

## ODU, Private Firm Begin Algae Fertilizer Joint Venture

By Jim Raper

Old Dominion's algae-energy research over the past five years has led to a joint commercial venture between ODU and a Hampton Roads company that has become the nation's largest supplier of commercial fertilizers made totally or partially of organic matter.

The formal agreement is between the Old Dominion Research Foundation and NP Labs, a subsidiary of Nutrients PLUS, a Virginia Beach company that formulates and markets "green" fertilizers. John Moriarty, the president of Nutrients PLUS, came to ODU Thursday, Aug. 23, to sign the documents creating the new company, Applied Algae Research Manufacturing and Marketing (AARMM), through which the two parties will merge their expertise (see photo below).

Representing ODU at the signing ceremony were Patrick Hatcher, the geochemist who has led the university's algae research, and Brent Edington, the university's director of patents and licensing. Ray Grover, an owner of NP Labs and a consultant to Nutrients PLUS, was also present.

Hatcher, who is the Batten Endowed Chair of Physical Sciences at ODU, is the executive director of the Virginia Coastal Energy Research Consortium, which will have a stake in AARMM's operations. He also directs ODU's College of Sciences Major Instrument Cluster (COSMIC) laboratory, which will provide sophisticated chemical analysis needed by the new company.

Nutrients PLUS began operations more than a decade ago supplying organic-content fertilizers to landscapers, and has since expanded its line to include products for gardeners and farmers. Organic material the company uses in its fertilizers range from ground-up chicken feathers to manure. Only recently has the company produced experimental batches containing algae.

Moriarty, who holds degrees in agronomy and forestry, has worked for three decades in industries that promote environmental stewardship. The Nutrients PLUS headquarters in Virginia Beach includes offices and a laboratory staffed by three employees and additional

consultants. "This is the nerve center," Moriarty said. "We have contractual relationships with another 300 to 400 people to make the fertilizers."

Representatives of the company have been interested in Hatcher's algal research for more than three years. Last year, at ODU's Algal Farm near Hopewell, Va., the university joined with Nutrients PLUS to oversee a corn crop experiment to test algae-fortified fertilizers.

Rows of corn were grown under test conditions using a variety of fertilizer formulas. "It was a bona fide agricultural trial experiment," Hatcher said. "We grew the corn and then weighed the plants and the roots and the actual corn, and found that a blend of our (dried) algae and commercial fertilizer produced more biomass than commercial fertilizer alone."

Already this year, the one-acre pond at the ODU Algal Farm, the only facility of its kind on the East Coast, has produced enough dried algae for Nutrients PLUS' manufacturing tests. One preliminary laboratory chore Moriarty and Grover have accomplished is to devise a proprietary process by which dried algae can be converted into granular pellets that look similar to commercial fertilizers.

Moriarty said analysis by his company has shown that surprisingly small amounts of dried algae can have beneficial effects when mixed with larger amounts of commercial fertilizer. "Fertilizer containing organic matter has tremendous benefits over traditional, synthetically made fertilizers," he said. "The plant growth regulators we find in algae are known to be effective at low concentrations and are a real bonus."

Fertilizers that include organic matter such as algae could be formulated with substantially less synthetic nitrogen and phosphorous, Moriarty said. When these nonorganic nutrients are washed off lawns and croplands in coastal Virginia, they have an adverse effect on water quality in rivers and the Chesapeake Bay. Virginia is under a federal consent order currently to reduce nutrient pollution in its tidal tributaries and the bay.

"We've got one solution for the bay," Moriarty said.

Promotional materials for the new company tout the plant growth regulators in organic matter, which include hormones: "When taken up by plant roots, directly, regulators promote strong cell walls without elongation. Good color and quality without surge growth greatly reduces (lawn) clippings and reduces water usage; you get the same rich growing benefits as 100 percent synthetic fertilizers but without the tendency for chemical runoff that ends up in our water supplies."

According to Hatcher, the benefits of algae for plant growth are high organic nitrogen content; organic matter content that retains nutrients and moisture;



John Moriarty and Patrick Hatcher

beneficial microbial activity; natural, slow-release fertilizing; beneficial trace minerals; and beneficial plant growth enhancers. In ODU's COSMIC lab, Hatcher has access to state-of-the-art instruments to provide the chemical analysis needed to ensure AARMM's formulations are the best possible.

Since the ODU Algal Farm opened in 2008, headlines about the facility have focused on its potential to produce algae-based biodiesel fuel. In 2010 a \$700,000 reactor known as the "Algaenator" was placed adjacent to the specially designed growing pond to produce biodiesel. That work is continuing, with attempts to perfect a continuous process that uses heat and pressure to convert algae into a liquid fuel. (Algae that died, sank to the ocean's floor and were covered by sediments millions of years ago were converted in much the same way - by heat and pressure - into the fossil fuels we use today.)

Nevertheless, Hatcher has always contended that biofuels were only one focus of the algae research at ODU. Much of the effort at the farm has been aimed at technologies to promote the growth of beneficial species and to perfect the harvest and drying of the algae. From the start, Hatcher has also extolled the potential benefits of algae as a fertilizer.

His initial goal was to reserve the algal byproduct of the biodiesel production for use in fertilizers. He and Moriarty said at this week's signing ceremony that the byproduct boosts synthetic fertilizers just as effectively as straight algae. But the Algal Farm does not yet produce enough byproduct to meet the needs of AARMM, requiring ODU to supply the new company with straight algae.

"Our job for this project is to maintain a constant growth situation at the farm," Hatcher said. "We have been in research mode in the past. This is the first year in which we have been in production mode."

Moriarty envisions hundreds of acres of algae ponds in coastal Virginia, and thousands more spread around the coastal United States, to produce enough algae to provide fertilizer for the entire country. "The technology we develop can then be used around the world," he added. "We and ODU are on the cutting edge of research to support natural ingredients for fertilizers."



At the signing in ODU's COSMIC Lab (from left): Ray Grover, Patrick Hatcher, Brent Edington and John Moriarty.