RUTGERS, THE STATE UNIVERSITY OF NEW JERSEY • PISCATAWAY

Chemistry & Chemical Biology News

Dismukes, Greenblatt Research Moves Sustainable Energy Forward

For years, scientists and researchers worldwide have confronted the daunting challenge of making sustainable energy sufficiently cost effective to be mass produced. Recent testing at the U.S. Department of Energy's research center on artificial fuels may indicate a solution has been found in the lab of Chemistry Professors Charles Dismukes and Martha Greenblatt.

"Developing chemical processes that will facilitate mass production of economical, environment-friendly solar and wind electricity is one of the biggest challenges of the energy crisis," said Dismukes. "The noble metal catalysts that are presently used in electrolyzers, the devices that convert direct electric current harnessed by solar panels into fuels, are very expensive. We have synthesized, patented and licensed a catalyst process that will be nearly as efficient as the current standard and is comprised of elements that are up to 10 million times more abundant in nature, and much less expensive."

Nick Romanenko

Professors Martha Greenblatt and Charles Dismukes

The Rutgers spinel catalyst, $LiCoO_2$ (lithium cobalt oxide), has been licensed to a large international corporation seeking to use the catalyst to replace IrO_2 (iridium oxide), the most widely used commercial catalyst, said Greenblatt, Rutgers Board of Governors Professor in the Department of Chemistry and Chemical Biology. Electrolyzers are used to separate hydrogen and oxygen from water via electrolysis, consuming electricity to make fuels.

"In theory," Dismukes said, "we will be able to build electrolyzers that will be much more energy efficient because the spinel catalysts can be used at much higher concentrations, thus reducing the amount of electricity consumed and waste heat generated. We envision electrolyzers that will be so cost-effective they are disposable. Capital and operating expenses will decrease significantly because electrolyzer design can be greatly simplified."

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Rutgers, The State University of New Jersey
610 Taylor Road
Piscataway, NJ 08854

For questions or suggestions, please contact:

Roger A. Jones, Chair
Phone: 732/445-1554
Email: chemchair@rutgers.edu
Web: chem.rutgers.edu

Coordinators: Karen Fowler and Kristina Wetter
Faculty Liaisons: Kathryn Uhrich and Eric Garfunkel
Writer/Editor: Fred Feiner

RUTGERS

An Action Packed Year for Rutgers & CCB

Welcome to the Winter 2013 edition of Chemistry & Chemical Biology (CCB) News! It has been an exciting start to the school year for both the department and the university.

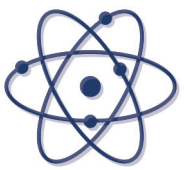
The university has welcomed a new President, Robert L. Barchi—a renowned neuroscientist, respected educator and academic innovator, and successful fundraiser. Prior to joining Rutgers, Dr. Barchi served as president of Thomas Jefferson University, and previously as provost of the University of Pennsylvania. We wish Dr. Barchi great success as the university's 20th president and look forward to working together as we advance the CCB research and education programs that are so vital to the future of New Jersey's economy and some of the region's largest and most important companies.

On Election Day, New Jersey voters approved a $750 million bond issue that will help fund capital improvements at New Jersey's colleges and universities. We anticipate that part of those funds will be dedicated to a signature science building that will become CCB's new home. The university and donors are required to fund at least 25 percent of the planned $115 million building. Donations are essential for us to bring the building to life, to continue to create scientific and technological breakthroughs in chemistry, and to educate both the industry leaders and technical workforce that are vital to the future of the region.

Another major New Jersey state undertaking that will affect us is the integration of Rutgers with the University of Medicine and Dentistry of New Jersey, which will result in the largest reorganization of New Jersey's university system in decades. For Rutgers, the addition of a medical school is an historic milestone that will result in enhanced prestige, greater access to federal research funding, much closer coordination of CCB's researchers with life science translational and clinical efforts.

Speaking of funding, we are proud to announce that CCB moved into the number one position nationally in federal research grant support for chemistry departments as published in a recent *Chemical & Engineering News* article (see table on page 8). The continued excellence of CCB in gaining federal support for research is a tribute to the superb science that takes place in the department every day.

CCB moved into the number one position nationally in federal research grant support.



In terms of recent research support, Eddy Arnold spearheaded an effort with Ronald Levy, Joseph Marcotrigiano and myself to win a five-year National Institutes of Health grant with an anticipated allocation of $6.3 million. The project is entitled "HIV Macromolecular Interactions and Impact on Viral Evolution of Drug Resistance" and involves researchers from Scripps, Harvard, Pitt, Ohio State, and the NIH. Eddy has also been notified that his NIH Method to Extend Research in Time (MERIT) Award has been extended for a second five-year period (2014-2019). The project title is "HIV-1 reverse transcriptase structure: function, inhibition, and resistance," with a total expected award of $3.8 million. NIH MERIT Awards are an honor bestowed on fewer than 5 percent of investigators.

CCB's reputation as a national leader in cutting-edge grant-funded research continues to grow stronger. Just a few of the many other recent noteworthy grants include: Associate Professor Daniel Seidel, "Development of Strategies for the Functionalization of Amines," NIH, $1.4 million over 5 years; Professor Jean Baum, "NMR Studies of Collagen Model Peptides and their Interactions with Collagen Receptors," NIH, $1.2 million over 4 years; Professor Charles Dismukes, "Photoassembly and Efficiency of Photosynthetic Water and Oxidases: Probing the Catalytic Core Atom by Atom," National Science Foundation (NSF), $350,000 over 3 years; and Professor Gregory Herzog, "Studies of Argon Dating and Cosmogenic Nuclides in Extra-terrestrial Materials," National Aeronautics and Space Administration (NASA), $140,000 over 1 year.

