

J. Craig Venter Institute: Genomics Research for the Benefit of Society

*Robert M. Friedman
Vice President for Policy
J. Craig Venter Institute*

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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.

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HISTORY

Groundbreaking Research in Biological Sciences

- **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

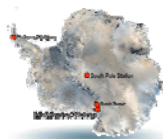
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Some Recent Research and Accomplishments



- 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



- Sequenced over 17,000 influenza genomes to help design future flu vaccines



- Studying the microbiomes and immune responses of astronauts before, during and after space flight



- Research on persistent antibiotic resistance for the Department of Homeland Security

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WHAT'S NEXT

Mission-Oriented Research To Help Solve

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



Disease
Diagnosis
and Treatment



Vaccine
Development for
Disease Prevention



Ocean Health



Sustainable
Wastewater
Treatment

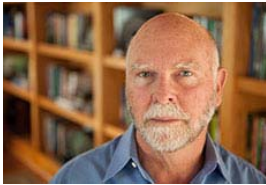


Climate
Change

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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.”

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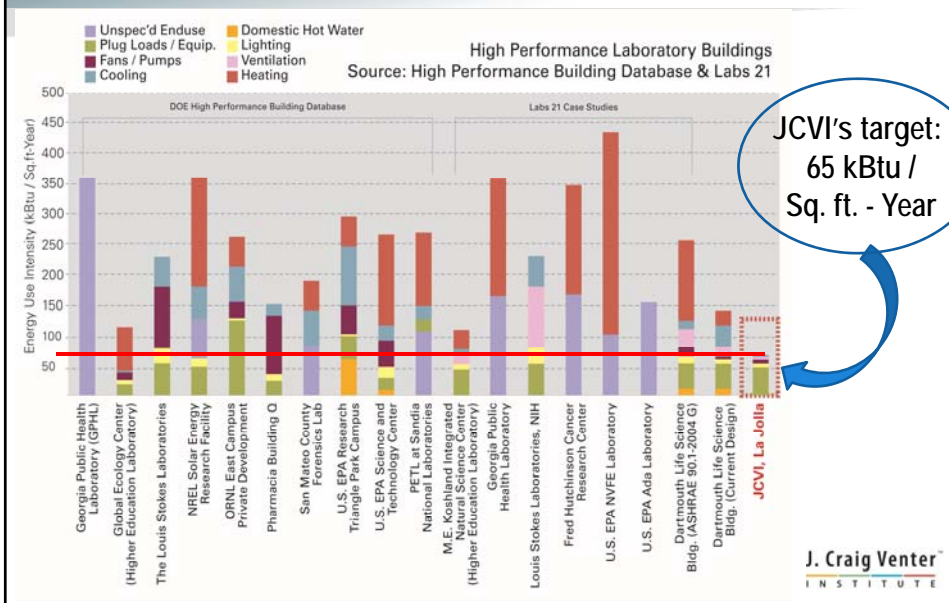
But a Net Zero *Laboratory*?

- 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”.

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Net Zero Research Laboratory as a "Stretch Goal"





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

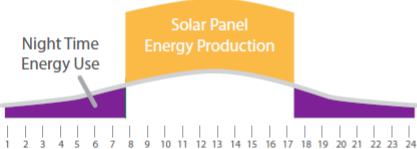
- 45,000 sq. ft. building supports 125 scientists and staff
- One-story lab wing, three-story office and conference wing
- On UC San Diego Campus to facilitate ongoing and foster new collaborations
- Aspire to be world's first "net zero energy" biological lab

485 kW Solar Panel System, Within Roofline (no fossil fuels, except for emergency generation)

**OVER THE COURSE OF A YEAR
ENERGY PRODUCTION EQUALS CONSUMPTION**

24 Hour Energy Use Profile




The chart shows a purple area representing 'Night Time Energy Use' from 0 to 6 and 18 to 24 hours. An orange area representing 'Solar Panel Energy Production' is shown from 6 to 18 hours, peaking at approximately 12:00. The x-axis is labeled 1 through 24.

Solar Panel System Facts

- Solar Array Size: 1/2 MW
- Annual Output: 850,000 kWh
- Most efficient panel available: 20.1%

Seasonal Energy Profile

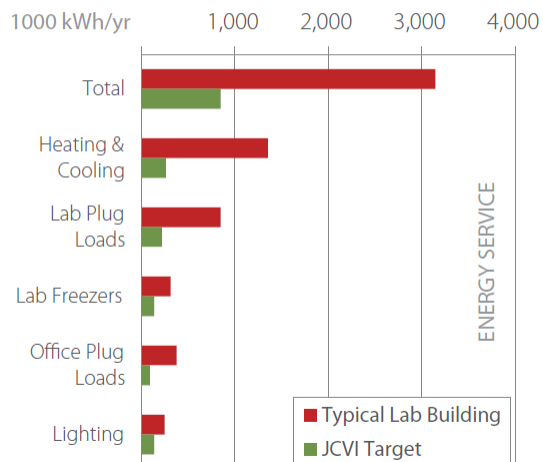


The chart shows a blue area representing energy consumption and an orange area representing energy production over a 12-month period (J, F, M, A, M, J, J, A, S, O, N, D). The production area is larger than the consumption area, and the net result is labeled as = 0.

