

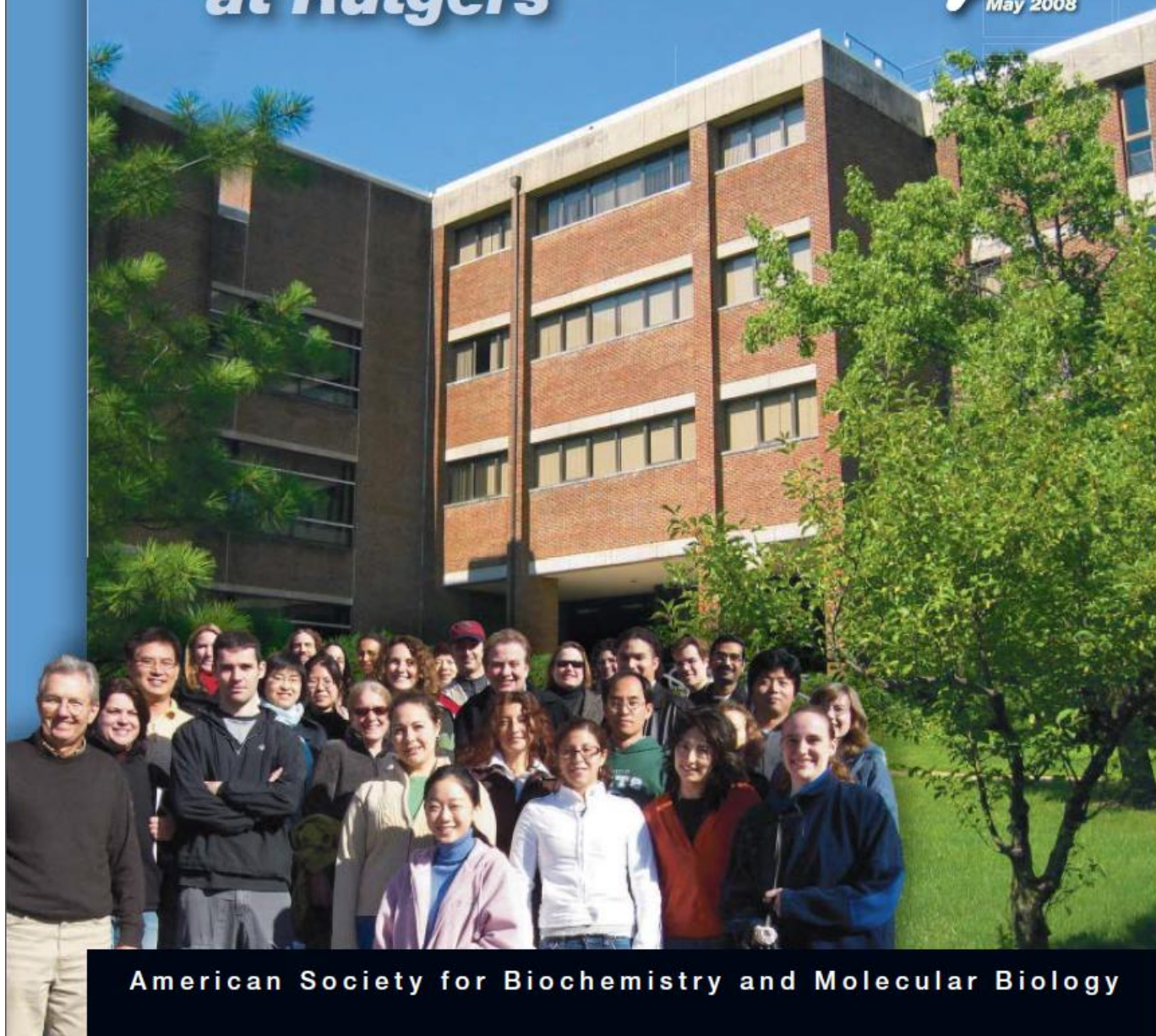
ASBMB 2008 ELECTION RESULTS INSIDE

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**Lipid
Research
at Rutgers**

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The Rutgers Center for Lipid Research

BY NICK ZAGORSKI

Driving through Rutgers University's School of Environmental and Biological Sciences (SEBS) (formerly known as Cook College), one might get a sense of being in a different time or place. Just a few miles north and south the strip malls, diners, and jug-handle turns that make New Jersey notorious are in full bloom; but here on this campus that hosts the agricultural, environmental, and food and nutritional science programs, the hustle of suburban life is replaced with rolling pastures, grazing livestock, and a sprawling botanical garden.

But although this bucolic setting evokes memories of times past—like the museum within Martin Hall that honors Selman Waksman's pioneering research with antibiotics—there are also those within this campus who are quite forward thinking. Among those are George Carman*, a professor of Food Science and the Director of the recently formed Rutgers Center for Lipid Research (RCLR), one of the first such dedicated lipid groups in the United States.