The exciting grant news would not be possible without the support of our stellar CCB administrative team led by Donna Kohl; see story on page 7). In this issue you can also read about:

- Prestigious national awards presented to Jing Li from the Department of Energy C3E Program, and to Alan Goldman from the American Chemical Society's Catalysis Lectureship for the Advancement of Catalytic Science.
- The department's first multi-student foreign exchange program with Jilin University in China.
- Our new Graduate Student Association President Michelle Ouimet.
- An impressive energy catalyst developed by Martha Greenblatt and Charles Dismukes.

These are exciting times for our department. We thank all of you for your support and look forward to a great year for the university and CCB.

Sincerely,
Roger A. Jones
Professor and Chair

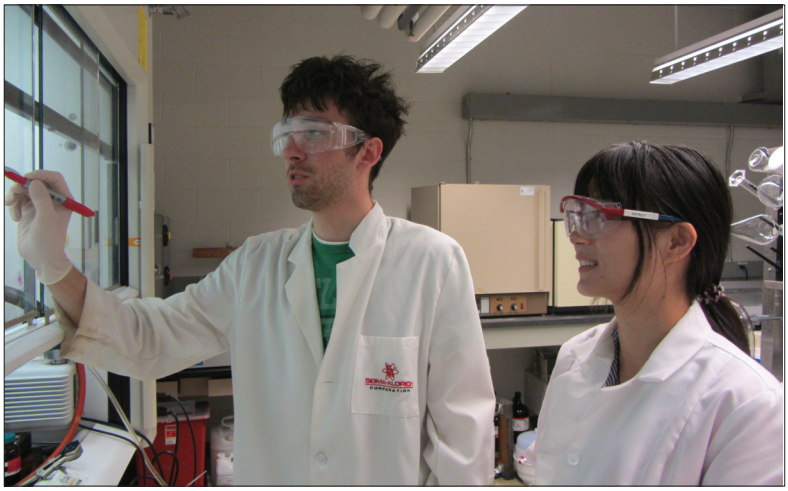
Chinese Students from Jilin University Participate in CCB Exchange Program

When chemistry student Xin Zhang left her home in Heilongjang Province, China to come to Rutgers for six months she was looking forward to her first trip abroad even if her parents were hesitant. Three months into her American adventure Zhang and many of her 19 classmates from Jilin University in Changchun, the first chemistry students to participate in a special student exchange program, were greatly impressed. Many are now considering coming back in the future for graduate study at Rutgers or elsewhere in the U.S.

"I would like to study and live here, but I would have to convince my parents to come visit to see what life is like here," Zhang said. "My mother was very worried about me. She thinks I'm not eating right and dressing warm enough."

Bo Li, a student from Hubei Province, is hoping to complete his chemistry graduate studies in the U.S., but seemed equally interested in the New Jersey beachfront. "I was impressed by the beach," said Li, who had never seen an ocean or a beach before a faculty-sponsored trip to the Jersey Shore in August. "Everyone seemed to enjoy the sunshine and I certainly did too."

"And there were a lot of pretty girls," Zhang added. "He liked that too."



Nick Romanenko

Jilin student Qiuju Liang observes Rutgers Chemistry graduate student mentor Nick Stebbins drawing the structure of the salicylic adipic diacid on the glass of the fume hood.

The 20 Chinese students have been brought to the U.S. as a result of an agreement between the Chemistry department, the Rutgers Program in American Language Studies, and Jilin University's College of Chemistry.

Their first eight weeks at Rutgers focused on developing

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Joseph Potenza Named ACS Fellow

Chemistry Professor Joseph Anthony Potenza has been named a Fellow of the American Chemical Society (ACS), recognizing over 44 years of service to the advancement of chemistry and the education of students. The honor was announced during the organization's Fall Meeting in Philadelphia.

Potenza's career at Rutgers spanned six decades, starting as an Assistant Professor of Chemistry in 1968 and culminating with his retirement as University Professor Emeritus in July. The Piscataway resident also held multiple positions in the Rutgers administration over the years, including Provost and Dean of the Graduate School, Associate Provost for Academic Affairs in the Sciences, and Chairman of the Department of Chemistry.

Andrea Kane

Janet and Joseph Potenza

Professor Jing Li Honored by U.S. Department of Energy Program

Chemistry Professor Jing Li was honored by the U.S. Clean Energy Education and Empowerment (C3E) women's initiative in September with the 2012 U.S. C3E Award for outstanding contribution to scientific research in innovation and technology development. Li was one of six women to be honored by the U.S. Department of Energy led program.

Chris Pedota

Chemistry Professor Jing Li

Li was also recently elected a Fellow of the American Association for the Advancement of Science, a prestigious peer honor.

Li's research interests and activities are primarily in the areas of solid-state inorganic and inorganic-organic hybrid materials that possess interesting and useful properties for clean energy applications. She has led extensive research on developing and advancing rare-earth free white light phosphors, which have the potential to be used as an alternative low-cost and energy-efficient general lighting source.

