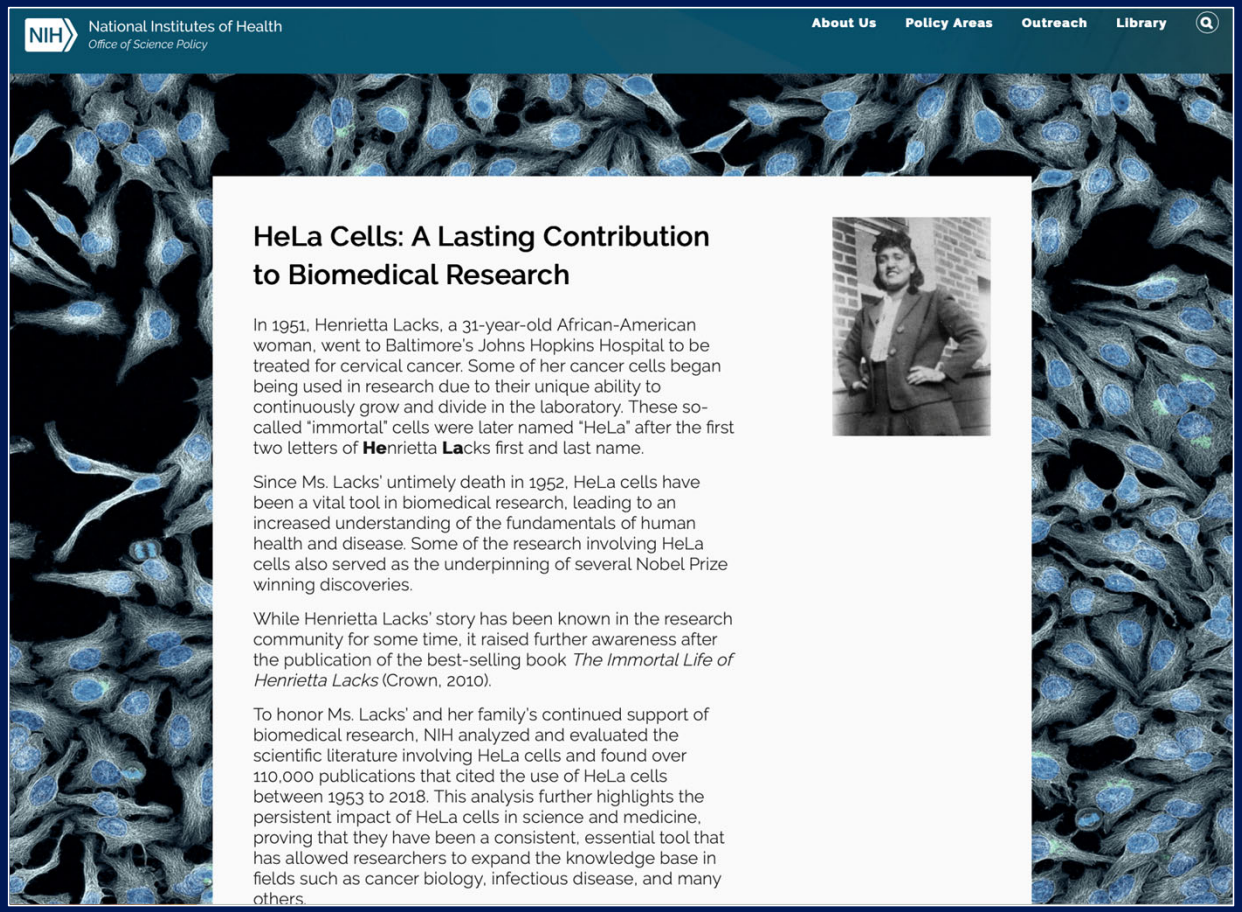
VII. NHGRI Intramural Research Program

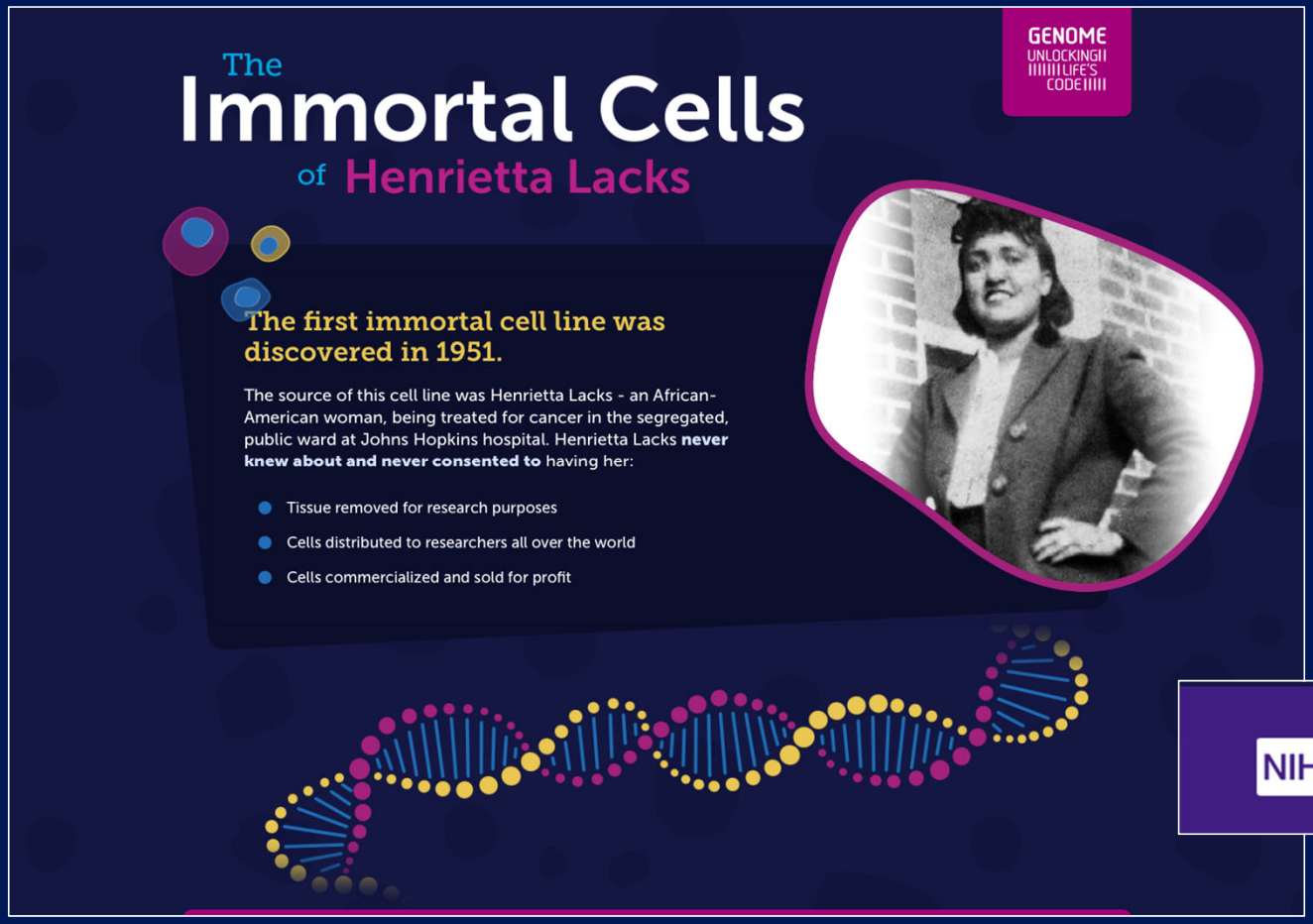
Congressional Outreach Activities

New Resource Celebrating Henrietta Lacks and the Impact of HeLa Cells on Biomedical Research



Document 34

New Lesson Plans Featuring Henrietta Lacks



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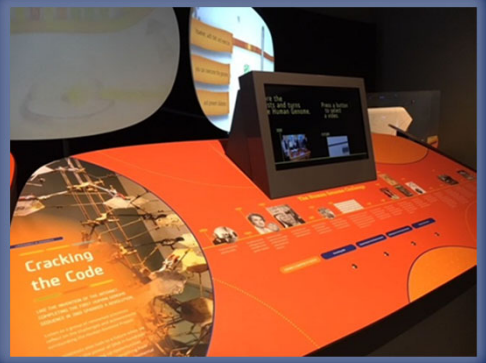
Document 35

Genome: Unlocking Life's Code Exhibition

Travel Schedule



GENOME
UNLOCKING
LIFE'S
CODE

- **September 12, 2019 – January 2, 2020**

  Turtle Bay Exploration Park, Redding, CA

- **January 17 – April 12, 2020**

  Museum of Science & History, Jacksonville, FL

NHGRI Short Course in Genomics

National Human Genome Research Institute
Short Course in Genomics

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NHGRI Summer Outreach Program

NHGRI's South by Southwest Conference Proposals

Director's Report Outline

I. General NHGRI Updates

