The New Mexico IDeA Network for Biomedical Research Excellence (INBRE) *Bioinformatics Core* at NCGR presents

Virtual Bioinformatics Intensive

on Differential gene Expression (DE), Metagenomics and Visualization

2021

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Agenda

- NCGR overview
  - Key Areas
  - Research
- Course Overview
- Student Information

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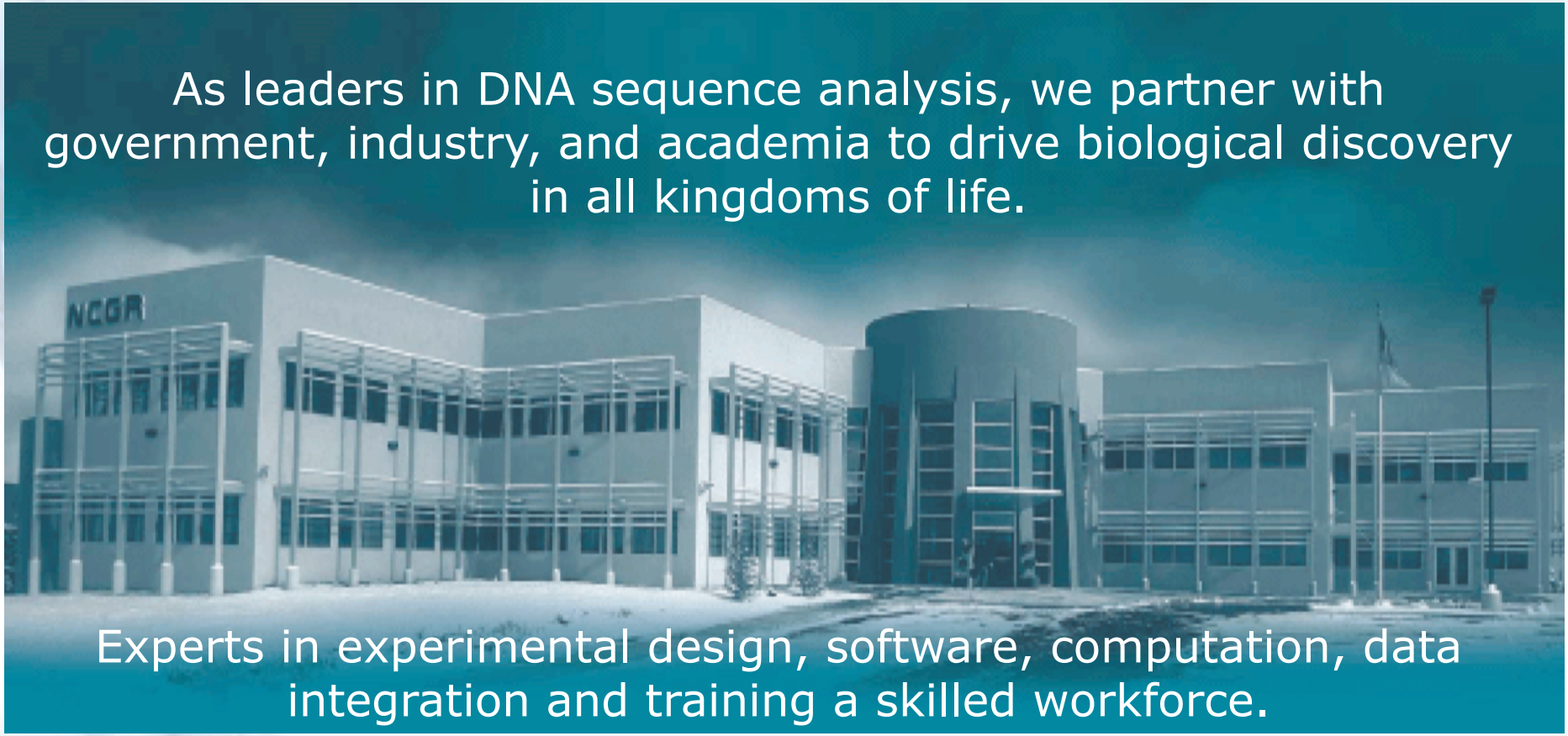
Genomic data science and education for a better world



