TEXAS A&M UNIVERSITY

Department of Biochemistry and Biophysics

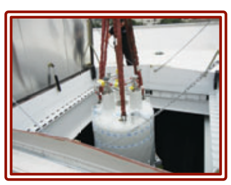
AgriLIFE RESEARCH Texas A&M System

Bio/Bio News – September 2012

Workers carefully line up placement for the new 800-MHz superconducting magnet which is being installed in the NMR Lab of the Biochemistry Building at TAMU. Eagle photo by Dave McDemand.

"AGGIES GO THROUGH THE ROOF FOR SCIENCE"

(From an article printed by The Eagle)



A 100-ton crane sat outside Texas A&M University's biochemistry and biophysics building Thursday — not an uncommon site for the construction-heavy campus.

But the crane's presence had nothing to do with raising another new building. Instead, it was there to lift a four-metric-ton, 800 megahertz Nuclear Magnetic Resonance spectrometer through an opening in the roof of the building.

"The installation of the NMR, which will be complete in two to three months, puts A&M on par with other top national research institutions," Dr. Gregory Reinhart, Head of the Biochemistry and Biophysics Department, said.

"NMR spectroscopy functions similar "to the way an MRI takes images of the body," Reinhart said. NMR was developed first, and expanded into the imaging technique known as MRI. NMR, however, allows for higher precision for molecular information."

"In NMR, we don't look at large objects, rather we look at individual molecules, like proteins and nucleic acids," Tatyana Igumenova, Assistant Professor and Director of the NMR facility, said. "This kind of instrument will allow us to determine the structure and dynamics of those molecules."

"The NMR will be extremely powerful for research in drug design," Igumenova said.

"You can identify potential drug candidates and use an NMR to determine where exactly they bind to the protein or enzyme, and what kind of effect they have on the structure and dynamics," Igumenova said.

With these capabilities, researchers will be able to design improved inhibitors to prevent the spread of disease.

"The NMR, along with the upgrade and relocation of two other instruments to the NMR facility, cost a total of $2.7 million. The NMR itself cost more than $2 million," Reinhart said.

The funds were provided by Texas A&M and Texas AgriLife Research.

Always under his "watchful eye!"

As the crane was hooked onto the equipment, Igumenova expressed concerns about the instrument getting tilted during the move, as it could potentially be damaged or ruined.

"It's really important that the coil that generates the magnetic field is perfectly aligned with other components," Igumenova said. "If the magnet or other apparatus gets tilted during the lift, it can result in the misalignment of those components and then it would be difficult to energize it."

Both Reinhart and Igumenova were relieved to have the NMR magnet make it safely into the facility, having anticipated its arrival for about seven years, when the idea for the facility was first conceptualized.

"These instruments are custom designed. It's not like a car dealership — you don't have the magnets lined up so you can pick and choose ... And it's finally here," said a smiling Igumenova.

The NMR is available for use to all Texas A&M faculty and students in the Biochemistry and Biophysics Department.

Krystal Morales, a senior in the department, said she's the most excited out of her peers to start using the new equipment.

"I think this puts us on the cutting edge. I think this is really going to bring a lot of interdisciplinary collaborations," Morales said. "This is a huge thing. Not everyone has the facility that we have here."
to extend the capability of NMR for studying large multidomain proteins."

OIL FROM ALGAE CLOSER TO REALITY THROUGH STUDIES BY UNIQUE COLLABORATION OF SCIENTISTS

Used by Permission: From an article by Kathleen Phillips, ka-phillips@tamu.edu Texas A&M AgriLife Communications

COLLEGE STATION – A team of researchers that has been working on getting fuel-grade oil out of algae may be within four years of a near-commercial-scale production level.

The team, with a combined expertise from agriculture to engineering, has received a $2 million National Science Foundation grant to help hasten the process, according to Dr. Tim Devarenne, a Texas A&M AgriLife Research biochemist and collaborator on the project.

Dr. Tem Devarenne, Associate Professor with the Department of Biochemistry & Biophysics, Texas A&M University.

The challenge is to help the oil-laden alga, Botryococcus braunii, live up to its potential, Devarenne said.
A team of researchers that has been working on getting fuel-grade oil out of algae may be within four years of a near-commercial-scale production level.

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Known by scientists for more than 100 years, B. braunii is the shirker of the algae world, seemingly floating aimlessly in bubbling tanks of water in no hurry to grow up and be pressed into oil. Other algae go through life as self-starters on a fast-track to success but don't produce oil like B. braunii. The researchers want the useful traits from each to commingle.

"We're interested in taking the genetic information out of the slow-growing alga – the genetic information for producing the hydrocarbons – and transferring that into a faster growing alga," Devarenne said. "Then maybe we can more economically produce these oils."

For his part of the study, Devarenne will study the B. braunii's molecular biology to find out what genes are responsible for production of the oil. His lab will also try to understand the function of those genes and how they contribute to the production of the oil.

"By understanding the molecular mechanisms, we can maybe manipulate the algae to produce more or better oil," he said.
Another key aspect to these studies is encouraging B. braunii to live life in the fast lane, Devarenne explained, using a device invented by Dr. Arum Han, lead researcher on the project and a professor of electrical engineering at Texas A&M University.

Called a "microfluidic lab-on chip," the device is about the size of a business card but has hundreds to thousands of microscopic wells, Devarenne said.