II. General NIH Updates

III. General Genomics Updates

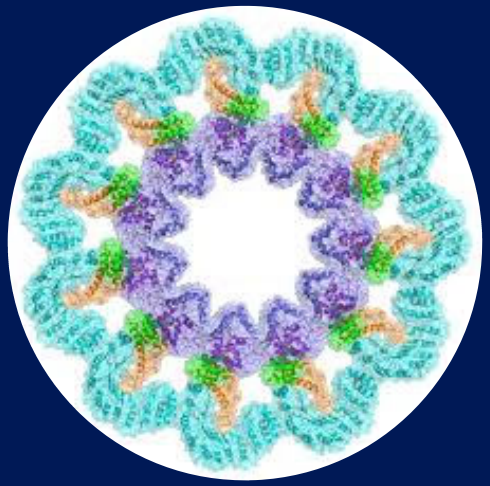
IV. NHGRI Extramural Research Program

V. NIH Common Fund/Trans-NIH

VI. NHGRI Division of Policy, Communications, and Education

VII. NHGRI Intramural Research Program

Ross Prize in Molecular Medicine



Dan Kastner, M.D., Ph.D.

Departure of NHGRI Intramural Investigator

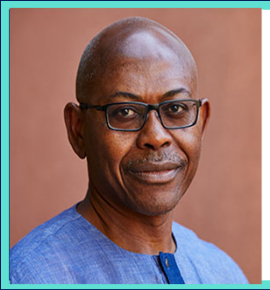
Max Muenke, M.D.

Document 40

International Summit in Human Genetics and Genomics

Document 41

NHGRI Intramural Research Highlights



nature COMMUNICATIONS

ZRANB3 is an African-Specific Type 2 Diabetes Locus Associated with Beta-Cell Mass and Insulin Response

Science Advances

***De novo* assembly of the goldfish genome and evolution of genes after whole-genome duplication**

Genetics in Medicine

Constructing identities: the implications of DTC ancestry testing for tribal communities

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