"The ever-increasing energy demands and the concerns about global warming have underscored the importance of developing high-efficiency light sources to reduce consumption," said Li, a Cranbury resident and mother of two. "Solid-state lighting (SSL) technology in the form of light-emitting diodes (LEDs) can convert electricity into light much more efficiently than conventional lighting sources. It has been predicted that a nationwide move toward SSL for general illumination in the U.S. would reduce electric energy consumption for lighting by roughly 25 percent, saving $120 billion in energy expenses, and reduce CO_2 emissions by 246 million metric tons over the next 20 years. Low-cost and high-efficiency LEDs are being intensely explored, especially white LEDs (WLEDs), which are considered a potential light source to replace conventional incandescent or fluorescent lighting."

Li's most recent research on hybrid white light phosphors was published in the January 2012 issue of *Angewandte Chemie International Edition* and April issue of *Chemistry of Materials*. She has published over 220 scientific papers, including 12 invited reviews.

The U.S. C3E Awards are intended to recognize rising women in clean energy who have demonstrated leadership and high achievement within one of the six award categories and have the potential for significant future contribution. The awards were administered by the MIT Energy Initiative, which recognized each of the awardees with a $10,000 cash prize. The Clean Energy Education and Empowerment (C3E) program, led by the U.S. Department of Energy, is designed to help increase the number of women engaged in clean energy disciplines, from science and academia, to industry, to policy, to advocacy.

Li is a member of the American Chemical Society, the American Association for the Advancement of Science, the Materials Research Society, and Sigma Xi. She has received a number of awards, including the Presidential Faculty Fellow Award; National Science Foundation CAREER Award; Cheung Kong Guest Chair Professor Award from the Ministry of Education of China; Outstanding Achievement Award from the Chinese Association of Science and Technology; and the Board of Trustees Fellowship for Scholarly Excellence from Rutgers University. She is currently an Associate Editor for the *Journal of Solid State Chemistry* and a member of the Editorial Advisory Board of *Crystal Growth and Design*.

GSA Features New Energy, Programs

If Organic Chemistry Ph.D. candidate Michelle Ouimet pursues her polymer research with the enthusiasm and energy of a cheerleader, there's a good reason: before coming to Rutgers three years ago, she could be found on the sidelines as an undergrad at Clemson University.

Today, Ouimet is bringing that energy to the table as the new President of the Chemistry Graduate Student Association (GSA). Ouimet is hoping to reinvigorate the GSA with new programs such as an industrial lecture series with Rutgers' Chemistry alumni. Former GSA President Eric Klauber, a CCB alumnus who works at BASF, started the lecture series in November, discussing the transition from graduate school to industry.

This past summer GSA brought in a career consultant who volunteered his time to meet with students. GSA also held its first tailgate event at the recent homecoming football game that attracted 35 current and former students.

"The career consultant was really valuable for many because he coached us on how to network as we get closer to entering the business world," said Ouimet, a Mount Olive resident. As for GSA activities: "We want to try new and different programs to get a better level of interaction with the graduate student community. A lot of graduate students don't realize what a great school we have and one of the real advantages is the access to industry we are provided through our alumni as well as research collaborations."

This summer, Ouimet got a great taste for those connections—literally. She had an internship with Kraft Foods New Technology Group in Whippany, N.J., which is an integral part of the company's $15 billion gum and candy product portfolio with brands such as Trident, Halls, Stride, Dentyne, Swedish Fish, and Sour Patch Kids. Ouimet interned with a group that drives product innovation with developments such as long lasting taste and flavor changing technologies.

Sabrina Snyder

GSA leadership (from left) are Co-Vice President Allison Faig, President Michelle Ouimet, Treasuer Matt Richers and Co-Vice President Katie Field.

"I was very interested in learning more about rheology, or the flow of matter, and how I could implement that knowledge within my research at Rutgers," said Ouimet, who worked on refining a gum with longer lasting taste. "The Kraft experience was great because it opened me up to the possibilities of working in the food industry. I also picked up some new experiences and skills that I could bring back to my team."

Ouimet is part of the group led by Kathryn Uhrich, Professor and Dean of Mathematical and Physical Sciences at Rutgers, which focuses on the synthesis and characterization of biocompatible polymers for medical and dental applications such as drug delivery and tissue engineering.

"My research focuses on synthesizing, characterizing, and formulating bioactive-containing polymers for cosmetic, personal care, wound-care, and food-based applications," said Ouimet. "I came to Rutgers because I wanted to learn from a world renowned polymer scientist like Kathryn and the experience has just been outstanding in every possible way. My goal has always been to continue learning and to consider new approaches and possibilities and our group really fosters that type of environment."Ouimet, a fellow of both the U.S. Department of Education and the Rutgers' Predoctoral Leadership

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GSA

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Development Institute, has co-authored several journal articles, including "Tunable drug release profiles from salicylate-based poly (anhydride-ester) matrices using small molecule admixtures," recently published in the *Journal of Bioactive and Compatible Polymers*.

Ouimet is particularly interested in hearing from alumni interested in speaking at GSA events. To learn more about the GSA, please contact her at mouimet@rci.rutgers.edu.

Alan Goldman Receives First ACS Catalysis Lectureship

Chemistry Professor Alan Goldman was recently awarded the first American Chemical Society (ACS) Catalysis Lectureship for the Advancement of Catalytic Science, recognizing Goldman's groundbreaking research on the manipulation of hydrocarbons focused on the development of cleaner, more efficient fuels.

