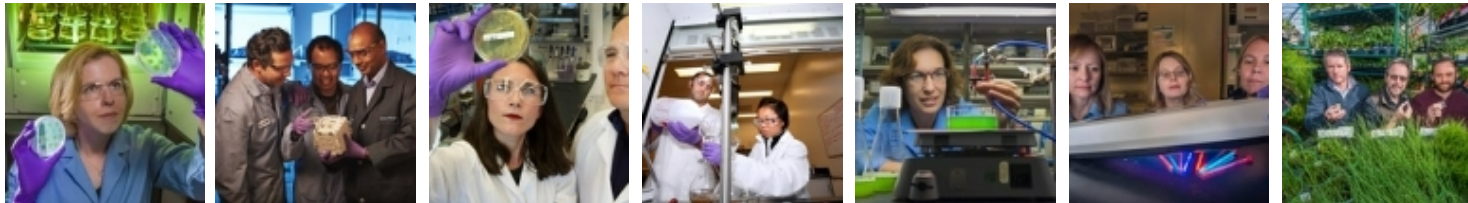




Algal research at Sandia National Laboratories: Partnering for success



October 4, 2021

Amanda N. Barry
Sandia National Laboratories

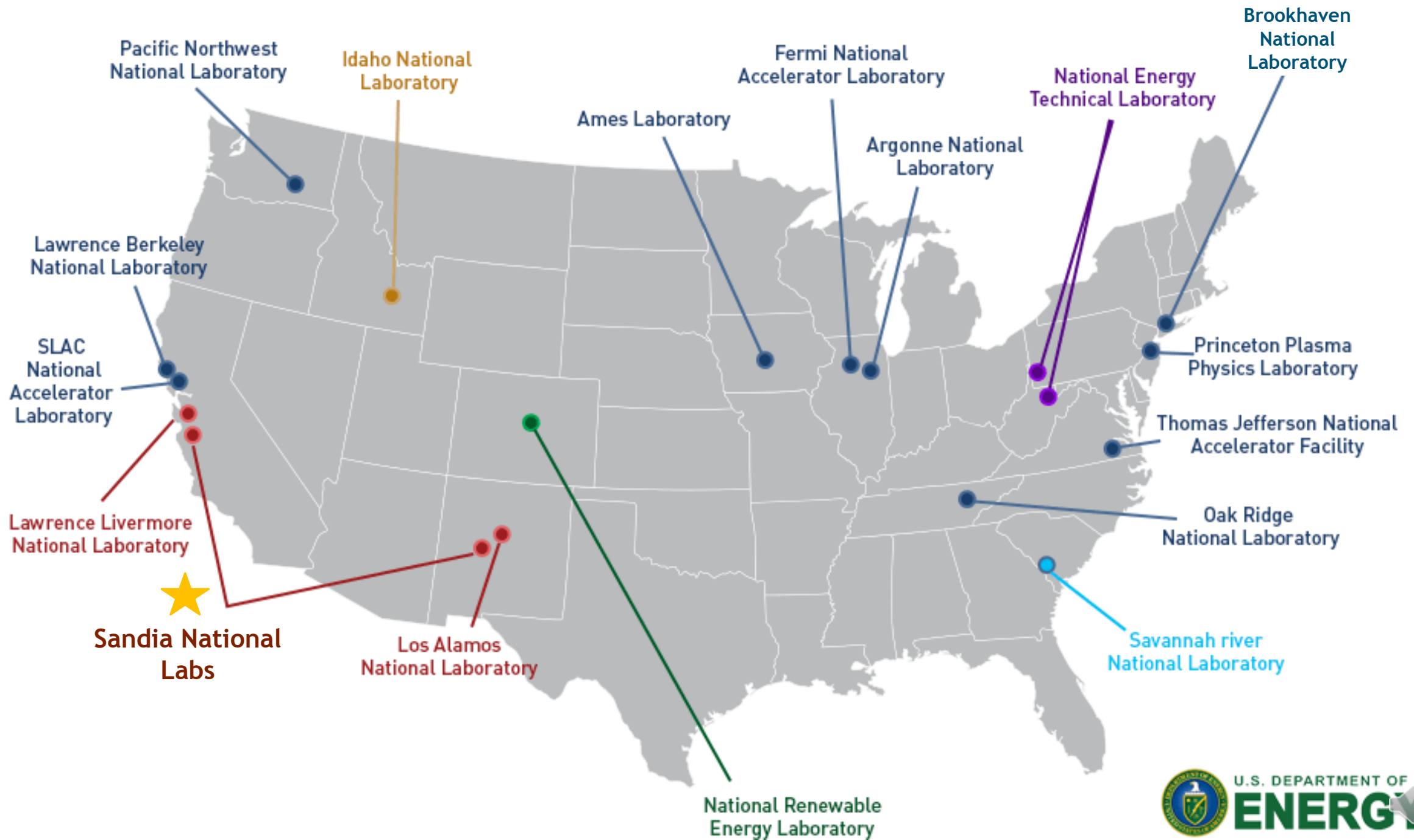
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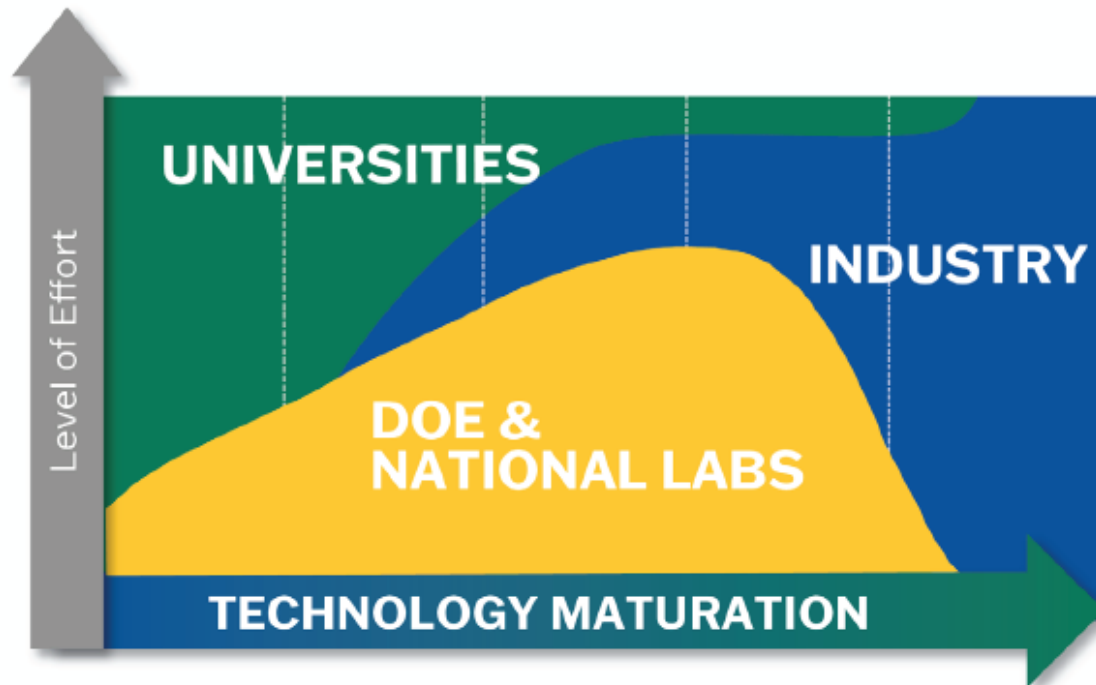


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SANDXXX



DOE NATIONAL LABORATORIES' RELATIONSHIP TO UNIVERSITIES & INDUSTRY IN THE INNOVATION SYSTEM



COMMERCIALIZATION

Technology available
for large-scale market use

DEMONSTRATION

System demonstrated
in operational environment

SYSTEM TESTING

System performance
confirmed at pilot-scale

DEVELOPMENT

Technology component
validated/integrated

DISCOVERY

Concept identified/proven at
laboratory-scale



U.S. DEPARTMENT OF
ENERGY





2

SANDIA'S PURPOSE



Render exceptional service in the national interest.

SANDIA'S VISION



On behalf of our nation, we anticipate and solve the most challenging problems that threaten security in the 21st century.

SANDIA'S MISSION



Our unique mission responsibilities in nuclear weapons create a foundation from which we leverage capabilities, enabling us to solve complex national security problems.

OBJECTIVE

Unleashed innovation and high-velocity engineering to counter global threats.

by...

