OVERVIEW
My talk this morning will include…

- A few words about the J. Craig Venter Institute (JCVI)
- Some remarks about why JCVI was motivated to build a Net Zero Energy research laboratory building
- A very brief overview of the sustainability aspects of our new building
What is the J. Craig Venter Institute?

A not-for-profit research organization focusing on genomics and related fields. JCVI has over 200 scientists and staff, with labs in Rockville, Maryland and La Jolla, California.

Founded almost 25 years ago as The Institute for Genomic Research (TIGR)

Our mission: To enhance the fundamental understanding of life, and to use that knowledge to improve human health and the health of the environment.

HISTORY

Groundbreaking Research in Biological Science

- First to sequence the genome of a free-living organism, *Haemophilus influenzae*, then went on to sequence hundreds of microbial genomes
- Craig Venter, led his team at Celera to **sequence the first human genome**, using a groundbreaking research approach
- Through **Global Ocean Sampling (GOS) Expedition**, provided an initial picture of how **microbes form the foundation for life** in the world’s oceans, discovered many millions of **new genes**, and a **baseline inventory** for understanding the effects of a changing climate.
- In 2010, created the **first cell** controlled by a **synthetic, self-replicating genome**, establishing the field of synthetic genomics
Some Recent Research and Accomplishments

- Created a bacterium with the smallest set of genes needed for growth, to understand the fundamentals of cellular life
- Researching the effects of climate change on ocean microbes in Antarctica
- Using synthetic genomic approaches, developing vaccine against “cattle wasting disease” in Africa
- Studied the microbiomes and immune responses of astronauts before, during and after space flight
- Sequenced over 17,000 influenza genomes to help design future flu vaccines
- Research on persistent antibiotic resistance for the Department of Homeland Security
- Using synthetic genomic approaches, developing vaccine against “cattle wasting disease” in Africa

WHAT’S NEXT
Mission-Oriented Research To Help Solve

...some of the greatest problems facing our planet.

- Vaccine Development for Disease Prevention
- Disease Diagnosis and Treatment
- Ocean Health
- Sustainable Wastewater Treatment
- Climate Change
Why Build a Net-Zero Research Building?

J. Craig Venter, Ph.D.
CEO and Founder, JCVI

“We talk about climate change and about a sustainable environment. But everything starts at home.
Given the opportunity to build our own research building, we decided to put our ideas into action and walk the talk.”

But a Net Zero Laboratory?

- Traditional research laboratories are notoriously high-energy use buildings, thus a particularly challenging candidate for Net Zero energy.
- JCVI’s scientists have always set 'stretch goals' for our own research. JCVI has a long history of scientific “firsts”, doing things that others said could not be done. Why not set a stretch goal for the building's design and construction team to meet, as well?
- Not all experiments succeed, but they never succeed if you do not try. We gave our design team the freedom to experiment with new ideas, to use our biology research laboratory as a “laboratory for ZNE design”. 
Net Zero Research Laboratory as a “Stretch Goal”

JCVI’s target: 65 kBTU / Sq. ft. - Year

Goals for JCVI’s New Building…

- Provide JCVI’s scientists with a highly flexible research environment, with attributes that improve and encourage collaborative and interdisciplinary research.
- Enhance collaborative research between JCVI and UC San Diego, in both health and environmental sciences
- Build a sustainable, carbon-neutral biological laboratory building that embodies and enhances our scientific mission
- Serve as a model for sustainable biological research buildings worldwide
JCVI, La Jolla

- 45,000 sq. ft. building supports 125 scientists and staff
- One-story lab wing, three-story office and conference wing
- On UC San Diego Campus to facilitate ongoing and foster new collaborations
- Aspire to be world’s first “net zero energy” biological lab

485 kW Solar Panel System, Within Roofline (no fossil fuels, except for emergency generator)
Combined with State-of-the-Art Energy Efficiency to Attempt to Reach Annual Net-Zero Energy

JCVI La Jolla is designed to use about 1/4 the energy of a typical lab building.

Optimize Orientation, Daylighting, and Airflows.
Heat from the Day is Captured for Use at Night
Water Cooled at Night is Used During the Day

Building Management System

FIRE ALARM & LIFE SAFETY
- Strobe Lights
- Annunciations
- Pull Stations
- Relays (Control)

MECHANICAL CONTROLS
- Air Quality Sensors
- Rose Sensors
- Digital Sensors
- Pressure Sensors
- Air Handling Units
- Exhaust Fans
- Heat Pumps
- Chillers
- Pumps
- Towers
- Zone Level Controls

ENERGY MANAGEMENT
- Current Transformers
- Occupancy Sensors

LIGHTING CONTROLS
- Occupancy Sensors
- Lighting Controls
- Control Panel
- Monitoring
- Weather Data

BUILDING DASHBOARD
- User Dashboard
- Information Panel

SECURITY SYSTEM
- Access Control
- Video Cameras

BUILDING MONITORING
- Thermometer Probes
- Control Panel
- Photovoltaic Generation
- Building Meter

IRRIGATION CONTROLS
- Control Panel
- Weather Data
Capture of Rainfall and Condensate Dramatically Reduce Water Needs

90,000 GALLON RAINWATER RETENTION SYSTEM

REDUCE CITY WATER DEMAND BY TWO-THIRDS

WATER FLOW AND CAPTURE OVERVIEW

RAINFLOW

CONDENSATE

RAINWATER SYSTEM

TOILETS

IRRIGATION

COOLING TOWER

SOLAR PANEL WASH

CITY WATER

Other Sustainability Features

- LEED Platinum
- Cement includes 30% fly-ash for lower CO₂ emissions from manufacture
- Sustainably harvested wood
- Low-water landscaping, most of it native
- Extensive recycled content
- Operable windows in office wing
Thank You!
Research Areas

- Genomic Medicine
- Infectious Disease
- Microbial & Environmental Genomics
- Synthetic Biology & Bioenergy
- Plant Genomics
- Policy Center
Quote from J.Craig Venter

The Institute’s unique design melds the environmental philosophies of our genomics research with the sustainability goals that, I believe, must be part of all of our lives.

We had several things in mind with the design of the building, and one is that in biology form and function go together.

Some Recent Research and Accomplishments:

- Created a “minimal cell” with only the smallest set of genes necessary for growth, to better understand the fundamentals of cellular life
- Early stage development of a vaccine, using synthetic genome approaches, for contagious bovine pleuropneumonia in cattle located in Africa
- JCVI scientists are studying the microbiomes and immune responses of astronauts before, during and after space flight to investigate the longer term impacts of flight on human health
- Funded by the National Science Foundation, scientists are studying the effects of climate change on ocean microbes at the McMurdo station in Antarctica
- Sequenced over 17,000 influenza genomes and developed an algorithm to predict optimal future vaccine composition
- The Department of Homeland Security recently awarded a $5 million grant to JCVI to study persistent antibiotic resistance