Goldman's work is particularly important in the search for cleaner energy. Goldman has conducted extensive research during his 25-year career focused on the conversion of hydrocarbons—organic compounds found in fossil fuels—and other small molecules. Goldman has developed a process to use low value byproducts that may be obtained from coal, natural gas or plants, into a synthetic diesel fuel that is more environmentally friendly than traditional diesel fuel.

"We hope to one day eliminate our dependence on foreign fuels," said Goldman. "The U.S. has 40-times more coal energy than oil, large reserves of natural gas, and many sources of biomass including agricultural byproducts, so if we are successful, the impact could be quite significant. Obviously, a cleaner, more cost-effective fuel supply would produce tremendous economic and environmental benefits."

Goldman's research has contributed to the development of novel catalytic methods for hydrocarbon conversions, which are required to use fossil fuels more efficiently and create sustainable fuel resources. His research has also provided important insights into the fundamental steps underlying hydrocarbon processes, vital to advancing the technology.

Goldman received his Ph.D. from Columbia University and was an IBM Postdoctoral Fellow at the University of Chicago. During his career, he has received many other awards and honors for his research achievements and dedication to science education, including the: Camille and Henry Dreyfus Distinguished New Faculty Award; Union Carbide Innovation Recognition Award; Alfred P. Sloan Fellowship; Camille and Henry Dreyfus Teacher-Scholar Fellowship; Rutgers Board of Trustees Fellowship for Scholarly Excellence; DuPont Aid-to-Education Award; and New Jersey Section of the American Chemical Society Pro Bono Award.

The lectureship is co-sponsored by the ACS Division of Catalysis Science & Technology and the ACS Publications journal *ACS Catalysis*. The ACS Catalysis Lectureship for the Advancement of Catalytic Science honors current groundbreaking research that enables better understanding of the links among the various subdisciplines of catalysis and also advances the field of catalysis as a whole. The lectureship may be awarded to an individual or a collaborative research team.

The inaugural *ACS Catalysis* Lectureship for the Advancement of Catalytic Science was presented at the Fall 2012 ACS National Meeting in Philadelphia. A symposium was held in the Goldman's honor and he received a monetary award.

Nick Romanenko

Chemistry Professor Alan Goldman

'Tis the Season, to be Shopping for Grants

If Black Friday in the retail world is the busiest shopping day of the year, the days leading up to the busy national grants deadlines in September and October probably deserve a name of their own.

Donna Kohl, Chemistry and Chemical Biology Executive Director of Administration, and Bonnie Emigholz, Chemistry Associate Director, don't exactly have customers lining up at their doors in the wee hours of the morning, but the grants process would not be a success without an all hands on deck approach similar to the day after Thanksgiving.

"CCB now ranks number one nationally in federal grants received—over $30 million annually—and while the inspirational work of our faculty drives that process, we are very fortunate to have a very dedicated and knowledgeable administrative staff coordinating the process," said Chemistry Chairman and Professor Roger A. Jones. "We had a record-setting grants season last year and a large part of that success goes to Donna, Bonnie and the administrative team."

Kohl has been with CCB for over 10 years and was directly responsible for the grants process before taking over her current responsibilities in 2007. Emigholz has been with the department for over seven years. Their combined expertise is put to good use when nearly every faculty member is submitting grant requests to the National Science Foundation or the National Institute of Health in September and October.

"Chemistry submits about 80 grant requests to NSF and other agencies every year so the volume of proposals can be significant," said Emigholz, who noted that the staff also coordinates grants for the faculty of the Earth and Planetary Sciences Department (formerly Geology). "Every grants program has different rules and some proposals will get rejected immediately for reasons that boggle the mind—for example the wrong typeface or the wrong margins! Our department is working on very important issues such as curing disease or enabling sustainable energy. We want to make sure the faculty get the resources they need."

Karen Fowler

CCB administrative staff (from left): Bonnie Emigholz, Lydia Haynes, Cynthia Howell, Kristina Wetter and Donna Kohl.

The most recent grants season was a challenge since Emigholz had been on maternity leave until recently with the birth of her third child. As with many CCB projects, the whole department pitched in to ensure a smooth process, particularly Purchasing Manager Lydia Haynes, Business Specialist Cynthia Howell and Senior Administrative Assistant Kristina Wetter.

Kohl and Emigholz advise faculty to plan early for the grants deadline by contacting them at least 30 days before a proposal is due.

"Our goal is to make the process seamless for the faculty," said Kohl. "CCB staff take care of all the administrative work for the faculty because we are a full-service department. The researchers should only concern themselves with the science of any proposal and leave us to worry about the rest. Even if faculty members don't have all the creative scientific ideas of a proposal worked out until the last day, we encourage them to contact us early with all the other information so we can be proposal ready when the science is finalized."

Proposals can be anywhere from 10 to 200 pages in length, with the administrative and budgeting components usually more than 50% of the proposal.

Kohl notes that the administrative staff's work doesn't end when the proposal is filed or even when the grant award is received. With many of CCB's approximately 300 employees paid from the resources of grants, the staff has extensive post-award responsibilities.

"Ten years ago our department received about $8 million annually in grants and now that number is more than $30 million," Kohl said. "As the saying goes, 'the devil is in the details,' and we want to make sure the department maximizes the resources provided through the grants. From coordinating the payroll to communicating with Purchasing and other departments, it's a rather large undertaking to ensure the most efficient use of resources."

"We had a record-setting grants season last year and a large part of that success goes to Donna, Bonnie and the administrative team."