- Anticipating future threats
- Applying revolutionary science and engineering
- Dramatically reducing delivery timelines
- Inspiring and including contributions from all
- Leading the enterprise
- Serving as an FFRDC with objectivity and independence in the public interest
- Taking appropriate risks

resulting in...

- ✓ Sustained US technical advantage
- ✓ An unstoppable team
- ✓ Breakthrough innovations
- ✓ Timelines cut in half
- ✓ Exceptional service in the national interest





5

RESPONDING TO CLIMATE CHANGE IS A STRATEGIC IMPERATIVE

Severe
Weather Events

Wildfires

Rising
Sea-Levels

Droughts

Floods

Water Supply Shortage

ENVIRONMENTAL IMPACTS

SOCIETAL IMPACTS

Interstate
Conflict

Population
Displacement
& Migration

Expansion
of Extremist
Groups

Destabilized
Economic Sectors

Critical
& Security
Infrastructure
Risk

Political
Instability

Resource
Conflicts

Changing
Agriculture



6

DIMENSIONS OF CLIMATE CHANGE CHALLENGE

AWARENESS

Establish environmental and socio/political situational awareness to support risk analysis and prioritization of efforts



MITIGATION

Decrease the anthropogenic sources contributing to climate change



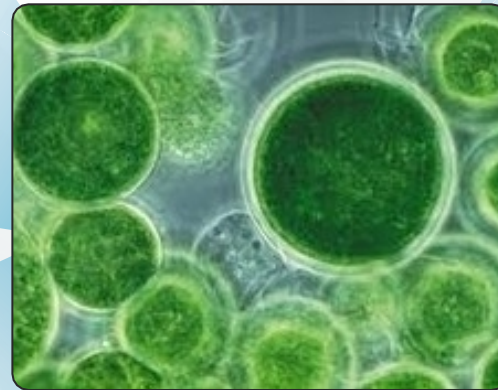
ADAPTATION

Accommodate climate impacts affecting both human and natural systems



INTERVENTION

Undertake deliberate, large-scale actions to modify the Earth's climate system

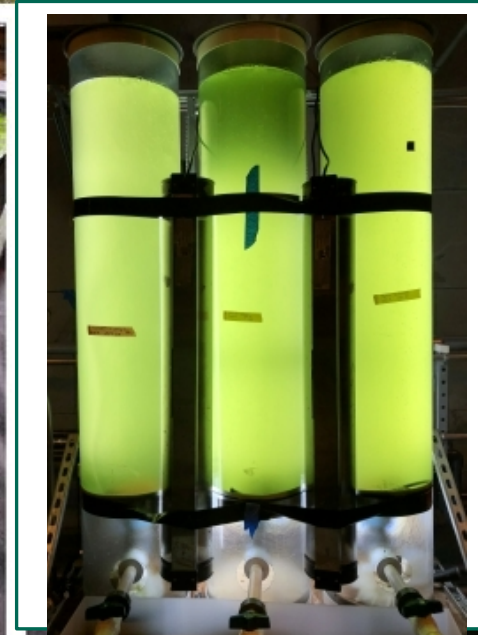
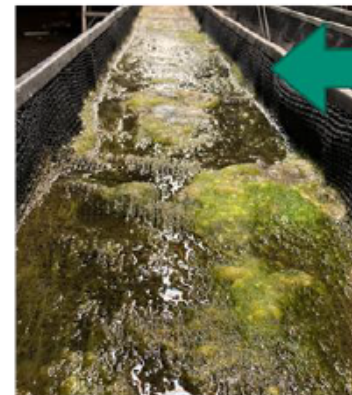


Algae Testbed in Livermore, CA



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Ryan Davis rwdavis@sandia.gov

Transition of
pioneer to
mature
algae turf



Algae Raceway Pond Greenhouse in Albuquerque, NM



- Greenhouse facility updated in Albuquerque
- Six 100 L raceway ponds for algae experiments
- Coupled with our existing pond facility in California, this now enables us to do paired experiments across sites/environments.