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Combined with State-of-the-Art Energy Efficiency to Attempt to Reach Annual Net-Zero Energy

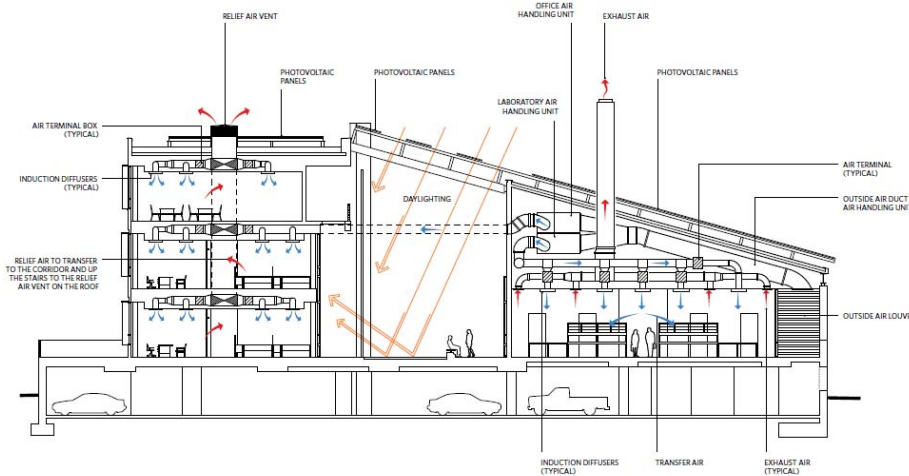
JCVI LA JOLLA IS DESIGNED TO USE ABOUT 1/4 THE ENERGY OF A TYPICAL LAB BUILDING

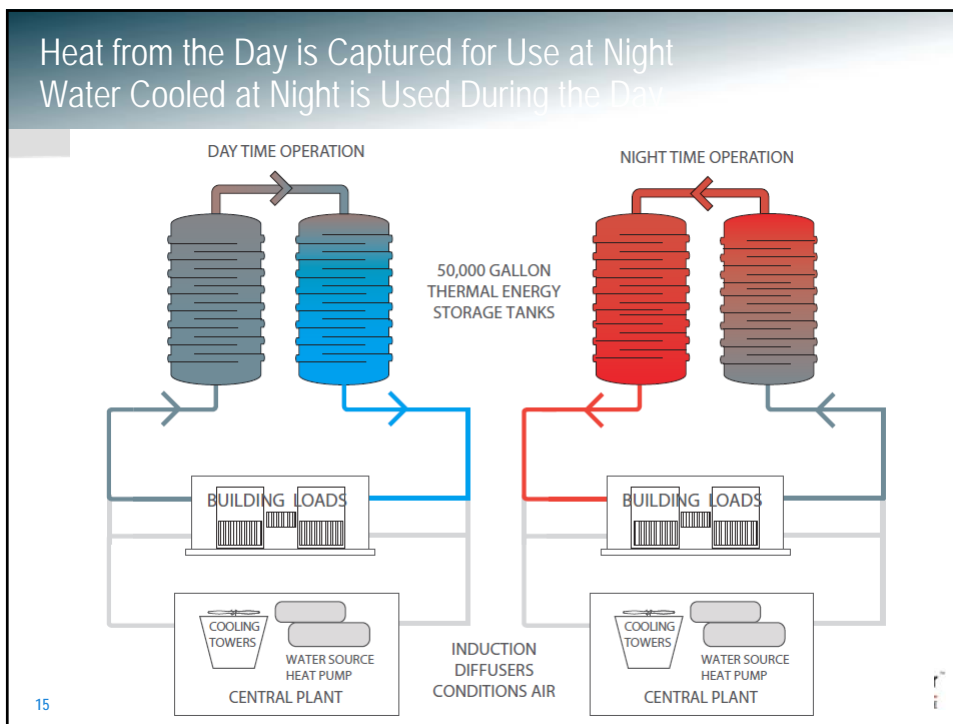


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Optimize Orientation, Daylighting, and Airflow