SCHOOLS WITH MOST FEDERAL SUPPORT FOR CHEMICAL R&D

Many institutions saw big leaps in federal funding from 2009

RANK									ANNUAL CHANGE	
2010	2009	$ THOUSANDS	2000	2006	2007	2008	2009	2010	2009–10	2000–10
1	3	Rutgers, State U of New Jersey	$8,071	$17,695	$16,696	$16,937	$25,693	$29,115	13.3%	13.7%
2	2	California Inst. of Technology	12,866	28,662	28,822	22,279	26,065	27,019	3.7	7.7
3	1	Massachusetts Inst. ofTechnology	16,690	16,004	18,449	21,539	27,379	24,206	-11.6	3.8
4	8	U of North Carolina, Chapel Hill	7,556	15,757	16,263	19,650	18,419	23,240	26.2	11.9
5	4	U of Illinois, Urbana-Champaign	10,294	16,496	19,674	20,495	21,340	22,576	5.8	8.2
6	5	Harvard U	14,788	31,683	25,629	21,183	19,649	22,544	14.7	4.3
7	7	U of California, San Diego	7,251	17,451	19,701	15,582	18,490	21,626	17.0	11.5
8	6	U of Washington, Seattle	6,493	15,243	15,592	16,955	18,504	20,609	11.4	12.2
9	9	U of Colorado	10,281	16,842	15,084	15,892	18,387	20,429	11.1	7.1
10	11	Northwestern U	8,865	13,767	14,785	13,645	17,260	19,713	14.2	8.3
		Total, first 10 institutions	**$103,155**	**$189,600**	**$190,695**	**$184,157**	**$211,186**	**$231,077**	**9.4%**	**8.4%**
11	20	Stanford U	10,973	12,970	13,052	15,695	13,209	19,361	46.6	5.8
12	10	Johns Hopkins U[a]	12,217	11,875	15,787	18,101	17,804	17,869	0.4	3.9
13	12	U of California, Berkeley	15,774	19,891	19,561	18,241	16,861	16,987	0.7	0.7
14	27	U of Arizona	7,265	10,235	10,630	10,646	10,857	16,771	54.5	8.7
15	17	Purdue U	6,958	9,604	12,721	15,069	13,680	16,583	21.2	9.1
16	13	U of California, Los Angeles	10,432	13,491	17,123	16,025	15,346	16,429	7.1	4.6
17	19	U of Michigan	7,317	12,962	11,371	12,573	13,349	15,923	19.3	8.1
18	18	Georgia Inst. of Technology	4,127	10,360	11,260	12,387	13,625	15,449	13.4	14.1
19	14	U of Texas, Austin	5,749	15,163	14,173	15,124	14,474	14,891	2.9	10.0
20	21	U of Wisconsin, Madison	8,094	11,624	10,230	10,733	12,736	14,694	15.4	6.1
		Total, first 20 institutions	**$192,061**	**$317,775**	**$326,603**	**$328,751**	**$353,127**	**$396,034**	**12.2%**	**7.5%**
21	54	U of Massachusetts, Amherst	5,667	4,004	3,100	4,838	6,153	14,507	135.8	9.9
22	16	Cornell U	9,103	14,528	11,387	12,256	13,732	14,493	5.5	4.8
23	15	U of Pennsylvania	11,992	14,892	12,182	13,026	13,745	14,177	3.1	1.7
24	22	Pennsylvania State U	9,797	12,082	10,184	12,547	12,371	14,154	14.4	3.7
25	34	U of South Carolina	5,826	5,900	5,901	8,653	9,085	13,754	51.4	9.0
26	24	Vanderbilt U	2,910	6,014	6,940	7,604	12,093	13,703	13.3	16.8
27	25	U of California, Irvine	6,979	10,901	11,227	10,638	11,190	12,651	13.1	6.1
28	42	Montana State U, Bozeman	2,869	5,629	6,006	8,000	7,572	12,523	65.4	15.9
29	28	U of Chicago	6,519	7,792	8,805	9,107	10,539	12,199	15.8	6.5
30	41	U of Kansas	4,725	4,965	4,311	5,205	7,680	11,875	54.6	9.7
		Total, first 30 institutions	**$258,448**	**$404,482**	**$406,646**	**$420,625**	**$457,287**	**$530,070**	**15.9%**	**7.4%**
31	26	U of Utah	7,172	10,130	9,963	10,095	11,188	11,205	0.2	4.6
32	23	U of California, San Francisco	9,033	19,962	15,957	14,982	12,158	10,880	-10.5	1.9
33	31	Texas A&M U	6,986	10,098	10,219	8,047	9,886	10,438	5.6	4.1
34	46	Columbia U	6,747	7,167	6,298	5,961	7,108	10,433	46.8	4.5
35	33	Ohio State U	5,529	7,916	7,924	9,465	9,662	10,317	6.8	6.4
36	29	U of Puerto Rico, Río Piedras	1,400	10,779	10,978	15,740	10,230	10,173	-0.6	21.9
37	30	U of Pittsburgh	6,436	10,037	10,437	11,547	10,180	10,043	-1.3	4.6
38	40	Arizona State U, Tempe	4,304	8,886	8,303	7,787	8,139	10,004	22.9	8.8
39	32	U of Southern Mississippi	2,861	6,991	9,376	9,075	9,765	9,519	-2.5	12.8
40	39	U of California, Davis	4,752	6,908	6,360	7,317	8,160	9,467	16.0	7.1
		Total, first 40 institutions	**$313,668**	**$503,356**	**$502,461**	**$520,641**	**$553,763**	**$632,549**	**14.2%**	**7.3%**
41	35	U of Florida	6,088	9,237	8,580	8,060	8,794	9,397	6.9	4.4
42	37	U of Minnesota	6,122	10,014	7,643	7,639	8,501	9,333	9.8	4.3
43	44	Virginia Tech	3,435	6,015	7,360	6,071	7,138	8,959	25.5	10.1
44	52	Boston U	2,070	3,375	3,843	6,267	6,201	8,838	42.5	15.6
45	36	Indiana U	5,988	6,494	5,642	6,603	8,647	8,742	1.1	3.9
46	70	U of California, Santa Barbara	4,946	6,088	3,223	4,469	4,516	8,717	93.0	5.8
47	55	State U of New York, Stony Brook	4,773	6,094	6,349	5,716	6,077	8,695	43.1	6.2
48	50	New York U	2,068	4,886	4,482	5,882	6,326	8,309	31.3	14.9
49	45	Emory U	4,917	8,127	7,344	6,154	7,120	8,056	13.1	5.1
50	51	U of Southern California	5,762	4,915	5,566	6,455	6,288	7,838	24.7	3.1
		Total, first 50 institutions	**$359,837**	**$568,601**	**$562,493**	**$583,957**	**$623,371**	**$719,433**	**15.4%**	**7.2%**
		TOTAL, ALL INSTITUTIONS	$631,606	$968,134	$975,723	$992,275	$1,037,432	$1,201,243	15.8%	6.6%

