

## **BUBBLE FARMING: SCALABLE MICROCOSMS FOR DIATOM BIOFUEL PRODUCTION**

**Richard Gordon**<sup>1</sup>, Clifford R. Merz<sup>2</sup>, George Philippidis<sup>3</sup>, Shawn Gurke<sup>4</sup>, Benoît Schoefs<sup>5</sup>

<sup>1</sup>*Gulf Specimen Marine Laboratory & Aquarium, Panacea, FL 32346 USA and C.S. Mott Center for Human Growth & Development, Department of Obstetrics & Gynecology, Wayne State University, Detroit MI 48201 USA, DickGordonCan@gmail.com*

<sup>2</sup>*College of Marine Science, University of South Florida, USA, CMerz@usf.edu*

<sup>3</sup>*Patel College of Global Sustainability, University of South Florida, USA, GPhilippidis@usf.edu*

<sup>4</sup>*Eagle Aerial Imaging Ltd., Canada, ShawnEGrk@gmail.com*

<sup>5</sup>*Metabolism, Bioengineering of Microalgal Molecules and Applications, IUML – FR 3473 CNRS, Le Mans University, Le Mans France, Benoit.Schoefs@univ-lemans.fr*

Currently there are two standard ways of growing microalgae for biofuel: open raceways and closed photobioreactors. Open raceways are a relatively inexpensive option, but are subject to airborne and exotic species contamination and evaporative losses of water, requiring large amounts of relatively flat land, and constant energy input for water circulation and stirring. Closed photobioreactors are much more expensive, can accumulate biofilms that diminish light from uniformly reaching the cells, are closed to gas exchange with the atmosphere, and require frequent maintenance. We propose that farming using bubble wrap (Bubble Farming) can solve most of these problems. The use of bubble wrap with selectively bred or genetically modified diatoms or other microalgae has the potential to make biofuels sustainable and cost competitive with fossil fuels as it will minimize water and energy use and protect from contamination, while allowing gas exchange for carbon dioxide absorption from and oxygen release to the ambient air. Diatoms could be harvested or milked or they could ideally secrete a potentially high-octane biofuel hence simplifying product (biofuel) separation. Bubble farming may also allow simultaneous cultivation of crops that thrive in hydroponic or aquaponics settings, and if so, food crops could be potentially grown via Bubble Farming, with the added benefit of protection from drought and insects.