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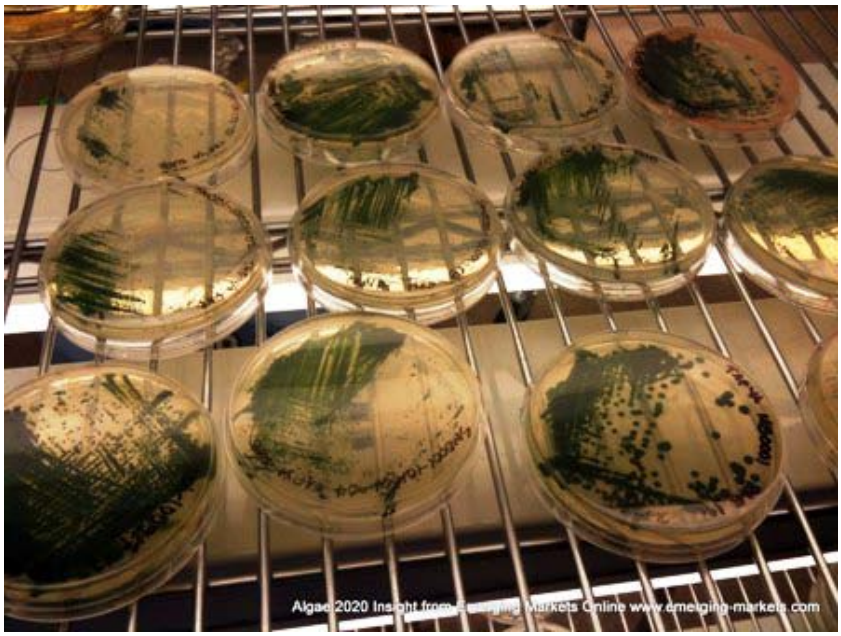
GLOBAL ENERGY AND BIOFUELS MARKET INTELLIGENCE

Algae's Culture Club: San Diego

By Will Thurmond, author of *Algae 2020*, and CEO, Emerging Markets Online

In southern California, the "Big 4" of San Diego's Algae Culture Club for synthetic algae bioneers all begin with the letter S: Sapphire Energy, Scripps Institute of Oceanography, Synthetic Genomics, and SD-CAB at UC-San Diego affiliated with the DOE's CAB-COMM.



Together, the Big 4 Algae Labs in San Diego represent nearly $1 billion in funding from private and public sector investment, representing the largest algae culture club in the world.

In October, *Algae 2020* author Will Thurmond visited these labs to gain insight on what's happening in the algae culture labs of today – in order to optimize species of algae today for commercialization tomorrow.

Sapphire Energy: The VIP of The Club

In San Diego, all algae engineering roads lead in one way or another to Sapphire Energy.

Most of these pathways originate from two key sources: the University of California at San Diego's algae laboratory run by Dr. Stephen Mayfield (where he serves as a founder and on the board of directors at Sapphire), and from the Scripps Institute of Oceanography lead by Dr. Greg Mitchell. They are all within three miles of one another in La Jolla, CA adjacent to San Diego.

At Sapphire Energy, Tim Zenk, the VP of Public Affairs and Mike Mendez, the VP of Technology and key scientist and founder behind the original recipe of Sapphire's "secret sauce", provided an overview of Sapphire's plans to move from the laboratory to the field in Las Cruces New Mexico.

Tim Zenk provided a tour of the most sophisticated algae laboratory in the world, thanks to $200 million plus (and rolling) in funding for both the laboratory and facility in La Jolla, CA near San Diego and the very large demonstration ponds now under development in Las Cruces, New Mexico.

Tim Zenk proudly displays Sapphire's trademark "Green Crude" under development, and ready deploy at pre-commercial scale ponds in Las Cruces, New Mexico.