NOTE: Institutional fiscal years. School ranks in 2009 revised to reflect revision of Louisiana State U data. **a** Includes funding for the Applied Physics Lab.
SOURCE: National Science Foundation, WebCASPAR Database System

Alumni Join Chemistry in Philadelphia at ACS

The Chemistry and Chemical Biology Department sponsored an alumni reception at the 2012 Fall National Meeting of the American Chemical Society (ACS), attracting graduates from across the country, some who travelled to the conference just for the Rutgers program.

The event, held at the posh Le Meridien Hotel in Philadelphia, was a successful follow-up to the department's first alumni event held at the ACS 2012 Winter Meeting in Denver, organized by one of our leading alumni, Suresh Damle, a retiree of PPG Industries. Suresh and his colleagues also joined us in Philadelphia. Suresh's commitment to the future of CCB and to strengthening the relationships between alumni, faculty and students was self-evident.

Alumni had the opportunity to hear department and university updates from CCB faculty members Kathryn Uhrich (also Rutgers Dean of Mathematical & Physical Sciences) and Eric Garfunkel. Attendees learned about the department's plans for a new state-of-the-art chemistry building to be built on the Busch Campus.

To learn about the fundraising campaign CCB has launched to support the new building, please send us an email at chemchair@rutgers.edu or call (732) 445-1554.

DISMUKES, GREENBLATT

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Earlier this year, the $LiCoO_2$ catalyst for oxygen evolution reaction (OER) was described in an article published in *Angewandte Chemie International* by Dismukes, Greenblatt and colleagues. The catalyst was recently tested at the Joint Center for Artificial Photosynthesis (JCAP), the nation's largest research program dedicated to the development of an artificial solar-fuel generation technology. Established in 2010 by the U.S. Department of Energy, JCAP is led by the California Institute of Technology and aims to find a cost-effective method to produce fuels using only sunlight, water, and carbon dioxide as inputs.

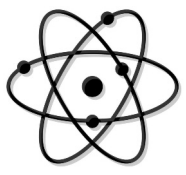
"$LiCoO_2$ is arguably one of the most effective, if not the best OER catalyst presently," said Greenblatt. "Nevertheless, we continue our research to discover new materials that are abundant, inexpensive and environmentally green, and highly efficient catalysts for splitting water into oxygen and hydrogen."

"We are very encouraged by the research because it has the potential to change the way electrical energy is stored and recovered—in covalent chemical bonds rather than charged ions or batteries," said Dismukes, a Rutgers faculty member in Chemistry and Chemical Biology, the Waksman Institute of Microbiology, and Biochemistry and Microbiology. "This step will require a new design of a low-cost electrolyzer that can work with these catalysts. This advance could be applied to both electrolytic energy storage—using solar or wind electricity—and renewable hydrogen generation. For example, as a replacement for batteries, this technology could help solve the energy storage problem that limits the adoption of solar panels. Also, hydrogen derived from water means a source of clean fuel that is both renewable and sustainable."

The recent licensure of the $LiCoO_2$ catalyst is Dismukes' and Greenblatt's latest opportunity to translate their fundamental research into a commercial application in collaboration with an industrial sponsor. The researchers have also worked with other corporate partners such as BASF to explore other applications of these materials. Additionally, Dismukes said Rutgers is a founding member of a new investigator consortium called the Solar Fuels Institute (SOFI), which hopes to accelerate the pace of technological advances needed to transition to solar produced fuels.

"Solar energy has become more attainable for property owners, but the challenge is producing a cost-effective process that results in mass production of renewable electricity," said Dismukes. "We are committed to working with colleagues worldwide to find solutions that ensure cleaner energy for future generations."

$LiCoO_2$ is arguably one of the most effective, if not the best OER catalyst presently.