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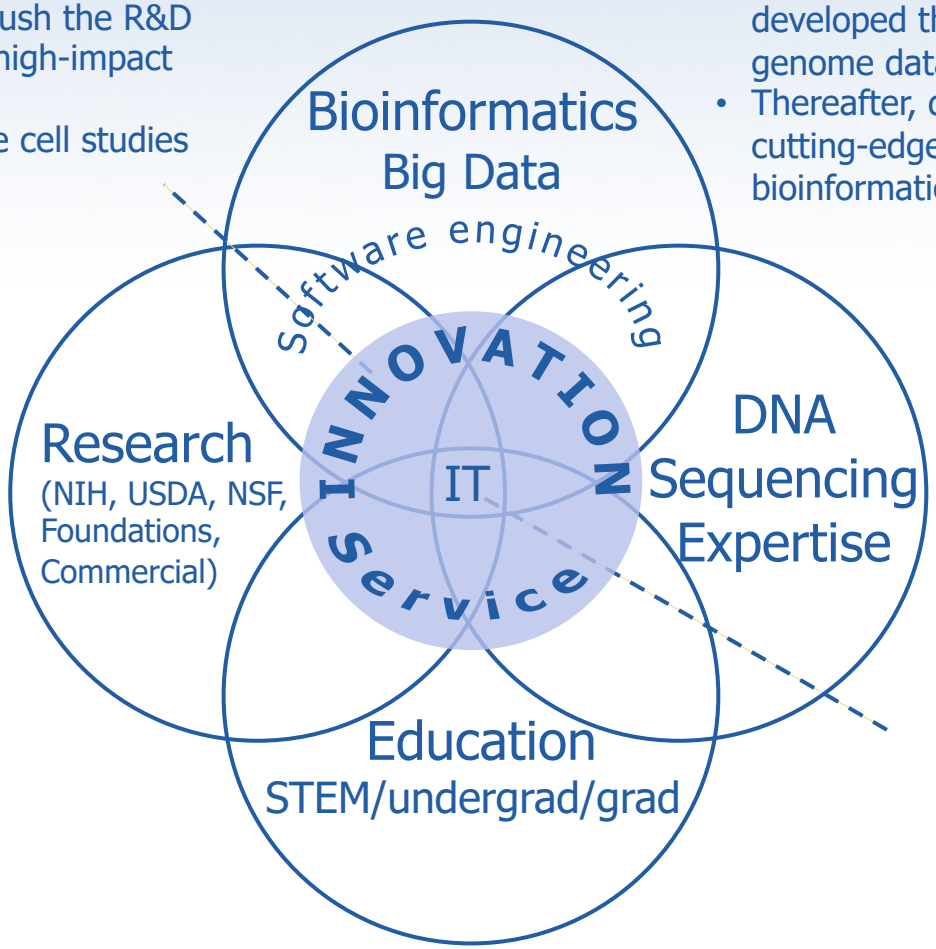
NCGR's Key Areas

Genomic exploration solutions
- Exploit technologies, push the R&D envelope, and deliver high-impact results
- Ground-breaking single cell studies

Bioinformatics champions for > 20 yrs
- Human genome project pedigree: developed the first relational human genome database (spun out of LANL)
- Thereafter, developed a multitude of cutting-edge "omics" tools and bioinformatics resources



Research in all kingdoms of life
- Expertise through numerous sequencing and bioinformatics projects
- > 225 publications

Nest generation sequencing pioneers
- 1st Illumina sequencing certified service provider in North America (2008)
- Early adopter of Pacific Biosciences sequencing technology
- Experimental design

Robust computational resources and petabyte-scale storage in a secure local infrastructure

Biotech Education. The center offers genomics/bioinformatics college seminars, workshops, internships, and pre K-12 basic science education including genomics and bioinformatics from grade three and up.

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Research at NCGR

- All kingdoms of life
- Human health
- Plant science and nutrition

Gordon and Betty Moore Foundation

National Oceanic and Atmospheric Administration, U.S. Department of Commerce

Berkeley Lab

BRDC

Generation

National Science Foundation

USDA

IBM

Sun microsystems

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MACROGEN
Advancing through Genomics

Seoul National University

UIC

JGI

Beyond Batten Disease Foundation

Bayer

The University Of Sheffield.