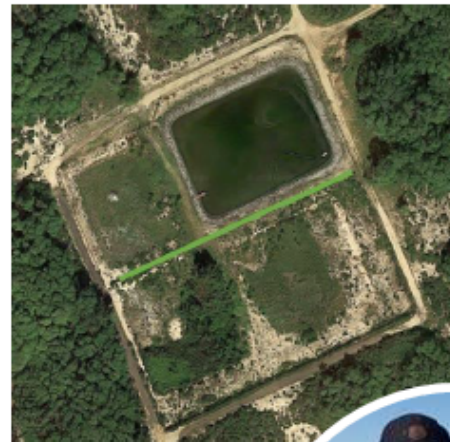
Sandia Contacts: Chuck Smallwood crsmall@sandia.gov
Amanda Barry anbarry@sandia.gov



Kauai Facility



- FY21 Deployment - home of Sandia's Modular Attached Algae System
- Navy base with independent waste-water treatment facility
- Facultative pond discharges to the Pacific Ocean
- *These waters are associated with local coliform & avian botulism of local concern*
- *Kauai-local stake-holders and project partners*



Eric Monroe

Algae Production Economics - Finding the Sweet Spot
Thursday, October 21, 10:00 am - 11:30 am
Carlos Quiroz-Arita

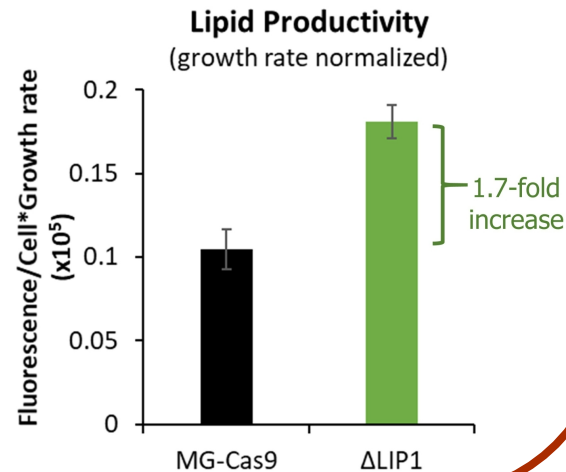
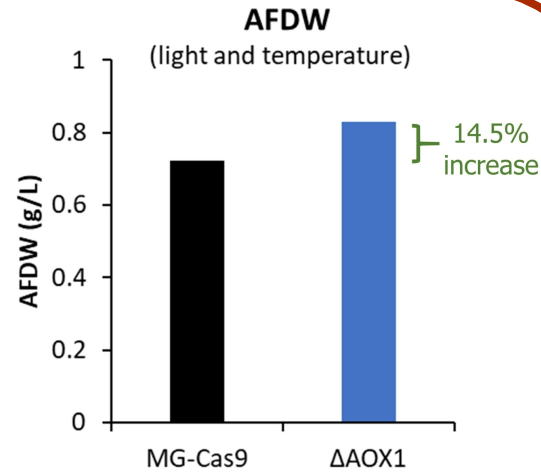
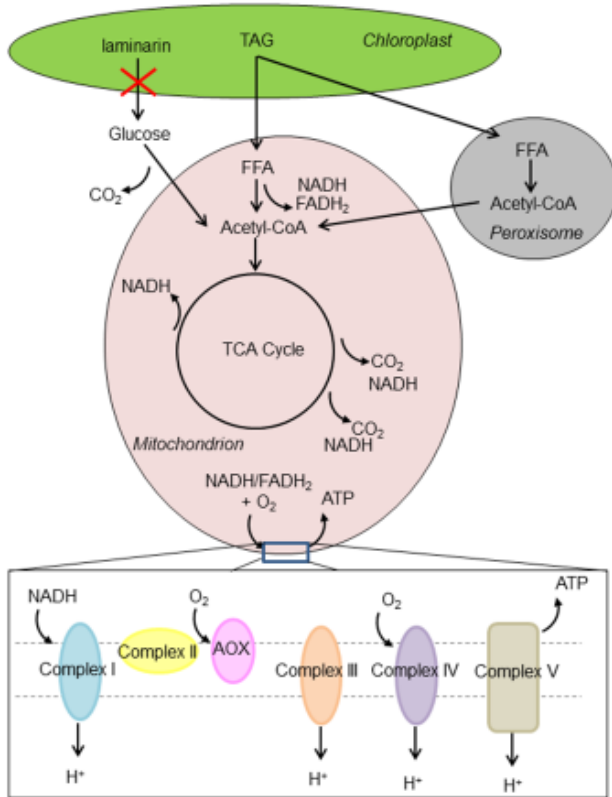
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Ryan Davis rwdavis@sandia.gov