STUDENT AWARDS

SPRING 2012
Undergraduate Awards

CRODA AWARDS: Presented for outstanding undergraduate activities. For excellence in General Chemistry, **Victor Hernandez, David Rehe, Kelley Steitz, and Jeffrey Yang;** for Outstanding Sophomore/Chemistry Major, Excellence in Organic Chemistry, **Brian A. Chang** and **Meera P. Trivedi;** for Outstanding Junior, Excellence in Organic Chemistry Laboratory, **Jimmy Patel**.

COURSEWORK AWARDS: Mark Leste V. Quilon and **Justin W. Marson** received The Rufus Kleinhans Award for Excellence in General Chemistry.

Precious O. Tabansi received The Roger Sweet Award for Excellence in Organic Chemistry.

Jessalyn A. Devine received The Phyllis Dunbar Award for Excellence in Physical Chemistry.

Sarah A. Goodman received the ACS Inorganic Division Award for Excellence in Inorganic Chemistry.

JILIN UNIVERSITY

continued from page 3

writing, speaking and listening skills in English, which many of the students had been studying in China for the last 10 years. The remaining time at Rutgers is primarily focused on chemistry course and lab work.

"Our English has improved greatly since we arrived," said Ling Ling Liu, a Jilin student from Heilongjang Province. "We met people from many different countries in our English classes and have learned about many different cultures."

Professor John Brennan, Vice Chair of the CCB Undergraduate Program, manages the students' chemistry experience with Professor Eric Garfunkel.

"Colleges and universities throughout the U.S. are globalizing their educational programs," said Brennan. "Jilin University is a good match for us because they are our primary 'sister school' in China, and are one of the five strongest chemistry education and research programs in China. Our goals are to offer the students an excellent research and education experience, help them develop their English skills, and open them up to the possibility of studying or working abroad in the future."

Jilin University's Professor Guangsheng Pang noted that the program is valuable for both the students and the universities.

"I think it's a great opportunity for some of our leading students to study in a new environment and to gain confidence while strengthening their scientific and language skills," said Pang. "The students will experience a different academic atmosphere and culture. It's a transformational learning experience that allows the students to develop a fresh perspective both in science and on international issues."

Over the last 18 months, seven Rutgers faculty members have visited Jilin University to help design the student exchange program. Former Jilin University President and Chemistry Professor Tang Aoqing helped initiate a cooperative relationship with Rutgers some 30 years ago, but the new program represents the first formal chemistry student exchange between the universities. The students, the top 20 among 250 senior chemistry undergraduates at Jilin, are supported both in China and the U.S. by a fund established in China in Prof. Tang's memory.

"Starting with this exchange of students, we are opening a new era for the relationship between Rutgers and Jilin," said Pang. "We look forward to strengthening our collaboration on research initiatives, and increasing opportunities for the exchange of students in both directions at the undergraduate, graduate and postdoctoral levels."

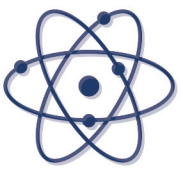
Since 1984, Garfunkel, the immediate past Chair of Chemistry, has been visiting China, where he has a long term relationship as a visiting professor at Fudan University in Shanghai. Three Chemistry faculty members of Chinese descent—Kuang-Yu Chen, Jing Li and Xumu Zhang—have also been actively involved in promoting student exchanges and joint research initiatives. They all emphasize the importance of continuing to build a strong relationship with leading universities in China such as Jilin.

"We hope to reciprocate by sending Rutgers students to Jilin in the very near future," Garfunkel said. "Jilin University is a very strong partner for the Rutgers Chemistry Department and together we can offer both Chinese and U.S. students an exceptional educational and cultural experience."

The partnership seems to be producing results already.

"We understand chemistry, but Chinese people often have a different way of thinking about things," said Qiuju Liang, a student from Jilin Province. "We are learning more about the scientific process and how to analyze things from beginning to end, and at the same time we are becoming more independent."

Starting with this exchange of students, we are opening a new era for the relationship between Rutgers and Jilin.



Byungkoo Park received the ACS Analytical Division Award for Excellence in Instrumental Analysis.

Patrick L. Kramer received The Hypercube Award for Excellence in Chemical Physics.

Aaron X. Sun received The Ning Moeller Award for Outstanding Academic Achievement for a Chemistry Major in the Junior Year.

Monica A. Hajduk received The Merck Award for General Academic Excellence and Research.

Timothy J. Susko received the Bruce Garth Award for general academic excellence and research.

Kristen M. Reale received the Van Dyke Award for Academic Excellence and Research in Chemistry.

Gina S. Chang, Kevin Lu, Patrick Rogler, and **Stephen L. Zieminski** received the Chemistry and Chemical Biology Department Undergraduate Service Award presented to a Chemistry major with a strong record of participation, outreach, and departmental service.

CHEMICAL RESOURCES AWARDS BY PAUL KEIMIG: **Jessalyn A. Devine, Sarah A. Goodman, Kareem J. Holligan,** and **Diana X. Sun** received the Chemical Resources Award for Distinction in Research.

Jon Ahn, Patrick L. Kramer, Albin A. Mammen, Aaron L. Petronico, and **Chun M. Tong** received the Chemical Resources Award for Highest Distinction in Research.

CHEMDOODLE AWARD DONATED BY KEVIN J.THEISEN: **James Huynh, Alex Lo,** and **Mohammed Malik** received the Chemdoodle Award for Excellence in computational chemistry and informatics.

