

STARTUP COMPANY

LIQUIDIA MAKES NANO-ENGINEERED PRODUCTS FOR LIFE SCIENCES, ENERGY, AND MATERIALS SECTORS

Joseph DeSimone and his colleagues from CERSP at the University of North Carolina at Chapel Hill have created a startup company called Liquidia Technologies based upon the PRINT™ nanoscale molding process, targeting applications in the life sciences, energy, and materials sectors.

Founded in 2004, Liquidia is working to precisely design and manufacture micro- and nano-structures in bulk, with particle sizes ranging from tens of nanometers to tens of microns. These structures may take multiple forms, including particles and patterned films.

Liquidia has partnerships with several major corporations to provide gram quantities of material for prototyping and feasibility studies. Examples include supplying particles that might become part of a medical device or an active layer in a display, and making fuel cell membranes or active layers in photovoltaic devices.

The company has grown to 24 people as of spring 2007 and has raised a total of \$25 million, says co-founder and senior scientist Ginger

Denison Rothrock, a former graduate student at CERSP. Located in Research Triangle Park and currently squeezed into 4,000 sq ft—"quite cramped but loving it"—the company is scheduled to move into a 17,000-sq-ft facility in August 2007.

In the life sciences, Liquidia is using the PRINT™ process to make particles containing therapeutic drugs that may be used to deliver medicine to a target site and gradually release it. The PRINT process gives precise control over particle size, shape, composition, modulus, and surface properties. According to the company, "Liquidia is the only company in the world that can independently tailor these variables simultaneously in the creation of engineered drug therapies."

Rothrock notes that discussions are underway with three major pharmaceutical companies for prototyping projects.



Ginger Denison Rothrock, former graduate student at CERSP and co-founder of Liquidia



THE SCIENCE HOUSE

The convergence of three forces in North Carolina has resulted in a resounding success for K12 education that has reached thousands of teachers and their students. The ingredients: CERSP, The Science House, and a new required course for high school students in the state of North Carolina.

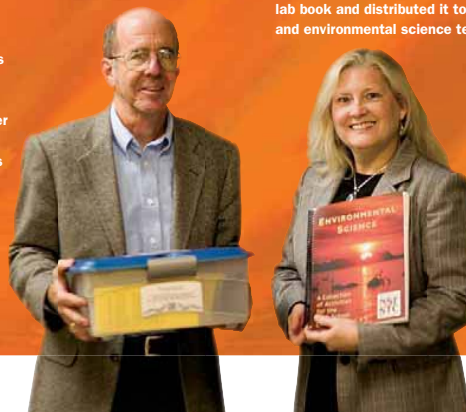
By coincidence, just about the time that CERSP was getting started, North Carolina adopted a new course on earth and environmental science that was required for graduation from high schools in the state. It was a

brand new course: the curriculum had been written but the teachers were not trained to teach it and there were very few resources linked to the curriculum.

Enter The Science House, a K12 outreach program of the College of Physical and Mathematical Sciences at North Carolina State University. The Science House organizes curriculum projects, student camps, and science enrichment programs, and it develops teacher training programs reaching a few thousand teachers a year. It is led by physicist David Haase

in conjunction with 12 full-time education staff involving five offices across the state of North Carolina.

With the adoption of the new course and the formation of a center on environmentally responsible solvents and processes, the players saw an opportunity that linked a real need in North Carolina schools and the general idea of green chemistry that featured prominently in the NSF Science and Technology Center (STC).



A CONVERSATION WITH THE DIRECTORS

Joe DeSimone & Ruben Carbonell

One of the characteristics that distinguish CERSP is its leadership in center management. "We were able to get our center up and launched very quickly," says center director Joe DeSimone. He identified the tools and brought in the infrastructure to facilitate the startup process, with a codirector and a deputy director to form a team of three leading the center.

"Once you get through the launch phase—which is a heck of a lot of work," he laughs, "almost like a startup company—and you get everyone marching in one direction, then it's actually a little easier sailing. Then you just have great people doing fabulous science—and nothing speaks more clearly than their science."

An executive coach was brought in to help the team members analyze and characterize their different thinking styles. The idea came from DeSimone's entrepreneurial background, gained by launching startup companies. The coach educated the team on different communication and working styles and how to use those tools to engage with others.

DeSimone's style is to engage in blue sky brainstorming to identify options and then to focus in on the research targets with great intensity. "We've been expansive in our thinking to consider what could be done, and then we narrow in on it and come to closure."