Engineering and Leveraging Algae Traits



CRISPR Engineering



Plant Substrate Utilization



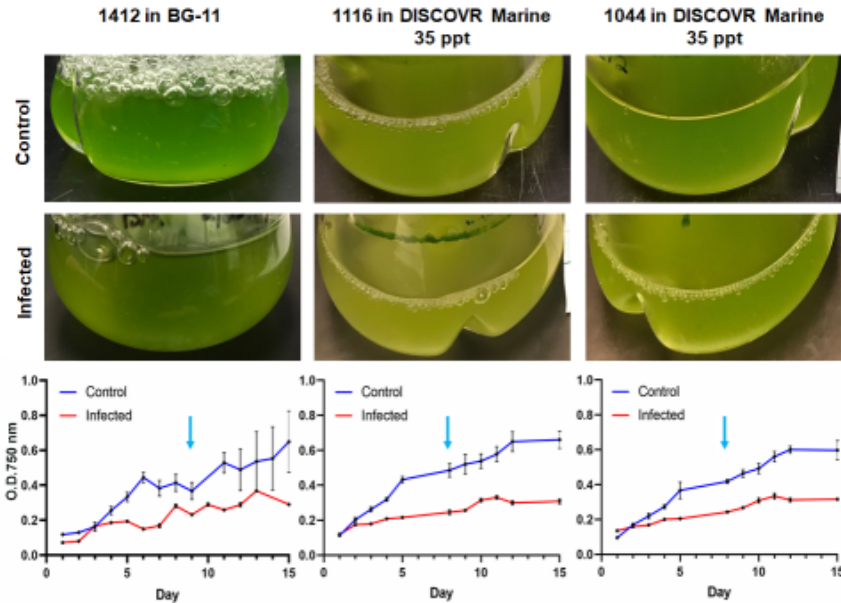
Schambach, J., Finck, A., Kitin, P., Hunt, C., Hanschen, E., Starkenburg, S., Vogler, B.W., and Barry, A.N. 2020. Growth, total lipid, and omega-3 fatty acid production by *Nannochloropsis* sp. cultivated with raw plant substrate. *Algal Research*

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 Chuck Smallwood crsmall@sandia.gov
 Amanda Barry anbarry@sandia.gov

Nutrients: Is Utilization Efficiency Important?
 Wednesday, October 6, 10:00 am - 11:30 am
 Chuck Smallwood