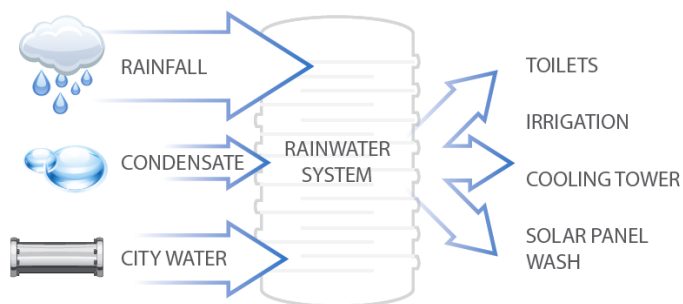


Capture of Rainfall and Condensate Dramatically Reduce Water Needs

90,000 GALLON RAINWATER
RETENTION SYSTEM

REDUCE CITY WATER
DEMAND BY TWO-THIRDS

WATER FLOW AND CAPTURE OVERVIEW



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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

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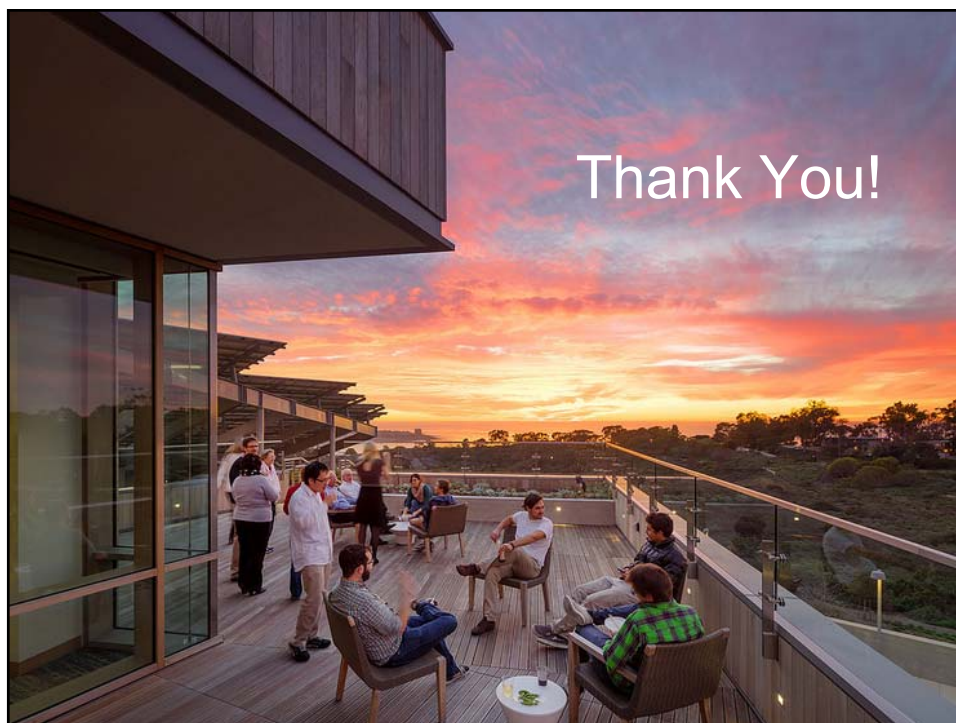
Project Team



Thank You!

ARCHITECT / INTERIOR DESIGNER
ZGF Architects LLP
GENERAL CONTRACTOR
McCarthy Building Companies, Inc.
MEP ENGINEERS
Integral Group / Peter Rumsey, P.E.
LIGHTING DESIGNER
David Nelson & Associates, LLC
CIVIL / STRUCTURAL ENGINEER
KPF Consulting Engineers, Inc.
LABORATORY PLANNER
Jacobs Consultancy
LANDSCAPE ARCHITECTS
Andropogon Associates, Ltd. /
David Reed Landscape Architects

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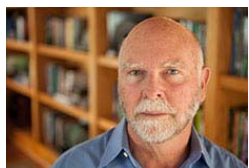
Research Areas

	Genomic Medicine		Infectious Disease
	Microbial & Environmental Genomics		Synthetic Biology & Bioenergy
	Plant Genomics		Policy Center

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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.

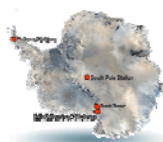
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Some Recent Research and Accomplishments



- Created a "minimal cell" with only the smallest set of genes necessary for growth, to better understand the fundamentals of cellular life



- Funded by the National Science Foundation, scientists are studying the effects of **climate change** on ocean microbes at the McMurdo station in Antarctica



- Early stage development of a vaccine, using synthetic genome approaches, for contagious bovine pleuropneumonia in cattle located in Africa



- Sequenced over 17,000 influenza genomes and developed an algorithm to predict optimal future vaccine composition



- 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



- The Department of Homeland Security recently awarded a **\$5 million grant** to JCVI to study persistent antibiotic resistance

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