The center recently has gone through another cycle of this process by means of workshops to identify new directions to see where the team could apply its expertise in a new arena. "We're morphing, we're looking at life sciences, alternative energy and power sectors,

green chemistry, innovation, and entrepreneurship—looking at ways for the center to continue to be sustainable."

CERSP co-director Ruben Carbonell points to the complementary skills sets in the management team as a key factor for success. "Joe is a creative chemist, I'm a detail-oriented engineer," he laughs. "That's been a complementary set of skills."

Deputy director Everett Baucom has brought extensive industry experience to the team, which has allowed the directors to focus on research issues.

Carbonell reflects upon the benefits to faculty of participating in the center: "Those who have been with the center since 1999 have learned the advantages of doing collaborative work. One of the legacies of the STC is that faculty become better trained in a sense because they see the bigger picture, beyond the normal confines of their discipline. And as a result of that, they become leaders themselves."

"I can see among my younger colleagues that, after seven or eight years of being with us, they're now becoming the leads in new proposals that involve centers. That's been interesting to watch. They have a better appreciation of what it takes to run them, and of what they can do compared to single investigator work. They become, then, a source of new ideas for other faculty. That's not a legacy that maybe NSF counts, per se—obviously it's a difficult thing to quantify. We're struggling with how to report that. But it's an interesting observation."



CERSP director Joseph DeSimone



CERSP co-director Ruben Carbonell

Experts from The Science House partnered with CERSP faculty to help determine which core topics in the STC should be developed for K12 outreach. They developed a lab book and distributed it to earth and environmental science teachers

with a guide that showed how those materials linked to the North Carolina and Texas curricula.

Haase emphasizes the value of this kind of partnership and notes, "We'd like to do this for more centers."

The materials were distributed to some 4,000 teachers in North Carolina and Texas. They prepare teachers to teach the lab program and show them how to do the labs. "Some of the lab equipment vendors partnered with us," says Haase, "so that the teachers would walk away not only with the laboratory manual but also some materials they could use in their own classrooms."

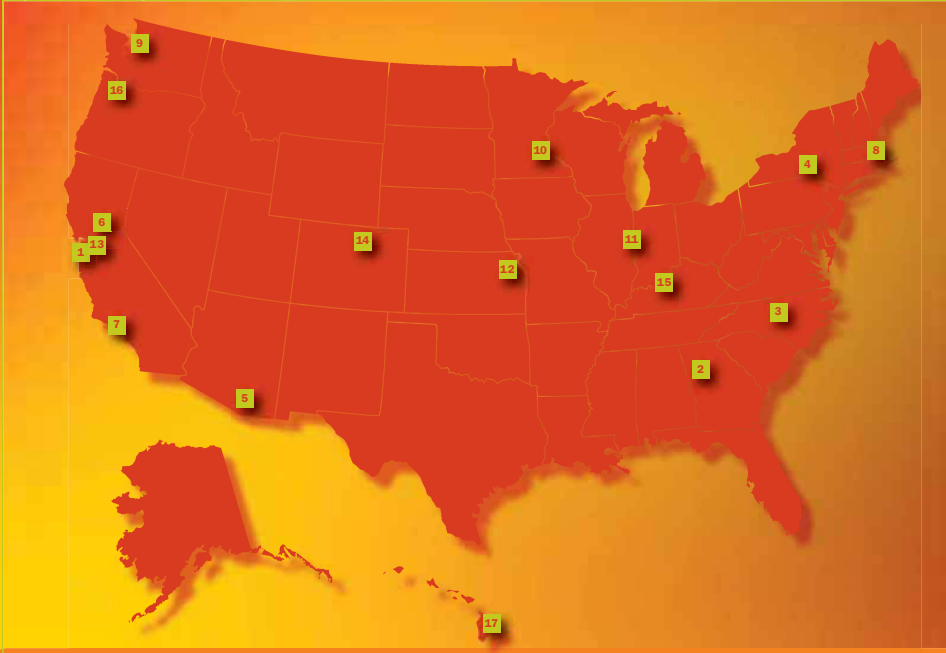
The STC provides about \$150,000 per year to The Science House, which in total is has an annual budget of about \$1 million per year.



Center: Physics professor David G. Haase (left), director, and Mary Louise Bellamy of The Science House at North Carolina State University

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