Origin of The Species: The UCSD Algae Laboratory

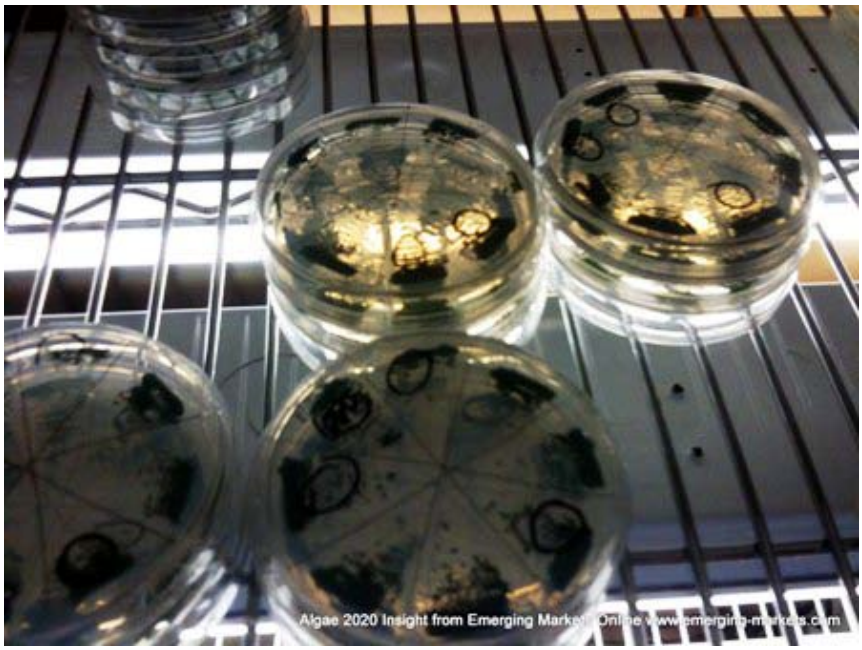
In San Diego's Algae Culture Club, Charles Darwin would trace the origin of the species – or in this case the synthetic genomic algal species - back to Dr. Stephen Mayfield at the University of California at San Diego.

Dr. Mayfield runs UCSD's Algae Laboratory, the SD-CAB the San Diego Consortium for Algal Biology, and the DOE's CAB-COMM or California Algal Biomass Collaborative (consisting of the University of California at San Diego, The University of California at Davis, Rutgers University and The University of North Dakota).

Dr. Stephen Mayfield is an energetic, enthusiastic, and passionate pioneer and proponent of using applied science in phycology and algal engineering to solve the world's biggest challenges: energy shortages, peak oil, growing populations in need of proteins and nutrition from algae; bio-remediation of pollutants by algae, and pharmaceutical applications by algae to help solve maladies such as malaria, and cancer, and algae for aviation in support of the US Air Force and energy freedom world-wide.

Dr Mayfield is also is a founding member of Sapphire Energy, and his tireless efforts to push algae forward, and to collaboratively support his colleagues world-wide is a key reason why San Diego is well known as "The Algae R&D Capital of The World."

Dr. Mayfield and his assistants gave a tour of the labs, and here are some key highlights from the tour.



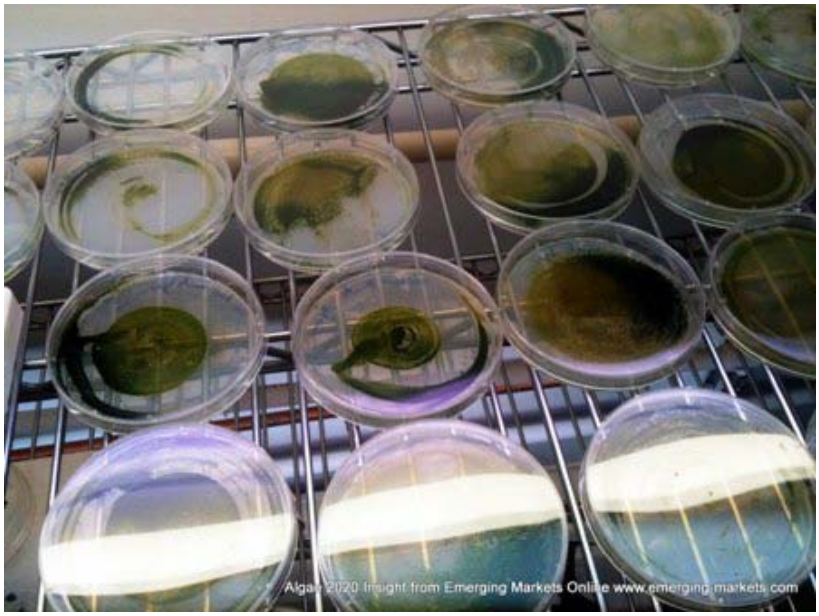
The USD SD-CAB and CAB-COM HQ for testing algae cultures from the US DOE, DOD, DOA, and dozens of collaborative partners world-wide.