National Institutes of Health

deCODE genetics

PIPRA

CUGI

Bayer CropScience

MARS incorporated

AJ Brass Foundation

BTI

National Institute of General Medical Sciences

CRAY

Seal of the State of New Mexico

IMP International Mesothelioma Program

syngenta

Washington State University

GLOBAL

University of Minnesota

Iowa State University

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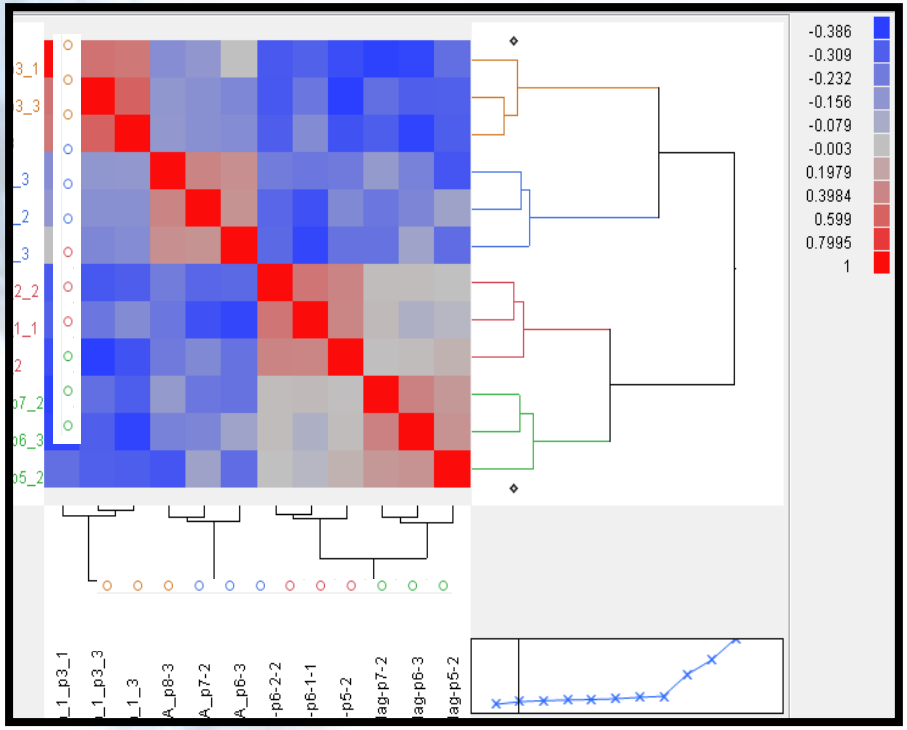
Course overview

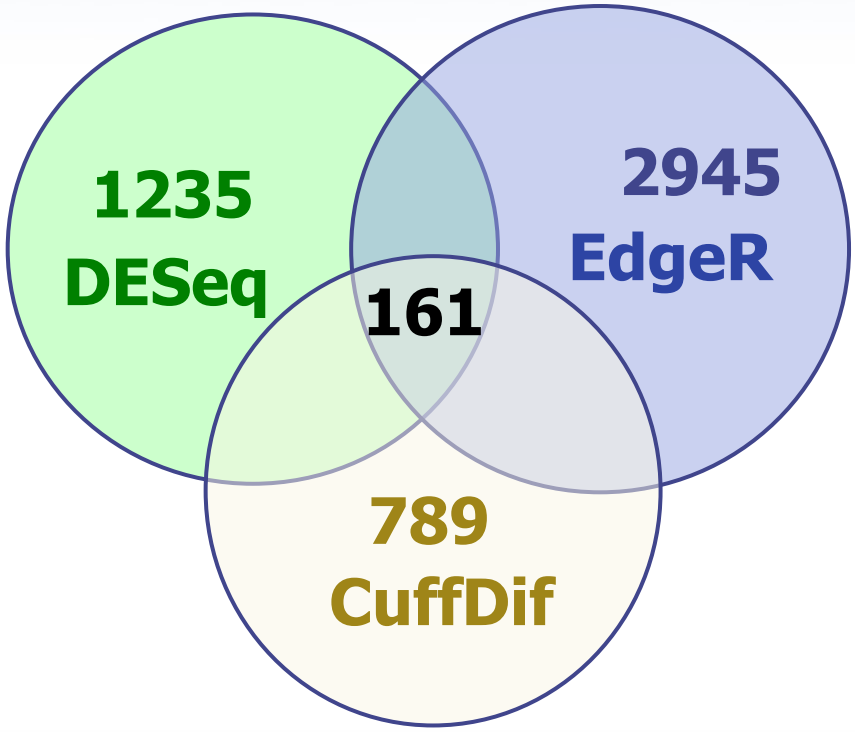
- Pre-reqs completion
- Computer systems set-up and coordination
- NCGR/NMINBRE/Course Introduction
- Participant Icebreaker
- System Orientation/Linux & Bash Basics
- Sequencing tech and lab protocols
- Differential gene Expression
- Pathway Analysis
- Visualization
- 16S Community Analysis
- Whole Genome Metagenomics
- Metatranscriptomics