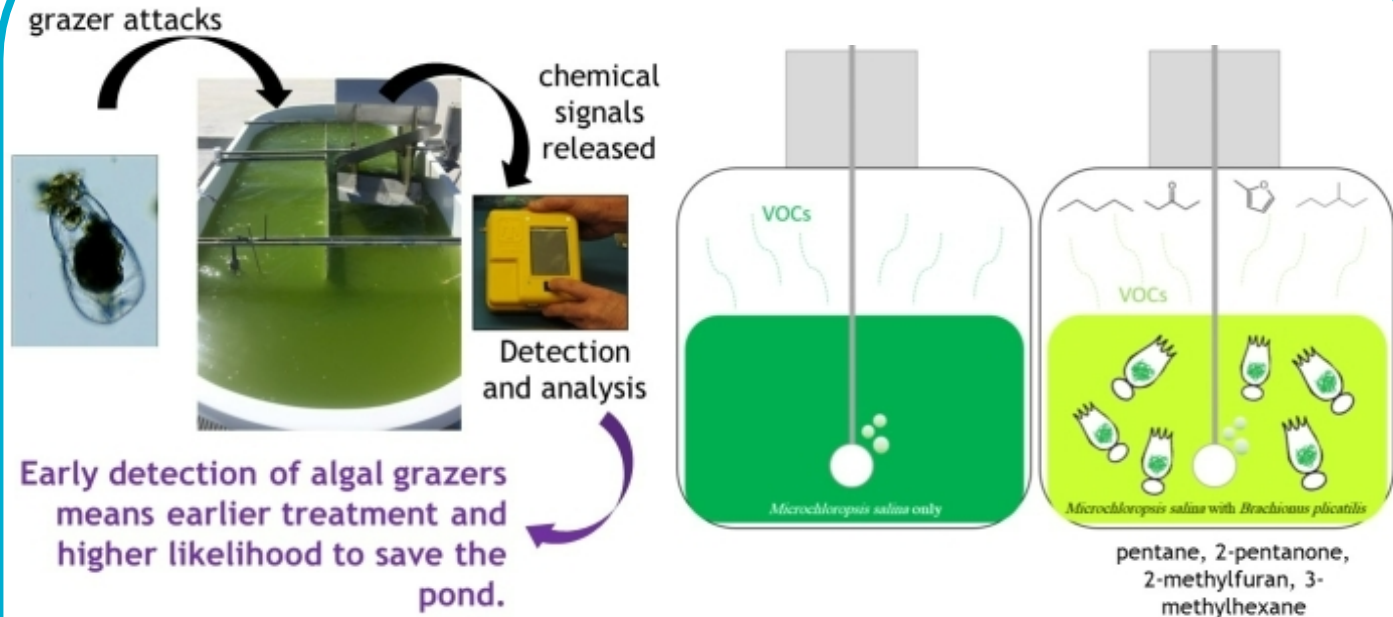


Understanding Predation and Crop Protection



Atencio, Lauren C, Maes, Danae, Hipple, Tyler, and Timlin, Jerilyn A. 2021. Susceptibility of Two Saltwater Strains of *Chlorella sorokiniana* to *Vampirovibrio chlorellavorus*. *Journal of Applied Phycology*

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Todd Lane twlane@sandia.gov

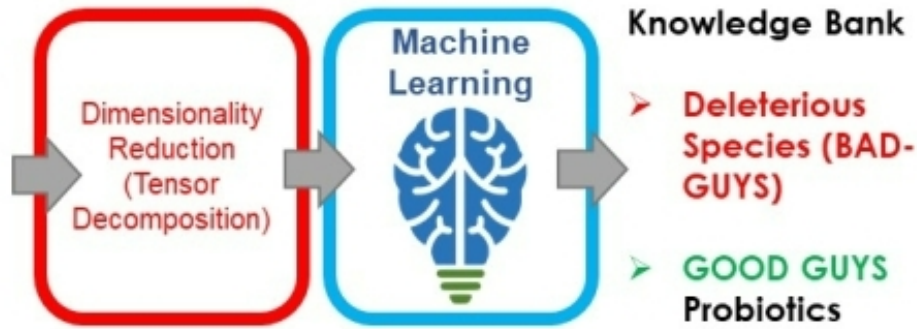


Fisher C.L., Russell M., Maddalena R., Lane, T.W. 2020. Low molecular weight volatile organic compounds (VOCs) indicate grazing by the marine rotifer *Brachionus plicatilis* on the microalgae *Microchloropsis salina*. *Metabolites*

Algal Culture Monitoring: What Am I Looking For?
Wednesday, October 13, 10:00 am - 11:30 am
Todd Lane