Scripps Institute of Oceanography

Dr. Greg Mitchell is probably the most famous among phycologists (algae scientists) world-wide for his long-term research and advanced applied science experiments on all forms of algae species: green algae, brown algae, blue-green algae (cyanobacteria), and macro algae also known as seaweed.

Dr. Mitchell's pioneering work in the field of algal biology adjacent to the Pacific ocean brings in all kinds of species from PhDs who surf the waves between classes, and world-class scientists and biologists from around the globe.

The Scripps Institute of Oceanography is also a key test laboratory for pushing the envelope on applied science in synthetic biology, and supporting the US Departments of Energy, Defense and Agriculture in energy security, national security, and food security – both for the US, and in leading the world in advanced applied algal microbiology.



Algae culture collections at Scripps Institute of Oceanography

One of the Culture Labs at Scripps Institute of Oceanography

Synthetic Genomics

There are $600 million reasons why Synthetic Genomics is a key player In San Diego's Algae Culture Club. The first reason is the largest oil and gas company in the world, Exxon-Mobil, has committed the largest amount of money of any oil and gas firm in an R&D collaborative with Synthetic Genomics to leverage genetic pioneer Craig Venter's knowledge of applied science in molecular engineering.

Here are a few shots of the Synthetic Genomics facilities in La Jolla, CA adjacent just 1 mile from the University of California at San Diego, the Scripps Institute of Technology, and next door to one of General Atomics' labs and DARPA-funded algae facilities.

In lieu of a tour of the laboratory, the above represents a preview of Synthetic Genomics site, which is part of a larger research park dedicated to genetic engineering, molecular biology, advanced treatments for diseases in the life sciences via applied medical biology, and pioneering efforts in producing next-generation biofuels, along with General Atomics (adjacent to the facility).

At the time of the visit in San Diego, Exxon-Mobil was already on site at SG. A lab tour was unavailable, as the PR and the R&D folks at Synthetic Genomics were very busy in meetings with Exxon, cleaning up the labs, tidying up the greenhouse, etc.

An insider at SG told Emerging Markets Online Craig Venter and SG's staff are fast at work in collaborative R&D efforts with Exxon to create designer hydrocarbon (drop-in fuels and chemicals) molecules, and green crude. However, SG's execs were not able to get permission from Exxon-Mobil to make a tour during this very private "honeymoon" phase of the R&D Collaborative with XOM.

Algae Culture – Catch The Wave

As you enter and exit Sapphire Energy's lobby, the Sapphire surfboard is a strident reminder you are right offshore of the beaches where petroleum crude oil originated hundreds of millions of years ago from algae.

Similarly, right before we entered the UC San Diego Algae Culture Laboratory and the Scripps Institute of Oceanography we saw several surfers (and PhD microbiologists in the lab) riding the waves, out collecting species between classes, and returning with seaweed and algae samples for testing.

San Diego remains at the top of the heap as the Algae R&D Capital of The World for algae culture labs supporting commercialization and energy security efforts world-wide.

Via the *Biofuels Digest, Algae 2020, Vol 2* author Will Thurmond will continue the ***Algae Culture Club* series**, with interviews and profiles of key bioneers in synthetic biology aiming to produce advanced biofuels, biodiesel, ethanol, drop-in fuels, biochemicals, biopolymers, specialty chemicals, livestock feed, and pharmaceutical remedies from algae.

This article was written by Will Thurmond, and includes excerpts of detailed company profiles and emerging market insights from the 2011 updated study Algae 2020: Vol 2, published by Emerging Markets Online www.emerging-markets.com Will Thurmond is the CEO of biofuels business development consulting and market research firm Emerging Markets Online, and serves as an Independent Energy Advisor to the National Algae Association, and start-up incubator Houston Technology Center.