Differential gene expression

Sequence-read counts of mRNA samples for expression profiling has supplanted probe array-based methods



Heatmap and Dendrogram



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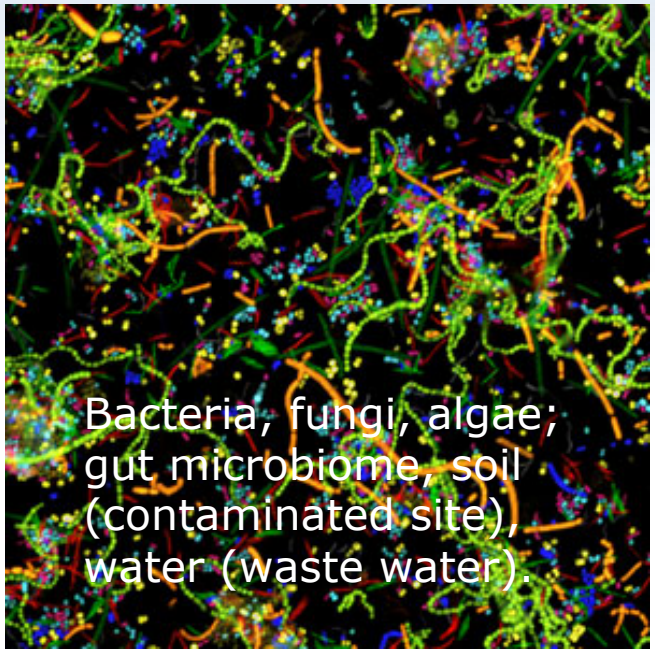
Pathway Analysis: find networks of gene interaction and function

Attaches known biological information, or functional annotation, to genomic elements.

Examples include expression, interaction, regulation, biological function, and biochemical function.

Microbial Community Analysis Meta-Genomics/Transcriptomics

- Investigate the variable regions of the small ribosomal subunit 16S gene: What species are there?
- Whole genome metagenomics: What are the genomes of these microbes?
- Metatranscriptomics: Whose active in the community?



Credit: Alex Valm.

Composition, Diversity and Abundance of Gut Microbiome in Prediabetes and Type 2 Diabetes.

Stacey M Lambeth, Trechelle Carson, Janae Lowe, Thiruvarangan Ramaraj, Jonathan W. Leff, Li Luo, Callum J Bell, Vallabh O Shah. *J Diabetes Obes 2(3): 1-7. doi:10.15436/2376-0949.15.031.* PMID: 26756039

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Student Information

- Workshop weebly website

  Find course documents in the calendar

- Virtual environment tips
  - Enable video and audio
  - Mute audio until speaking
  - Be interactive and ask questions - we're here to help!
- Funding/Acknowledgements
  - IDeA Award from NIGMS (5P20GM103451)
  - NCGR staff who assisted
- Survey & Certificate of Completion

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IDeA Award from
NIGMS (5P20GM103451)

HR/Accounting

Doreen Landau, Tyler Exe

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Thank you!

Questions?

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