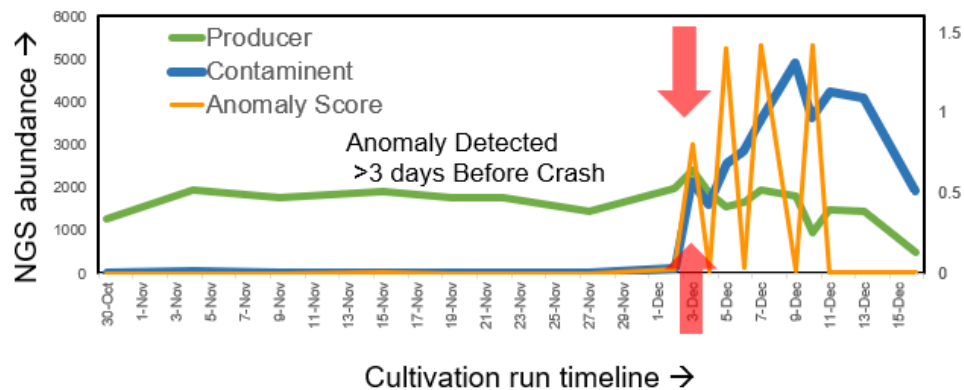


Machine Learning Tools for Improved Pond Management

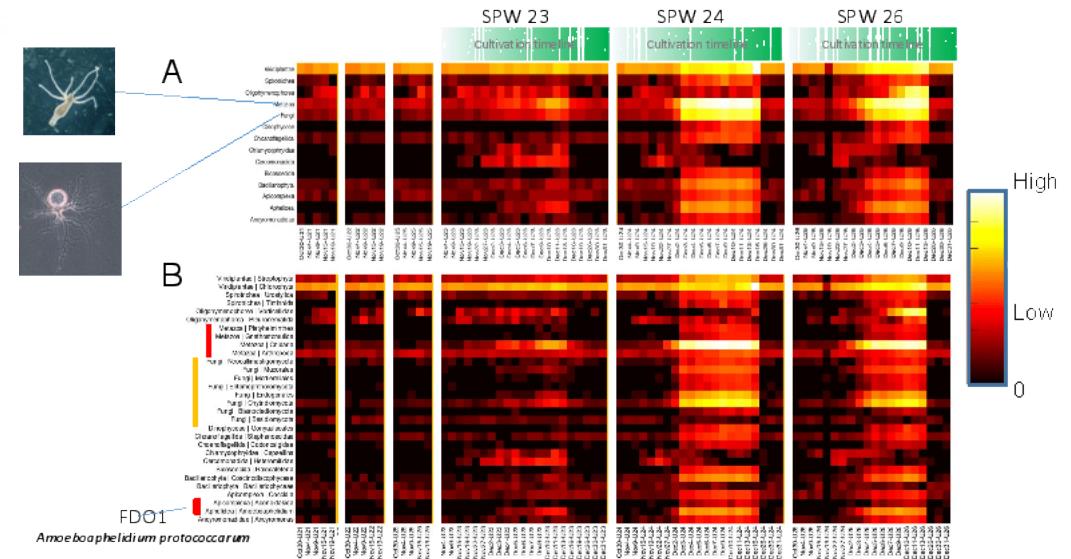


Predictive Model: Productivity and Pond Crashes

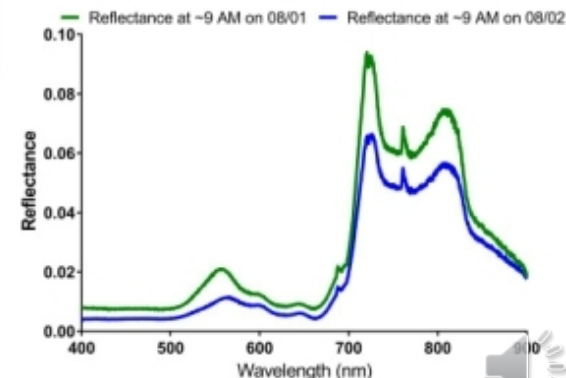
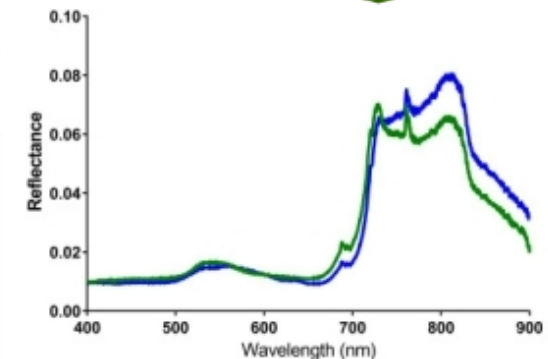
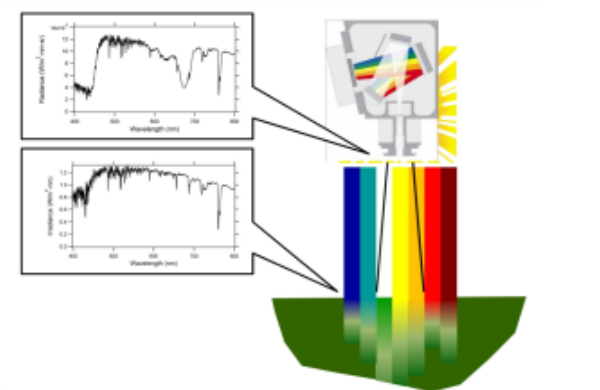
Example of Prediction of Anomaly in Cultivation Run Timeline