"There are a few well known lipid-focused institutes around the world," says Carman, noting the Biomembranes Institute at Utrecht University in the Netherlands and the Molecular and Cellular Biology of Lipids (MCBL) group at the University of Alberta as two examples. "And I believe Rutgers has a core group of lipid researchers that's just as strong as those places, so we decided to get ourselves added to that small but distinguished list."

The Birth of a Dream

As an entity, the RCLR may be fairly new, but as a concept, it has been coalescing for many years. In fact, the first seeds may have been planted right after Carman arrived at Rutgers as a fresh-faced assistant professor back in 1978.

"I remember that on my 2nd day at Rutgers I met Charles Martin*, another faculty member who studied lipids, and I found out that we had been hired only 1 day apart." The pair, in fact, had fairly similar research goals: using yeast as a model to understand lipid metabolism. Carman is interested in how the synthesis of phospholipids, the structural components of cell membranes as well as important signaling molecules, is regulated, whereas Martin's interests lie in the enzymes responsible for elongating and desaturating fatty acids, the precursors of many lipids.

Yet despite this connection, Carman notes that since that first encounter, the two of them would only cross paths at conferences. "I could usually count on seeing Chuck twice a year," he says. "At the Gordon Conference on Lipid Metabolism and the ASBMB annual meeting. And it wasn't just

On December 3,

The lipid droplets (red) of cultured 3T3-L1 adipocytes are coated with CGI-58 (green), a protein of unknown function that participates in metabolism of triglyceride.

him; as the years went by I met many other scientists who either worked at or eventually ended up getting jobs at Rutgers."

These lipid researchers came together via many different routes. In 1992 Carman himself helped recruit conference colleague and Judith Storch*, who studies the transport of fatty acids inside of cells, whereas others arrived for slightly different reasons. Lipoprotein expert Joseph Dixon, for example, relocated in 2004 from his position at the University of Missouri where he had moved 12 years earlier

for his son's asthma, thus bringing the Brooklyn native back home.

Dawn Brasaemle*, who's deciphering the composition and function of lipid droplets—a cell's major energy silo—also found herself at Rutgers through

show up to work and there would be chains on all the doors and I couldn't access my own lab," she recalls. "And then I said "What the heck am I going to do now?"

To which Storch quickly replied: "You send me your resume, because we have a spot here!"

Considering this convergence of talent, it seemed odd that these researchers would meet so infre-

could use to analyze the lipid and protein content of various samples. It's a machine many of them needed to take their research to the next level, but none could afford by themselves.

"The LCMS definitely helped bring us together even more," Brasaemle says. "Of course our real thanks should go to Joe who set aside some of his personal research on the components of lipoproteins to teach the rest of us how to use this instrument." Dixon, though, was more than glad to

2007 the Rutgers Center for Lipid Research was officially born.

a bit of happenstance. In 1997 she started her first faculty position at the Allegheny University of the Health Sciences in Philadelphia, which had recently formed from a merger of two local medical schools. As luck (and a bit of top-level corruption) would have it, the University was forced to declare bankruptcy just 1 year later.

"I called Judy [Storch], who I knew from all the meetings, the next day and told her I was scared that I would

quently. However, such is the nature of Rutgers, which encompasses three different campuses across New Jersey. Even the "main campus," which houses most of the lipid team, is actually a conglomeration of five sub-campus that sprawls across six townships. "Many of us are only separated by a river and a highway," says Dixon, "but it might as well be another state."

In 2005, Carman decided that it was about time these strangers became friends. "I got in touch with my colleagues and mentioned that we never see each other on campus, so why don't we get together once a month and present our work at a joint meeting. That wouldn't be too burdensome." Naturally, these meetings brought the group closer together, revealing even more shared interests—"As a mammalian cell researcher, I never thought I'd have so much in common with a yeast guy like George," Brasaemle says—and opportunities for collaboration.

In their first major group effort, several of the lipid clan wrote up a joint grant to purchase a new state of the art liquid chromatography mass spectrometer (LCMS), which they

do it. "At Missouri, I was *the* lipid guy, which on one hand was satisfying, but on the other meant I had no one with whom to collaborate. That's definitely not a problem here."

This past summer Carman felt this lipid group was ready for a true "identity" and decided to make a pitch to the Dean of SEBS, Robert Goodman. "I told him we have this outstanding group of lipid people and we would like to form a center," he says. "Our needs were minimal; we just wanted an official designation and website so we could publish collaborative papers and apply for National Institutes of Health training grants and program project grants, as well as a little seed money to start a seminar program."

"It was a brilliant idea," agrees Goodman. So on December 3, 2007, with a speech by Phil Yeagle* (a lipid biophysicist and founding member of the RCLR who had recently been appointed as Dean of the Faculty of Arts and Sciences at Rutgers Newark), a round of applause, and a popping of corks, the Rutgers Center for Lipid Research—conceived and nurtured by the work of just a few dedicated faculty—was officially born.