"These little wells can each hold an individual alga cell, and we can treat each well differently in terms of media compositions or light amounts, for example," he explained. "So we can see how different parameters affect growth rate, oil production and biomass accumulation.

"In that little microfluidic device, we can screen hundreds to thousands of different growth conditions at once and do in a week's time what in a normal lab atmosphere would take probably a year to screen," Devarenne added. "So essentially we can miniaturize everything and screen high volumes of algae to find optimal growth conditions to make the best amount of oil." In addition to providing an alternative fuel source to power conventional combustion engines, fuels derived from algae would be easier on the environment, Devarenne said.

"If we harvest algae and process them into fuels, we don't emit any excess carbon into the atmosphere that is currently being emitted from petroleum fossil fuels," he said.
When the fast-growing traits have been combined with the hydrocarbon-producing capabilities in one alga, team member Dr. Tzachi Samocha with AgriLife Research in Corpus Christi will help determine how to grow it on a large scale.

Upon completion of those studies, Devarenne said, the team may work with the fuel industry to scale up production even farther.

"If we can produce an alga that produces high amounts of oil and grows fast," he said, "an industry partner could grow large amounts of it, extract the oil, convert that oil into gasoline or diesel fuel and sell it just like at a normal gasoline pump."
The product could also be doubly helpful for the environment, he said.

"What is somewhat beneficial about growing algae is that you can use municipal wastewater to grow algae and they'll clean up the wastewater," Devarenne noted. "A lot of people have an idea of growing their algae ponds next to coal-burning power plants where they'll take the CO2 emissions from the power plant and feed it to the algae.

"Algae take CO2 out of the atmosphere to make the oil and then when we burn the oil as fuel, we just put that CO2 back into the atmosphere," he added. "That is different from petroleum because the CO2 from petroleum has been stored underground for hundreds of millions of years and then we release that into the atmosphere when we burn fuels created from petroleum."

Also collaborating on the project are Dr. David Stern from the Boyce Thompson Institute for Plant Research and Dr. Jefferson Tester from Cornell University.

BGA OFFICERS ELECTED FOR 2012-13

Front Row L-R: Dr. Jennifer Herman, Amy Whitaker, Samantha Shasserre, Allison Cockrell. Back row, L-R Qutaiba Ababnedh, Arielle Milstein, Ben Caster, Callie Kobayshi, Rohit Kongari.

The Biochemistry Graduate Association has elected officers for the 2012-13 Academic year. The newly elected officers took their office at a transition luncheon on Wednesday, June 22. The new officers are:
President - Allison Cockrell; Vice President - Amy Whitaker; Secretary – Samantha Shasserre; Treasurer – Rohit Kongari; GPC Representative – Arielle Milstein; GRAC Representative – Callie Kobayashi; GSC Representative – Qutaiba Ababneh. Dr. Jennifer Herman was elected to serve as the Faculty Advisor for the BGA.

The faculty, students and staff would like to express appreciation and thanks to the outgoing officers:
President – Julian Avila; Vice-President – Kyle Renfrew; Secretary – Rohit Kongari; Treasurer – Carol Vargas-Bautista; GPC Representative – Daniel Shoup; GRAC Representative – Tyler Githens; GSC Representatives Karl Gorzelnik and Ben Kaster; Faculty Representative – Dr. Paul Straight.

Biochemistry & Biophysics Seminar Series
Sept. & Oct. 2012 - Bio/Bio Bldg Room 108
Wednesday Afternoons @ 4PM

Sept 19
Paul Lindahl, Dept. of Chemistry, Texas A&M University ***"Biophysical probes of iron metabolism in eukaryotic organelles, whole cells and organs"***. Host: Timothy P. Devarenne

Sept 26
Jeffrey Chen, Institute for Cellular and Molecular Biology, The University of Texas at Austin. ***"Circadian and small RNA Regulation in Plant Hybrids and Polyploids".*** Host: BGA.

Oct. 3 – B129 Life Sciences Bldg
Stephen Hajduk, Dept. of Biochemistry & Molecular Biology, University of Georgia. ***"Mechanisms of Proteinn Diversificatin within the Strange Mitochondrion of Trypanosomes"***. Host: Jorge Cruz-Reyes.

Oct. 10
Jeff Gore, Dept. of Physics, Massachusetts Institute of Technology. ***"Cooperation, cheating and collapse in microbial populations."*** Host; Lanying Zeng.

Oct. 17
Gary Lorigan, Dept. of Chemistry & Biochemistry, Miami University ***"Magnetic Resonance Studies of Membrane Proteins"***. Host Tatyana Igumenova.

Oct. 24
Jared Rutter, Dept of Biochemistry, University of Utah. ***"Good and Bad Growth: The virtues and vices of mitochondria and metabolism"***. Host: Vishal M. Gohil.

Oct. 31
Ralf Bundschuh, Dept. of Physics and Chemistry & Biochemistry, The Ohio State University. TBA. Host: Jorge Cruz-Reyes.

Upcoming Events in Bio/Bio
Bio/Bo Faculty Meeting – TBA
SECC Bake Sale – Bio/Bio Lobby Nov. 2.
Scientific Sales Solutions Vendor Show – November 13, Bio/Bio Lobby – 9:30AM – 2PM.
Annual Departmental Fall Extravaganza Flower Fundraiser – October 31