Pond Sentry



Spectroradiometric Monitoring of Algae Biomass & Algae Predators



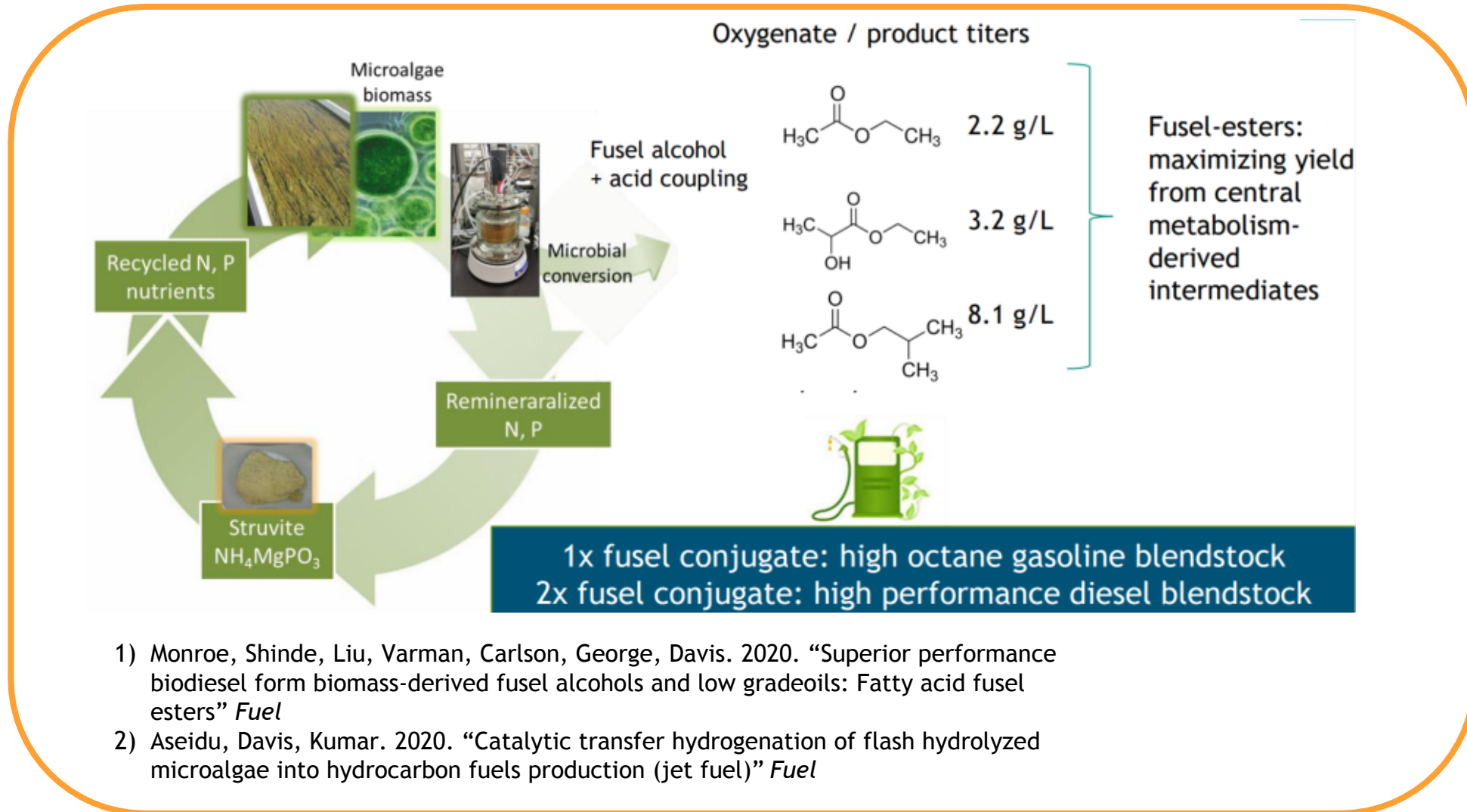
Sandia Contacts:

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Tom Reichardt tareich@sandia.gov

Better Together: Government-Supported Consortia for the Advancement of the Algae Industry
Tuesday, October 5, 11:45 am - 1:15 pm
Michael Huesemann, PNNL, DISCOVR Consortium

Bioconversion of Algae Proteins and Carbohydrates



Collaborate with us!



BLOOM Foam™ Algae Shoe