CHEMISTRY SOCIETY OUTREACH PROGRAM: The following students were recognized for their participation in the Outreach Activities of the Rutgers University Chemistry Society: **Mina Aknouk, Denisse Arevalo, Kristina Carney, Walter R. Drake, Andrea Fawzy, David Figueroa, Frank P. Fumo, Marielle Jamgochian, Prabhdeep Kaur, Jayswinder Kaur, Adam Kornmehl, Yung-Jae Lee, Helen Lopez, Kevin Lu, Sandra Ministro, Apexa Modi, Valerie S. O'Besso, Agnesa Redere, Jennifer Redona, Maria Riego, Bryant M. Ruano, Melissa Valarezo, Samantha S. Vidal,** and **Aileen Zaydel.**

CHEMISTRY 499 INTRODUCTION TO TEACHING CHEMISTRY LAB: The following students were recognized for their contribution to the department in the teaching of a freshman chemistry lab: **Monika A. Hajduk, Alvin A. Mammen, Jimmy Patel, Tejas U. Shah,** and **Aaron X. Sun.**

GRADUATE AWARDS WINTER 2011

REID AWARD
Mingxi Chang
Fuguo Jiang
Mojgan Roushan
Junling Sun
David Wang

VAN DYKE AWARD FOR EXCELLENCE IN RESEARCH
Deepankar Das
Kexuan Huang
Roselin Rosario-Meléndez

KRISHNAMURTHY AWARD FOR OUTSTANDING PAPER OR THESIS IN SYNTHETIC ORGANIC CHEMISTRY
Hiyun Kim

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DEGREES CONFERRED

OCTOBER 2011

M.S.
Rebecca Allison
Lynn Callison
Yu-Chu Chen
Jennifer Inghrim

PH.D.
Princy Abraham
Joseph Cusick
Chandrakanta De
Roberto Delgado
Tatiana Fadeeva
Eric Klauber
Min Liu
Sanhita Pramanik
Nirmala Shankar

JANUARY 2012

B.A.
Joseph Cioffi
Amy Deighan
Spandan Desai
Nicholas Ewankov
Katherine Koh
Cristina Lattarulo
Michael Lee
Xavier O'Connell
Christine Perez
Aaron Petronico
Maia Saito
Nikolai Streltsov
Shaotang Yuan

PH.D.
Xianglan He
Hiyun Kim
Maria Hanshella Magno

MAY 2012

B.A.
Jon Ahn
Isita Amin
John Balaes
Jinwhan Cha
Sohyung Choe
Daniel Coiro
Benjamin Deibert
Ashley Dye
Christopher Esposito
Lee Eunsol
Shanice Grant
Gregory Guadagno
Nancy Guillaume
Monika Hajduk
Benjamin Ho
Matthew Hueston
Kathleen Jillions
Kyle Kramer
Patrick Kramer
Ilona Litvak
Albin Mammen
Zachary Maron
Nicole Masiuk
Christopher Michals
Michael Moken
Emily Nering
Byungkyoo Park
Patrick Rogler
Tejas Shah
Rowena Simmons
Timothy Susko
Chun Tong
Craig Zelazny

M.S.
Matthew Laughland
Robin Lefkowitz

OCTOBER 2012

M.S.
Sergey Buryachok
Shraboni Ghoshal
Kevin A. Memoli
Laura A. O'Grady
Nicholas Rue
Zhexun Sun
Sisi Zhang

PH.D.
Erkan Z. Ciftlikli
Sayantani Das
Wojciech Jankowski
Lijuan Kang
James J. Lallo
Heather Y. Lee
Kai Liu
Anna Michelson
Alexander L. Reznichenko
Mojgan Roushan

AWARDS

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RIEMAN AWARD FOR OUTSTANDING ACCOMPLISHMENTS AS A TA
James Lallo
Nisha Mittal
Prasad Subramaniam

CHEMISTRY 171 EXCELLENCE IN TEACHING AWARD
Aleksandra Biedron

CHEMISTRY SERVICE AWARD
David Laviska

SPRING 2012

DEAN'S RESEARCH AWARD
Fuguo Jiang

CHINESE GOVERNMENT AWARD FOR OUTSTANDING SELF-FINANCED STUDENTS ABROAD IN 2011
Fuguo Jiang

WINTER 2012

REID AWARD
Mu Chen
Rafael da Silva
Michael C. Haibach
Nisha Mittal
Rojita Sharma
Haohan Wu

THOMAS REID FELLOW
Michael C. Haibach

VAN DYKE AWARD FOR EXCELLENCE IN RESEARCH
Graeme P. Gardner
Jason D. Hackenberg
Lijuan Kang

KRISHNAMURTHY AWARD FOR OUTSTANDING PAPER OR THESIS IN SYNTHETIC ORGANIC CHEMISTRY
Longle Ma

STANLEY MANDELES GRADUATE AWARD
Mu Chen
Anand Ramanthan
Lijuan Kang

RIEMAN AWARD FOR OUTSTANDING ACCOMPLISHMENTS AS A TA
Roselin Rosario-Melendez
Birju P. Shah
Aniruddh P. Solanki
Nicholas D. Stebbins

Honorable Mention
Hiep N. Nguyen
Prasad Subramaniam
Robert Young
Libing Yu

CHEMISTRY 171 EXCELLENCE IN TEACHING AWARD
Allison M. Faig
Jacqueline R. Sikora

CHEMISTRY SERVICE AWARD
Kathleen D. Field
Michelle A. Ouimet

RUTGERS
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Rutgers, The State University of New Jersey
610 Taylor Road
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