George Carman

The Little Center That Could

Joe Dixon knows that a little notice can go a long way. Years back, the biotech company Parke-Davis brought him in to evaluate some promising research on a next-generation cholesterol-lowering drug, atorvastatin. "This drug was originally developed by Parke-Davis," he says, "and then Warner-Lambert realized this new drug might be pretty big, so they bought Parke-Davis. Well, some time later, Pfizer caught wind of this drug and realized that it might be *really* big, so they bought Warner-Lambert. Today, Pfizer makes around \$12 billion per year off of Lipitor, and most doctors don't know that they had nothing to do with its development."

Dixon and rest of the RCLR hope that their own little center might someday reach such a lofty status. Similar to how Alberta's MCBL receives generous support from Canada's canola oil industry, Carman envisions that his group will catch the eye of New Jersey's substantial pharmaceutical presence. After all, numerous lipid research discoveries



This new LCMS will enable RCLR scientists to identify the many components of lipoproteins and tackle other complex questions.


in the 30 years since Carman came to Rutgers, from the strong link between fat metabolism and diabetes to the role of lipid messengers in cancer development, have illuminated the central contribution of lipids in disease.

Another future partnership for the RCLR will be with Rutgers newly

planned Institute for Food, Nutrition, and Health (FNH), one of three University-wide initiatives aimed at promoting more cross-disciplinary and translational research in areas of high public interest. "I see the Lipid Center becoming a core element of this initiative," Goodman says."


RCLR Mini-Bio: *Dawn Brasaemle*

While leafing through the back of a journal in 1992, Brasaemle came across an intriguing job opening. "This lab mentioned they had just identified perilipin, the first lipid droplet protein, and were looking for a lipid specialist to help out. I thought, this is a gold mine!" Lipid droplets, the cell structures that store lipids for energy, had long been thought to be inert structures. But Brasaemle, who applied for and got that staff scientist position in Constantine (Dean) Londos' lab at the NIH, is helping change that view. "Of course, when I first told Dean how excited I was to look for more lipid droplet proteins, he said "Oh no, this is the only one." Well, sure enough I soon found numbers two and three."

Since starting her own lab at Rutgers, Brasaemle has continued her characterization of lipid droplets (now properly known as dynamic organelles), particularly how these three surface proteins (perilipin, adipophilin, and TIP47) regulate the access of metabolic enzymes to the energy-rich lipids stored inside. 

RCLR Mini-Bio: *Judy Storch*

"It's an unresolved issue as to whether or not cholesterol can just zip through membranes," says Storch, who's long been interested in lipid traffic inside and across cells. She points out that if a cell is defective in a cholesterol-binding protein called NPC2, then the cholesterol accumulates in the cell's degradation center, the lysosome. "It makes you wonder, because if cholesterol could just move out through mass action, then why doesn't it?" Using both biochemical and biophysical approaches, Storch is unraveling how NPC2 controls cholesterol transport, and has recently found that a lipid found only in lysosome membranes, LBPA, might also be involved.

Channeling her previous career as a nutritionist, Storch emphasizes that this mystery is important at the individual and not just cellular level; defects in NPC2 and its phenotypic cousin NPC1 lead to Niemann-Pick disease, a terrible and fatal metabolic disorder. "And unfortunately one that's overlooked because it's so rare," she says. "Of course, it's only rare when it's not your child." 

At present, however, this little group has more modest ambitions. The first order of business is completing the coalescence of the RCLR and getting more of the team under one roof. Fortunately, space has opened up in the Food Science building where Carman works, providing enough room for all the members at the SEBS campus, who can hopefully complete the move by the end of the year.

The Food Science building may not be the fanciest digs (although the 10-year plan of the FNH Institute calls for a new building, perhaps housing a Lipid Center wing?) but it will let the researchers acquire more shared lab equipment and build the kind of relationships needed for success. As Brasaemle notes, "Bumping into people in the hall, that's where most great science gets done."


Beyond packing up lab equipment,

the RCLR members are busy trying to increase their visibility at their own university and external scientific circles. If assistant professor Ariel Igal, one of the newest members of the RCLR, is any indication, then they've been doing a great job.

Igal, a promising young Argentine who studies the enzyme stearyl-CoA desaturase and how it connects lipid metabolism and cancer, had been offered a great position with the latest and greatest amenities at a highly regarded biomedical research center, but instead chose Rutgers because of the people with whom he would work.

And with Igal's addition, Carman believes the 10 scientists comprising the RCLR are an exceptional group, with each one adding their own wrinkle to the diverse field of lipid research—whether it involves cell membranes, fat metabolism, energy storage, choles-

terol, or even fat-soluble molecules like vitamin A and its derivatives, the area of expertise of another new addition, nutritional scientist Loredana Quadro*. The studies also range in scope from Carman's fundamental yeast biochemistry to Rich Mendelsohn's biophysical analysis of lipid membranes to clinical work examining how fat cells contribute to insulin resistance being carried out by Hong Ruan at the Robert Wood Johnson Medical Center.

"I may have made some sacrifices in terms of lab space and facilities," Igal says of his quaint lab in the Thompson Nutrition Building, "But you can't beat the people here; they're top-notch." 

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